The London School of Economics and Political Science

Choice Architecture 2.0
Can we use reflection in nudges to promote climate citizenship?

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Declaration

I certify that the thesis I have presented for examination for the PhD degree of the London School of Economics and Political Science is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it). The copyright of this thesis rests with the author. Quotation from it is permitted, provided that full acknowledgement is made. This thesis may not be reproduced without my prior written consent. I warrant that this authorisation does not, to the best of my belief, infringe the rights of any third party.

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Statement of co–authored work

I confirm that chapter 3 was jointly written with Professor Peter John. I was primarily responsible for writing section 3.3–section 3.7, with supervisory inputs from Peter John for this and other sections. I also confirm that section 1.1 is adapted from jointly written work with Professor Peter John. I confirm that I have received supervisory inputs from Professor Susana Mourato, Professor Peter John and Dr Matteo M Galizzi in all chapters of this thesis. I confirm that data used in experiment–II has been jointly collected with Mr. Julien Picard.

Statement of prior publication

A version of chapter 2 was published as a book chapter (see Banerjee (2021)) and a version of chapter 3 was published as an article (see Banerjee and John (2021)). A version of chapter 4 is currently under review and is available as a pre-print (see Banerjee et al. (2022a)).

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Abstract

A nudge in the right direction has helped us improve our behaviours towards better health, wealth, and happiness (Thaler and Sunstein, 2008). Nudges have been increasingly deployed to deliver climate policies in the last decade (Orlove et al., 2020). But recent evidence shows nudges are hard to scale–up (Löschel et al., 2020; Beshears and Kosowsky, 2020; DellaVigna and Linos, 2022; Mertens et al., 2022). So can we use nudges more effectively, or should we rely on other tools of behaviour change? In this thesis, I claim that reflective strategies can enhance nudges by encouraging agency and ownership in citizens. I discuss the need for behaviour change interventions to step–up to big environmental problems of our age, like climate change, in chapter 1. Then, I review the toolkit of behavioural public policy in chapter 2. I show there is more to behaviour change than nudging. Behaviour change interventions like thinks and boosts also lie at the origin of the behavioural policy cube, as conceived by Oliver (2017). In chapter 3, I outline a new behavioural toolkit, nudge+. Nudge+ builds on recent work combining heuristics and deliberation. It may be used to design pro-social interventions that help preserve the autonomy of the agent. The argument turns on seminal work on dual systems, which presents a subtler relationship between fast and slow thinking than commonly assumed in the classic literature in behavioural public policy. I review classic and recent work on dual processes to show that a hybrid is more plausible than the default interventionist or parallel competitive framework. I define nudge+, set out what reflection could entail, provide examples, outline causal mechanisms, and draw testable implications. I test these claims of nudge+ using two online, survey experiments in chapter 4. In the first experiment, I systematically compare nudges to reflective toolkits like thinks, boosts, and nudge+ over orders of low-carbon meals with 3,074 participants in the United Kingdom. I find all behavioural toolkits increase intentions for climate-friendly diets, but encouraging reflection prior to nudging ("nudge+") strengthens these treatment effects by 30%. In the second experiment, I re–test these claims with another 5,552 participants in England. I show that nudge+ almost doubles the effectiveness of the nudge. There is also evidence that nudge+ promotes positive behavioural spillovers, as it increases donations to pro-social charities by 20% or more, compared to the nudge. In chapter 5, I summarise these contributions of nudge+ to environmental and behavioural economics, and discuss avenues for new research in future. There is potential for reflection in nudges to promote climate citizenship.

Contents

List of Figures

List of Tables

Preface

Exhibit A. As a child, I was very fond of my grandfather, my mum's dad. He had an overgenerous, loving disposition towards me. Possibly, that explained why he was my favourite! He taught chemistry to high school graduates. During my holidays, when I would visit him and my grandmother, he would often take me to his school and let me sit in some of his classes. I would listen keenly to everything he had to say. He had over thirty years of teaching experience, my mum would tell me. And I could see his charismatic appeal to students. Then one day, one of his students asked him about changing atmospheric compositions by human–led activities (I think the student was referring to the "Ozone depletion"). Being a chemistry teacher that he was, grandpa quickly explained the science behind it, and how the ban of the chlorofluorocarbons by the "Montreal Protocol" was helping us repair it. That day on our way back home, I had lots of questions about it for him. He told me humans do bad things to the environment, they simply do not care about it. It raised a lot of questions for my little self. Some I would not know the answers to for a while. But not all of what he said was true. We do care. And we can also do good things for the environment, only if we think about them. I will convince you through this thesis.

Exhibit B. It was the fall of 2016. I was an undergraduate student of Economics in India, completing my second year of university education. I had just completed a module in Environmental Economics taught by Professor Joyashree Roy. I found it quite interesting. It was possibly the best module I had taken after Economic History. Then it was time to apply for a Masters degree. So I went around asking some of my favourite professors if I should read for an MSc in Environmental Economics. Most of them advised against it. They said, it would be hard to do something meaningful afterwards. Except Professor Roy. She encouraged me to apply. Naturally, I thought she would be biased, after all she was an (environmental) economist herself. But I liked the module. So I decided to take her advice and take the plunge. Five years later, here I am! It was a good decision. I have realised environmental economists, particularly behaviourists like me, can change how people

think about the environment and act towards it.

We face an increasing number of environmental problems in the 21^{st} century. Who would have thought really that after thousands of years of growth and development, humanity will fail to take sufficient care of our planet, one that has been ever so giving to us. It is nothing short of shameful. And to top it all up, we simply make more and more global problems, concocted from the unlimited expanse of our desires, that need concerted efforts across a range of fields. There is an overarching need for us to change our lifestyles and behaviours if we want to survive as a species. Yet in trying to do this, we find ourselves trapped in our inability to act, begging our politicians to assume responsibility and then steer us towards what we think our desired outcomes should be. Most of these problems translate into sub-optimal states for our society, as an economist (like me) would say. We could have done better, and we know we need to do better, yet when we find ourselves in the position to act, we do not.

Now pause for a minute. Think about the two exhibits. You may ask: what is the relevance of these exhibits in this thesis? And the answer is, not only have these incidents been influential to me, in helping me define and understand my research, but also they explain some of the big environmental problems we face today. These anecdotes point towards the general apathy that we have (or at least we think we have) towards our environment. Both in my grandpa's evaluation of how humans continue to harm the environment, in ways that they do not possibly fathom. Or in the odd wisdom of my former teachers, that studying the economics of environmental regulation might not behold a meaningful future for me.

Our economic activities have increased the amount of carbon in our atmosphere, more than what it can assimilate. This has resulted in changing climate systems. Climate change is a crisis, big enough that it can wipe off humanity from the face of the earth, and I am not exaggerating the risks of climate disasters when I say this. Increasingly citizens globally agree with the risks they face from climate change (Fagan and Huang, 2019), with research over the last four decades showing that we are currently faced with the sixth mass extinction crisis (Wake and Vredenburg, 2008; Ceballos et al., 2015), some of it related to changing climates (Talukder et al., 2022; Urban, 2015; Sirois-Delisle and Kerr, 2018). Only difference from the previous five, this time we have caused it. Our race to extract, produce, and emit is costing us species and biodiversity (Harley, 2011), and it might not be long before it is our turn to disappear—forever. We might not want to hear of our inevitable doomsday, given where we are headed, but it will be naïve of us to even turn a blind eye to the consequences of climate change and our actions, things we see happening

around us almost every day now: destructive weather patterns, forest fires, flooding and desertification, which then have knock on effects on other activities, such as migration and war. I remember during my graduate studies at the LSE, I was sitting in a class on the *economics and science of climate change*. Professor Simon Dietz was speaking about how climate change might have been a stressor to cause one of the biggest humanitarian crises we have seen: the Syrian War (Gleick, 2014; Kelley et al., 2015; Selby et al., 2017). It was distressing to hear. How is it that all of this has to do with our actions and behaviours? And yet if we had a choice to undo this, we would not?

After reading through these problems, it is only natural to feel slightly disorientated (no pressure!). Maybe even question everything we do as humans and be angry at what, why, and how we do things that contribute to these problems. Yet the picture is not as bleak as it seems, for if it was, we would not have made it so far. But that's not to say, we have done enough. The point is, there are these large-scale and intractable public problems that we need to solve, and changing our behaviours can be one way of doing that. In this thesis, I will outline a novel way of changing human behaviours, by engaging citizens in the process of behaviour change. I call it nudge+, a nudge with a bit more of thinking in it, for citizens to step–up to the big environmental (and social) problems of our time.

Chapter 1

Introduction

There is a global urgency to deliver scalable climate policies (Ramanathan et al., 2016), particularly as accelerated climate change renders many existing solutions ineffective (Tollefson, 2022). Over two decades of climate research (IPCC, 2022) has forecasted different future scenarios (O'Neill et al., 2020) of a significantly warmer world (AghaKouchak et al., 2020), enabling social scientists develop optimal policy responses to them. Yet these climate models can be misleading (Stern, 2016), partly due to their failure in accounting for the realism of climate policies, such as the politics of delivering them (Peng et al., 2021) or our behavioural biases in which they are situated (Safarzyńska, 2018). For example, regulatory policies, such as carbon taxes, promise to mitigate emissions (Andrew et al., 2010) but their applications have been limited mostly (Povitkina et al., 2021; Umit and Schaffer, 2020; Carattini et al., 2018) due to a lack of public support towards them (Sommer et al., 2022; Hammerle et al., 2021; Douenne and Fabre, 2020). These shortcomings of traditional economic policies point towards a greater need to engage citizens in the climate dialogue, enabling them to own and drive the process of behaviour change (see Hadden (1994)). But how can we do so effectively?

Citizen–led, bottom up approaches have been suggested to bring people within a democratic policy making frame (Kythreotis et al., 2019). Such softer forms of environmental governance offer us a way to scale up climate action (Steg, 2018), particularly as people become increasingly aware of the perils of climate change (Fagan and Huang, 2019) and are motivated to exercise their goodwill (Hagedorn et al., 2019). But designing such citizen–oriented climate policies require a careful interrogation of the different tools of behaviour change that are at the disposal of governments and policymakers. I do this in the next section, as I briefly review the literature on tools of (environmental) governance in public policy, to inform the

direction that this thesis will take in outlining a new way of engaging citizens with behaviour change processes for building a safer climate. Then, I discuss my plan for the remaining thesis.

1.1 Tools of (environmental) governance

Let's consider what are generally called the tools of governance to help citizens make better decisions. These have been classified in various ways and in quite complicated forms (Elliott, 2002), but where the simplest version was set out by Chris Hood (1983), adapted and modernised later by Hood and Margetts (2007) as the NATO scheme: **N**odality (network tools), **A**uthority (laws and regulation), **T**reasure (finances and taxes), and **O**rganisation (public bureaucracy and agencies) (see also John (2011)). With these resources, governments and other units of political authority can aim to change policy outcomes, using some of these tools in combination with each other to deliver (pareto-) efficient solutions.

These tools have led us a long way to solving many public problems. Early evidence by Oates and Baumol (1975), for example, shows the relevance of these different tools in environmental regulation. Tietenberg (1990) also notes a wider array of these tools, that came to be used in environmental regulation, with an increasing prominence of incentive–based approaches, moving away from authoritarian "command and control" measures. Economic analysis of regulation (Hahn and Tetlock, 2008) was quick to point out that some of these traditional tools to regulate environmental problems did not quite deliver on their theoretical promises (Hahn and Hester, 1989), partly as they did not follow quite the 'textbook model of application' (Hahn, 1989). Increasingly, it was realised that governments can suffer from problems by relying too much on regulatory mechanisms that create resistance and avoidance by those who are the targets of such policies (Fiorino, 1999). Resistance[1], crowding out of public service motivation (Grand, 2010), reduced firm–level competitiveness (Dechezleprêtre and Sato, 2020), and then reactance, as well as lack of engagement with citizens, to name a few. Consequently, there has been the movement to more decentralisation and citizen participation as well as consumer choice and voice (John, 2011, 2013) in environmental governance (Lemos and Agrawal, 2006). It has been realised that most of these tools of governance imply various assumptions about human nature and behaviours baked into them (Schneider and Ingram, 1990) which need to be thought through (see Mullainathan and Thaler (2000)), in particular the information environment of these tools, that is

[1]We have seen a series of protests against carbon taxes, such as in Australia (see Ward (2015)), France (see Douenne and Fabre (2022); Mehleb et al. (2021)) and Sweden (see Ewald et al. (2021))

from the perspective of the individual incentives and norms, so much so that John (2013) indicated that 'all tools are informational now' .

It is here that insights from behavioural economics and psychology (Simon, 1979, 1978, 1976, 1955; Thaler and Shefrin, 1981; Thaler, 1980; Kahneman and Tversky, 1981, 1979) have been proposed to deliver better (environmental[2]) policies by disarming the false assumptions of human rationality (Levitt and List, 2008). Such has been the focus of "behavioural environmental economics" (Lohmann, 2022; Bouma, 2021; Shogren and Taylor, 2020; Shreedhar, 2018; Pollitt and Shaorshadze, 2013; Shogren, 2012; Brekke and Johansson-Stenman, 2008; Koroscil, 1971), for example, a tractable and emerging sub–discipline that evaluates the role of human behavioural anomalies in understanding and responding to global environmental changes (for a review, see Hepburn et al. (2010)). This was partly attributed to the wider revolution in behavioural economics that started in the 1960s, although with prominent antecedents (Oliver, 2017), which led to massive advances in knowledge about why suboptimal outcomes in public policy were linked to the biases of individual that were hard to correct with standard economic tools seeking to change costs and benefits only. These standard tools were part of the NATO framework, especially in its **A**(uthority) and **T**(reasure) letters. What came through as a result of this was a nudge revolution, building on such an idea, with the insight that policymakers can develop a policy toolkit that could get individuals to the point where their own welfare would benefit, and where the state would help individuals achieve better goals but with little effort on their part (Thaler and Sunstein, 2008). Things made even more sense suddenly when the financial markets crashed in 2008! Nudge—the cure to an economist's fetish with the dysfunctional market, an object of (ir)rationality—became the talk of the town (towns rather). Governments quickly lauded this behavioural toolkit (Halpern, 2015), partly to divert the blame on to error-prone citizens. And nudge units started popping up, here, there, everywhere. Today there are more than 200 or more of these units around the world (OECD, 2017). But is that the same as saying, nudges have been very successful? Can they solve all problems, including climate change?

Certainly, one must not denounce the nudge revolution. The idea of a nudge, changing the way choices are presented to people, was novel at the time, immensely successful in changing many human behaviours. Think of defaulting citizens into the right (as judged by the policy maker) choices. Effects were tremendous, as shown by Beshears et al. (2006) for pension contributions. And millions of people, who were opted in to save smartly, went on to increase their savings, pushing average saving rates over five times or higher (Thaler and Benartzi, 2004). There were similar

[2]for a discussion, see for Economic Co-operation and Development (2017)

connotations of defaulting people into greener choices for environmental protection (Sunstein and Reisch, 2014). Nudges were quickly tested across a range of domains such as increasing tax compliance (Kettle et al., 2016), prompting organ donation (Whyte et al., 2012), increasing charitable givings (Goswami and Urminsky, 2016), and more (see Egan (2013)). Their incredible success lent nudges a cost-effective status, favourable to traditional tools (Benartzi et al., 2017), catering widely to citizen's palates (Sunstein, 2017c), albeit only when citizens wanted to be nudged.

But these behavioural insights from nudging also had some limitations. First, studies showed that nudges backfired or failed to work (Willis, 2013), typically when citizens disagreed with the nudger (Sunstein, 2017b; Sunstein et al., 2019). Second, scholars pointed out that nudges could also manipulate (Bovens, 2009; Selinger and Whyte, 2012; Whyte et al., 2012; Hansen and Jespersen, 2013; Schmidt, 2017; Engelen et al., 2018; Schmidt and Engelen, 2020). Third, the generalisability of nudging was questioned amidst growing concerns of non–persistent effects (Brandon et al., 2017; Hummel and Maedche, 2019; Löschel et al., 2020). These shortcomings explain why we are still yet to solve many other problems with the nudge. But if not nudge, then what? How can we continue to account for the behavioural anomalies of citizens, cost–effectively in ways that will change their behaviours *for good*? This leads me to the first research question that I will investigate in this thesis.

Research Question 1: What alternative forms of behaviour change can empower humans to engage in welfare–improving, pro–social behaviours?

1.2 Nudges that can step-up for the environment

Early applications of nudging (Thaler and Sunstein, 2003, 2008), rendered its attention to regulating internalities (Allcott and Sunstein, 2015). Such internalities were individual decisions that failed to maximise personal welfare, often also deduced as irrational behaviours. But increasingly nudges were targeted also at pro–social behaviours, individual actions which could improve social welfare, such as better forms of climate citizenship (Carlsson et al., 2021). Here, there is growing consensus from economists (Bhargava and Loewenstein, 2015), psychologists (APA, 2022; Nielsen et al., 2021), and climate scientists (Creutzig et al., 2018) to do more, such as to reinforce human agency in behavioural climate policies. But why might it be the case that we cannot rely on existing nudges solely for these problems?

One explanation, for example, is that nudges were not designed to target (negative) externalities (Galle, 2013; Desai, 2011). Externalities arise when individual actions lead to (uncompensated) unanticipated effects on other people. Here we are

concerned with negative externalities, which reduce other people's welfare. When applied to these externalities, nudges can have limited results, as recent evidence suggests (Löschel et al., 2020; Mertens et al., 2022; DellaVigna and Linos, 2022; Chater and Loewenstein, 2022). Another explanation is that the design of a nudge, in how it works, impedes our ability to make more of it. A nudge was traditionally conceptualised[3] to take advantage of our automatic reflexes. Humans were thought to rely on shortcuts ("heuristics"), which led to mistakes ("biases"), a paradigm more formally known as the 'Heuristics and Biases' tradition (Gilovich et al., 2002). In this, a nudge would bypass human limitations by playing on their fast cognition. However, any long–lasting behavioural transformation, like the ones that are needed to build a safe climate, means engaging in collective action (Ostrom, 2010), not something a simple choice architecture can solve. It requires enabling citizens to assume agency and take responsibility, not bypass it with some gimmick in the environmental set-up. The latter can be cost effective when the stakes are low, or when humans engage in a one-shot decision, but it's not ready for the challenge where they are needed to make a series of right decisions. Is it not a bit naïve to think, for example, subjecting adults to climate–friendly food items at eye–level will solve the climate crisis? Sure, it can prompt them to buy it once or twice, but at what cost? Disrespecting their autonomy to accept responsibility? And even then, there is limited evidence that citizens will not override this choice architecture when they visit the same till on another day. As a matter of fact, they might just end up buying more this time, both the climate-friendly and non-friendly items. And that's happened before. Prompting healthier purchase, increased the sale of healthy products, but not at the cost of the unhealthy ones (Kroese et al., 2016). Nudges often risk belittling human capacities in an urge to steer them towards right behaviours, as if people were 'cognitive misers' (Mols et al., 2014).

But critiquing nudges here is not completely justified either. If existing nudges have to step–up to bigger problems, then we need to upgrade them. This is where this thesis proceeds to contribute next. It sets out an agenda to advance nudge theory (Thaler and Sunstein, 2003; Sunstein and Thaler, 2003), without abandoning the current know–how, but by uplifting the status of humans. My arguments do not invalidate the cost–effectiveness of nudges. Instead, my claim of empowering citizens to own their actions and behaviours can help strengthen the effectiveness of nudges. But we need a defensible theory of cognition before we can do this. We also need to find a way to design these interventions. My proposition for this type of a nudge, that invites a participatory approach to nudging, where citizens can reflect on the nudge and engage with it, will be called a nudge+ (Banerjee and John, 2021). This

[3]Recent work on system 2 nudges attempts to overcome this, see Sunstein (2016c)

leads me to the second research question in this thesis.

Research Question 2: How can we effectively upgrade a nudge to a nudge+, to empower citizens to autonomously and reflectively change their behaviours?

But we should be careful in how far we take this claim. Upgrading nudges is not the same as claiming they will solve the climate crisis completely. In the last five years, when I have presented my research, often other scholars have misconstrued my ideas to imply either (a) nudges are our ultimate solution, or (b) they do not work at all in motivating climate–friendly behaviours. Neither have been my claim. And before I motivate nudge+ any further, I would like to clarify these misconceptions. First, the misconception that "nudges are our ultimate solution" to the climate crisis is not true because there is no evidence of any "one–size–fits–all" policy. I acknowledge that are other regulatory tools, pricing or quantity, that will offer substantial social benefits, possibly of the magnitude and scale that we will need for a post–carbon transition. Here we cannot avoid a discussion on carbon taxes and/or emission trading schemes, subject to conditionalities highlighted earlier in this chapter. In fact, some nudges might not be even preferable as complementary toolkits to harder regulation, because they might crowd out support for the latter policies (Hagmann et al., 2019). We are overshadowed by an extreme hype of nudges, but the behavioural toolkit of the policymaker is wider than has been anticipated, and we should acknowledge that.

Second, even if we were able to transform all (bad) human behaviours with nudge+, we would still fall short in our actions to mitigate climate change. Reversing the impacts of climate change, or preventing them, will require, at–par, transformative, large–scale shifts that will continue to redefine many of our existing systems in place (Farmer et al., 2019). Then, the misconception that "nudges do not work at all in motivating climate–friendly behaviours" is not true because there is growing evidence that some green nudges can be effective (Schubert, 2017; Orlove et al., 2020; Carlsson et al., 2021). However, that is not the same to say that they are doing enough. My claim, instead, is that leaving nudges the way they are, to be applied as green nudges, will deny us the chance to make a lasting impact at transforming human behaviours. I will build on this conversation more in the next two chapters as I lay out the groundwork for nudge+ which will empower citizens to be aware and take responsibility of the behaviour change through the nudge.

To summarise this discussion, we must not forget that the hype to the nudge relates to what many early nudge proponents should take the blame for (Chater and Loewenstein, 2022). The popularity of nudges, and their consequential critique, tempted scholars to ever-expand its definition and over glorify its means (see Bristol

(2021)). A nudge started out as a means to alter choice architecture only, one that took advantage of people's unconscious biases passively in gently steering them to better decisions. Nonetheless, we have ended up with "fuzzy" nudges (Selinger and Whyte, 2011), blurring the conceptual undertone to these interventions (Berthet and Ouvrard, 2019). We have realised our mistake and we are moving past this. A start to this has begun already in behavioural public policy and sciences (Oliver, 2013, 2017), albeit not long ago, as practitioners and policymakers have consciously steered away from confounding all behavioural insights to nudges. As we become increasingly aware of the different forms of behavioural regulation, we should embark on tests of what works best, my third and last research question in this thesis.

Research Question 3: What works best in promoting climate citizenship?

In answering this question, it is important for us to acknowledge the boundaries of these toolkits and ask the right questions, come up with a set of evaluative rules to determine what works best and when. We need more testing, not just for nudges (for those there are plenty), but for other tools that have been pitted against nudging, in an attempt to overcome the moral and ethical limitations of (climate) nudges (Siipi and Polaris, 2021). I will contribute to this discussion in chapter 4, where I will systematically test over 14 different behavioural climate policies, spanning over four different toolkits, in two different experiments, with more than 8,500 people in the United Kingdom. And in this journey, I will also discover the merits of nudge+. The ultimate goal of this thesis is to scale–up public policy (Al-Ubaydli et al., 2017, 2021; Chater and Loewenstein, 2022; Banerjee and Mitra, 2022), while retaining nudges for their convenience, yet enabling them to step–up to our bigger problems. Like a software upgrade that was long pending! Something, Thaler and Sunstein should have debugged early on. And attempts to correct nudges were also made, such as with the acknowledgement of "system–2" nudges (Hansen and Jespersen, 2013; Sunstein, 2016c), but they did not quite square the circle.

This thesis is my narrative to the journey of nudge+. It's a journey, by all true means, that I started out on five years back with Susana Mourato, Peter John, and Matteo Galizzi. It is fundamental to my thesis that these developments to make more citizen–oriented climate (public) policies, which is what nudge originally represented, are supported and argued for. It is just that nudging could go further in inviting the citizen into the policy process, to be collaborators, as part of the conversation, so that we can jointly solve these big environmental problems together, to overcome the intractable collective action dilemma and craft appropriate solutions. I will show how we can do this in the next three chapters.

1.3 Thesis plan

In the next chapter, I will tackle the first research question of this thesis, namely, *what alternative forms of behaviour change can empower humans to engage in welfare–improving, pro–social behaviours?* Here, the goal will be to go beyond classic nudges in introducing public policy practitioners and researchers to a wider range of alternative behaviour change interventions like boosts and thinks. This chapter will lay the ground work for a new behavioural framework, called nudge+. It will show that boosts and thinks, much like their classic nudge counterparts, are libertarian, behaviourally informed policies that target people's internalities, and lie at the origin of the behavioural policy cube, as originally conceived by Oliver (2017). This chapter will review these interventions and conclude with the claim that nudge+ can become a truly hybrid strategy, by combining the best of both worlds, reflexive nudges and reflective boosts (or thinks). It is a prelude to a wider agenda of recognising what works best in changing human behaviours and hopes to do so by breaking the false synonymity of behavioural insights with nudging.

Then in chapter 3, I will tackle the second research question, namely, *how can we effectively upgrade a nudge to a nudge+, to empower citizens to autonomously and reflectively change their behaviours?* The chapter will set out the psychological theory of nudge+. In this chapter, I will introduce nudge+ as a modification of the toolkit of behavioural public policy. Nudge+ will incorporate an element of reflection–the plus–into the delivery of a nudge, either blended in or made proximate. It will build on recent work combining heuristics and deliberation, and can be used to design pro-social interventions that help preserve the autonomy of the agent. The argument of nudge+ ultimately will turn on seminal work on dual systems, which will present a subtler relationship between fast and slow thinking than commonly assumed in the classic literature in behavioural public policy. This chapter will review classic and recent work on dual processes to show that a hybrid is more plausible than the default interventionist or parallel competitive framework. My goal will be to define nudge+, set out what reflection could entail, provide examples, outline causal mechanisms, and draw testable implications.

Finally in the last chapter, I will tackle the third and last research question of this thesis, namely, *what works best in promoting climate citizenship?* Here I will set out to test the claims of nudge+. I will to do so in the context of climate–friendly diets, since what we eat contributes substantially to our global emissions, as well as in the United Kingdom (Scarborough et al., 2014; Poore and Nemecek, 2018). Diets give people an opportunity to take ownership of their small yet important daily behaviours, and provides us with the perfect test bed for nudge and nudge+

interventions. This chapter will argue that reflective strategies can enhance nudges by encouraging agency and ownership in citizens. It will start by providing an economic exposition of the psychological framework of nudge+. Then it will validate my claims using two online, survey experiments. In the first experiment, I will systematically test nudges against reflective toolkits like thinks, boosts, and nudge+ over orders of low-carbon meals with 3,074 participants in the United Kingdom. In the second experiment, I will re–test these claims with another 5,552 participants in England. These results show that all behavioural toolkits increase intentions for climate-friendly diets, but encouraging reflection prior to nudging ("nudge+") strengthens these treatment effects. For example, in experiment–I, reflection increases the effectiveness of the green default nudge by 30%, while in experiment–II it almost doubles the effectiveness of the social norms nudge. Engaging in reflection prior to nudging also promotes positive spillovers, as findings in this chapter will show. The chapter will conclude with a call for more tests of nudge+ in the field, and in other behavioural settings that continue to impact our climate, such as food waste, energy, transport, et cetera.

In this thesis, I take a interdisciplinary approach in outlining and evaluating reflective behavioural policies to mitigate climate change. For example, chapter 2 understands and advances the literature on public policy, particularly behavioural public policy, with tools of human behaviour change. Then chapter 3 engages thoroughly with recent developments in social cognitive psychology, particularly dual–process theories, to develop the psychological framework of nudge+. The mechanisation of nudge+ draws heavily on contemporary philosophical discourses that stress on the importance of autonomy and agency of citizens in any process of behaviour change. Finally chapter 4 advances the literature on behavioural–environmental economics by situating the use of this new tool, nudge+, in tackling the climate crisis. I evaluate what works best in promoting climate citizenship through sustainable dietary behaviours. Here the thesis relies on large–scale online survey experiments (Mullinix et al., 2015; Sniderman, 2018; Fuster and Zafar, 2022), and assesses the impact of different (behavioural) climate policies in reducing demand for carbon–intensive diets.

This thesis makes multiple contributions to the literature in environmental economics and behavioural sciences. First and foremost, it puts forward a new form of behaviour change, nudge+ which acknowledges the limitations of nudges, yet retains its know–how in scaling–up behaviour change. Nudge+ proposes an ethical way of delivering lasting behaviour change. These citizen–oriented climate policies will be vital in driving behavioural transformations needed to meet our carbon transition goals (Cinner, 2018). Second, it breaks the synonymity of behavioural

insights with nudging. It acknowledges a much wider policy toolkit that speaks to the agency of citizens (Sanders et al., 2018). Third, it advances conversations on what works best (Hertwig, 2017; Franklin et al., 2019; Bradt, 2019; Krawiec et al., 2021; van Roekel et al., 2022; John et al., 2022), by systematically comparing four different behavioural toolkits in promoting climate citizenship through sustainable dietary behaviours. These experiments deliver generalisable policy insights to a growing food delivery market that can embed reflective prompts in user–engagement platforms to empower customers to make climate–friendly food choices. Fourth, it also advances the causal estimation of behavioural spillover effects (Dolan and Galizzi, 2015; Maki et al., 2019; Alacevich et al., 2021; Picard, 2021). While the success of nudge+ is promising, there remains a lot more to be done in taking this research further and strengthening it.

Chapter 2

There's more to behaviour change than nudging

Abstract: This chapter goes beyond classic nudges in introducing public policy practitioners and researchers to a wider range of alternative behaviour change interventions like boosts and thinks. It lays the ground work for a new behavioural framework, called nudge+. Boosts and thinks, much like their classic nudge counterparts, are libertarian, behaviourally–informed policies which target people's internalities. These policies also lie at the origin of the behavioural policy cube, as originally conceived by Oliver (2017). The chapter reviews these interventions and concludes with the claim that nudge+ can become a truly hybrid strategy, by combining the best of both worlds, reflexive nudges and reflective boosts (or thinks). The chapter is a prelude to a wider agenda of recognising what works best in changing human behaviours and hopes to break the false synonymity of behavioural insights with nudging.

2.1 Introduction

Richard Thaler, in his acceptance speech of the *Sveriges Riksbank* ("Nobel") Prize in Economic Sciences, attributed his success to the discovery of 'the presence of human life in a place not far, far away, where [other] fellow economists thought it did not exist: the economy' (Thaler, 2017). The introduction of *nudge*, as popularised by Thaler and Sunstein (2008) through their eponymous book *Nudge: Improving Decisions about Health, Wealth and Happiness*, revolutionised the toolkit

of a policymaker (see John (2018)). Traditional public policy had largely focused on regulatory tools and campaigns (Hood, 1983; Hood and Margetts, 2007), as discussed in chapter 1. Many of these tools relied on the mistaken belief of a rational human being, referred to as *Homo Econs* in common economic parlance. But humans were found often found to act in ways incoherent to these assumptions, as noted by scholars in psychology and behavioural sciences (Mullainathan and Thaler, 2000). Thus, trying behaviour change in citizens with tools that relied on assumptions of rational behaviour naturally had limitations (Levitt and List, 2008). With nudges, the toolkit of policymakers expanded. Thaler and Sunstein (2008, 2021) proposed a new way of regulating human behaviours by working through people's biases. The nudge could steer humans into making welfare–improving decisions. Thus, began the new age of behavioural regulation.

A nudge, better understood as a change in choice architecture, was conceptually embedded in the framework of libertarian paternalism. Tools of nudging were paternalistic in steering individuals to make better decisions for themselves while being libertarian in preserving their freedom to choose. As such, nudges were quickly thought of as non-coercive interventions that retained all available choice alternatives for decision-making agents; for instance, placing fruits near checkout tills to make them more salient to people would count as a nudge. However, banning chocolates would not. Nudges were neither mandates nor sanctions. They did not provide financial or economic incentives to alter human behaviour. They also did not add new information to aid decision-making processes, more than what was already available. A behaviour change through the nudge was manifested in alterations to our external choice environments. Through these features, nudges were shown to be good value for money as they promised large–scale benefits at relatively small costs to public organisations (Benartzi et al., 2017). The success of nudges was far-reaching. Ever since then, nudging has been shown to help people to save more (Thaler and Benartzi, 2004), reconcile citizens' short– and long–term goals (Goldhaber-Fiebert et al., 2010), improve pro–social behaviours (Zarghamee et al., 2017; Capraro et al., 2019), prime honesty (Martuza et al., 2022; Dunaiev and Khadjavi, 2021; Shu et al., 2012), increase healthy decisions, such as smoking cessation (Giné et al., 2010; Volpp et al., 2009), healthy dietary uptake (Cadario and Chandon, 2020; Rozin et al., 2011) and boosting vaccine uptake (Reñosa et al., 2021), increase college entry (Castleman and Page, 2015, 2013), and more (see Egan (2013)).

Nonetheless, as nudges were extensively prescribed, some scholars critiqued their application. A lot of this criticism was directed at how nudging was designed to work. These tools targeted people's biases and heuristics and often left citizens out of the deliberative process, compromising their ability to own and sustain long–term

behaviour changes. As such, the nudge was deemed to be opaque and manipulative (Bovens, 2009), one that co-opted the internal cognitive processes of individuals by overriding their consent. Interestingly, nudge theorists viewed the policymaker as an omniscient and benevolent central unit that could facilitate a socially beneficial behaviour change. However, little did they acknowledge the shortcomings of reality. There was a chance that social policy planners, in a behavioural world, could be limited by their cognitive abilities as well (Schnellenbach, 2012). Worse, they could be motivated by selfish reasons, engaging in what later came to be known as sludging (Thaler, 2018; Sunstein, 2020). To counter these ethical and moral shortcomings, other behaviour change interventions were proposed as alternatives to the nudge.

John et al. (2009a, 2013, 2020), for instance, put forward the idea of thinks. Unlike nudges that compromised consumer sovereignty, thinks involved large-scale deliberations that could enable citizens own the process of behavioural reforms. Thinks included citizen forums and large–scale behavioural therapies. They were schooling techniques that taught individuals how to become better citizens, by enabling transformations to a 'self-guiding society'(John and Stoker, 2017). However, while thinks were morally superior to nudges, they were also very hard to scale–up. Many thinks failed cost considerations by policymakers (John, 2018), for example, Smith et al. (2013) show that online deliberation leads to positive yet weak preference shifts. Similarly, Strandberg (2015) show not all deliberation leads to positive democratic outcomes. At the same time came along the competing idea of boosts. Boosting recommended updating citizens' 'repertoire of skills' by improving their internal psychological capacities (Grüne-Yanoff and Hertwig, 2016; Hertwig, 2017). Boosts enabled individuals to use mental shortcuts (our so–called "heuristics"), smartly and effectively. For example, improving statistical skills among people to reduce numerical fallacies (Hertwig and Grüne-Yanoff, 2021; Hoffrage et al., 2000). Or enabling people to use better rules that matched their needs (Kozyreva et al., 2020). Boosts were thought to be different than thinks in one aspect. They did not want to simply school citizens. Instead boosts proposed to equip people with tools that enabled them live a smarter (and better) life by making fewer mistakes. But this quickly led to conceptual problems against nudging. Boosts were seemingly proposing new shortcuts for humans. Some proponents believed it was nothing nudges could not already do[1].

Finally, John and Stoker (see (John and Stoker, 2017; John, 2018; John and Stoker, 2019) attempted to reconcile this idea of facilitating greater citizen reflection within the framework of nudging by proposing mini–thinks in nudges. The proposition was to embed thinking in nudging, as a guide for citizens to navigate

[1]for a discussion, see Hertwig and Grüne-Yanoff (2017)

nudges and use them more effectively. These mini–thinks in nudges, taken together as a whole, is what we[2] would call a nudge+. We claim that nudge+ can become a hybrid nudge–think strategy, one that facilitates both types of cognitive processes, fast and slow, in achieving a behaviour change. But before we can do that, we must unpack the nudge, the boost, and the think, to understand the synergies and differences between them. This chapter makes a start to that. It advances the scholarly discourse on nudge theory in behavioural public policy by systematically reviewing these tools. We do so by revisiting the behavioural policy cube proposed by Oliver (2017). We show that nudges, thinks and boosts belong to different psychological camps. Our work is ultimately motivated by the need to familiarise policy practitioners with a wide range of behaviour change interventions that can step–up to big, collective actions of our age, such as climate change. Hopefully, by the end of this chapter, you will be convinced that there is more to behaviour change than nudging.

2.2 The behavioural policy cube and its origins

The last chapter introduced different tools of behaviour change. A prominent way of classifying these tools, regulatory or not, has been though the NATO framework (Hood, 1983; Hood and Margetts, 2007). However, these tools of behavioural regulation often have multiple dimensions that characterise them. In what follows, we will review a three–dimensional classification of behavioural tools, put forward by Oliver (2017) as the behavioural policy cube. Our aim will be to understand the origin of this cube, so we can situate newer forms of regulation such as boosts, thinks, and eventually nudge+ in them.

Policy practitioners often have a choice of many tools when targeting policy problems. The use of these tools depends on the context of the problem at hand, but also pre–dispositions of the social planner. Let's explore this in more detail. Let's assume that Meera works as an official for the Indian government in the department of social care and health policy. Meera, being a public policy practitioner, as part of her first assignment, is tasked to devise a plan that counters excessive smoking among young adults in the country. What can Meera do? Meera knows that she has traditional policy tools at her disposal; for instance, Meera can initiate social campaigns against smoking. However, smoking is a sticky behaviour and Meera understands that there might be socio–cultural connotations associated with smoking. As such, to effectively change behaviours, she is open to other ideas. What else can

[2]The term nudge plus was coined by Gerry Stoker and Peter John. As the idea evolved, we changed it to nudge+. For a discussion, see Banerjee and John (2022)

Meera rely on?

One alternative is to target demand–side contractions by using *shoves*. Meera can use a price regulation such as the imposition of sin taxes on cigarette consumption, or she can seek a smoking ban (in public areas). These regulatory tools are target internalities, and are informed by insights from behavioural economics. For example, altering price or quantity will reduce the cigarette demand in the country. Nonetheless, these policies are paternalistic as they do not respect the smoker's autonomy and agency. Another alternative is to use supply-side contractions, one that targets sellers. An example of such a policy is a *budge*. A budge, for instance, can prevent sellers from adopting tricks that makes smoking, the societal evil, more lucrative.

But let's say, for the sake of argument perhaps, that Meera is a strong libertarian[3]. She prefers maintaining smoker's sovereignty and wants to rely on behavioural measures that preserve their liberty. At the end she realises humans make their own choices and she wants to respect the dignity of smokers. But she also wants to guide them towards quitting. One way of doing this is to use a behavioural intervention, internality–targeting, like a nudge, as discussed before. An example of a nudge in this case is to label cigarette packets to make smoking risks more salient to smokers. Other examples include shortening the length of cigarettes, although, such a policy would need mandates regulating suppliers to begin with. Alternatively, there could be other behavioural measures as well. Alternatively, Meera can decide to use educative strategies to school young adults about the harms of smoking (a "think") or help them learn quick rules to quit smoking (a "boost") as they do in a rehabilitation centre.

What we find in this discussion is that for every policy problem, there are a range of available alternatives, that a policymaker like Meera can choose from. Oliver (2017), in his *Origins of Behavioural Public Policy*, puts forward a framework that helps us in understanding the different legislative tools available to policymakers when faced with a policy challenge. This framework is conceptualised as a policy cube, as shown in Figure 2.1. The policy cube motivates three key features that define a policy. The first feature asks, is an intervention or policy tool informed by the standard axiomatic assumptions of rational economic theory or by behavioural insights from psychology and behavioural science? The second asks, does the policy target internalities or externalities? The third asks, is it regulatory or libertarian in nature? These attributes of a policy can be mapped on to axes of the policy cube namely **ab**, **ac** and **ad**, respectively as indicated in Figure 2.1. We can situate policies

[3]I have thoroughly enjoyed discussions with Adam Oliver about *Who is a libertarian?*. My claims of libertarianism do not match his.

in this three–dimensional space where they are characterised by a combination of all three features.

Consider, for instance, the **ab** axis. Movement along this axis, towards the origin, indicates that a policy is increasingly informed by insights from behavioural economics rather than being driven by assumptions of rationality for the *Homo Econs*. Similarly, as we move along the **ac** axis, towards policies centred at the origin, we are essentially designing policies that are internality–targeting rather than those that target externalities. Finally, a movement along the **ad** axis, towards the origin, indicates the degree to which it preserves some ones choices under regulation. As such, when a policy maker is centred at the origin of this policy cube, they are essentially choosing policies that are behaviourally informed, target internalities (harms that citizens cause to themselves), and preserve people's right to choose and opt–out of the policy.

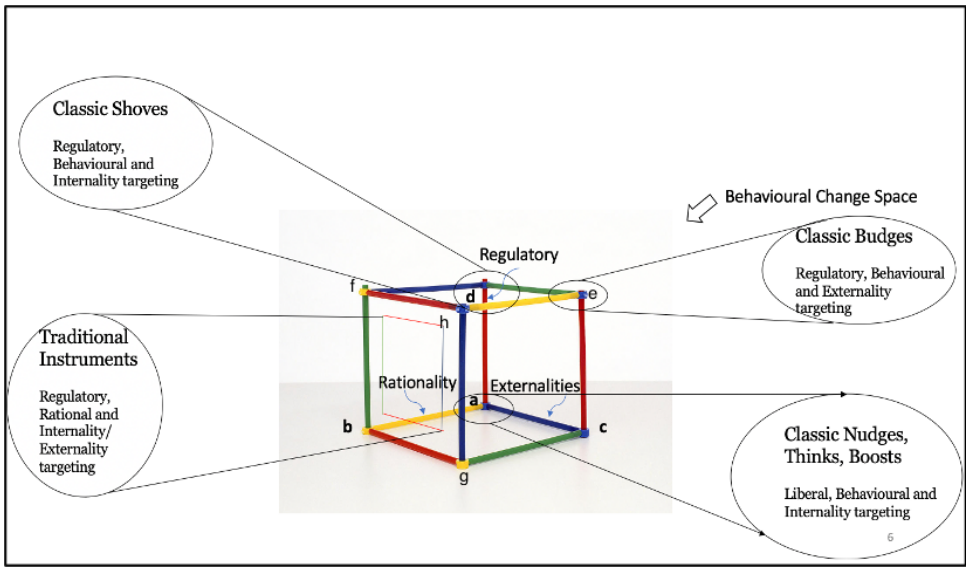

Figure 2.1: The behavioural policy cube

In Meera's problem, the origin represents policies like nudges, as conceived by Oliver (2017), but also thinks and boosts which imply similar notions of behaviour change. On the contrary, budges lie at the edge **e** of this policy cube such that they are regulatory tools that target externalities yet are behaviourally designed. If you remember, Meera's idea to regulate cigarette sellers would be a budge. Contrarily, shoves lie at the corner **d**. These are regulatory tools that target internalities yet are behaviourally informed in nature. Meera's idea of imposing a sin tax would lie in this corner. Finally, all tools facing the **fbgh** plane of the policy cube are informed

by standard axiomatic rules of rational economic theory.

For the rest of this chapter, and the thesis, I will abstract from the general study of this policy cube, and focus solely at its origin. I acknowledge that the policymaker has several tools at their disposal to change human behaviour. I will unpack nudges, boosts, and thinks, and evaluate them in trying to understand what can work in promoting climate citizenship. Having done this, then in chapter 3, I will be able to introduce nudge+ to the origin of this policy cube and pit it against the other three tools.

2.3 The classic nudge

We take the classic nudge to describe a form of behavioural intervention that was set out by Thaler and Sunstein (2008). The definition of nudge, much cited, *is any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid.* Thaler and Sunstein in their original conceptualisation include at least seven different examples of nudging; these include defaults, campaigns, commitments, information mechanisms, transactional shortcuts, improved design strategies, and warnings and reminders. An eighth one was recently proposed as information disclosures (Thaler and Sunstein, 2021). All forms of nudging change the design of rules and procedures that, in part, are controlled by governments and other agencies through their command of bureaucratic and legal processes which affect the eventual choices of citizens.

Nudges drew on twenty-five years of research (or more) in behavioural economics that sought to find the origins of human behaviour in the psychological process to modify a simple rational cost calculation using the Heuristics and Biases (HB) tradition (Gilovich et al., 2002). This paradigm aligns itself with the view that given our cognitive limitations, we, humans, abide by certain short-cuts that reduce our cognitive burden, and as a result often run into multiple biases; for instance, availability or salience bias explains that we tend to make decisions based on what's familiar to us. Consequently, traditional policy tools that do not tend to these biases are bound to falter (Bowles and Gintis, 1993; Gintis, 2000). Often, prescribing such policies can cause governments to draw the label of a "nanny–state" (Le Grand and New, 2015). Classic nudges were argued to be easy to introduce as they did not depend on heavy cognitive processes. With its libertarian side, it was thought that individuals will like these kinds of interventions because nudges ultimately help people to get to where they want to be but maintain their autonomy to reject the

nudge if they do not want to go along with it.

However, as nudges were increasingly scrutinised and evaluated over time, scholars pointed out discrepancies that blurred the classification of what counts as a nudge. For example, Hausman and Welch (2010) and Selinger and Whyte (2012) showed several of Thaler and Sunstein's nudges did not conform to their original idea of a conventional nudge, and as such these interventions were, at best, considered to be examples of 'fuzzy' nudges (Selinger and Whyte, 2011, 127-128). Later, Hansen and Jespersen (2013) classified nudges into four different kinds typified by their distinction of epistemic transparency of the nudge and the system of cognition it worked on. Then, Baldwin (2014) highlighted the different degrees of nudging. The urge to propose a new classification of nudging has been endless, as many other scholars have continued to propose their own typology of a nudge (for a review, see Lin et al. (2017); Van Gestel et al. (2020); Congiu and Moscati (2022)) Going forward, to simplify this discussion for readers, I will adopt Thaler and Sunstein's classic definition of a nudge[4]. A behaviour change intervention will be considered a nudge *if and only if* it modifies how choices are presented to people, keeping all incentives and information provisions unchanged. I will build on this later in the next two chapters.

Although nudges promised to retain a faith in rational human action as a desirable state of affairs, and acknowledged that people need help to come to decisions that approximate these process, they quickly ran into moral criticisms. Nudges were said to 'work in the dark' and manipulate individuals by making some choices more salient than others (Bovens, 2009). They would often alter the means to reach suitable ends (Yeung, 2012; Hansen and Jespersen, 2013). Sunstein (2016b, 2017a, 2018) sought to defend nudges on account of "consent validation", the idea that people who are nudged agree with the nudge thereafter. Survey evidence was also quick to show the public palatability of nudges was conditional on its overtness and goals (Reisch and Sunstein, 2016). For example, Sunstein (2016a) showed support for nudges diminished when citizens did not trust the motives of choice architects or when their goals did not match. Further, Sunstein (2016c) showed that citizens often preferred reflective, system–2 nudges, especially when decisions were important, such as choices on abortions. These preferences for educative and transparent nudges were consistent across various partisan feelings. Eventually, these findings paved the way for a new form of nudging that was largely reflective and educational in purpose as citizens (Sunstein, 2015a).

[4]see footnote 1 in Sunstein (2015a)

2.4 Thinks

As nudges became the go–to tool for policymakers, some scholars realised it was hard to sustain the behaviour change achieved with a nudge (Allcott and Rogers, 2014). While cost-effective, nudges lacked persistence of some sort, with early official evaluations[5] casting doubts on its effectiveness. Sunstein (2017b) tried explaining why some nudges fail, with hints that people with strong antecedent preferences often reject the nudge. It was starting to seem like people with weak or in–transition preferences were ultimately influenced by the nudge. A new form of behaviour change intervention, thinks, was conceived to overcome some of these limitations. The idea of thinks was to rooted in bottom–up governance to lead citizen behaviour change. Examples included citizen juries, deliberative polls, and extended consultation, all forms of citizen governance (John et al., 2009b; Cotterill et al., 2011). In democratic theory, the think was seen to be good for its own sake, and these applications tied the use of these mechanisms to desirable policy outputs and outcomes (Fung, 2006). Think procedures were considered to be more legitimate for making public policy as they encouraged people participation in the actual policy decisions. On a conceptual note, thinks were thought to be more effective as they required people to understand the nature of the policy challenge, which could not be delivered by nudges alone.

Thinks, unfortunately, also implied a huge drain of people's mental resources given their large cognitive demands. Slowly it occurred that while desirable, they might be ultimately impractical for effective interventions (John et al., 2013, 2020). Closely tied to thinks was the competing idea of empowering behaviour change by boosting people's capacities, which came next.

2.5 Boosts

Boosts referred to a class of behavioural change interventions that sought to improve the decision–making power (or competence) of people. Boosts differed from other behavioural instruments as they were solely directed to increase cognitive capacity. As Hertwig and Grüne-Yanoff (2017) put it, the goal of boosting was to 'improve people's competences to make their own choices and to make it easier for people to exercise their own agency by fostering existing competences or instilling new ones'. Conceptually, boosts were based on a different psychological paradigm that discussed why humans depart from fully rational behaviour. It was motivated to show how people can improve their decision-making process by upgrading their repertoire of decision-making skills ("the adaptive toolbox").

[5]The UK House of Lords (2011) had reported any 'sustained behavioural change is difficult to accomplish and requires more than a well aimed 'nudge' in the right direction'

Early on Hertwig (2017) acknowledged boosting can be very similar to think (educative) strategies, a subtle difference between the two lay in their conceptual rationales. It became increasingly clear that boosts wanted to go beyond regular schooling mechanisms, unlike most pure thinks which spoke of self-reflection through learning. There were many examples of boosting to guide practitioners to apply them (Grüne-Yanoff and Hertwig, 2016; Kurvers et al., 2016), such as uncertainty management rules to interpret complex information tangles or goal management with appropriate implementation intention plans. In all cases, boosts believed that humans sometimes made wrong decisions, not because they failed at cognition but because they needed better shortcuts to guide their choices. Rather than being just another device to improve rationality, boosts relied on the idea that people were intuitive and frugal in their use of the minds, and, therefore, interventions must be targeted to make best use of the common sense that people had innately. So with some training, individual capacity could be increased, hence the name *boosts*.

Conceptually, this was also what set apart boosting from nudging. Boosts worked within the prism of the Simple Heuristics (SH) approach (Gigerenzer and Todd, 1999). They believed that humans, given their cognitive burden, chose shortcuts which could often be useful but also go wrong at times. However, such biases were never systematically tied to the heuristics. Thus, instead of getting rid of all heuristics, boosting chose to make such heuristics smarter and intuitive to avoid those occasional mistakes. The heuristics worked best when the human's cognitive skill set and their external environment were in tandem, a condition that, more formally, came to be known as "ecological rationality" (Todd and Gigerenzer, 2007, 2012). The limitation of boosts, however, was the assumption that all humans would have the motivation and competence to benefit from such improved decision-making processes. This was different to the classic nudge which assumed a "somewhat mindless, passive decision maker" (Thaler and Sunstein, 2008, 36). While the proponents of classic nudge theory viewed economic agents as *cognitive cripples*, boosts made a sharp departure from this thought process by positing that changing the environment, or their cognitive skills and abilities (competency), could eventually make humans better decision–makers. This conceptual difference kept aside, practically it was hard to tell apart boosting from nudging. Then, Hertwig and Grüne-Yanoff (2017) classified boosts into two broad categories: short-term and long-term boosts.

It became clear that short-term boosts sought to improve the competences of humans in a specific decision–making context, while long term boosts improved the general cognitive ability of humans, equipping them with a unique skill set that could be applied to all decision-making contexts. Ultimately, it were these short–term

boosts which shared commonalities with educative nudges or thinks. The long-term boosts made a genuine attempt to help humans overcome behavioural barriers by enabling them to decide better.

2.6 Conclusion

Our review discussion so far seems to suggest, behaviour change interventions can possibly work in two different ways. Either, they help us manoeuvre our biases, by bypassing our mental shortcuts with nudges, or they enable us to become more more thoughtful and better versions of ourselves with thinks and boosts. There seems to be a gray area in–between, such as with short–term boosts that propose smarter heuristics as a means to achieve better cognitive capacities and deliver lasting behaviour change. Yet, much remains to be done. It might not be the case that we must rely only one of these two extremes, reflexive or reflective cognition. Maybe nudges, thinks, and boosts are tools of the past, and we can move past them. A start to this conversation was made with the idea of the nudge+ (John and Stoker, 2019). However, early discussions of nudge+ interventions were mainly centered around claims for more autonomy and agency for citizens.

But there remains unanswered questions. How can we design a nudge+? Can such reflective nudges be more effective? If we have learnt anything from the experience with thinks, we should be worried about the scalability of nudge+, because reflection can often imply increased cognitive burden for people. To make a true stride in going beyond nudges, it is important that we are able to design tools that overcome the trade–off between efficiency and agency. In the end, it is hard to avoid concluding that the debate about nudge+ and by implication nudge, think, and boost must turn to a model of cognition to work out what is going on when people are making choices. We will do this in the next chapter, armed with a wider understanding of behaviour change interventions from this chapter. The origin of the behavioural policy cube is far richer than it has been acknowledged for. It certainly extends beyond nudges to include other interventions like thinks and boosts. Understanding the richness of behavioural public policy is imperative, if we must embark on evaluating what works best in delivering large–scale behaviour change. But it does not necessarily imply an imminent substitution of nudges by these alternatives.

There is no doubt that nudges are effective in many different settings. Therefore, they should be retained for those. Nonetheless, for cases when they fail, other alternatives must be considered. To do this, a policymaker must acknowledge and use a wider toolkit for policy experimentation. It is here that there was a need to

break the false synonymity of behaviour change to nudge-type interventions. This chapter has done that. Hopefully, in times to come, we will see a greater uptake of boosts, thinks, and nudge+ by public policy practitioners and researchers. It is only with greater empirical applications we can sufficiently defend the claim to go beyond nudges.

Chapter 3

Nudge+, incorporating reflection into behavioural public policy

Abstract: Nudge+ is a modification of the toolkit of behavioural public policy. It incorporates an element of reflection–the plus–into the delivery of a nudge, either blended in or made proximate. Nudge+ builds on recent work combining heuristics and deliberation. It may be used to design pro-social interventions that help preserve the autonomy of the agent. The argument turns on seminal work on dual systems, which presents a subtler relationship between fast and slow thinking than commonly assumed in the classic literature in behavioural public policy. We review classic and recent work on dual processes to show that a hybrid is more plausible than the default interventionist or parallel competitive framework. We define nudge+, set out what reflection could entail, provide examples, outline causal mechanisms, and draw testable implications.

3.1 Introduction

A nudge that incorporates an element of reflection might at first seem to be a contradiction in terms. After all, the whole point of nudge is that it happens automatically without much conscious thought on the part of the individual. The acknowledgement of low cognitive capacity to make fully rational choices is thought to show its superiority over other policy instruments, such as information campaigns, laws, and taxes (Thaler and Sunstein, 2008). Nudge is supposed to work on fast and

automatic type 1 processes leaving the slow and reflective type 2 unengaged. Thaler and Sunstein stress that the individual could reflect and agree with a nudge after its delivery rather than before or during (Thaler and Sunstein, 2008, 244), with most citizens approving of this approach to designing public policies (Sunstein, 2016b, 140-141).

Nonetheless, recent work in behavioural public policy suggests that a nudge could become more effective and legitimate if it incorporated an element of self-awareness and internal deliberation, which could generate long-term, persistent, and sustainable behaviour change (see Kalleitner et al. (2020)). As we saw in the last chapter, John and Stoker (2019) made a start by coining nudge+, which adapts their earlier contrast between the classic nudge and a purely deliberative 'think'. Nudge+ refers to an intervention that has a reflective strategy embedded into the design of a nudge. It can be delivered either as a one-part device in which the nudge and the reflective plus are intrinsically combined, or two-part whereby the nudge is extrinsically combined with a deliberative instrument that prompts individual reflection on the nudge. Examples include the dual–self pledge involving multiple commitment contracts catering to an individual's short– and long–term preferences, other commitment devices prompting deliberation before a nudge, nudges with information disclosures, and a GPS device combined with AI technology assistants.

Some existing nudges already have an element of self-reflection, which could be enhanced in a programme of nudge+. A commitment device, for example, is based on the idea that a pre-commitment default keeps people to a desired course of behaviour (Thaler and Shefrin, 1981); yet it also ensures that the individual has some autonomy and space to think through what is involved, which precedes the signature of the contract (Stutzer et al., 2011). Reflection also appears in Sunstein's advocacy of educative nudges and contrast between system 1 and system 2 nudges (Sunstein, 2016c; Sunstein et al., 2019), leading to work on transparent nudges (Hansen and Jespersen, 2013) and deliberation tools, such as cooling-off periods (Yeung, 2012). Other examples include encouraging job seekers to think more slowly (Heller et al., 2017) and training in youth self-investment using Cognitive Behavioral Therapy (Blattman et al., 2017).

Recent research shows that classic nudges work better by bundling them with reflective elements to make them more salient. For instance, Bradt (2019) finds that providing information about the probability of inundation over a thirty-year span increases the effect of the nudge in improving demand for risk insurance. Visintin et al. (2021) test the efficacy of a 'thought-provoking' nudge for the implementation of disability insurance policies in Switzerland. Nudge may be enhanced if citizens

are convinced of its ethical dimension (Engelen et al., 2018). The engagement of the conscious brain also appears in the recent debate about whether being aware of a nudge affects its efficacy (Loewenstein et al., 2015a; Bruns et al., 2018a). Finally, work on capacity-building devices, such as boosts (Grüne-Yanoff and Hertwig, 2016; Hertwig, 2017; Hertwig and Grüne-Yanoff, 2017), suggests that the individual needs preparation to make an effective choice.

Building on this contemporary empirical research, nudge+ implements such strategies systematically. Nudge+, as a modification of classic nudge, must involve an active trigger of reflection as the plus, as the potential for reflection is not sufficient to prompt deliberation and cause lasting behaviour change. A commitment device, for instance, can be upgraded to a nudge+ when it also provides information about the underlying aims of the process or when it has a way of feeding back to the individual. Nudge+ needs to rest on a coherent and defensible account of cognition and to fit with dual process models as advanced by Stanovich and West (2000), taken up by Kahneman (2011) and Thaler and Sunstein (2008). Using recent research in psychology, it is possible to show how type 1 and 2 processes can be in play at the same time. To achieve this aim of grounding the tool of nudge+, this paper synthesises classic and recent literature on social cognitive psychology, showing convincing evidence in favour of hybrid dual process theory and providing credibility to nudge+. The later part of the paper concerns reflection as embodied by the plus and conveys practical examples. These insights set out the mechanisms involved in the design of nudge+ and generate testable propositions.

3.2 From nudge to nudge+

Nudge is low-cost signal or procedure that encourages, from the planner's point of view, a socially desirable change in behaviour while preserving individual liberty (Thaler and Sunstein, 2008). Although there is considerable debate about definition, as discussed in chapter 2, nudge is best thought of as an instrument involving a change in choice architecture. Nudge takes advantage of biases of type 1 processes by changing the external environment (choice architecture) to help a person get to the socially optimal outcome.

One common criticism is that nudge can only deal with relatively minor public problems strictly under the guidance of the benevolent policy-maker (Marteau et al., 2011). The size of the challenge of achieving sustainable behaviour change may require more profound and long-lasting solutions that build on the consent of individuals. There also needs to be a way to address the common criticism that nudge manipulates individuals, reducing their autonomy and bypassing their explicit

consent (Glod, 2015). If you further recall from chapter 2, nudge is often thought to 'work better in the dark', undermining its legitimacy (Bovens, 2009). Thaler and Sunstein have justified nudge on the basis of type transparency in line with Rawls' publicity principle (Lub, 1996). A watchful agent may identify the underlying choice architectural change and opt out, making nudge 'in principle token transparent' (Sunstein, 2015a; Lades and Delaney, 2022). Yet this still leaves the problem of lack of autonomy at the point when nudge is being delivered.

Recall, these objections are addressed in an alternative programme of 'think', which implies that debate and deliberation can help individuals achieve their objectives (John and Stoker, 2019; John et al., 2020). Think is always open to public scrutiny and respects freedom of choice. But it is hard to scale up to the general population. The individual has to donate considerable time they may not be willing to give and it relies on a strong commitment. To be closer to nudge, nudge+ proposes incorporating an element of reflection and autonomy, yet being cognitively easy to uptake. In combining the nudge and think, nudge+ promises to make nudge token transparent, such that all receivers, regardless of watchfulness, are conscious of nudge with its deliberative prompt, respecting the autonomy of the individual who can decide what is best, even if that does not entail the socially optimal choice. Nudge+ gets autonomy at minimal cost.

Let's consider reducing obesity. How would nudge+ work differently to nudge? Nudge works by tapping into people's biases by changing the choice architecture only; for instance, defaulting the obese into buying healthier meals yet not necessarily leading to the uptake of healthy-eating behaviour. A default can even backfire as individuals experience moral warm glow and compensate by binge-eating other meals. Alternatively, a think strategist recommends education; for instance, consultation with a dietitian to draw up a detailed plan. In contrast, nudge+ is a hybrid nudge-think strategy that combines nudge, in this case a default, with an active mechanism device, like a pledge that enables reflection on future meal choices, including the possibility of binge-eating. While the obese may choose to over-ride the motive of the nudge, the pledge makes the nudge transparent in that individuals own the process of behaviour change. While the claim that nudge+ is more efficient than nudge remains to be validated, nudge+ has the benefit of restoring consumer autonomy and agency. At this stage, it is important to note, that nudge+ is different to boosts, which work by enabling citizens to use their heuristics smartly. For example, a quick rule, such as to eat frequent yet smaller meal portions or to combine junk food with healthier options (temptation bundling), does not necessarily involve reflection and autonomy as must happen with nudge+. We will outline these differences between nudge, boosts (or, thinks) and nudge+ later in this chapter, after providing its

psychological exposition.

3.3 Dual process theories and nudge+

Nudge+ is based on a different approach to cognition than nudge. It deploys a hybrid framework that incorporates both heuristic and reflective processes, a bifurcation often referred to as dual process theories. But even within dual process theories, there can be a sub-categorisation depending on the type of the response mechanism involved. Although there can be different interaction mechanisms of the dual processes, one may suit the role better. Furthermore, dual processes can act in conjunction. To address these issues, we review dual process theories, in particular recent evidence from social cognitive psychology and neuroscience that supports nudge+ as a hybrid nudge-think strategy.

Dual process theories posit that 'there are two distinct processing models available for cognitive tasks: one (type 1) that is fast, automatic and non-conscious, and another (type 2) that is slow, controlled, and conscious' (Frankish, 2010, 914). They date back to the 1960s and have been evolving ever since. Although different schools of thought have emerged, cognitive processes have been clearly distinguished into an intuitive (or, heuristic) and analytical (or, systematic rule-based) type that might interact with one another and take precedence, depending on the nature of the task. Earlier labelled as system 1 and system 2, and extensively used following Stanovich (1999) and Stanovich and West (2000), they were popularised by Kahneman (2011). While these theories came to existence independently, an attempt to combine them into a more structured and generalised framework, based on the common traits of these models, was made much later (for a summary, see Gawronski and Creighton (2013)). Evans and Stanovich (2013a,b) argue that these processes share multiple features, but they are not all defining. They put forward a necessary and sufficient condition for each of the dual processes: type 1 processes must have autonomy and type 2 processes must satisfy cognitive decoupling for hypothetical thinking, i.e., being able to differentiate an assumption from a belief and back up a rational decision with a thought experiment. These cognitive processes interact with one another and resolve conflict in different ways: they might take precedence sequentially or operate in parallel depending on the nature of the task.

The former conflict resolution strategy is commonly referred to as the default-interventionist model. It posits that both brain processes can dominate one another; see A-dominating (Lindsay and Jacoby, 1994) or C-dominating (Jacoby, 1991) process dissociation models. However, classic default-interventionist models (Evans, 2010; Kahneman, 2011; Evans and Stanovich, 2013b) assume a corrective role for the

rational processes at all times i.e., the type 2 processes will override type 1 processes if there is a conflict. Contrarily, the latter conflict resolution model is referred to as the parallel competitive model in which the dual processes fight constantly to gain dominance (for details, see Evans (2007)). Which of these are more effective and suit the role better remained an ontological concern until recently as 'all models enjoy[ed] implicit support from dual process theorists' (Evans, 2007, p10). For instance, Epstein's cognitive-experiential self-theory (Epstein, 1994) presumes that the two types of processes (called systems incoherently) might occur in parallel, while Kahneman and Frederick (2002) endorse a default-interventionist structure as they write, 'we assume, system 1 quickly proposes intuitive answers to judgment problems as they arise, and system 2 monitors the quality of these proposals, which it may endorse, correct or override' (p52). There is no situation where any type of processes is passive and inactive.

There is more to cognitive processes than following a sequential (default interventionist) or simultaneous (parallel competitive) conflict resolution mechanism (Pennycook, 2017; Lurquin and Miyake, 2017). Nudge+ requires an integrated theory of cognition, one that is rooted in a more involved interaction of brain processes, essentially a hybrid approach. Recent evidence from neuroscience qualifies simple dual-process conflict resolution strategies by advocating the role of a third and superior type of brain processes, called executive functions that monitor the heuristic and reflective processes (Varga and Hamburger, 2014; Grayot, 2020). Furthermore, these dual processes are not discrete. As Grayot writes, 'although most researchers prefer to believe that system 1 and system 2 are arranged sequentially, there isn't sufficient empirical evidence to validate either the default-interventionist model or the parallel-competitive model of system interaction. Recent meta–analyses and replications indicate that neither model is singularly equipped to predict and explain how individuals' reason and make decisions' (Grayot, 2020, 115). These dualistic conflict resolution models might be flawed. As Camerer et al. (2005) argue, 'human behaviour requires a [much more] fluid interaction between controlled and automatic processes' [p11].

A hybrid framework suggests a more involved role of dual processes (De Neys, 2012, 2014; Pennycook et al., 2018). It overcomes the shortcomings of the cognitive theories. Gronchi and Giovannelli (2018) argue that a 'shallow analytic monitoring process is always active to detect potential conflicts between the two systems, and an optional deeper processing stage is activated once an actual conflict between fast and slow thinking is found'. DeNeys suggests two types of system 1 responses: one that is heuristically driven (the so-called intuitive processes); the other which is logically intuitive. The two system 1 processes are activated in parallel followed by

the system 2 processes, which act to validate and justify the conflict resolution put forward by the logically intuitive processes. DeNeys upgrades the role of system 1 processes; and acknowledges that system 2 processes are more of the validator than the corrector that has been incorrectly assumed by the prior scholarly literature on dual process accounts. Another account by Bohl and van den Bos (2012) suggests some form of complementarity between two neural systems, each embodying a type of dual process.

Most available behavioural change interventions endorse either the parallel competitive or the default-interventionist conflict resolution strategies; for instance, a system 1 nudge is theorised to correct for failures of the automatic cognitive processes while a system 2 nudge (or think) facilitates deliberation in the agents and corrects for conscious biases. Nudge is strictly defined to work following a default-interventionist conflict resolution strategy where either type of the cognitive processes assumes the role of the rectifier in sequence but never work together simultaneously. Contrarily, boosts work by upgrading an individual's repertoire of decision-making skills, the adaptive toolbox. In so doing, the boost closely resonates with a unified theory of cognitive processes, one where there is no distinction between the fast and the slow mind. However, recent evidence from cognitive psychology and neuroscience suggests that different sections of the brain might be activated in response to a common stimulus; for instance, Karlan et al. (2019) explain how a charitable-giving nudge can work either through impulse or deliberation. The functionality of this nudge, however, depends on the context. As such, behavioural change interventions based only on the default interventionist or a parallel competitive account are always unable to explain fully the interplay of cognitive resources. This makes a hybrid nudge-think tool like nudge+ so compelling as a way to effectuate lasting behaviour change.

Nudge+ is flexible in that it shares features of both the parallel-competitive and default interventionist dual processes accounts, depending on the context of application. A simple way to think about this would be using Kahneman's characters, slightly renamed, Bobbie (Type 1) and Joey (Type 2). Let us assume that Bobbie and Joey participate in a pub quiz as a team. Bobbie and Joey get a minute to answer questions in a round. Both are normatively rational in that they have their own thematic strengths, allowing them to selectively sort out rounds based on their expertise. If this is the case, either Bobbie or Joey react more quickly, leaving the other to validate the response. Nonetheless, there may arise situations when both need to consult each other and work out the answer. The former, the default interventionist model of conflict resolution, supports a sequential nudge+ mechanism whereby the plus precedes or follows the nudge, letting automatic and reflective

processes act in sequence, reinforcing each other; the latter, the parallel competitive model of conflict resolution, suggests that a simultaneous nudge+ can be delivered at the same time prompting both type of brain processes to act together.

3.4 Operationalising nudge+

How can nudge+ be designed and administered? This depends on two factors: the timing of the delivery of the plus with the nudge and the combination strategy. The plus can be conceived by the policy-maker to be delivered before, after, or as part of the classic nudge, either as a one- or two-part device (see Table 3.1). The preferred order of the nudge and plus depends on the task, generating different treatment effects. We will show this in chapter 4, when the effect of reflection will attenuate in its order of sequencing to the nudge. Although nudge and plus can be separable, as in the two-part device, both elements are complementary in the functioning of nudge+. The agent receiving the reflective plus switches from thinking fast to thinking slow in a way that helps responding to nudge. When stand–alone, plus reduces to simple think. Whilst nudge involves any change in the choice architecture, it can prompt either an unconscious, reflexive action (a system 1 nudge) or a conscious, reflective action (system 2 nudge) but not both. A think involves a purely educative strategy that prompts deliberation. Nudge+ is a hybrid as it modifies the nudge by prompting both conscious and unconscious actions. It must have nudge as its fully functional and central unit, with the reflective device designed to enhance reflection of the receipt of the nudge. This point will also become clearer through our experiments in the next chapter, where we will show that nudge+ is significantly more effective than the standalone nudge and think components. It is hybrid cognition which remains essential to scaling up effective behaviour change. While nudge+ promises greater autonomy and token transparency relative to nudge, each works differently. Some classes of plus may work by making the design and construct of the existing nudge more salient to the receiver while others might allow the agent to reflect deeply on their own preferences. However, the change in effectiveness might be an ambiguous signal to the policy-maker in these latter instances. This remains a normative judgement, for what is considered best for the agent by the policy-maker might not be true for the agent.

		Timing of nudge+	
		Simultaneous	**Sequential**
Type of nudge+	**One-part**	GPS	Dual self pledge device
	Two-part	Nudge with information disclosure	Nudge with offer to pledge

Table 3.1: Classification of nudge+

An illustration is Sunstein's example of the global positioning system (GPS) which 'tells you how you can best get to your preferred destination, but it does not impose any sanction or costs if you refuse to do what it says' (Sunstein, 2015a, 208). While such devices increase navigability, there remains the potential of reflection, acquired through prior experience, embedded in the agent's reliance on the device; and people have, at times, complained of lack of precision and accuracy. Such glitches in GPS devices mean when used they not only nudge but also direct an agent's conscious deliberative efforts to the choice environment in a way that they have to undertake some active decisions; for instance, the active choice of not using a GPS when one is familiar with a road system hints that the user has consciously thought about its use, possibly learning from past failures, and has not just been tricked into using the device heuristically once again. The conscious brain can be engaged even when relying on the automatic system. When these reflective features are improved, nudge can expand into a nudge+, as with the GPS, it encourages the user to follow the map heuristically, who can choose to override the advice, a decision that is taken consciously through the experience of using the device in the past.

Also consider a dual-self pledge device to commit to a certain goal as an example of a one-part nudge+. It differs from an ordinary commitment device in that it accounts for the dual-self nature of individuals by providing them with two different pledges: a current-scenario pledge where they commit to a short-run goal and a future-scenario pledge in which they envisage themselves in the long-run. Take Hinge, a popular online dating application founded by Justin McLeod. The creators envisage it as a 'long term relationship' app that is *designed to be deleted*. In marketing their application, the creators encourage singles to first fulfil their short-term goal of finding a suitable romantic match. Having successfully realised this goal, Hinge encourages these users to delete the application as they embark on a romantic relationship with their suitable matches, a long-term goal.

Most fitness trackers prompt the user about their activity level on a daily or weekly basis. This prompt can be enhanced to include a reflective element by adding the option of setting up future fitness goals; for instance, the application could prompt the user not only about their current active hours given their short-term commitment, but also engage them to think of their future goals (a weight goal or a particular physique) inducing reflection through the feed-in loop, helping them appraise their goals. Additional prompts could be built in to engage the user: for instance, often after a period of inactivity, a fitness app can prompt the user to either start a new activity or pop-up questions that assesses reasons for missing out the daily goals, allowing users to update their short-term efforts if they were to stick

to their long-term goal. By building in these mechanisms, the dual-self pledge device corrects an individual's present bias and induces reflection: firstly, committing to the future will require deliberation over willingness and capacities to achieve target; and, secondly, at the onset of a new period, the comparison between committed versus realised targets can feed back into deciding the next pledge, thus reinforcing this chain of reflection.

The application of the dual-self pledge device can be conveniently delivered in a variety of online contexts. The trigger of the reflective plus can be activated whenever a person views their monthly e-statement, for example. The arrangement can be extended to other user-friendly service domains as well; most network providers, for instance, give customers the option to control their spending beyond their chosen plan by specifying a threshold limit such that any spending beyond the limit automatically terminates additional services, unless reinstated voluntarily. This lock-in contract may be thought as the parallel to the current–self pledge in the previous examples. Now add on to this a trigger that accounts for the temporality of usage, where the customer is also prompted to set up a future threshold consumption limit that they want to achieve over a period of time to reduce their bills. Similar to the current limit, the future–self threshold allowance can be revisited by the user and adjusted over time. When the customer logs in to view their billing statement, they are prompted with their performance history; including, but not limited to, suggested tips to stick with their goals. Another extension is to limit one's digital screen time usage.

A combination of tools, such as a two-part device, may also be seen as nudge+. A nudge, for instance, when combined and delivered with active triggers that increase the salience of utilising information, can be classified to be a simultaneous nudge+. These information signals can relate either to the construct of the nudge or about the choice environment in which citizens are functioning. Consider the traffic–lighting scheme as an example of a nudge. While the construct of a labelling scheme like the traffic-lighting nudge rests on the tenet that the agent is subtly reminded of red lights meaning stop, green lights meaning go and amber ones meaning at one's own risk, such that they make the healthier and safer lifestyle choices automatically; agents, with strong antecedent preferences or working in defiance of ecological rationality, might miss the visual cue, thereby, rendering the nudge ineffective. In such cases, adding an information trigger that explicitly explains what the colour coding means, which is the plus, would initiate an agent's reflection.

Interestingly, however, increasing efficacy is not the only overarching objective of the nudge+; for example, the given design can also be extended to other nudges to

increase transparency; for example, a default can be administered with an information signal that increases the salience of opting-out to the receivers. Jachimowicz et al. (2019) show that efficacy of defaults hinge mainly on endorsement or endowment effects, potential threats to consumer agency. Similarly, the heterogeneity in the uptake of a labelling scheme varies with the covertness of the nudge, the effective ones being the ones that work heuristically (Galizzi, 2012), compromising consumer sovereignty. Whether the addition of a reflective plus enhances the effectiveness of such a nudge remains to be empirically validated, one we take on in the next chapter. But it definitely makes such a covert scheme epistemically transparent and restores the individual's agency and autonomy. It is important to note that the additional information provision does not fall within the remit of the classic nudge, as we discussed in chapter 1. As nudge taps into biases by making existing information more accessible, the information signal as the plus provides additional knowledge that induces deliberation, much like the short-term boost or educative nudge (Damgaard and Nielsen, 2018).

Similarly, providing a choice to commit before or after a nudge could have different implications. Consider the opt-out default nudge once again. A default setting is usually taken up by an agent due to the cognitive easing it comes with; for instance, choosing from a set-menu is often easier for an individual who dreads a large menu with many options. Providing the agent with the choice to commit to a healthier diet, such as a pledge to Veganuary, before the default menu is presented makes the uptake of the default more salient to the agent. However, if the sequence of this nudge+ is reverted such that the set menu is presented first, and just before ordering the agent is asked to commit to a healthier diet, the choice thereafter would be governed by self-reflection, and in essence should be more transparent to the agent, even though the treatment effect of the nudge+ might be different relative to its nudge counterpart. Through these exemplars, summarised in Table 3.1, it is clear that nudge+ respects the ability of individuals to decide for themselves so granting autonomy; it also makes the design of the instrument transparent.

The role plus plays, and the outcomes it aims to achieve, depends on the kind of reflection it seeks to deliver. In the dual process view, type 2 processes involve reflection. When this reflection is embedded into the nudge as the plus, it leads to an experiential learning environment. This means that when a nudge+ is taken up by an individual, they reflect on account of the plus and learn from such an experience which ultimately leads to a behaviour change. If this learning experience is conducive to the individual and aligns with his/ her personal goals, it strengthens the effect of the classic nudge. We test this is chapter 4, and find this to be the case, as well. Reflection, true to its origin as seeing 'one's reflection in the mirror'

has often been used to relate to self-reflection. An intellectual, for instance, is a mind that watches itself (Camus, 1963). However, contrary to the common belief, reflection could personify different meanings (Bortolotti, 2011; Van Seggelen-Damen et al., 2017); for instance, one could reflect on choices, beliefs, thoughts or feelings, or on the available alternatives, or even on the structural assumptions behind a construct. Reflection involves thinking about something.

However, is the experience of reflection always conscious? Reflection could be consciously experienced, for instance, when a person deliberately thinks of options and successfully re-represents it upon introspection; or unconsciously experienced in that that the experience of reflection cannot be introspected and re-represented (see Kastrup (2017)). However, irrespective of whether or not this experience of reflection is conscious or unconscious, depending on the awareness of the individual, it leads to the same experiential learning environment. Even more, it could be a solitary act when one reflects on one's own choices, or as part of the herd; for instance, one could introspect and evaluate their preferences either individually or through the process of a group-discussion. Often, the most familiar area in which reflection occurs in groups is when debriefing takes place. As Boud writes, 'debriefing occurs when participants in a learning activity, be it a simulation, workshop experience or other event, are led through a session in which they relive parts of their experience in a supportive environment and draw conclusions from it' (Boud et al., 2013, 15). However, whether self- or group-led, conscious or unconscious, reflection involves transformation of perspectives.

What does perspective transformation entail? Scholars recognise different stages in reflection that lead to the generation of new perspectives; Schon (1984), for instance, identifies three different stages in reflection: think, criticize, and act accordingly. Atkins and Murphy (1993) summarize this to involve an initial discomfort/dissonance from a certain stimulus, followed by critical analysis of one's feelings and thereafter acting in accordance with them. This critical reflection could either come as kneejerk reaction, for instance, a sudden heart disorder can lead to automatic changes in lifestyle; or it can come in transition, for instance, borderline changes in blood sugar levels can make someone conscious of their lifestyle habits and encourage small lifestyle changes. Yet certain conditions must be fulfilled, these being typified as necessary[1] and sufficient[2], to engage in the process of perspective

[1]Being conscientious and goal-oriented helps to critically analyse feelings in response to experiences; it is necessary to initiate the process of perspective transformation; for instance, an agent facing an initial trigger, but lacking conscientious and goal-orientation, will fail to habitually engage in critically evaluating their feelings

[2]Being motivated is sufficient to engage with the reflective plus. Motivation is key to transforming intentions into behaviour, leading to perspective transformation.

transformation. This distinguishes reflection from just letting thoughts emerge, which is clarified in our definition of the reflective plus.

Reflection is the act of thinking and re-evaluating prior actions, choice constructs, or available alternatives and search rules, triggered by conscious or unconscious experiences, resulting in the uptake of new perspectives.

The plus, when taken up by the agent, implies self-reflection in relation to long-term preferences, for instance, when asked to commit after a default, or to deliberate on the design of the tool at hand that prompts behavioural change, or with the dual-self pledge cards. Whatever might be the reflective process, the agent learns in the environment and behaves accordingly with a new reactance. The environment is transparency enhancing, autonomy inducing, and/or effectiveness enhancing. Nudge+ has an effect through both the nudge and its plus; but to reinforce a persistent change, it is important to decide whether the plus comes before, after or with the nudge depending on the context in hand. The application of the nudge+, however, is not just limited to policy-makers.

While most nudge proponents justify nudging on the presumption that agents are 'cognitive cripples' who suffer from myopia and lack of self-regulation (Edwards, 1983, 508), the essence of nudge+ lies in overriding this assumption by allowing individuals to reflect and do what is best as judged for by themselves. As such, the nudge+ can be administered either by an external agency, like a policy-maker as with a regulator or third-party provider, or by the individual. In the more classic nudge dialogue, the former approach involves the plus being delivered by the policy-maker who also delivers the nudge for the agent; for instance, energy/water regulators can engage in providing dual-self pledge devices to residential consumers. It can be also delivered as a two-part device by a regulator and a third-party provider, unrelated to one another; for instance, an external pledge like Veganuary, delivered in the UK by a registered charity, could significantly increase reflection for an agent who volunteers in for the pledge. When visiting a store that has food items labelled as mandated by the regulator or a restaurant that provides with a default menu, the agent is able to reflect and update priors through perspective transformation initiated by the pledge made earlier. Nudge+ can also be self-administered as the agent devises strategies to self-nudge as a means to strengthen self-control. Individual agents can function as 'citizen choice architects' by 'not only learning the trick [but] also some insight into the psychological mechanisms behind it' (Reijula and Hertwig, 2022, 24).

To sum up, nudge+ embeds reflective strategies into the classic nudge, either as a single device that prompts reflection besides capitalising on one's heuristics or as a two–part device that involves combination of tools. Nudges can be upgraded

to a nudge+ by embedding an active trigger of reflection in them. Most already include a passive reflective component, even the default, as the dialogue between the policymaker and the citizen is not a one–off, but occurs over time, perhaps over the whole lifespan of a citizen, such as a pensions default that is introduced at the start of someone's career but is also explained at a later stage.

3.5 Mechanistic scheme

Having set out an account of cognition that supports the effective use of nudge+ and provided some examples, the next step is to outline the mechanistic design. Let's consider a search strategy. To find an optimal strategy, individuals rely on their characteristic set that are broadly composed of agent-specific traits and some ancillary conditions. In a given setting, these agent-specific traits include dispositional factors that affect an individual's behaviour, for example, these refer to one's grit and commitment to goals or their inherent preferences of risk, time and information; while the ancillary conditions can be best thought of as 'a feature of the choice environment that may affect behaviour but is not taken as relevant to a social planner's evaluation' (Bernheim and Rangel, 2007, 2009). The ancillary conditions, in turn are composed of contextual information cues and the typical choice construct (involving situational factors) in which the agent is functioning in. Drawing on this characteristic set, the agent devises simple search rules to narrow down the alternatives of the choice set along with their properties which leads to a final choice.

Given this search, the behavioural instruments work by engaging with different elements of the characteristic set of the individual. Nudge, for instance, operates by co-opting the biases of an individual and changing the choice construct only, such that all other attributes including the set of alternatives and their properties remain unchanged; for example, when consumers choose a restaurant, they might see a menu with labelling that influences their meal choice. Or they can be served a smaller portion size. Contrarily, regulatory policies involve changing the set of alternatives or its properties; for instance, a ban reduces the set of alternatives or a price alteration changes the properties set. Nudge+ could work differently based on what role the plus plays; for instance, the plus can induce reflection on one's dispositional factors as with dual-self pledge device, or it can use contextual information in order to issue alternative commands to help someone get to their destination, as explained in our example of combining the GPS with AI technology assistants to signal better navigability. We set out a more detailed economic conceptualisation of nudge+ in the next chapter.

But here, let's motivate it with an example. Consider the traffic lighting scheme which is combined with a pledge: while the nudge facilitates a change in the situational factors and hence facilitates the uptake of a specific dish by a visual cue, a pledge on the menu to eat sustainably redirects consumers' attention to reflect strongly on their traits (e.g., one possibility is by making the agent a sophisticated hyperbolic time discounter). If these consumers have other goals in place, for instance, a fitness regime they have signed up for, the reflection on the dishes can entail other parallel considerations as well. It might well happen that consumers decide to resist and block such a change (e.g., take a cheat day just because she has been asked to reflect) which is still autonomy enhancing and open, but less effective compared to the classic nudge of traffic lights alone.

Nonetheless, 'no behaviour sits in vacuum' since at any given time an individual is involved in multiple tasks (Dolan and Galizzi, 2015, 1). Engaging in a process of perspective transformation through the reflective plus and adopting a given sustainable behaviour can also spill over to other behavioural domains as there could be different mechanisms through which such a spillover can manifest itself; for instance, upon perspective transformation, reflection could lead to an increase in the salience of one's personal goals. This, in turn, could encourage citizens to be consistent with their new goal-orientation: they generate new dispositions strengthening a broad domain of related behaviours e.g., pro-environmental behaviour (Bem, 1972); and induce greater compliance in future, or generate identity effects (Lacasse, 2016). In a recent field experiment, Lacasse (2019) demonstrates that participants, who were randomly assigned to adopt a new pro-environmental behaviour for three weeks, experience a sense of increased environmental responsibility, culminating in the purchase of organic produce and support for pro-environmental policies. However, since the experience of reflection through the plus can be unconscious, the resulting behavioural spillover can also happen unconsciously. For instance, Nash et al. (2019) use qualitative semi-structured interviews to show that around half their sample respondents, on self-reflection, unconsciously engaged in behavioural spillovers. This setup creates the following testable implications:

Hypothesis 1: Nudge+ empowers agents and increases their autonomy compared to classic nudges only.

Hypothesis 2: Nudge+ leads to a more effective behaviour change compared to the classic nudge or the think.

Hypothesis 3: The change in an individual's direct behaviour induced by the nudge+ promotes positive pro-social spillovers.

Hypothesis 1 is true by the design of nudge+. A nudge+ intervention respects the cognitive abilities of decision–making agents and provides token transparency, in turn implying greater autonomy for the agent. Hypothesis 2, the availability of the reflection in nudges, leads to a transformation of perspectives that then induces a more effective behaviour change compared to the nudge. In more than one–off interactions, this also opens up the possibility of sustained behaviour change. With a nudge+, people reflect and adopt new behaviours unlike nudges whose effects may wear off when withdrawn, if a habit is not created. This hinges on the fulfilment of the necessary (conscientiousness and goal-orientation) and sufficient (motivation) conditions. Nudge does not translate into permanent behavioural changes because agents are simply responding to a modified external choice environment and are not updating their beliefs. Finally, hypothesis 3 depends on the success of the plus in altering the direct behaviour under consideration. As someone learns to reflect on dietary choices for environmental considerations, they simultaneously adopt or alter other related pro-environmental behaviours. Thus, stronger direct behavioural changes can spillover to promote other significant good behaviours. The transformation of perspectives ultimately has rippling effects on related behaviours.

3.6 Nudge+ versus nudging and boosting

Having set out the nudge+, we are now ready to compare it to boosting and nudging, in fully understanding the synergies and differences between them. Table 3.2 does this. It provides a systematic overview of the conceptual design and key features of these behaviour change interventions. Our discussion closely follows Grüne-Yanoff and Hertwig (2016) and Hertwig and Grüne-Yanoff (2017) who made a start to this, with their comparative analysis of nudging and boosting. We extend this by pitting nudge+ in this frame. We limit our exposition to nine important dimensions of these behaviour change interventions, namely, (1) their psychological paradigm, (2) the interplay of cognitive processes, (3) their target outcomes (4) their opacity in design, (5) the reversibility of behaviour change effects, (6) associated autonomy and agency for citizens, (7) their requirements of bias awareness from citizens, (8) their relevance to the social planner's information about end goals and benevolence, and lastly (9) the motivation and competence required of citizens to engage with these interventions. Through this comparison, it should become clear, that nudge+ interventions truly combine the best of reflexive and reflective policies, a hybrid form of cognition that is missing in its competitors.

Let's start with the psychological paradigms that underlie these behaviour change interventions. As you might recall from the discussion in chapter 2, classic

nudges have been implied to follow the "Heuristics and Biases" paradigm, while boosts the "Simple Heuristics" approach. More recently from the discussion in this chapter on the operationalisation of nudge+ and its mechanistic design, there is good reason to believe that nudge+ interventions resonate with the heuristics and biases approach. Primarily, nudge+ remains an extension of the classic nudge, and builds on it by embedding reflective strategies as the plus component. It is fundamental to the design of nudge+ that such a combination rests on the coherence of dual process theories which are principally denounced by proponents of the simple heuristics paradigm. It is the latter who believe in the malleability of brain processes.

Next, let's consider the interplay of cognitive processes that explain how these interventions affect our target responses. Our review of dual process theories in section 3.3 highlighted that nudges have prominently adhered to the default–interventionist view, where "system 2" cognition is dominantly considered to play the role of a rectifier, jumping to effectuate behaviour change only when automatic processes start failing. Classic nudges work by bypassing our reflexive shortcuts, so we do not indulge in biases systematically. Nudge+, still relying on this dual–process account, suggests a more evolved hybrid form of cognition, where both default–interventionist and parallel–competitive processes actively work to define our cognition. This, in turn, allows us to design sequential or simultaneous nudge+ interventions (see Table 3.1). Contrarily, boosts deny all dual–process accounts of cognition and are based on a singular theory of unified brain processes. According to boosters, both cognitive systems co-exist and function simultaneously, sharing multiple common characteristics, making it hard to have a clearer distinction between them.

Further, there are differences in how these interventions realise behavioural changes. For instance, classic nudges are conceptualised to alter ends, which are final human behaviours, leaving people's means ("capacities") unchanged. Boosts, however, target people's competencies, which then realise into desired ends. A nudge+ does both. The nudge works by changing ends, whereas the reflective plus empowers people to reflect on means that reinforce these ends. It is this design of a nudge+ that also makes it open and transparent to the receiver. If you recall, nudges often require that people become watchful to avoid the nudge. Boosts and nudge+ are transparent by design, since they restore people's agency and autonomy to follow through with desired behavioural changes. On a similar note, a nudge often assumes that the social planner is benevolent and is capable of judging human ends to design nudge interventions that ultimately lead to social welfare improvements. Under circumstances when this fails, it is only the watchful who will successfully circumvent the nudge. However, since the boost and nudge+ strengthen reflective capacities in

humans, they are immune to biases of the social planner, if any. By design, citizens when made to reflect on the nudge, will opt–out if they realise their goals do not align with the nudge. Nonetheless, we should be wary of its caveats. Nudge+ and boosts might lead to heterogeneous treatment effects, where such interventions work only for those that want to engage in any meaningful behaviour change.

A nudge is free from any requirements of citizen engagement. This is what, in turn, makes nudging attractive to all and easier to deliver. On the contrary, nudge+ and boosts often require citizens to be motivated to engage in the process of behaviour change. When compared to a boost, a nudge+ nevertheless offers some cognitive easing, since it combines the flexibility of the nudge with cognitive burden from thinking. By design, the nudge+ should not make it any more difficult to engage with than the nudge. After all, people who do not want to engage in any reflective process can simply proceed to use the nudge as before. Opting out of reflection is easier than opting out of the nudge, as it does not require humans to be watchful, since the reflective prompt is transparent by design. However, when one does, the effectiveness of the nudge can significantly increase.

	Nudge	**Nudge+**	**Boost**
Psychological Paradigm	Heuristics and Biases	Heuristics and Biases	Simple Heuristics
Dual Process Theory	Yes	Yes	No
Target Responses	Behaviours	Capacities & Behaviours	Capacities
Opacity	Token Transparent	Transparent	Transaparent
Effects	Reversible	Persistent	Persistent
Autonomy	Compromised	Empowered	Empowered
Bias Awareness	Needs watchfulness	Aware	Aware
Social planner's benevolence	Required	Not required	Not required
Pre-conditions	None	Motivation	Motivation

Table 3.2: Nudge+ versus nudging and boosting

3.7 Conclusion

We have outlined a modification of the toolkit of behavioural public policy called nudge+. It is based on the idea that encouraging an element of reflection as part the delivery of nudge enhances outcomes because it gives an opportunity for citizens to own the process, and thereby to commit and invest in it. As well as offering greater efficacy, nudge+ is desirable on its own terms by offering greater autonomy.

We have set out the conceptual foundations for nudge+. By reviewing theories of dual processes, we show that the pure dependence on dual processes implied by classic nudge is not sustainable, at least not in all domains. As a result, we claim that nudge+ is based on a plausible account of cognition. We then elaborated the potential for nudge+ in behavioural public policy, giving examples and ideas for researchers and practitioners to test and adopt. Although there have been considerable advances in the scope and range of behavioural interventions in recent years (see Benartzi et al. (2017)), we have identified a new range of interventions where nudge could be enhanced with the addition of the plus.

There remains much work to do, such as to examine the welfare implications of increasing autonomy, and to check whether nudge+ subtly manipulates individuals as the sponsor may be designing reflection to lead to an understated but preferred choice. Alternatively, nudge+ might be a sustainable route to other kinds of participation, which could address more general collective action problems, such as the prevention of climate change, by providing a link between citizen action on public policy issues and bottom-up movements for social and political action. By encouraging reflection, people may become more aware of wider political issues. Even with these intellectual challenges, the way forward is more tests of nudge+, which is what we turn to next.

Chapter 4

What works best in promoting climate citizenship?

Abstract: Nudges have been increasingly deployed to deliver climate policies in the last decade. But recent evidence shows nudges are hard to scale–up. So can we use nudges more effectively, or should we rely on other tools of behaviour change? We argue that reflective strategies can enhance nudges by encouraging agency and ownership in citizens. We test this claim using two online, survey experiments. In experiment–I, we systematically compare nudges to reflective toolkits like thinks, boosts, and nudge+ over orders of low-carbon meals with 3,074 participants in the United Kingdom. In experiment–II, we re–test the claim with another 5,552 participants in England. We find all behavioural toolkits increase intentions for climate-friendly diets, but encouraging reflection prior to nudging ("nudge+") strengthens these treatment effects. There is no evidence of compensating behavioural spillovers as measured by participants' donations to pro-social charities, but in some cases nudge+ promotes positive spillover effects.

4.1 Introduction

Nudges offer simple modifications to the design and framing of choice sets, without limiting any options (Thaler and Sunstein, 2008). They have been generally successful

in steering welfare-improving behaviours (Thaler, 2016). Nudging is simple and cost-effective (Benartzi et al., 2017), and most people tend to like it after all (Hagman et al., 2015; Sunstein, 2016c; Reisch and Sunstein, 2016; Jung and Mellers, 2016; Sunstein, 2017c; Loibl et al., 2018; Sunstein, 2019; Sunstein et al., 2019; Pe'er et al., 2019; Reisch et al., 2021). In the last decade, nudging has been increasingly deployed in climate policies (e.g. Gosnell and Bazilian, 2021; Stern, 2011; Dietz et al., 2009), with recent consensus[1] from economists (Bhargava and Loewenstein, 2015) and psychologists (APA, 2022) to do more. The current challenge, therefore, is to enhance nudges to tackle these global challenges more effectively, such as overcoming limitations in their scalability (Löschel et al., 2020; Mertens et al., 2022; DellaVigna and Linos, 2022; Beshears and Kosowsky, 2020; Chater and Loewenstein, 2022) and delivering them transparently (Bovens, 2009; Sugden, 2009; Wilkinson, 2013; Sunstein, 2015b; Nys and Engelen, 2017; Sugden, 2017; Schmidt and Engelen, 2020). So we ask, can we upgrade nudges to address the big problems of our age? Alternatively, should we rely on other tools of behaviour change, such as thinks and boosts?

In this chapter, we systematically test the effectiveness of nudge+ in promoting climate citizenship[2]. We start out by providing an economic conceptualisation of nudge+. This is the economic parable to the psychological exposition of "nudge+" as set out in chapter 3. As we show in section 4.2, nudge+ interventions are informational toolkits that draw a recipient's attention towards an alternate framing of their choice sets as introduced by the nudge. By consciously informing recipients of the nudge, nudge+ helps motivated decision–makers make better choices. We then evaluate different behavioural policies in improving intentions for climate-friendly diets. We do this systematically, using two online survey experiments.

In the first study, we randomly compare four different nudge+ variants to two nudges (green default and labelling scheme), two boosts (quick rules and implementation intentions), and a think (pledge). This study is the first systematic evaluation of these four behavioural toolkits, and also first formal evaluation of nudge+. As such, it contributes to a growing comparative literature on nudging versus alternate forms of behaviour change (van Roekel et al., 2022; John et al., 2022; Krawiec et al., 2021; Hertwig, 2017; Bradt, 2019; Franklin et al., 2019). In November 2020, 3,074 participants, recruited from Prolific, participated in an online experiment, where they placed an order for a meal delivery under the different experimental treatments. We present three main findings from this experiment. First, we find

[1] for details, see Report of the APA Task Force on Climate Change

[2] Climate citizenship is a form of environmental citizenship, for details see here and Vihersalo (2017)

all behavioural policies, with or without reflection in them, are significantly and substantially effective in minimising the intended consumption of carbon-intensive foods. Second, nudge+, which embeds an opportunity for recipients to reflect on their own preferences before being presented with the nudge, are the most effective: compared to its standalone nudge, nudge+ with reflection reduces carbon emissions from intended meal orders by an additional 30%. Building transparency in the nudge is only as good as the nudge in itself, but it is self-reflection that remains key to scale up its effects. Third, there is no evidence of compensating behavioural spillovers as measured by subsequent contributions of participants to a charity of their choice.

In the second study, we re–test these experimental findings for nudge+ by adding varying degrees of reflection to a different type of nudge: dynamic social norms to consume low–carbon diets. Specifically, we use a 4x2x2 factorial design to test three experimental dimensions, primarily reflection, but also familiarity (Litt et al., 2011), and menu-composition (Parkin and Attwood, 2022). The additional dimensions speak to the role of heterogeneity in reflection to promote low-carbon diets. Between March and April 2022, another 5,552 participants in England, recruited from Prolific, participated in an online experiment, and placed an order for a meal delivery under experimental conditions. The second experiment validates our claims for nudge+, once again. In particular, we find that enabling participants to reflect on social norms, with a pledge to consume low–carbon diets, almost doubles the effectiveness of the nudge. These treatment effects improve on our previous findings, as we instrument for participant's levels of treatment compliance and account for spatial fixed effects by participants' residential location in the UK[3]. As before, we do not find any evidence of compensating behavioural spillovers. Instead, we find that reflection leads to promoting spillovers, such that nudge+ increases pro–social donations by $\approx 20pp$ more than the nudge.

The choice of our experimental task in both these studies was motivated by diets continuing to contribute substantially to greenhouse gas emissions, globally as well as in the United Kingdom (Gerber et al., 2013; Poore and Nemecek, 2018). To our advantage, nudges have been used extensively to alter eating habits (Lohmann, 2022; Gravert and Kurz, 2021; Morren et al., 2021; Hansen et al., 2021; Garnett, 2021; Cadario and Chandon, 2020; Banerjee, 2019; Kurz, 2018; Rose, 2018). We build on this knowledge to test the nudge in improving the uptake of climate-friendly diets and diagnose any additional benefits of reflection. Nonetheless, we do so in the context of an unprecedented growth in the food delivery market (Nunn, 2021), which is currently valued at more than 150 billion USD globally (Ahuja et al., 2021).

[3]at the zip–code level

Further, this market has expanded four-to-seven times during the pandemic, and it is expected to grow even more in future. As such, we simulated our experiments to mimic an online meal delivery experience for participants to make it real for them and minimise potential concerns of hypothetical bias. Our findings suggest that food delivery companies can contribute to net–zero goals by introducing small design changes to their user–engagement platforms. For example, our best case of a nudge+, where reflection on the pledge precedes the nudge is readily implementable through push–in notifications that engage with citizen's environmental preferences before they check out to order their meal. These are likely to be low-cost interventions for citizens who can easily opt-out, if they do not want to comply with the reflective prompts. Long–term customer rewards can further incentivise such in–app interactions. We discuss these broad policy implications in the conclusion.

The remaining chapter is organised as follows. Section 4.2 outlines the economic framework of nudge and nudge+. In section 4.3, we describe the design of our first experiment, discuss the experimental data, our methodological approach and report all findings. In section 4.4, we do the same for the second experiment. We conclude with a broad discussion of our experimental findings in section 4.5.

4.2 The economics of nudge and nudge+

The behavioural foundations of choice theory were originally proposed by Herbert Simon (1955). In what follows, we adopt the spirit of Simon in conceptualising how individuals make choices when they are rationally bounded (and inattentive). Then, we use this set-up to understand how behavioural policies like the nudge and the nudge+ operate. More generally, our conceptualisation enables us to situate also traditional policies like bans and taxes in our set-up. While this exercise is deliberately simple and self-contained, there remains scope to further theorise into predictions of nudge+[4]. Our current set-up conveniently[5] conveys the economics of nudge+, a new policy tool. We will now outline the key primitives of our conceptualisation, explain the operational differences between the nudge and nudge+, and propose testable predictions.

4.2.1 Primitives

Our conceptualisation of human behaviour change relies on the following elements of choice processes:

[4]for details, see (Allcott and Kessler, 2019; Farhi and Gabaix, 2020a; Löfgren and Nordblom, 2020)

[5]Here we take a pragmatist view (Chetty, 2015)

A set of behavioural alternatives (Call it A): It is a set of choice alternatives, akin to Simon (Simon, 1955, p102, 1.1.1), which represents a collection of consumption bundles in an individual's consumption space.

A set of affordable alternatives (Call it Å): It is a subset of the set of behavioural alternatives A which represents a collection of consumption bundles that are affordable to the individual. Our exposition of Å explicitly recognises an individual's budget constraint.

A set of perceived alternatives (Call it Â): It is a subset of the set of affordable behavioural alternatives Å, which represents a collection of affordable choice bundles that are salient to the individual when choosing optimally[6]. Under circumstances of deliberate choice-making, it is possible that sets Å and Â will be equivalent to each other i.e. whatever is affordable can also be saliently considered by the individual in choosing what is optimal.

A set of outcomes (Call it S): It is a set of outcomes, akin to Simon (Simon, 1955, p102, 1.1.3), which associates future state of affairs to choice bundles in A.

Utlity function (Call it U): This is a 'payoff' function, akin to Simon (Simon, 1955, p102, 1.1.4), which represents values attached to outcomes in S.

Information Signal (Call it I): This represents the probability with which an individual ascertains a particular choice bundle is related to a given outcome in S with a certain payoff (or utility). This is akin to Simon (Simon, 1955, p102, 1.1.5-6).

Given individual preference orderings, people optimally choose from the set of affordable and perceived behavioural alternatives Â.

4.2.2 Conceptualisation of behavioural policies

The primitives defined above deduce choice processes of individuals in a behavioural world. Different policies affect elements of this set-up differently. Consider purely heuristic interventions, such as nudges or quick rules. A nudge is *any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives* (Thaler and Sunstein, 2008, p6). Similarly, simple rules help people design new shortcuts for making smarter choices (Gigerenzer et al., 2011). In our conceptualisation of

[6]Simon (1955) considers different pathways of bounded rationality. We simplify this assumption to the salience of the affordable subset here. Without loss of generality, we limit our discussion to a world of limited information with certainty.

Simon's behavioural world, these policies work by re-orienting the set of perceived alternatives (Â) within a given set of affordable alternatives (Å)[7]. In this way, nudges or rules do not change the actual set of choices (A) or underlying incentives (Å), but re-design what's perceived by recipients when making an optimal decision. For example, a classic nudge like the default works by changing the status-quo, so people go with the flow of what's made available to them[8]. Defaulting individuals into pension plans with higher saving rates can increase lifetime savings (Thaler and Benartzi, 2004). Food rules (Pollan, 2013) re-direct attention to newer and better choice alternatives, overwriting prior rules of salience perception. Other nudges like the labelling work by automatically drawing our attention to what's good and bad, playing on our ability to relate to traffic lights when we respond to the task at-hand. Similarly re-ordering items or campaigns, which are also nudges, re-direct our attention significantly to one part of the choice set more than the others. A social–norm leads to learning from others, where we try and imitate the new norm which is now salient to us. All these examples lead us to define such purely heuristic policies as follows.

> **Definition 1**: A purely heuristic policy, like nudges or quick rules, re-orients the salience of perceived choice alternatives (Â) to individuals while keeping their set of affordable alternatives (Å) unchanged.

The simplicity of nudges, in automating decision processes, makes them very attractive. Nudges, however, may also have limitations. For example, automating all decisions through micro-behaviour interventions can fail to deliver bigger collective actions of the type needed to tackle climate change, for instance. Moreover, covert nudges that compromise autonomy (Bovens, 2009) are likely to be disproved (Sunstein, 2016c), more so by people with strong antecedent preferences (Sunstein, 2017b). Nudges that crowd out motivation, can generate reactance towards better policy alternatives (Hagmann et al., 2019; Maki et al., 2019). There is also the possibility that nudges are likely to be ignored, or attenuate in effects over time when taken away (Allcott and Rogers, 2014). These limitations point towards a possible disengagement of citizens with nudges. An alternative approach is to rely on purely reflective interventions.

Next consider purely reflective interventions, such as thinks or educative system 2 nudges[9]. These deliberative policies enable citizens to think about their available and affordable choice alternatives before they engage in optimal choice processes. In

[7] this conceptualisation is based on Thaler and Sunstein's nudge (more recently called a system–1 nudge (Sunstein, 2016c; Löfgren and Nordblom, 2020)

[8] defaults can fail, see Sunstein (2017b)

[9] boosts (Hertwig and Grüne-Yanoff, 2017) can be educative as well

the world of thinks, such as citizen forums, or system 2 nudges, such as information disclosures, a range of scenarios with additional information are provided to citizens which help them increase their set of perceived behavioural choice alternatives. In economic parlance to Simon's behavioural world, these purely reflective interventions correspond to an expansion in the set of perceived alternatives. Complete deliberation would simply amount in equivalence of Â and Å. These reflective economic policies therefore delimit attention to the set of existing perceived alternatives, and enable individuals to consider a bigger set of affordable alternatives. We define such purely reflective policies as follows.

Definition 2: A purely reflective economic policy, like educative nudges or thinks, expands the set of perceived choice alternatives (Â) salient to individuals while keeping their set of affordable alternatives (Å) unchanged.

However, thinking for all actions is cognitive costly and non-scalable (John et al., 2013, 2020). We consider hybrid policies, such as the nudge+. Banerjee and John (2020) define "nudge+" as a policy that embeds reflection in nudges. A nudge+ addresses theoretical shortcomings of a nudge in two fundamental ways: (1) it makes the nudge completely transparent to its recipients, and (2) it empowers recipients to consciously think about their self-need for a nudge, before or after providing them with one. Psychologically, a nudge+ has been posited to work by combining fast and slow processes (Kahneman, 2011) of the brain–they enable individuals to think slowly about the nudge.

Let's consider two such examples here. First, nudge+ with information disclosure represents a combination of nudges like defaults or labelling with an educative disclosure explaining how and why the nudge was constructed (i.e. how you perceive Â from Å). These policies are best understood as interventions which simultaneously re-orient and expand an individual's set of perceived alternatives. While a pure nudge re-directs attention towards other affordable alternatives, the disclosure transparently educates recipients of the possibility of missed alternatives that are affordable yet were left out by the nudge. These nudge+ information disclosures represent transparent nudging (Loewenstein et al., 2015b) and are defined as follows.

Definition 3: A nudge+ with information simultaneously re-orients and expands the set of choice alternatives (Â) salient to individuals while keeping their set of affordable alternatives (Å) unchanged.

Second, consider nudge+ with reflection which combines a pure nudge with an active reflective mechanism. These policies represent a sequential combination of nudges like defaults and labelling, with the possibility of self-reflection on one's final outcomes and payoffs through commitment contracts

(Bryan et al., 2010). These policies are best understood as interventions which prompt recipients of the nudge to think about where (or what) they want to be (in future), and help them do so with a nudge. In Simon's behavioural world, this self-reflection, facilitated by a commitment contract in place, corresponds to directing one's attention to assessing their preference orderings. These nudge+ with reflection are defined as follows.

Definition 4: A nudge+ with reflection enables individuals to re-assess their preferences (and orderings) while re-orienting the set of choice alternatives ($\hat{A}$) salient to them for compliance. It keeps their set of affordable alternatives ($\mathring{A}$) unchanged.

Our conceptualisation situates also traditional policies like price or quantity interventions. These are defined as follows.

Definition 5: A price intervention, like a tax, minimises the set of affordable alternatives $\mathring{A}$.

Definition 6: A quantity intervention policy, like a ban, minimises the set of behavioural alternatives A.

Using this economic conceptualisation, and the psychological set–up in chapter 3, one can consider nudge+ as an attempt to upgrade nudges and scale them up by making citizens a part of it. The ability of oneself to think slowly about the nudge, in fact, can improve the uptake of the nudge, particularly when the nudge is effective (i.e. leads to positive treatment effects). In this way, a nudge+ is conjectured to be more effective than its standalone nudge counterpart. A nudge+ is also fully transparent to the receiver. Hence, it should improve people's self-perceived autonomy, lest be unchanged. Thinking through the nudge and owning it reduces moral warm-glow effects as people are no longer tricked into good behaviours. For those who respond to the nudge+, they truly want to improve their intentions, actions and behaviours. Such hybrid interventions save people substantial cognitive effort when compared to purely reflective policies. Hence, a nudge+ is also conjectured to produce more effective outcomes compared to standalone reflective policies. We expect a nudge+ to produce optimal behaviour change along the reflective spectrum in economic policies.

Whilst nudge+ effects are conjectured to hold true for the population on average, we believe that increased deliberation comes at substantial cognitive costs to people (and economic costs to the society). Hence, the effectiveness of these economic policies will increase cognitive fatigue in people after treatment. By extension, people who are cognitively fatigued should be less responsive to nudge+.

In validating this theory of nudge+, we propose to test these claims using two online survey experiments.

4.3 Experiment-I

4.3.1 Survey Design

We administered a preregistered[10], online experiment to 3,074 participants[11] (Banerjee et al., 2022b) to test the role of self-reflection in nudges. The experiment was designed on Qualtrics and distributed to a pool of 127,488 eligible participants registered on Prolific. The experiment was administered in two waves[12], using preset filters to exclude (1) experienced participants who had participated in two prior pilot studies and/or (2) non–residents of the United Kingdom. All participants were rewarded[13] for their participation time [14], on an hourly basis, based on Prolific reward rates. The survey is available in Appendix C.

Participants were informed of the survey purpose and protocols for data anonymisation and storage. They were also asked for their consent to proceed with the survey. The survey had four parts. In its first part, we measured moods, attitudes and beliefs of participants using standard survey questions. Then, in the second part, participants revealed their risk and time preferences using an incentive-compatible monetary task[15]. In this part, we also measured baseline altruism levels as participants were asked to donate a part of these monetary earnings to a charity of their choice. After this, they were entered into the between-subjects experiment where they had to place an order for an online meal delivery under different experimental conditions (see section 4.3.2). This task was consequential, as participants were randomly selected to be awarded a restaurant (or, equivalent Amazon) voucher worth £20 to replicate their order[16]. To measure pro-social behavioural spillovers, we asked participants to donate a part of their food voucher to a charity of their choice in the United Kingdom. They were reminded that, if successful, their final voucher payment will be adjusted for any donations made at this stage. In the last part, we measured participants palatability towards the food menus in the experiment,

[10]The experiment was preregistered on Open Science Foundation (OSF) platform and the pre-analysis plan is available in section A.1

[11]for power analysis, see section A.1.3, and for ex–post effect sizes see section B.1.1

[12]on $12^{th} and 19^{th} November, 2020$

[13]the average completion time for the survey was 24 minutes (σ of 10.4 minutes) and the average reward was £3.35 GBP/hour

[14]rewarding participants based on actual completion time minimises concerns of strategic behaviour by participants to complete surveys hastily

[15]participants were randomly selected to receive an Amazon voucher (upto £80) equivalent to their earnings in the risk and time preference task

[16]we measure intended behaviours as vouchers could not be randomised or tracked

and re-assessed their mood. Standard socio-demographic characteristics were also measured.

4.3.2 Experimental Design

In the between-subjects experiment, participants were randomly assigned to one of nine experimental treatments, besides a control group. The task was set-up in four stages.

Stage 1: All participants were informed of the rules of the task. They were told they would be presented with a restaurant menu and will have to place an (intended) order for an online meal delivery. They were informed that they had a chance to win a food voucher to replicate their choice.

Stage 2: Participants were randomly assigned to one of the nine treatment groups, mimicking a behavioural policy, or the control group. Each behavioural policy was linked to a restaurant menu that was then shown to them.

Stage 3: Participants were taken to a check-out screen to place their intended order for an online meal delivery.

Stage 4: Participants were given the option to donate to a charity.

The randomisation in stage 2 worked as follows. In the control group, participants were shown a restaurant menu which had 36 main course items[17]. Each menu item was priced at less than or equal to £20. Of these 36 items, 18 items each were vegetarian and non-vegetarian. The remaining nine treatments were behavioural manipulations of this control group. The treatment design is available in Appendix A.1.6 and menu design is available in Appendix A.1.4.

Primarily, we wanted to compare the effectiveness of two nudges against two nudge+ with information and two nudge+ with reflection policies. Our first nudge was a green *default*[18], where participants were automatically opted in to a shorter menu consisting of sustainable food items with an option to opt-out. Our second nudge was a carbon *labelled*[19] menu which used a traffic lighting scheme to colour code all food items by the carbon intensiveness of the main ingredient[20] in the dish.

[17] these items were chosen from Deliveroo and Just Eat top 100 items ordered in the UK in 2019 and were adjusted following pilot surveys

[18] these green default represent standard set-menus in restaurant business

[19] carbon labelling was recently adopted at COP26 in Glasgow, for details see UK Cabinet office, 2021

[20] This categorisation was done using the McCance and Widdowson's CoFID user guide(England, 2021).

Using these nudges, we re-oriented people's attention to a subset of environmentally sustainable items available on the menu.

For our *nudge+ with information* treatments, we combined the green default and the labelling nudge with an information disclosure. This information disclosure informed people of the purpose and the construct of nudge they had received. In this way, while the nudge increased the salience of environmentally sustainable items on the menu, the nudge+ with information combined the nudge with a disclosure about other items that had been made non-salient.

Finally, in the *nudge+ with reflection* treatment, we provided participants with an offer to pledge to a sustainable diet. This pledge explained the meaning of a sustainable diet. Then it asked people to think about whether they would accept such a pledge. They could choose to be indifferent to it. For those who accepted the pledge, or were indifferent to it, goal motivations were assessed to comply with their reflective outcomes. After this self-reflection, participants were provided with the green default nudge. We also tested a different sequence of this nudge+ with reflection, where participants were first shown the default to help them make their choice. Then they were taken through the reflective process, and finally given another chance to revisit their initial choices. In this way, nudge+ with reflection empowered people to think about their preferences and where they want to be, which was made easier with the nudge.

To test the full spectrum of self-reflection, we also evaluated three more behavioural policies. One, called quick rule boosts (Hertwig, 2017; Hertwig and Grüne-Yanoff, 2017; Grüne-Yanoff and Hertwig, 2016), taught people to follow smarter heuristics. In this treatment, we asked participants to memorise and use three new food rules while choosing what to eat[21]. After this, they were provided with the full menu to test their new heuristics and place an intended order. The other two policies corresponded to reflective strategies. The first was designed to evaluate the complete effect of reflective empowerment, i.e., what happens when people have to actively think through all choices. Unlike its nudge+ counterpart, this think treatment did not provide people with the default nudge to ease compliance. After reflecting on the pledge and whether they wanted to take it, participants were enrolled to into a second reflective task where they had to customise a self-nudge[22] from a set of pre available nudges, the default, the labelling or full menu. The second reflective policy used an implementation intention (Gollwitzer, 1999), where participants were asked to make *if-then* goal plans to follow a sustainable diet. Each

[21] these rules were to eat (a) a balanced diet, (b) meat occasionally, and (c) mostly vegetarian items

[22] see self-nudging (Reijula and Hertwig, 2022)

participant made six goal plans.

4.3.3 Testable hypothesis

Using this experimental design, we propose to test the following set of pre–registered hypotheses to validate the claims of nudge+ (see section 3.5).

Research Question 1: Do behavioural policies promote climate-friendly behaviours compared to doing nothing?

Hypothesis 1: A behavioural policy will significantly improve pro-environmental behaviours compared to the control condition.

Research Question 2: Does adding reflection in the nudge improve climate-friendly behavioural outcomes?

Hypothesis 2: A nudge+ will be more effective than its standalone nudge.

Hypothesis 3: A nudge+ with reflection will be more effective than standalone reflection.

Hypothesis 4: A nudge+ with reflection will be more effective than a nudge+ with information.

Hypothesis 5: A nudge+ with reflection will be more effective than a reflective boost.

Research Question 3: Do behavioural policies promoting climate-friendly behaviours lead to any adverse behavioural spillovers?

Hypothesis 6: A behavioural policy will not produce adverse behavioural spillovers compared to the control condition.

Research Question 4: Are some people more responsive to reflective behavioural policies than others?

Hypothesis 7: Treatment effects of nudge+ will vary by participant's prior level of (a) anxiety (b) tiredness and (c) calmness.

Research Question 5: Do behavioural policies lead to a loss of autonomy?

Hypothesis 8: A behavioural policy will lead to no change in self-perceived autonomy of people compared to the control condition.

4.3.4 Empirical Analysis

Variables

We use *Greenhouse gas emissions (GHGe)* as a proxy for the environmental impact of participants' dietary choices in the experimental task. In particular, the outcome measure corresponds to the life cycle emissions of the main ingredient[23] in their chosen food item. The GHGe variable ranges from 0.8 to 68.8 kilos of CO2e, with an average emissions score of 17.1 kilos of CO2e. For robustness, we also measure such choices discretely with an ordinal variable called *Carbon Intensity(CI)* [24]. We measure indirect behaviours as participants' level of *Charitable Donations* in stage 4 of the experimental task. This is a continuous variable and reflects pro-social charitable contributions by participants.

Our main explanatory variables are dummy variables, called $Treatment_i$, indicating experimental conditions to which participants were randomly assigned to, such that

$$Treatment_i = 1, \{\text{if participant is in } i^{th} \text{ experimental condition, 0 otherwise}\}$$
$$\forall i = Treatment_{default}, ..., Treatment_{nudge+reflection}$$

Further, we construct variables for participants' mood measures, namely *anxiety*, *tiredness*, and *calmness*, measured on a 5-point likert scale. To measure differences in levels of autonomy, we construct $diff_{autonomy} = autonomy_{posttreat} - autonomy_{pretreat}$, where we measure $autonomy_t$ on a 5-point likert scale $\forall t = \{pretreat, posttreat\}$. We also construct other pre-registered covariates to use as controls in regressions and to check for balance of means in assessing randomisation (for details, see section B.1.2).

Empirical Strategy

We test hypothesis H1 by measuring the average treatment (intent–to–treat) effect of being assigned to an experimental condition, relative to the control group. We do so using a regression-based least-square approach, which in its simple form corresponds

[23] This variable was constructed as follows: we identify the primary food type and ingredient of each dish on our menu using the McCance and Widdowson's CoFID user guide(England, 2021). Each food item is assigned a carbon score (in kgCO2e) using the UK Greenhouse gas emissions scale developed by Scarborough and colleagues(Scarborough et al., 2014); for details, see Appendix A.1

[24] The GHGe variable has discrete jumps due to measurement of carbon intensiveness of each food item. To account for these value breaks, we further discretise the GHGe outcome into an ordinal variable. CI is an ordered categorical transformation of the GHGe outcome variable. It has nine categories, starting with the food type: beans, and lentils at the lowest level (0) of carbon emissions, to the food type: ruminant meat at the highest level (8)

to a means-comparison of *greenhouse gas emissions* between the treatment and control group, as outlined by specification [1].

$$\text{GHGe} = \alpha + \sum \beta_i \text{Treatment}_i + \epsilon \tag{4.1}$$

$$\forall i = Treatment_2, ..., Treatment_{10}$$

For robustness[25], we then control for n covariates, selected using a lasso-based regression technique (Bloniarz et al., 2016), outlined by specification [2]

$$\text{GHGe} = \alpha + \sum \beta_i \text{Treatment}_i + \sum \delta_k \text{Control}_\text{k} + \epsilon \tag{4.2}$$

$$\forall i = Treatment_2, ..., Treatment_{10} \quad \& \quad k = Control_1, ..., Control_n$$

Finally, in order to test hypotheses H2-H4, which compares a nudge+ to its corresponding nudge condition, we re–use model specification [2] by setting the nudge+ condition as our reference category, instead of the control group.

Next, we test for behavioural spillovers to validate hypothesis H5. There is increasing interest in measuring such spillovers in behavioural economics and psychology (Alacevich et al., 2021; Galizzi and Whitmarsh, 2019; Maki et al., 2019). However, there is limited agreement on identification of causal pathways effecting such indirect behaviour change. As such, we estimate behavioural spillover effects using two commonly accepted definitions in the literature[26].

In its first definition, behavioural spillovers are considered as the direct causal effects of a policy intervention on people's indirect behaviours. In following this definition, we re–use model specification [2] with *Charitable Donations* as our outcome variable of interest. This is specified in specification [3].

$$\text{CharitableDonations} = \alpha + \sum \beta_i \text{Treatment}_i + \sum \delta_k \text{Control}_\text{k} + \epsilon \tag{4.3}$$

$$\forall i = Treatment_2, ..., Treatment_{10} \quad \& \quad k = Control_1, ..., Control_n$$

In its second definition, we re-estimate behavioural spillovers as the effect of changes in *GHGe* on *Charitable Donations*. To account for endogeneity in the measurement of the *GHGe* variable, we use a two-stage least-square regression-based

[25] for additional robustness, we use a generalised ordered logistic regression approach, using *Carbon Intensity*. We report these results in section B.1.3

[26] We conduct a narrative review of studies estimating spillover effects in behavioural economics; see here

approach[27]. Here, we use our initial random assignment to experimental conditions to instrument for changes in emissions, which are then used to predict any charitable donations. Set up this way, we can use model specification [2] as our first-stage reduced-form equation. The TSLS estimator can be estimated from a second-stage model specification as outlined in [4].

$$\text{CharitableDonations} = \alpha + \sum \beta_i^{TSLS} \widehat{\text{GHGe}}_i + \sum \delta_k \text{Control}_\text{k} + \epsilon \tag{4.4}$$

$$\forall k = Control_1, ..., Control_n$$

While the first definition proposes a direct causal estimate of behavioural spillovers resulting from policy intervention, we believe that the second definition identifies the pathway of this indirect behaviour change. This is because spillovers effects are best thought of as cascading or ripple effects mediated by a change in direct behaviours (Shreedhar and Galizzi, 2021; Margetts and Kashima, 2017; d'Adda et al., 2017; Dolan and Galizzi, 2015; Lanzini and Thøgersen, 2014; Truelove et al., 2014).

We also test for any heterogeneity in our average treatment effects. In order to test hypotheses H6a-c, we re-use model specification [2] by adding a linear interaction with our pre-specified mood measures, namely, *anxiety*, *tiredness*, and *calmness*. This is outlined in specification [5].

$$\begin{aligned} \text{GHGe} = \alpha + \sum \beta_i \text{Treatment}_i + \sum \gamma_{ij} (\text{Treatment}_\text{i} * \text{Mood}_\text{j}) \\ + \sum \delta_k \text{Control}_\text{k} + \sum \rho_j \text{Mood}_\text{j} + \epsilon \end{aligned} \tag{4.5}$$

$$\forall i = Treatment_2, ..., Treatment_{10} \quad \& \quad k = Control_1, ..., Control_n \quad \& \quad j = Mood_{anxiety}, Mood_{tired}, Mood_{calm}$$

Finally, we assess if any of these experimental conditions lead to a change in participants' levels of self-perceived autonomy, as set out in hypothesis H7. In this, we re–use model specification [2] once again, by using $diff_{autonomy}$ as our outcome variable. We outline this in specification [6].

$$\text{diff}_\text{autonomy} = \alpha + \sum \beta_i \text{Treatment}_i + \sum \delta_k \text{Control}_\text{k} + \epsilon \tag{4.6}$$

$$\forall i = Treatment_2, ..., Treatment_{10} \quad \& \quad k = Control_1, ..., Control_n$$

[27] for robustness, we use a Baron and Kenny (1986) mediation analysis to determine if experimental conditions mediate behavioural spillover effects

We follow Young (2019) to account for joint and multiple hypotheses testing. We report these results in section 4.3.5. All analysis has been performed using Stata 17.

4.3.5 Results

Summary Statistics

We find participants were randomised[28] effectively in the ten different experimental conditions. We also satisfy our ex-ante sampling requirements[29]. As such, our study is powered to test hypotheses H1-H7. We follow Hadi (1994) in identifying and removing 65 outliers by the age of participants and their time taken to complete the survey[30]. The remaining sample consists of 3,009 participants, of which 2,494 participants are residents of the United Kingdom.

	Control	**Heuristic**	**Reflective**	**Hybrid**	**All**
			Outcomes		
GHG emissions	$\mu = 23.48$	$\mu = 12.12$	$\mu = 9.14$	$\mu = 9.83$	$\mu = 12.34$
	$\sigma = 28.35$	$\sigma = 22.49$	$\sigma = 17.27$	$\sigma = 18.21$	$\sigma = 21.34$
Donations	47.6%	47.15%	45.93%	45.88%	46.45%
			Demographics		
Age	$\mu = 29.12$	$\mu = 29.55$	$\mu = 28.60$	$\mu = 29.14$	$\mu = 29.17$
	$\sigma = 10.51$	$\sigma = 11.001$	$\sigma = 10.15$	$\sigma = 10.84$	$\sigma = 10.73$
Male	51.33%	51.60%	51.40%	53.04%	52.11%
First Degree or more	55.67%	52.27%	54.71%	51.38%	52.74%
Employed	49%	51.93%	50.91%	52.38%	51.61%
Student	41.67%	42.76%	45.45%	44.45%	43.87%
Christian	41%	39.78%	46.12%	45.62%	43.50%
White-UK	35.67%	32.38%	32.73%	32.86%	32.97%
Married	27.33%	31.05%	27.93%	27.86%	27.86%
			Survey characteristics		
Score	99.55	99.44	99.44	99.47	99.46
Completion time	23.76	24.16	25.27	24.22	24.37
Observations	298	902	600	1,191	3,009

Table 4.1: Descriptive statistics by treatment categories[31]

Our sample consists of young adults with a mean age of 29 years (σ=10.73). It is relatively balanced by gender with 52% male and 46% female representation.

[28] for balancing checks, see section B.1.2

[29] for sensitivity analysis, please see section B.1.1

[30] Our sample has young adults, representative of age of online food delivery customers. We remove older adults who can be outliers.

More than a half of the participants are in full- or part-time employment, and 44% of them are students. We recruit only English-speaking participants, with 29% of them self-reporting English as their first language. Furthermore, all participants are well-educated with at least 50% having a first degree from the university or more. The sample is pre-dominantly white in ethnic origin, and 85% of them have religious affiliations. These sample characteristics by the broad treatment categories are provided in Table 4.1.

The mean emissions from all intended meal orders is 12.34 kilos of carbon–equivalent (CO_2e) and the modal food type consumed is white fish and poultry, consistent across all treatments including the control condition. We find that the convergence to this modal food category is further exacerbated by our treatments[32] (see Figure 4.1).

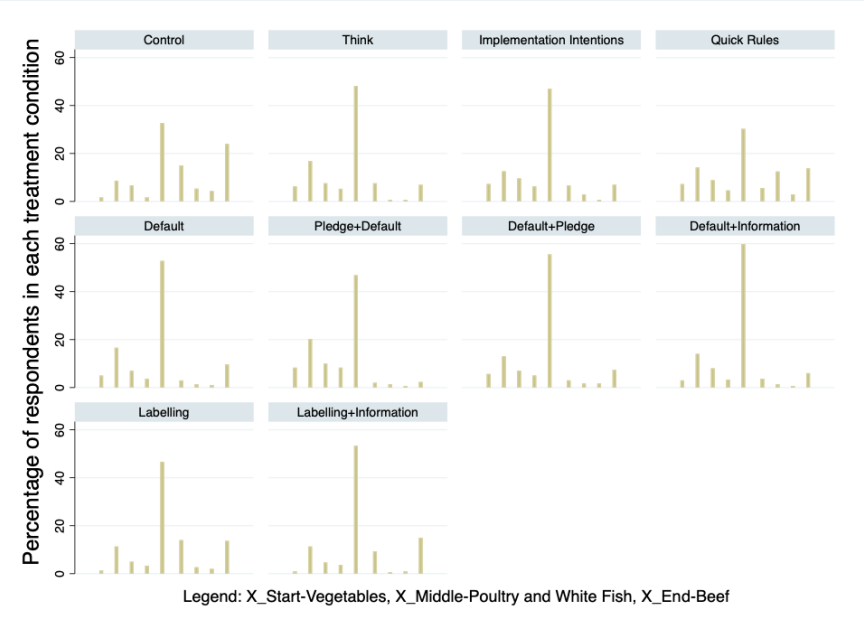

Figure 4.1: Frequency plot of meal orders across experimental conditions

This has implications for our average treatment effects, since a simple shift from a ruminant–based food item to a poultry– or fish–based food item will reduce emissions by ten times or more (Scarborough et al., 2014; Poore and Nemecek, 2018). In terms of charitable donations, we find donations are distributed with three clear peaks: participants are likely to donate nothing, half their endowments or mostly everything. Altruistic people, those who donate their monetary earnings from the

[32] a two-way tabulation test of the type of food consumed and treatments returns a chi^2=468.9978 at p¡0.00001

risk and time preference tasks, are more likely (ρ=0.495; p<0.0001) to donate in the post-treatment task. 29% of our sample chose to donate to an environmental charity[33], whereas the remaining donate to pro-social charities[34].

Average Treatment Effects

Result 1: All behavioural interventions significantly promote intentions for low–carbon diets.

Our first finding tells us that nudges, thinks, boosts, and nudge+ are all significantly effective in reducing the intended emissions over orders of meals in the experiment. Figure 4.2 plots the mean emissions in these different treatments, including the control condition. Table 4.2 further summarises these average treatment (intent–to–treat) effects of being randomly assigned to an experimental condition on the intended *greenhouse gas emissions*. Columns 1 corresponds to ordinary least–squares based regression, while column 2 repeats this analysis for robustness by controlling for covariates chosen using an adaptive lasso-based selection technique. In absolute terms, the green default cuts emissions by 53% (μ=-12.475, σ=1.669), on average, relative to the baseline. Other purely heuristic policies, like the labelling nudge and quick rules, reduce emissions by 35% and 30%, respectively. Thus, simply re-directing people's attention towards pro-environmental options using nudging or quick rules boosting increases intentions to consume climate-friendly items significantly.

So, what about the nudge+? First, consider nudge+ with information. We find that adding disclosures to the default nudge reduces absolute emissions by 63% (μ=-14.768, σ= 1.673), on average, compared to the baseline. In absolute terms, this reduction is greater than that offered by the standalone default. Contrarily, adding disclosures to the labelling nudge reduces these emissions by 36% (μ=-8.497, σ=1.671), which is similar to the absolute reductions offered by the standalone labelling nudge. Now, consider nudge+ with reflection. Facilitating reflection on one's own preferences before re-directing attention towards pro-environmental choices with the default reduces absolute emissions by 76% (μ=-17.905, σ=1.669), on average, relative to the baseline. However, when the sequence of this nudge+ is reversed, such that participants are first steered towards pro-environmental choices with the nudge, and then facilitated to reflect and revisit choices, the intent-to-treat effect is attenuated. The average absolute reduction offered by this nudge+ variant is 57% (μ=-13.396, σ=1.673), similar to its standalone nudge.

Finally, do purely reflective strategies work? We find when participants are

[33]WWF, Keep Britain Tidy, Greenpeace, PETA, and Friends of Earth

[34]British Heart Foundation, Samaritans, Children in Need, UNICEF, LGBT Foundation and Abortion Rights

made to reflect fully on their decisions first (1) on the offer of the pledge, (2) and subsequently on how to follow through with it, either by choosing a self-nudge (such as in the *think* condition) or by making goal plans (such as in the *implementation intentions* condition), the absolute emissions are reduced by just more than 60%, on average, relative to the baseline.

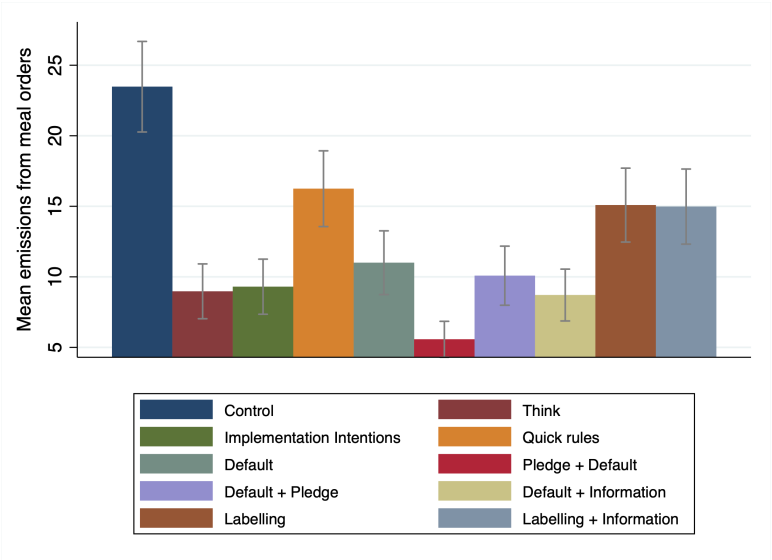

Figure 4.2: Mean emissions from meal orders in experimental conditions

Result 2: Adding reflection before the nudge improves climate-friendly behavioural outcomes.

Next, if we rank these behavioural policies in terms of their effectiveness relative to the control group, we find the nudge+ is at least as good as its corresponding standalone nudge or reflection, if not better. However, we have not yet compared these policies directly so far. Consequently, to assess if these pairwise differences are statistically significant, we now set our comparison directly to nudge+ categories. These findings are listed in Table 4.2 in columns 3-6, which correspond to least-squares regressions, controlling for covariates as selected by an adaptive lasso–based technique. As we move across these columns, we find average treatment effects of an experimental condition with respect to the default+information (column 3), *labelling+information* (column 4), *pledge+default* (column 5) and *default+pledge* (column 6), respectively.

We find that nudge+ with information is no better than the nudge, boost or think. Adding these information disclosures to the default or labelling nudge

do not offer any significant reductions in emissions. As an exception, the default nudge with information disclosures is better than the quick rules boosts. However, this is not true for the labelling nudge with information disclosures. We then find nudge+ with reflection offers significant emissions reduction. Adding reflection to the default nudge significantly improves intentions for climate-friendly diets compared to all other treatments. Figure 4.3 shows these treatment effects, relative to this nudge+ category, with 95% confidence intervals. Nonetheless, enabling participants to think about their own preferences is effective only when it precedes the nudge (Col 5). When people are steered with a nudge first, any reflection that follows the nudge fails to modify initial choices. These findings in column 5 validate our confirmatory hypotheses that a nudge+ can be more effective than its standalone nudge but with the caveat that it is not true for nudges combined with information disclosures. Moreover, we test for pairwise differences between purely reflective strategies, particularly, the standalone think (but also implementation intention boost) and the nudge to assess if the effectiveness of the nudge+ with reflection is purely driven by the reflective component in it. We fail to find any significant pairwise differences between them. Thus, reflection by itself cannot scale–up these emission reductions. However, when combined with the nudge sequentially, reflection stands to offer substantial benefits.

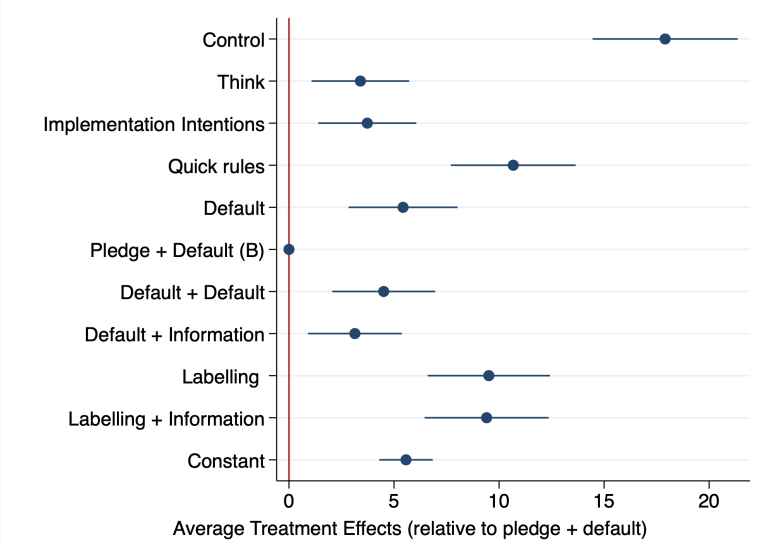

Figure 4.3: Average treatment effects relative to pledge before default (nudge+)

GHG emissions	(1)	(2)	(3)	(4)	(5)	(6)
Control	Baseline	Baseline	13.583	7.506	16.996	12.849
	-	-	(1.628)	(1.655)	(1.644)	(1.632)
	-	-	[0.0052]	[0.00067]	[0.00067]	[0.00098]
Quick Rules	-7.23	-6.983	6.599	0.523	10.013	5.866
	(1.666)	(1.623)	(1.618)	(1.630)	(1.612)	(1.616)
	[0.00084]	[0.00077]	[0.00091]	[0.78169]	[0.00048]	[0.00245]
Default	-12.475	-12.230	1.353	-4.724	7.766	0.618
	(1.669)	(1.622)	(1.619)	(1.636)	(1.623)	(1.621)
	[0.00045]	[0.00044]	[0.39618]	[0.00226]	[0.00259]	[0.69587]
Labelling	-8.497	-7.493	6.089	0.013	9.503	5.356
	(1.671)	(1.629)	(1.619)	(1.626)	(1.621)	(1.621)
	[0.00087]	[0.00016]	[0.00092]	[0.99229]	[0.00037]	[0.00148]
Default+Information	-14.768	-13.583	Baseline	-6.076	3.413	-0.734
	(1.673)	(1.628)	-	(1.632)	(1.624)	(1.621)
	[0.00041]	[0.00081]	-	[0.00038]	[0.03632]	[0.63466]
Labelling+Information	-8.497	-7.507	6.077	Baseline	9.489	5.343
	(1.671)	(1.655)	(1.632)	-	(1.624)	(1.628)
	[0.00077]	[0.00022]	[0.000001]	-	[0.00062]	[0.00097]
Pledge+Default	-17.905	-16.996	-3.412	-9.489	Baseline	-4.147
	(1.669)	(1.643)	(1.624)	(1.624)	-	(1.623)
	[0.00071]	[0.004]	[0.03657]	[0.00069]	-	[0.0125]
Default+Pledge	-13.396	-12.849	0.724	-5.342	4.167	Baseline
	(1.673)	(1.632)	(1.621)	(1.627)	(1.623)	-
	[0.00028]	[0.00044]	[0.6347]	[0.00093]	[0.01223]	-
Pledge [Think]	-14.505	-12.807	0.776	-5.3	4.189	0.042
	(1.667)	(1.642)	(1.619)	(1.612)	(1.612)	(1.618)
	[0.00097]	[0.00086]	[0.63899]	[0.00247]	[0.01272]	[0.97657]
Impl. Intentions	-14.176	12.031	1.551	-4.524	4.964	0.818
	(1.668)	(1.669)	(1.639)	(1.631)	(1.623)	(1.633)
	[0.00014]	[0.00083]	[0.35944]	[0.00774]	[0.00384]	[0.64819]
Constant	23.477	35.113	21.53	27.607	18.117	22.264
	(1.182)	(7.896)	(7.957)	(7.956)	(7.917)	(7.953)
Observations	3009	2991	2991	2991	2991	2991
R-squared	0.0544	0.1298	0.1298	0.1298	0.1298	0.1298
Controls	No	Yes	Yes	Yes	Yes	Yes

Notes: OLS estimates of specification [1] in column 1, [2] in columns 2-6 (with baseline set to control, default+information, labelling+information, pledge+default, and default+pledge). Robust standard errors reported in parentheses. Young (2019) randomised p-values in box brackets. Columns (2-6) includes control variables. The list of controls included correspond to a Lasso-based selection technique, and include indicators of palatability towards menu, dietary styles, pro-conservation beliefs, gender, climate change scepticism, age, scores on healthy eating index, ONS measures of anxiety and life satisfaction, beliefs for command and control regulation, religious beliefs, effect of COVID-19 on income, and whether one's favour the environment over economic growth. We follow Young (2019) to account for joint and multiple hypotheses testing.

Table 4.2: Intent to Treat effects

Further, our treatment effects are not driven by participant's time spent on the survey. Being randomly assigned to a treatment condition does not significantly correlate with the time taken to complete the survey (see Appendix B.1.5). In our experiment, therefore, it is unlikely to have triggered demand effects (Mummolo and Peterson, 2019). We do not find any evidence of heterogeneity[35] in treatment effects of these behavioural policies, by pre-experimental mood levels of participants, as conjectured earlier. Being exposed to these treatments does not change participants' perceived autonomy.

Spillover effects

Result 3: Behavioural interventions do not lead to negative behavioural spillovers.

There is increasing interest in measuring behavioural spillovers in economics and psychology (Alacevich et al., 2021; Galizzi and Whitmarsh, 2019; Maki et al., 2019). However, there is limited agreement on identification of causal pathways effecting such indirect behaviour change. We conduct a narrative review of studies estimating spillover effects in behavioural economics; available online here. We then contribute to this literature by estimating spillover effects from our designed behavioural interventions using two commonly accepted definitions of spillover effects (for details, see Appendix B.1.4). In its first definition, we consider behavioural spillovers as direct causal effects of policy interventions on indirect behaviours. We test this using an ordinary least square regression[36] of *Charitable Donations* on *Treatment Indicator*. We do not find any statistically significant evidence to suggest that random assignment to a behavioural economic policy leads to any significant difference in pro-social contributions relative to the control condition, on average. The average contributions, with 95% confidence intervals, are shown in Figure 4.4.

While this first definition proposes a direct causal estimate of behavioural spillovers resulting from policy intervention, we believe it fails to identify the pathway of this indirect behaviour change. This is because spillovers effects are best thought of as cascading or ripple effects mediated by a change in direct behaviours (Shreedhar and Galizzi, 2021; Margetts and Kashima, 2017; d'Adda et al., 2017; Dolan and Galizzi, 2015; Lanzini and Thøgersen, 2014; Truelove et al., 2014). As such, we use re–test for spillovers using a two–stage least–squares regression–based approach, where we use our initial random assignment to an experimental condition to instrument for changes in emissions, which are then used to causally infer effects

[35] heterogeneity analysis is available online here

[36] we check for robustness by controlling for covariates

on donations to charities. Yet again, we do not find any evidence of (adverse) spillover effects. These results are available in section B.1.4.

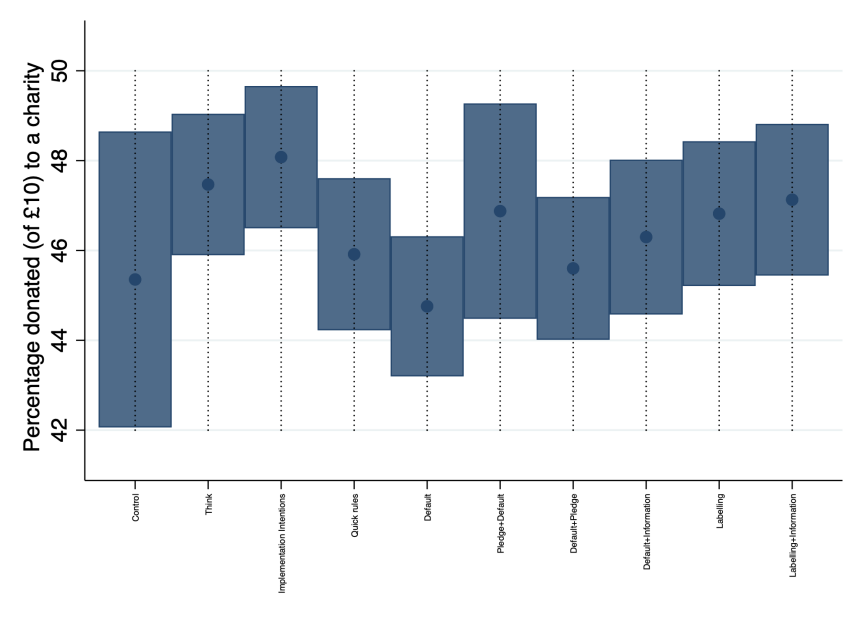

Figure 4.4: Average donations to a charity across treatments

To summarise: we find that all behavioural policies are significantly effective in promoting climate citizenship by improving intentions of climate-friendly diets. We further show that adding reflection before the default nudge improves its effectiveness by 30%. This nudge+ with reflection is better than nudges combined with informational disclosures or purely reflective strategies. While we do not find evidence[37] to suggest that adding an information disclosure to a nudge always improves its effectiveness, our evidence reaffirms findings in the literature that transparency about the nudge, in the form of disclosures, does not generate reactance, on average. We do not find evidence that supports (1) cognitive fatigue dampens treatment effects of nudge and nudge+ policies, (2) behavioural policies reduce autonomy or lead to negative spillovers.

[37] study was not designed by power to detect pairwise differences

4.4 Experiment-II

4.4.1 Survey Design

We administered another preregistered[38], online experiment to 5,552 participants[39] (Banerjee and Picard, 2022) to test the role of reflection in social norms, along with any heterogeneity by menu–familiarity and menu–composition. The experiment was designed on Qualtrics and distributed to a pool of 10,785 eligible participants registered on Prolific. The experiment was administered in one wave[40], using preset filters to exclude (1) experienced participants who had participated in three prior pilot studies (2) non–residents of England and non–citizens of the United Kingdom (3) participants with self-reported vegetarian diets and/or (4) participants who failed an attention check[41] at beginning of the survey. The sample was pre–selected to satisfy gender–balance. All participants were rewarded[42] for their participation time, on an hourly basis, based on Prolific reward rates. The survey is available in Appendix C.

Similar to experiment-I, participants were first informed of the survey purpose and protocols for data anonymisation and storage. They were also asked for their consent to proceed with the survey. The survey had four parts. In the first part, we measured moods, attitudes and beliefs of participants using standard survey questions. In the second part, they were entered into a between-subjects experiment, where they had to place an order for an online meal delivery under different experimental conditions (see 4.4.2). This task was consequential as before, and participants were randomly selected to be awarded a restaurant voucher worth £20 to replicate their order. To measure pro-social behavioural spillovers, we asked participants to donate a part of their food voucher to an environmental (pro–climate action) charity of their choice in the United Kingdom. They were reminded that, if successful, their final voucher payment will be adjusted for any donations made at this stage. Finally, in the last part, we measured participants' palatability towards the food menus in the experiment. Standard socio-demographic characteristics along with participants' residential locations (outer postcode) were also measured.

[38]The experiment was preregistered on Open Science Foundation (OSF) platform and the pre-analysis plan is available in Appendix A.2

[39]for power analysis, see Appendix A.2.3

[40]from 1^{st} March, 2022 to 15^{th} April, 2022

[41]People are very busy these days and many do not have time to follow what goes on in the government. We are testing whether people read questions. To show that you've read this much, answer both "extremely interested" and "very interested". Options include: Not all interested, Slightly interested, Moderately interested, Very Interested, and Extremely interested

[42]the average completion time for the survey was ≈8 minutes (σ=11.1 minutes) and the average reward was £5.39 GBP/hour

4.4.2 Experimental Design

Between-subjects experiment

In this between–subjects experiment, participants were randomly assigned to one in sixteen experimental conditions, including the control group. The task was set up in four stages, as before. This task differed from our previous set–up in experiment-I (see 4.3.2) in stages 1, 2 and 4.

Stage 1: Participants were tested for their attention using a screener[43]. If they failed the attention check, they were reminded to pay attention to the survey.

Stage 2: Participants were randomly assigned to one in sixteen experimental conditions, where each condition mimicked a behavioural public policy. All participants were then defaulted accordingly in to a set–menu with a take–it or leave–it offer. If they opted–out of this default, they could place an order from an ala–carte menu.

Stage 3: Participants were taken to a check-out screen to place their intended order for an online meal delivery.

Stage 4: Participants were given the option to donate to a charity. Participants were checked for their compliance with the reflective treatment with a manipulation check[44].

The randomisation described in stage 2 was based on a 4 (reflection) x 2 (familiarity) x 2 (menu-composition) factorial design intended to test randomly the effect of each of these three different dimensions on dietary choices. Consider the first dimension. This corresponds to varying levels of reflection that can be embedded in climate nudges. Participants were assigned to one of the following levels.

- Control: In this condition, participants were provided with a baseline menu, without any nudge or reflective prompt.
- Social norms: In this condition, participants were shown a dynamic and descriptive social norms message[45] emphasising on an increasing uptake of

[43]Most modern theories of decision making recognize that decisions do not take place in a vacuum. Individual preferences and knowledge, along with situational variables can greatly impact the decision process. To demonstrate that you've read this much, just go ahead and select both red and green among the alternatives below. Based on the text you read above, what colour have you been asked to select? Options include: White, Black, Red, Pink, Green, Blue

[44]Before being shown the restaurant menu, you were shown a message. What was the message about? Options include: People changing diets to become climate-friendly,People changing their diets to lose weight, People changing their diets to respect animals' well-being, I was not shown any specific message, I do not remember any specific message displayed.

[45]A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

low-carbon diets by British citizens.

- Social norms + Personal norms: In this condition, participants were shown the social norms message. Then they were asked to reflect on their own personal norms, in particular, if they were trying to change diets to become climate friendly.

- Social Norms + Personal norms + Pledge: In this condition, participants were shown the social norms message and then asked to reflect on their personal norms. Finally, they were asked to think if they were willing to make a pledge to adopt more climate-friendly diets.

The second dimension of our factorial design was designed to test the role of familiarity with names of food items in dietary choices. In this, we redesigned menus into two types. In the familiar type, we used colloquial labels to name food items on the menu, for example, *Fish and chips*. In its non–familiar type, we used neutral names to label similar items; for example, *cod fillet* instead of Fish and Chips. By randomly varying these names, we wanted to evaluate the role of "foolish familiarity" (Litt et al., 2011), namely that people tend to make welfare–reducing ("foolish") decisions when they encounter familiar choice bundles.

Finally, the third dimension of our factorial design was designed to test the role of menu-composition. Parkin and Attwood (2022) show an increasing saturation of menus with low–carbon items is imperative to promote climate–friendly diets. As such, we redesigned our menus into two different types: a low–carbon variant, where more than three–fifths of the menu items had an embedded carbon footprint lower than the average emission of all items on the menu, and a high–carbon variant, where more than three–fifths of the menu items had an embedded carbon footprint higher than the average emission of all items on the menu. The full factorial experimental design is outlined in Table 4.3. In our analysis (see section 4.4.3) here, as specified in our pre–registration plan, we restrict our attention to the role of reflection, by collapsing all treatment conditions to the reflective dimension only[46]. The menu designs and treatment designs are available in Appendix A.2.2.

[46]For robustness, we will control for the effect of being randomly assigned to familiar (or non–familiar) and/or high–carbon (or low–carbon) menus.

	Familiar	
Degree of reflection	**Low-Carbon**	**High-Carbon**
Baseline	Treatment 1	Treatment 2
Social Norms	Treatment 5	Treatment 6
Social Norms + Personal Norms	Treatment 9	Treatment 10
Social Norms + Personal Norms + Pledge	Treatment 13	Treatment 14
	Non-Familiar	
Degree of reflection	**Low-Carbon**	**High-Carbon**
Baseline	Treatment 3	Treatment 4
Social Norms	Treatment 7	Treatment 8
Social Norms + Personal Norms	Treatment 11	Treatment 11
Social Norms + Personal Norms + Pledge	Treatment 15	Treatment 16

Table 4.3: Experimental design: Between-subjects

4.4.3 Testable hypothesis

Using this experimental design, we propose to re–test our research questions in experiment–I (see section 4.3.3), in line with the claims of nudge+ (see 3.5) with the following set of pre–registered hypotheses.

Research Question 1: Do behavioural policies promote climate-friendly behaviours compared to doing nothing?

Hypothesis 9: A social norms nudge will significantly improve pro-environmental behaviours compared to the control condition.

Hypothesis 10: A social norms nudge with reflection on personal norms will significantly improve pro-environmental behaviours compared to the control condition.

Hypothesis 11: A social norms nudge with reflection on personal norms and a pledge will significantly improve pro-environmental behaviours compared to the control condition.

Research Question 2: Does adding reflection in a nudge improve climate-friendly behavioural outcomes?

Hypothesis 12: A social norms nudge with reflection on personal norms will be more effective than the standalone social norms nudge.

Hypothesis 13: A social norms nudge with reflection on personal norms and pledge will be more effective than the standalone social norms nudge.

Hypothesis 14: A social norms nudge with reflection on personal norms and pledge will be more effective than the standalone social norms nudge with reflection on personal norms.

Research Question 3: Do behavioural policies promoting climate-friendly behaviours lead to any adverse behavioural spillovers?

Hypothesis 15: A social norms nudge will not produce adverse behavioural spillovers compared to the control condition.

Hypothesis 16: A social norms nudge with reflection on personal norms will not produce adverse behavioural spillovers compared to the control condition.

Hypothesis 17: A social norms nudge with reflection on personal norms and a pledge will not produce adverse behavioural spillovers compared to the control condition.

4.4.4 Empirical analysis

Variables

In our between–subjects experiment, we use *Greenhouse gas emissions (GHGe)* as a proxy for the environmental impact of participants' dietary choices in the experimental task. Like in experiment–I, this outcome measure corresponds to life cycle emissions of the main ingredient in their chosen food item. Similarly, we measure participants' indirect behaviours as their level of *Charitable Donations* in stage 4 of the experimental task. Our main explanatory variables are dummy variables, indicating the experimental conditions to which participants were randomly assigned to. These include variables that correspond to each of the three dimensions in our factorial design (see Table 4.2), namely $Reflection_i$, *Familiarity*, and *Menu Composition* where,

$$Reflection_i = 1, \{\text{if participant is in } i^{th} \text{ reflective condition, 0 otherwise}\}$$

$\forall i$ ={control, social norms, social norms + personal norms , social norms + personal norms + pledge}

$Familiarity = 1$, {if participant is assigned to the familiar condition, 0 otherwise}

$MenuComposition = 1$, {if participant is assigned to a low–carbon menu condition, 0 otherwise}

We also use a dummy variable, called $Compliance_{1i}$, to measure participants' compliance with the reflective treatment that they were randomly assigned to, such that

$Compliance_{1i} = 1$, {if participant is in i^{th} reflective condition and answers the manipulation check correctly, 0 otherwise}

$\forall i$ ={control, social norms, social norms + personal norms , social norms + personal norms + pledge}

Finally, we measure participants' attention levels, prior to the first experimental task, with a dummy variable, called *Attention*, such that

$Attention = 1$, {if participant answers the attention check correctly, 0 otherwise}

For the between–subject experiment, we construct other pre-registered covariates to use as controls in regressions and to check for balance of means in assessing randomisation.

Empirical Strategy

We test hypotheses H9-H11 by measuring average treatment effects of being assigned to a reflective experimental condition, relative to the control group. We do this in two different ways. First, we calculate the intent–to–treat effect (ITT) of *reflection* on *GHGe* using linear regressions. In this, we control for the effect of familiarity and menu–composition, for any n covariates selected using a lasso–based regression technique (Bloniarz et al., 2016), and for participants' residential fixed effects (at the zip–code level) as outlined by specification [7] below.

$$\begin{aligned} \text{GHGe} = \alpha + \sum \beta_i \text{Reflection}_i + \rho \text{Familiarity} + \sigma \text{MenuComposition} \\ + \sum \gamma_j \text{Covariates}_j + \sum \delta_k \text{Zip}_k + \epsilon \end{aligned} \tag{4.7}$$

$$\forall i = Reflection_{socialnorms}, ..., Reflection_{socialnorms+personalnorms+pledge}$$
$$\forall j = Covariate_1, ..., Covariate_n$$
$$\forall k = Zip_1, ..., Zip_z$$

Second, we calculate complier average causal effects (CACE), also known as treatment–on–treated effects of reflection on GHGe using a two–stage least–squares based regression approach. In the first stage, we use the initial random assignment to a reflective treatment to instrument for participants' levels of treatment compliance, $Compliance_{1i}$. In the second stage, we use these instrumented compliance levels to predict its causal effect on emissions. We control for familiarity, menu composition, the selected lasso covariates and zip fixed effects as before. This second stage regression is outlined by specification [8] below. Further, to understand what explains participants' levels of compliance with assigned experimental treatments, we follow Marbach and Hangartner (2020) in profiling compliers and non–compliers in this analysis by pre–treatment individual characteristics.

$$\begin{aligned} \text{GHGe} = \alpha + \sum \beta_i^{TSLS} \widehat{Compliance}_{1i} + \rho\text{Familiarity} + \sigma\text{MenuComposition} \\ + \sum \gamma_j \text{Covariates}_j + \sum \delta_k \text{Zip}_k + \epsilon \end{aligned} \tag{4.8}$$

$$\forall 1i = Compliance_{socialnorms}, ..., Compliance_{socialnorms+personalnorms+pledge}$$
$$\forall j = Covariate_1, ..., Covariate_n$$
$$\forall k = Zip_1, ..., Zip_z$$

Next, in order to test hypotheses H12-H14, which compares either the different nudge+ treatments to the nudge ("social norms + personal norms" or "social norms + personal norms + pledge" versus "social norms"), or compares an increasing degree of reflection ("social norms + personal norms + pledge" versus "social norms + personal norms"), we re–use specification [7] and [8] by setting "social norms + personal norms + pledge" as our reference category of comparison.

We further test for behavioural spillovers to validate hypotheses H15-H17. As before (see section 4.3.4), we do this using two different definitions of behaviour spillovers. The first definition, which proposes a direct causal effect of an experimental condition on *Charitable Donations*, is estimated by a linear regression as outlined in specification [9] below.

$$\begin{aligned} \text{CharitableDonations} = \alpha + \sum \beta_i \text{Reflection}_i + \rho\text{Familiarity} + \sigma\text{MenuComposition} \\ + \sum \gamma_j \text{Covariates}_j + \sum \delta_k \text{Zip}_k + \epsilon \end{aligned} \tag{4.9}$$

$$\forall i = Reflection_{socialnorms}, ..., Reflection_{socialnorms+personalnorms+pledge}$$
$$\forall j = Covariate_1, ..., Covariate_n$$

$$\forall k = Zip_1, ..., Zip_z$$

The second definition, which proposes to measure spillover effects as the causal effect of changes in *GHGe*, mediated by experimental conditions, on *Charitable Donations*, is estimated by a two–stage least-squares regression–based approach. The first–stage reduced equation is equivalent to specification [7]. The second–stage regression is outlined by specification [10] below.

$$\begin{aligned} \text{CharitableDonations} = \alpha + \beta^{TSLS}\widehat{GHGe} + \sum \gamma_j \text{Covariates}_j \\ + \sum \delta_k \text{Zip}_k + \epsilon \end{aligned} \tag{4.10}$$

$$\forall j = Covariate_1, ..., Covariate_n$$
$$\forall k = Zip_1, ..., Zip_z$$

We follow Young (2019) to account for joint and multiple hypotheses testing. All analysis has been performed using Stata 17.

4.4.5 Results

Summary Statistics

We find participants were randomised effectively into the sixteen different experimental conditions (see Appendix B.2.2). As such, our study is sufficiently powered to test hypotheses H9-H19. We remove participants who do not meet our inclusion criteria, leaving us with a final sample of 5,555 participants. This sample is gender–balanced with 50% female representation. The modal age of participants is between 25 and 34 years, and $\approx$ 30% of the sample is over 45 years of age. More than half the sample has a university degree or more, with only 14% of it being in full– or part–time education. 5% of the sample is unemployed. The sample is predominantly white in ethnic origin ($\approx$89%). More than half the sample($\approx$ 55%) has left–leaning political views. The sample characteristics by reflective treatment categories are summarised in Table 4.4 below.

The mean emissions from all intended meal orders is 16.79 kilos of carbon–equivalent (CO_2e), which is slightly higher ($\approx 4CO_2e$) than the mean emissions in experiment–I. As before, the modal food type consumed by participants is white fish and poultry. This is consistent across all treatments including the control condition. Nonetheless, unlike in experiment–I (see section 4.3.5), where the convergence towards mid–emission food items was exacerbated by treatments, here we see a

	Control	**Social Norms**	**Social Norms Personal Norms**	**Social Norms Personal Norms Pledge**	**All**
Outcomes					
GHG emissions (μ)	19.35	16.61	16.48	14.71	16.79
(σ)	25.56	24.02	24.00	22.69	24.14
Donations	34.03%	33.69%	33.73%	37.1%	34.64%
WTA (μ)	4.16	4.02	4.07	3.91	4.04
(σ)	3.64	3.62	3.70	3.75	3.68
Demographics					
Male	51.6%	48.7%	48.8%	50.4%	0.50%
First Degree or more	53.33%	53.31%	53.07%	50.10%	52.46%
Employed	74.84%	74.75%	72.53%	74.48%	73.90%
Student	14.38%	12.95%	13.73%	16.05%	14.28%
White-UK	89.45%	88.78%	88.41%	89.15%	88.95%
Survey Performance					
Attention	99.78%	99.71%	99.86%	99.86%	99.80%
Compliance_1	81.86%	81.51%	83.91%	72.38%	79.92%
Compliance_2	80.52%	80.22%	82.50%	70.10%	78.36%
Completion time	7.56	7.88	8.48	9.14	8.27
Observations	1,384	1,390	1,398	1,383	5,555

Table 4.4: Descriptive statistics by reflective treatment categories

further shift[47] towards low–carbon items due to the reflective treatments (see Figure 4.5). In terms of charitable donations, we find donations are distributed with three clear peaks: participants are mostly likely to donate nothing, after which they either donate half their endowments or everything. This finding is also similar to that in experiment–I.

[47] a two-way tabulation test of the type of food consumed and treatments returns a chi^2=105.2193 at p<0.00001

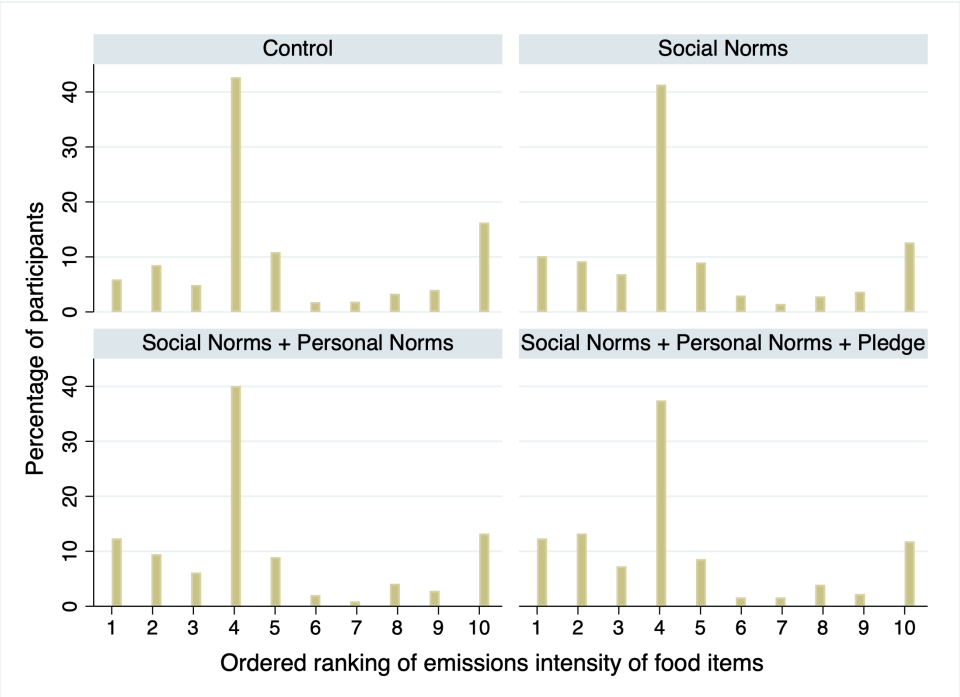

Figure 4.5: Frequency plot of meal orders across reflective treatments

Average treatment effects of reflective behavioural policies

Result 1: All behavioural interventions significantly promote intentions for low–carbon diets.

Our first finding tells us that all behavioural interventions, namely the social norms nudge, and its nudge+ variants, such as with reflection on personal norms and/or a pledge, reduce emissions over meal orders of participants, compared to the control condition. Table 4.5 summarises the average treatment effects of being randomly assigned to a reflective condition on the intended *greenhouse gas emissions* of participants. In this, column 1 corresponds to ITT estimates from specification [7] which controls for the effect of being randomly assigned to the familiar and high–carbon menu compositions. Column 2 provides robust estimates by further controlling for covariates chosen by an adaptive lasso–based regression technique and the locational fixed effects at participants' zip–code level. Column 3 corresponds to complier average causal effects (or treatment on treated) effects as estimated by specification [8], controlling for other treatment dimensions, all lasso–based covariates and locational fixed effects.

Participants who receive randomly the social norms message choose meals that

GHG emissions	Column 1	Column 2	Column 3
Social Norms	-2.739	-2.830	-3.538
	(0.930)	(0.981)	(1.055)
	[0.0032]	[0.0039]	[0.001]
Social Norms + Personal Norms	-2.890	-2.953	-3.487
	(0.881)	(0.934)	(1.015)
	[0.0029]	[0.0020]	[0.001]
Social Norms + Personal Norms + Pledge	-4.624	-5.242	-7.233
	(0.909)	(0.975)	(1.184)
	[0.00001]	[0.00001]	[0.00001]
Familiar (1=Yes)	0.828	0.740	0.7244
	(0.639)	(0.674)	(0.599)
	[0.1952]	[0.2718]	[0.227]
Menu Composition (1=High Carbon)	7.247	6.551	0.458
	(0.640)	(0.675)	(0.603)
	[0.00001]	[0.00001]	[0.00001]
Constant	15.325	16.032	16.678
	0.787	14.242	8.421
$\text{Treat}_{(socialnorms+personalnorms+pledge)-(socialnorms)}$	-1.884	-2.412	-3.694
	(0.872)	(0.926)	(1.114)
	[0.031]	[0.009]	[0.001]
$\text{Treat}_{(socialnorms+personalnorms+pledge)-(socialnorms+personalnorms)}$	-1.734	-2.289	-3.736
	(0.877)	(0.942)	(1.109)
	[0.048]	[0.015]	[0.001]
$\text{Treat}_{(socialnorms+personalnorms)-(socialnorms)}$	-0.151	-0.122	-0.041
	(0.898)	(0.951)	(1.029)
	[0.866]	[0.897]	[0.968]
Controls	No	Yes	Yes
Fixed Effects	No	Yes	Yes
Instrumented	No	No	Yes
Observations	5555	5555	5555
R-squared	0.028	0.286	0.2827
First–Stage F	-	-	1375.05

Notes: OLS estimates of specification [7] in columns 1 & 2. TSLS estimates of specification [8] in column 3. Standard errors in parentheses; Young's randomised–p values in box brackets. In columns 2 & 3, controls selected by adaptive lasso–regression include: whether person has other commitment after the experiment (hurry), political ideology (left-right scale), whether they prefer British food, whether they think cultural diets should be meat–based, scepticism towards climate change, moral duty in acting against climate change, palatability towards the menu, whether they faced a trade–off (liking versus pro–climate) in choosing their meal orders, and whether they felt they helped the environment

Table 4.5: Intent to treat effects

significantly reduce their emissions in the order of $\approx [2.5 - 3.9]$ carbon–equivalent units, relative to the control condition. Similarly, when participants are made to reflect on their personal norms, after being provided with these social norms, it also significantly reduces emissions from meal orders in the range of $\approx [2.7 - 3.8]$ carbon–equivalent units, relative to the control condition. However, when the reflective comparison of the social and personal norms are strengthened by an offer to pledge to climate–friendly diets, these reductions in emissions from meal orders, compared to the control condition, significantly increase to the order of $\approx [4.3 - 7.3]$ carbon–equivalent units. These results validate hypotheses H9–H11. They also add

robustness to our overall claim that behavioural policies, such as climate nudge and nudge+ interventions, can be substantially effective in promoting intentions for climate–friendly diets. These findings for the social norms nudge are in the same direction as with the green default and labelling nudge in experiment–I.

Result 2: Adding reflection to a nudge increases its effectiveness

Next we compare the effectiveness of the nudge and nudge+ policies. These pairwise differences are also highlighted in Table 4.5. We find that when participants are made to think about social norms, by reflecting on their own personal norms on pro–climate diets, the effectiveness of the social norms nudge remains unchanged, on average. This is also true when we control for participants' compliance with these experimental conditions (column 3). As such, we are unable to validate hypothesis H12. Nonetheless, we find heterogeneity in these treatment effects. For example, the treatment effect of the nudge is significantly more for participants whose personal norms are aligned with the social norms. Thus, if participants report having intentions to consume climate–friendly diets, the effectiveness of the nudge increases significantly through the reflective prompt. These results reaffirm findings in the literature that a nudge is effective when the nudger's goals are aligned to that of the nudgee (Reisch et al., 2021).

The effect of the nudge is strongest when participants are prompted to think about the social norms, first by identifying their own personal norms, and then by deliberating on an offer to pledge to climate–friendly diets. As Table 4.5 shows, reflection on the pledge, almost doubles the effectiveness of the social norms nudge. In particular, the effect of this reflection is strongest for participants who comply with the experimental condition perfectly, as can be seen in column 3. These findings for the pledge match our claims for "nudge+ with reflection" via a pledge as shown before in experiment–I. We are also able to validate hypotheses H13-H14 [48]. Figure 4.6 plots the complier average causal effects across these reflective experimental conditions.

[48]Further, our treatment effects are not driven by participant's time spent on the survey, except for that in the pledge condition (see Appendix B.2.4).

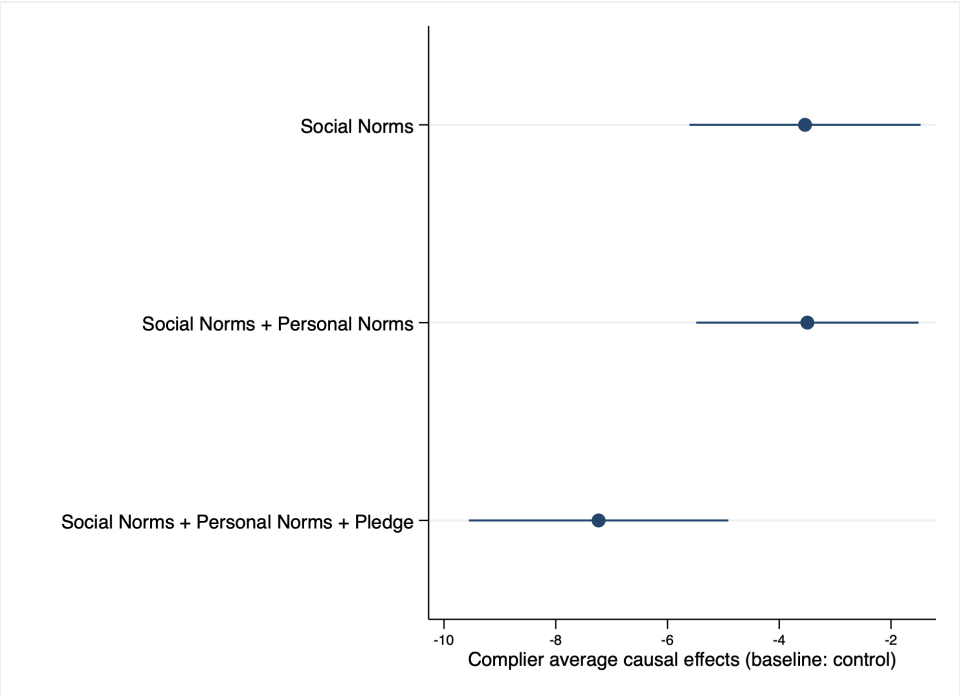

Figure 4.6: Complier average causal effects across reflective treatments

In order to understand what leads to compliance with these treatment conditions, we follow Marbach and Hangartner (2020) in profiling[49] compliers and non–compliers of treatments in these reflective conditions. We do not find any measurable differences between compliers and non-compliers of these treatments by individual's age, gender, political ideology, level of hurry, level of hunger, dietary preferences, or climate change beliefs. However, the less educated are found to be less compliant with the higher order nudge+ ("social norm + personal norms + pledge") condition [p=0.0347] (see Figure 4.7 in Online Appendix). These results show that some behavioural policies can have more localised effects based on sub–population characteristics. As such, any behavioural change program can be strengthened by adopting a wider toolkit of behavioural policies, targetted by population dynamics (Mills, 2022).

[49]These complier profiling analyses were not pre–registered.

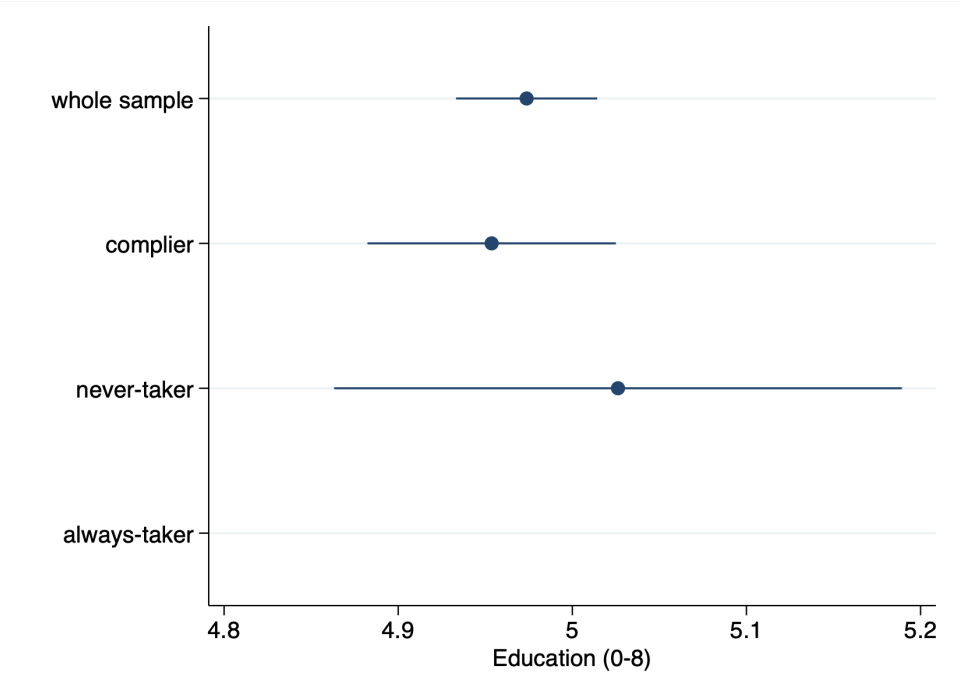

Figure 4.7: Profiling of treatment compliance by individual characteristics

Spillover effects from reflective treatments

Result 3: Behavioural interventions do not lead to negative behavioural spillovers

Like experiment–I, we estimate behavioural spillovers using two different approaches (see Appendix B.2.3). First, we estimate the direct causal effect of being randomly assigned to a reflective condition on participants' levels of *charitable donations* using specification [9]. We find that being assigned to "nudge+ with reflection" via the pledge significantly increases charitable donations by $\approx 5pp$, compared to the control condition [p=0.01], or the social norms nudge with [p=0.009] or without [p=0.006] reflection on personal norms. These treatment effects are also robust when we account for treatment compliance. Figure 4.8 plots these treatment effects (CACE) across the reflective conditions.

Next, we re-evaluate spillover effects using specification [10]. In this, we compute the effect of meal orders, measured by emissions instrumented by our random treatment assignment, on *charitable donations*. Here, we find that a decrease in emissions, caused by our reflective treatments, increases pro–social donations significantly [$\beta = -0.066$, p=0.028]. Using estimates of emissions reductions in

Table 4.5, we find that the "nudge+ with reflection" via a pledge increases charitable donations by $\approx 20pp$, compared to the social norms nudge. These findings validate hypothesis H15-H17. In addition, we also validate our claim set–out in chapter 3 that reflection on nudges can promote other good behaviours, which will manifest in the form of positive behavioural spillovers (Banerjee and John, 2021).

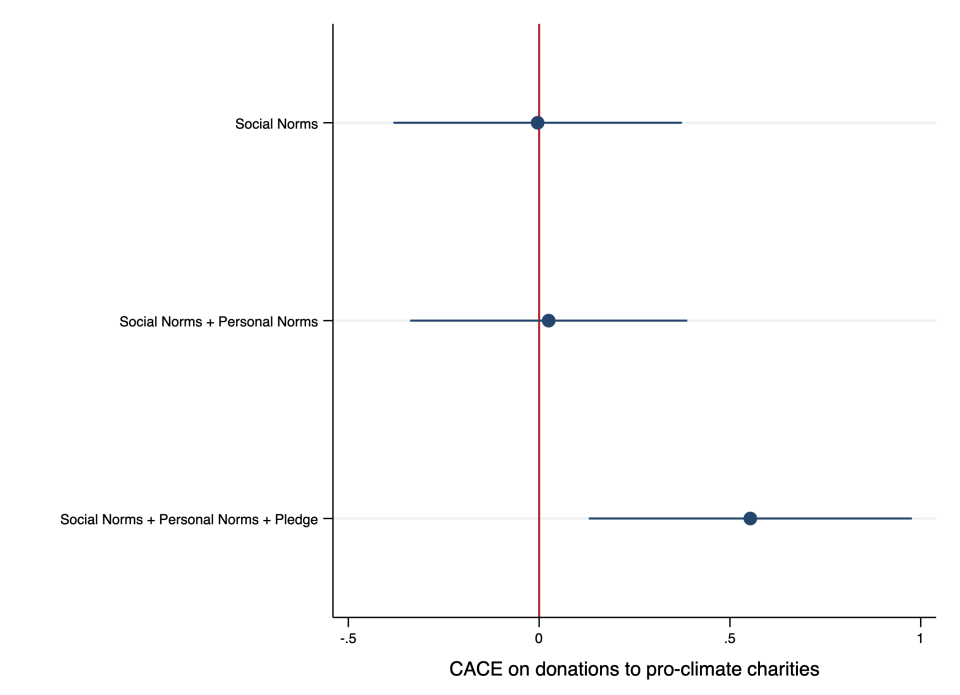

Figure 4.8: Promoting spillover effects of reflective treatments

To summarise: we find that nudge+ with reflection almost doubles the effectiveness of the social norms nudge in promoting climate–friendly diets. Compliance with the nudge and nudge+ interventions is explained by people's beliefs about climate change and age. There is evidence that reflection can promote positive spillover effects.

4.5 Conclusion

In this chapter, we introduced the first tests of nudge+ to the literature in economics and behavioural sciences. Nudge+ offers us a way to enhance existing nudges by involving citizens in the process of behaviour change. As we show through these experiments, while nudges re-orient the salience of affordable choice sets to

people, a nudge+ builds on them by informing recipients of a nudge of the process of behavioural change. It can do so, either by expanding the set of perceived alternatives, using information disclosures, or by enabling a reassessment of one's own preference orderings, using commitment devices. At face value, a nudge+ is merely an informational tool to help people become consciously aware of the nudging process, and think about the reasons to need a nudge. However, they can be effective in scaling up nudges to deliver climate policies. Further applications reasonably extend beyond promoting climate citizenship, to boost vaccine uptake by citizens, improve job search outcomes and financial decisions, limit reactance to policies, and prevent sludging, tests of which are underway.

Contrary to the perception that nudges work best when they are in the dark (Bovens, 2009; Hansen and Jespersen, 2013), we show that adding transparency to a nudge, in the form of disclosures, does not reduce its effectiveness. This reaffirms findings in the literature that transparent nudging is as good as nudging (Loewenstein et al., 2015b; Bruns et al., 2018b) and does not necessarily imply reactance from citizens. Nonetheless, denying citizens the right to engage with the nudge can actually dampen its effects and limit its true purpose in facilitating welfare improving behaviours. As our findings show, when people are made to think about the nudge and why they might need it, the traction of the nudge significantly increases.

Besides validating nudge+, these experiments also shed light on the practicalities of evaluating what works best in promoting climate citizenship. As argued in chapter 2, we show not every behavioural change intervention is a nudge (Hansen and Jespersen, 2013; Baldwin, 2014; Oliver, 2017). Experiment 1, for example, demonstrates the workable differences in the application of these different behavioural frameworks. It is clear that nudge+ retains the simplicity of nudging, in automating decision processes which makes nudges very attractive to people and policymakers. Yet it upgrades the nudge by making it transparent or adding a reflective prompt to it. Contrarily, boosts and thinks rely on a purely deliberative cognitive channel of behaviour change (Banerjee, 2021) as they school people to build a better repertoire of skills. Nonetheless, boosts, thinks and nudge+ share a common feature, that they all work towards empowering citizens so that they can make better decisions for themselves. Consequently, these toolkits put a greater emphasis on restoring human agency and autonomy which offer advantages to nudging, as these findings show. Reflective strategies offer a fix to the possible disengagement of citizens with nudges by enabling a participatory approach to nudging. We can use them to step–up our actions against climate change.

Chapter 5

Conclusion

5.1 Summary of findings

Changing human behaviours, to make them climate–friendly, is key to mitigate greenhouse gas emissions and achieve our climate goals. There is strong consensus among climate scientists (IPCC, 2022) and policymakers (Stark et al., 2019; Williamson et al., 2018) that human behaviour change can contribute between 20%–40% of our post–carbon transition, subject to scaling–up these new behaviours (Newell et al., 2021; Whitmarsh et al., 2012). But how do we do so? In this thesis, I set out to answer this overarching question, with three research (sub-) questions in mind.

First, I asked, what *alternative* forms of behaviour change can *empower* citizens to engage in welfare–improving, pro–social behaviours? This question is increasingly important as the field of behavioural public policy (Oliver, 2013, 2017) grows. There are two important parts to this question. First consider the emphasis on "alternative". For a long time, most tools of behaviour change were (incorrectly) dubbed as nudges. This was partly attributed to the initial hype around nudging, as a 'neo' neo–classical form of behavioural regulation which acknowledged the cognitive biases of humans in designing policies to make them better off, 'as judged by themselves and the society' (Thaler and Sunstein, 2008). Nudges, using insights from behavioural economics and psychology, presented choices differently to people to steer them towards welfare–improving decisions. They were popular (Reisch et al., 2021) and cost–effective (Benartzi et al., 2017), but they also had their own limitations, as I discussed in chapters 1 and 2. These limitations were related to their failing effectiveness over time (Allcott and Rogers, 2014; Brandon et al., 2017), limited scalability (Beshears and Kosowsky, 2020; DellaVigna and Linos, 2022; Mertens et al., 2022), and ethical and moral shortcomings (Bovens, 2009; Whyte et al., 2012; Hansen and Jespersen,

2013). To overcome these limitations to nudge theory, it is imperative to recognise the boundaries of a nudge (Baldwin, 2014), and acknowledge other frameworks of behaviour change.

Then, consider the emphasis on "empower". This mainly relates to the problem at hand and what is required of behavioural public policy to address it. Delivering systemic changes to achieve our climate goals requires engaging citizens in the process of behaviour change, one that most nudges often fail at (Chater and Loewenstein, 2022). Nonetheless, this can be achieved in alternative programs of behaviour change, such as boosting (Hertwig and Grüne-Yanoff, 2017; Hertwig, 2017; Grüne-Yanoff and Hertwig, 2016), thinking (John et al., 2020, 2013, 2009a), or nudge+ (Banerjee and John, 2021), that we must acknowledge after having recognised the boundaries of the nudge. Empowering people to own their agency and autonomy, in this way, enables policymakers to scale up behavioural insights (Al-Ubaydli et al., 2017, 2021; Chater and Loewenstein, 2022; Banerjee and Mitra, 2022).

In chapter 2, I primarily contribute to this debate, and advance it systematically, by unpacking the behavioural policy cube (Oliver, 2017). This analysis further refines the long standing literature on tools of the government (Hood, 1983; Schneider and Ingram, 1990; Hood and Margetts, 2007; John, 2011). It is here that I review the definitional remit of a nudge. The nudge is posited to lie at the origin of the cube such that it is informed by behavioural economics, targets internalities (only), and preserves choices (liberty) for individuals as well. However, this space is also shared by boosts and thinks, as I show in this chapter. Boosts propose new (smarter) heuristics to build people's capacities, while thinks educate people to account for their actions by deliberating and reflecting on them. These tools differ in their cognitive working, a discussion I begin in this chapter, but one that is not fully concluded until chapter 3. From this chapter, I conclude that the origin of the behavioural policy cube is much richer than it has been acknowledged for. Consequently, I also conclude that the toolkit of behavioural public policy is much wider than it has been anticipated so far.

Second, I asked, how can we *upgrade* a nudge to a nudge+, to empower citizens to engage in welfare–improving, pro–social behaviours? Here, note the emphasis on "upgrade". Nudges have advantages that make them attractive to citizens and policy makers alike. While they were not designed to do everything, if they must be put forward to solve the climate crisis, they should be modified in ways that retain their functional advantages and make them stronger. But to do this, we need a defensible theory of cognition that we can use to situate nudges and learn about them. We also need to understand how we can design such modified nudges, and administer

them. I tackle this in chapter 3.

Here, I review the literature on cognitive social psychology to show there is a subtler relationship between fast and slow thinking, in ways that they can be combined together. This is the guiding principle of nudge+. It is a nudge which embeds an element of thinking–the plus–in it, in ways that enable people to think slowly about the nudge and use it better. In this chapter, I propose different ways of combining the nudge with its reflective plus. The operationalisation of nudge+ depends on two things: (1) the timing of the plus, whether it comes before, after, or along with the nudge, and (2) and how it is administered, whether as a one–part device, which combines thinking and nudging into one tool, or as a two–part device, which makes it proximate to each other. I outline examples of these nudge+ interventions, such as defaults or traffic lights which are made transparent with information disclosures that explain the construct of the nudge to its receivers in ways that prompt them to think about it, or these nudges preceded or followed by an active mechanism design, the pledge, where people have to think whether they want to commit to a nudge before being guided by it. Ultimately, a nudge+ delivers more effective behaviour change, compared to a nudge, guided by the principle of "perspective transformation". When people receive a thinking prompt, they evaluate their beliefs alongside the nudge, and decide to either update them and reinforce the effectiveness of the nudge, or retain their prior beliefs and reject the nudge. A nudge+ can be administered by different agents, such as the policymaker, firms, or even individuals, either independently or in combination with one another. I conclude with testable predictions for nudge+, and situate it in the behavioural policy cube. It is here that I finally show nudge+ combines the best of both worlds, reflexive nudges, and reflective boosts or thinks.

Third, I asked, *what works best* in promoting climate citizenship? Now consider the emphasis on "what works best". It is not sufficient to acknowledge and recognise these alternative forms of behaviour change that can empower people. We must also test these interventions systematically in similar settings to evaluate their effectiveness. For a long time, this has been a gap in this literature, with limited contextual joint tests of these interventions, with recent notable contributions from Hertwig (2017); Franklin et al. (2019); Bradt (2019); Krawiec et al. (2021); van Roekel et al. (2022); John et al. (2022). These scholars have put up joint tests, either of different types of nudges, such as system 1 or 2, or nudges versus boosts. Their findings suggests inconsistencies in predicting if a type of intervention is unilaterally best at changing human behaviours in related contexts. For example, Bradt (2019) find nudges more effective than boosts at increasing flood insurance demand, whereas Franklin et al. (2019) find the opposite for financial decision–

making under uncertainty. These point towards the need for greater joint tests of effectiveness, to determine heuristics for policymakers in choosing between these interventions.

I contribute to this growing literature on what works best, with two large, systematic, online–survey experiments in chapter 4. I focus on climate–diets to test randomly these alternative behavioural change interventions. Diets contribute more than 15% to global greenhouse gas emissions (Poore and Nemecek, 2018). Therefore, limiting carbon–intensive diets presents us with scalable pathways to meet our climate targets (Schiermeier, 2019). In the first experiment, with 3074 individuals in the United Kingdom, I show that all behavioural climate policies are effective in reducing (intended) meal orders over menu items with a higher carbon footprint. Adding transparency in the nudge, such as with green defaults or labelling nudges, via a nudge+ with information disclosures, does not limit the effectiveness of the nudge. These findings affirm the role of transparency in nudging (Loewenstein et al., 2015b; Bruns et al., 2018b). However, if we need to scale–up these nudges, then we need more than transparency. When individuals were encouraged to reflect on the green defaults, via a nudge+ with reflection through pledges for pro–climate diets, then the effectiveness of the green defaults increased by 30%. In this experiment, I did not find any evidence of compensating spillovers as measured by donations made by participants after the food choice task to pro–social charities.

To validate these claims consistently, I re–test the role of reflection randomly in a third nudge variant, dynamic social norms, with 5,552 participants in the United Kingdom. Social norms nudges work by signalling normative social identities to people (Reno et al., 1993; Cialdini et al., 2006; Cialdini, 2007). They have been used extensively in many domains of behaviour change (see Bergquist et al. (2019)), but their use in sustainable dietary transformations is sparse (Byerly et al., 2018), with mixed evidence on their effectiveness (Sparkman and Walton, 2017; Brachem et al., 2019; Çoker et al., 2022). Social norms nudges have been shown to fail more generally as well (Kantorowicz-Reznichenko and Kantorowicz, 2021; Mol et al., 2021; Gravert and Collentine, 2021; Dur et al., 2021), adding to a recent literature on the limits to scale of nudges (Beshears and Kosowsky, 2020; DellaVigna and Linos, 2022; Mertens et al., 2022). Scholars relate these shortcomings of norms nudges to a lack of "norm internalisation", a phenomenon when individual preferences are either non–aligned to social identities or unaffected by them (Mols et al., 2015; Sunstein, 2017b; Hauser et al., 2018; Bicchieri and Dimant, 2019; Entwistle, 2021; Hall, 2021). In this experiment, I show that, first, by enabling people to identify their personal norms around climate–friendly diets (also see Trujillo et al. (2021)), and then, by encouraging them to think about their commitment to social norms,

almost doubles the effectiveness of the social norms nudge. Reflection is key here to internalising these norms as they also promote positive spillovers to charitable donations. These findings not only validate the claims for nudge+, but also produce readily generalisable insights for a growing food–delivery sector (Nunn, 2021) which can use these behavioural insights from the nudge+ programme to achieve net–zero goals.

To summarise, through this thesis, I have established a research program of nudge+ that is capable of driving citizen–action to facilitate behaviour change of the scale needed to deliver ambitious and effective climate policies. Through reviews in chapters 1 and 2, I have highlighted the role of alternative behaviour change interventions like boosts and thinks in achieving climate goals. Then, I have developed a new way to upgrade nudges, put forward its psychological exposition in chapter 3 and economic parallel in chapter 4, suggested ways to operationalise them with tests to validate these claims finally in chapter 4.

5.2 Research limitations and way forward

There remains much more to be done to strengthen the research programme of nudge+. There are also limitations of my current research work which suggests new directions for future research. I summarise these limitations and ways forward next.

Behavioural Agency Framework: There is scope to learn from the commonalities in the working of reflective behavioural toolkits, such as educative nudges (Sunstein, 2015a), thinks (John et al., 2020, 2013, 2009a), boosts (Hertwig, 2017; Hertwig and Grüne-Yanoff, 2017; Grüne-Yanoff and Hertwig, 2016), and nudge+ (Banerjee and John, 2021), thereby proposing a unifying approach in behavioural public policy that works to promote the agency and autonomy of citizens during any process of behaviour change. Such a unified approach, called the *behavioural agency framework*[1], will enable policymakers and practitioners to realise scalable public policies by exploring the complementarities of these individual research programs.

Micro–behavioural foundations: There is also scope to theorise into the predictions of nudge+[2] to assess welfare implications and distributional effects (Laffan et al., 2021) of applying these policies. Here, there remains an opportunity to contribute to and extend research on the positive and normative evaluation of behavioural interventions, as put forward by Farhi and Gabaix

[1] ongoing joint work with Ralph Hertwig and Peter John
[2] ongoing joint work with Julien Picard

(2020b) and Löfgren and Nordblom (2020) for nudges and boosts. There is also a need to evaluate the long–term effectiveness of behavioural interventions (see Brandon et al. (2017); Allcott and Rogers (2014)) such as nudge+, but also nudges and boosts, which this current research does not answer.

External Validity of results: Further, these results for nudge+ need to be validated in external settings, with randomised control trials in the field (List, 2020; List and Metcalfe, 2014; Levitt and List, 2009; Harrison and List, 2004). The onset of the pandemic in 2020 was a double edged sword for the research programme of nudge+. Boon, for it allowed tests of nudge+ in an online setting with generalisable results for an online food–delivery sector. Curse, for it limited any field tests of nudge+, thereby failing tests of intention–behaviour gaps (Nguyen et al., 2019; Sheeran and Webb, 2016; Hassan et al., 2016; Godin et al., 2005; Ajzen and Fishbein, 2005, 2000, 1977; Fishbein and Ajzen, 1977) and experimental–demand effects (Mummolo and Peterson, 2019). Here, there is scope to embark on field tests of nudge+ to promote climatarian diets (see Lohmann (2022); Garnett (2021); Fosgaard et al. (2021); Gravert and Kurz (2021); Kurz (2018). The robustness of these experimental findings to use nudge+ in promoting climate citizenship must also stand the test of many ongoing field trials for nudge+ to reduce food waste[3], improve sustainable decisions[4] such as transport, food, housing, and plastic waste, and reduce carbon–intensive energy demands[5]. The applications of nudge+ can also be extended to other pro–social domains such as vaccination uptake[6], tests of which are underway. Results from these tests of external validity will refine the theory of nudge+ going forward.

Ethics of behaviour change: Nudge+ is theorised to empower citizens, by restoring their human agency and autonomy. Nudge+ interventions are transparent by design. However, these claims must be tested[7]. While nudge+ dilutes an ask for *watchfulness* from the nudgee, it should still qualify for tests of non–alien control (see Schmidt (2017)). It is possible that governments and policymakers hold "reserve control"[8] which then endangers the program of nudge+ (see Lades and Delaney (2022)).

The possibilities of tests for nudge+ are endless. Nonetheless, I am confident

[3] joint work with Peter John, Scotland Zero Waste, Scottish Council of Fife
[4] joint work with Matteo Galizzi, Peter John, and Live Nation Entertainment
[5] joint work at the Institute of Environmental Studies, Vrije Universiteit Amsterdam
[6] joint work with Peter John, Peter John Loewen, Brendan Nyhan, Manu Savani, John McAndrews, Richard Koenig, and Blake Lee–Whiting
[7] ongoing joint work with Mollie Gerver and Peter John
[8] a choice they make to let citizens be in charge

that if we design nudges transparently and reflectively, we can prove them even more effective to sustain lasting behavioural change that helps us build a safer climate, and take better pro–social decisions.

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Appendix A

Pre-registration plans

A.1 Experiment-I (Pre-registration 1)

Title: What works best? A comparative analysis of the effectiveness of boosts, thinks, nudges and nudge+ in promoting environmentally sustainable diets.

Registration Date: April 2020 on Open Science Platform.

Transparent changes date: November 2020 on Open Science Platform.

Authors: Sanchayan Banerjee, Matteo Galizzi, Peter John, Susana Mourato

A.1.1 Introduction

Current dietary habits are largely unsustainable: the average meat (over) consumption has been increasing globally with increasing income in the past few decades (nutrition transition hypothesis; see Popkin 2001; Meat Atlas, 2015; Ranganathan et al., 2016;) Meat production is emissions intensive and contributes to an increase in greenhouse gas emissions. Meat related emissions, for example, account for 15 to 20 percent of UK's total GHG emissions, and for about 15 percent of the global emissions. Considering this and given UK's recent pledge, in line with the Paris Agreement goals, to neutralize net emissions by 2050, sustainably altering the dietary intake of individuals is imperative. However, dietary choices are core human values which are rarely surrendered to others, and hence remain difficult to be modified (Rozin, 1996). Food choice, for instance, is not simply guided by biological factors. They are dominantly shaped by cultural pre-adaptations, and psychological and socio-cultural determinants, all of which add to the complexity and heterogeneity of the problem (Rozin and Todd, 2015).

In this context, any evidence-based policy making exercise must overcome the behavioural barriers that might prevent the persistent uptake of a modified yet sustainable diet. While a range of regulatory (price or quantity) economic tools are readily available to achieve this goal, such regulatory policy interventions are often criticised due to their paternalistic character. Given this, the introduction of 'cheap and easy to avoid' behavioural change interventions (BCIs) popularised as classic nudges through Thaler and Sunstein's (2008) eponymous book titled Nudge: Health, Wealth and Happiness generated effective short-term results and garnered quick attention from policy makers worldwide. Over the last decade and more, nudges have been widely tested in a range of scenarios including the promotion of healthy dietary choices (see Cadario and Chandon, 2019; Hummel and Maedche, 2019); some classic ones in this domain include setting default menus, reordering menus, placing healthy food items at eye levels near the till and so on.

However, even though nudges have been predominantly used by the policy maker and alike to achieve behavioural changes, they have also been criticised for generating reactance and compensatory behaviour (Sunstein, 2017; Meder et al., 2018). Moreover, most nudges often lack persistence and are opaque. To overcome these defects, different behavioural tools have been proposed in the literature, but have rarely been tested in influencing dietary choices, for instance, John, Smith and Stoker (2011, 2019) proposed Thinks; Hertwig (2017) and Hertwig and Grune-Yanoff (2017, 2018) proposed Boosts; Oliver (2017) promoted Shoves and Budges while more recently John (2019) and Banerjee and John (2019) have promoted nudge+. Furthermore, even when applied, these instruments are often tested in isolation, thereby rendering a comparative analysis infeasible. As such, this paper will primarily contribute to the literature by providing the first holistic view on the effectiveness of four alternate types of behavioural change interventions, namely nudges, boosts, thinks and nudge+, in promoting the uptake of environmentally sustainable diets. In doing so, it aims to offer a comparative lens in analysing these different interventions in a contextually similar environment dealing with a consistent behavioural challenge and hopes to provide evidence to policy makers in assessing the first best policy option to achieve dietary shifts contingent on the underlying characteristic profile of the subjects.

In the remaining part of this pre-registration document, we will briefly describe the research motivation and the core hypotheses of this research. Followed by this, we will describe the experimental design and procedure, the sampling plan, the variables of interest, and provide a script of the survey questionnaire and the different treatment arms included in this study.

A.1.2 Hypotheses

Before stating the core hypotheses, pertaining to our research question, it is important to understand why is it essential to test the effectiveness of different behavioural change interventions in promoting the uptake of sustainable diets? Until the beginning of this decade, the scholarly literature provided strong evidence in the favour of nudges in stimulating healthy eating behaviour; most nudges, on an average, were stipulated to have moderate effect sizes of Cohen's d= [0.3, 05]. However, these effects seemed to fade away and only rarely transformed into a persistent and long-term behavioural change. Chatham House (2014) and Ipsos Mori (2015) in studying the different pathways to lower meat consumption postulated the earliest evidence for the existence of an awareness gap that possibly explained why treatment effects faded away when the nudges were retracted; by nature, the nudges work by co-opting agents' internal biases and modifying their choice environment. As such, the nudges take advantage of the agents' volitional biases, and on retraction, the agents fail to reflect on their actions and sustain their modified behaviour. More recently, the National Diet and Nutrition Survey (2014-2016) indicated a prevailing intention-behaviour gap that prohibits wilful meat reduction by the already aware UK residents. The existence of these behavioural barriers to realising an agent's true intentions and sustaining their modified behaviour motivates this comparative study of analysing alternate salience/ competency building interventions using an experimental framework.

Before proceeding further, two convoluted issues in the literature must be clarified clearly: first, is meat consumption unsustainable on the overall? And second, how would one define sustainability? To answer the first question, while all meat is generally energy inefficient and energy intensive compared to plant protein, there exists a wide heterogeneity between the different meat classes with respect to their carbon footprints; for instance, ruminant meat (beef, lamb, mutton) is ten times or more emissions intensive relative to poultry meat (chicken, turkey, fowls) and so on. One of the overarching objectives of this paper is to embrace this wide heterogeneity in meat's energy inefficiency while designing the right intervention. To answer the second question, sustainability easily encompasses several dimensions: the most commonly used ones include environmental, nutritional, economic, cultural and aesthetic sustainability (for details, see One Dot, 2018; FAO, 2015) Although different dietary scales have been developed to encompass a few of these dimensions, they are generally limited in their outreach and are hard to combine meaningfully; therefore, in this research, we adopt a single dimension of sustainability, environmental friendliness, for convenience and interpretability. In doing so, we aim to measure pure preference shifts only, while maintaining other factors like nutritional and cost considerations

unchanged in the treatment framework.

Finally, this experimental work aims to generate confirmatory evidence for/ against different hypotheses generated in prior alternate theories of behaviour change, mainly those posited in favour of boosts and nudge+. For brevity, nudge+ build on Thaler and Sunstein's nudges by combining them with reflective strategies, either simultaneously or sequentially. The role of the reflective strategies is, however, multifaceted. While some pluses purely work by improving the salience of the agent and facilitating greater uptake of the classic nudge, others might help the agent to self-reflect on their own actions and ensures greater autonomy and transparency of the instrument. As such, nudge+ can be "thought to lie on a continuum of agency autonomy, with the left end of the spectrum (no autonomy) being occupied by classic nudges and the right end (complete autonomy) being occupied by pure reflective strategies." (Banerjee and John, p8, 2019) On the contrary, boosts work by building on the competences of the agent and enabling them to use their pre-acquired heuristics in a smarter way. As such, boosts can deliver as part of their intervention skill enhancing training, even though they are not completely synonymous to schooling interventions like cognitive therapies. Both nudge+ and boosts promise to achieve long-term and persistent behavioural change and depend on the underlying motivation of the agents. In testing these variants of these interventions, the following core hypotheses will be tested that can be grouped in these categories below.

Category 1: Hypothesis listed underneath concerns with the overall efficiency of the instruments in their average treatment effects relative to the control group.

Hypothesis 1: Exposure to any of the proposed interventions i.e. variants of nudges, nudge+, thinks, boosts or boost pluses will have no different effect on meat consumption compared to the control group. This is a two-sided test.

Category 2: Hypotheses listed underneath concern with efficiency of the instruments in their average treatment effects relative to one another.

Hypothesis 2a: Exposure to nudges combined with salience building information pluses will sustainably decrease meat consumption compared to the nudge only intervention. This is a one-sided test.Exposure to nudges combined with self-reflective pluses will sustainably decrease meat consumption compared to the pure self-reflective think only intervention. This is a one-sided test.

Hypothesis 2c: Exposure to nudges combined with salience building information pluses will have no different effect on sustainable meat consumption compared to the competency-building non-motivational boosts. This is a one-sided test.

Hypothesis 2d: Exposure to competency building motivational boosts will have no different effect on sustainable meat consumption compared to nudges combined with self-reflective pluses. This is a two-sided test.

Hypothesis 2e: Exposure to nudges combined with salience building information pluses will no different effect on meat consumption compared to nudges combined with self-reflective pluses. This is a two-sided test.

Category 3: Hypotheses listed underneath concern with the behavioural spill over resulting in charitable giving associated with the proposed interventions.

Hypothesis 3a: Exposure to any of the proposed interventions i.e. variants of nudges, nudge+, thinks, boosts or boost pluses will lead to no significantly different contributions to charitable causes (or, donations) compared to the control group. This is a two-sided test.

Hypotheses 3b: Exposure to boosts combined with salience building pluses will lead to significantly higher positive contributions (or, donations) to charitable causes compared to the boosts only intervention. This is a one-sided test.

Hypotheses 3c: Exposure to nudges combined with self-reflective pluses will lead to significantly higher positive contributions (or, donations) to charitable causes compared to nudges combined with salience building pluses. This is a one-sided test. **Hypothesis 3d**: Exposure to nudges combined with salience building pluses will lead to significantly higher positive contributions (or, donations) to charitable causes compared to nudges only intervention. This is a one-sided test.

Hypothesis 3e: Exposure to nudge+ will lead to no significantly different contribution to charitable causes (or, donations) compared to the boosts. This is a two-sided test.

Category 4: Hypotheses listed underneath concern with heterogeneous changes in subgroups of agents due to exposure to the proposed interventions

Hypothesis 4a: In subgroups of agents with equal motivation, exposure to a competency building motivational boost will sustainably decrease meat consumption compared to the pure self-reflective think only intervention. This is a one-sided test.

Hypothesis 4b: In sub-groups of agents who feel slightly or definitely tired at the beginning of the experiment, exposure to nudges combined with reflective or salience building pluses, or competency building boosts will lead to no different

change in meat consumption compared to sub-groups of agents who do not feel tired per se. This is a two-sided test.

Hypothesis 4c: In sub-groups of people who feel slightly or definitely anxious at the beginning of the experiment, exposure to nudges combined with reflective or salience building pluses, or competency-building motivational boosts will lead to no different change in meat consumption compared to sub-groups of agents who do not feel anxious per se. This is a two-sided test.

Hypothesis 4d: In sub-groups of people who feel slightly or definitely calm at the beginning of the experiment, exposure to nudges combined with reflective pluses or salience building, or competency-building motivational boosts will lead no different change in meat consumption compared to sub-groups of agents who do not feel anxious tired per se. This is a two-sided test.

Hypothesis 4e: Exposure to competency building boosts or nudges combined with self-reflective nudges will lead to no change in agents' levels of happiness in the pre and post intervention periods compared to the control group. This is a two-sided test.

Hypothesis 4f: Exposure to competency building boosts or nudges combined with self-reflective nudges will lead to no change in no change in agents' levels of anxiety in the pre and post intervention periods compared to the control group. This is a two-sided test.

Hypothesis 4g: Exposure to competency building boosts or nudges combined with self-reflective nudges will lead to no change in agents' levels of tiredness in the pre and post intervention periods compared to the control group. This is a two-sided test.

Hypothesis 4h: Exposure to self-reflective pluses or competency building boosts will lead to no change in agents' perception of control over decisions (enhanced transparency effect) compared to the classic nudges only or nudges combined with salience building information pluses. This is a two-sided test.

Category 5: Hypotheses listed underneath concern with the heterogeneity in behavioural spill over resulting in charitable giving or reducing food wastage associated with the proposed interventions.

Hypothesis 5a: Exposure to nudges will lead to no significantly different (a) contributions to charitable causes (or, donations) or (b) levels of food waste generated due to increasing levels of pro-environmental attitudes of agents compared to the control group. This is a two-sided test.

Hypothesis 5b: Exposure to nudge+ will lead to no significantly different (a) contributions to charitable causes (or, donations) or (b) levels of food waste generated due to increasing levels of pro-environmental attitudes of agents compared to the control group. This is a two-sided test.

Hypothesis 5c: Exposure to boosts will lead to no significantly different (a) contributions to charitable causes (or, donations) or (b) levels of food waste generated due to increasing levels of pro-environmental attitudes of agents compared to the control group. This is a two-sided test.

A.1.3 Sampling Plan

Data Collection Procedures

Altogether twelve different treatment arms will be employed collectively originating from the previously described BCIs. Each of these treatment arms can be more generally sub-classified into the behavioural interventions corresponding to the hypotheses stated above (see Figure A.6). Specifically, we would collect new data; to facilitate this, we would administer an online survey, with randomised treatment arms and non-randomised attitudinal and preference questions, using Prolific's digital platform. The subjects will be recruited from across the UK, with parameters conditioned by demographics (age, gender and income) and geography (region) to achieve a nationally representative sample.

The subjects will be paid for at the prevailing market rate for recruitment according to Prolific's recruitment pricing plans. Besides this, the subjects will be offered the chance to win real monetary rewards by participating in two incentive compatible tasks. One of this includes a time preference task where the subjects will have to choose one payment option of two available options in six different payment schemes. The difference between the two options is that Option A is payable in 1 months' time and Option B is payable in 7 months' time from the date of the experiment. The payment options in all the schemes range between £100 to £200. One of the subjects will be randomly selected to win an Amazon Cash voucher in the subject pool and will be paid according to their choice in one of the randomly selected payment schemes. Besides this, ten randomly chosen subjects will also win a restaurant food voucher that will allow them to actually order the two-course meal that they will choose in the online experiment. The restaurant voucher will be generated by the firm Restaurant Choice and will cover 9 restaurant chains across the UK. The menu in the online experiment has been designed in line with available menus from these 9 restaurants to make the food choices consequential and incentive compatible.

Sample Size and Rationale

Prior studies of healthy eating nudges have indicated effect sizes in the range of Cohen's d= [0.3, 0.5]. However, most of the treatments (boosts and nudge+) being used in the current study have not been tested before in a similar setting, thereby preventing us to draw inferences on power analysis from prior experimental studies. As such, we adopt a more conservative approach in anticipating a small effect size of Cohen's d= 0.25 (or, 20 percent) across each of these twelve treatment arms, on an average.

Using a 2-groups independent means comparison t-test design, the a priori computed total sample size requirement corresponds to n=253 for Cohen's d=0.25, Power =0.8 and Type-I error = 0.05. Since the cost of recruiting subjects in each of the treatment arms is equal, each treatment arm has an equal required sample size, resulting in a total sample size requirement of N=3036. The critical t associated with this analysis is 1.963 and the non-centrality parameter is 2.807. The sample size calculations were carried out using G*Power 3.1. All required variables of interest are explained in detail later (see, Figure).

A.1.4 Design

To test the effectiveness of the different behavioural change interventions, a split sample design has been adopted. Four broad classes of interventions are being tested via this online experiment. The recruited subjects will be asked to participate in five different tasks: this includes an incentive compatible time preference task, an incentive compatible food choice task, and three tasks where subjects answer different attitudinal and lifestyle questions.

In the food choice task, the respondents will be shown different set-menus (treatments delivered via these menus either before, after or with them) and tasked to choose one starter and one main course item. The menu has been drawn up with two different meal course options corresponding to a set menu of £20: starters involving 15 non vegetarian items and 14 vegetarian items and main courses involving 18 vegetarian and non-vegetarian items each. Each item on this menu has been food coded by recipes on Scarborough et al., (2014) carbon emissions scale using Public Health England's recent McCance and Widdowson's CoFID user guide (2019). Furthermore, all items on the menu have been chosen from menus of restaurants listed on the Restaurant Choice food vouchers which will be randomly paid out to the subjects as a payment for their participation. These food vouchers are redeemable across 9 UK restaurant chains anywhere in the country. All combinations of starters and main courses add up to £20 pounds or less allowing the winning subjects to

actually reorder their experimental food choice. For menu design, see Figure

The food items have been further categorised into low, medium and high environmental footprint. These scales are devised using the following condition: items with carbon footprint corresponding to less than mean emissions have been classified to have the lowest environmental emissions; these include all plant proteins, fish and poultry meat (chicken, geese, turkey or fowls). Food items with emissions higher than the mean emissions but lower than the median emissions are classified to have medium environmental emissions; these include all pork meat. Finally, all food items with carbon footprint more than the median emissions have been classified to have high environmental emissions. On this scale, the vegetarian items are equally divided into low and high emissions, while the non-vegetarian items have been equally divided to also include the medium emission food items.

The different treatment arms are indicated in Figure A.6 below. Figure A.8 describes all the variables of interest that will be recorded using the survey, the source of the survey questions/ scales used and the analysis they will be relevant for.

Menu Design

The regular menu is displayed in Figure A.1. This consisted of 36 main course items, of which 18 items were vegetarian and non-vegetarian respectively. The menu was drawn up from top 100 most ordered items in the United Kingdom in the year 2019 (Deliveroo, 2019; Just Eat, 2019) and was adapted to meet consumer palatability in the pilot studies.

The default menu (see Figure A.2) was designed by retaining only 18 of the 36 items on the regular menu. These 18 items were chosen using the following rule: if the carbon emission intensity of an item was less than the average carbon emission intensity of all the items on the regular menu, it was deemed to be environmentally sustainable. The nudge+ version of the default menu (see Figure A.3) combined it with an additional information disclosure at the bottom of the menu.

To construct the menu labelled with the traffic lighting scheme (see Figure A.4), items on the regular were categorised into high, medium, and low emission intensities. To do this, each item was food coded by recipes (see Table A.1). The emission intensity of each item was determined using a carbon emission scale (Scarborough et al., 2014) and corresponded to the life cycle emissions (carbon footprint) associated with the main ingredient of the recipe. Thereafter, the menu categorisation was reached by comparing individual item emissions to the mean and median emissions of all menu-items. 18 items, with emissions less than the median, were classified to have low emission intensity. This included all items with plant proteins, fish,

and poultry (chicken, geese, turkey, or fowls). 6 items, with emissions higher than the median but lower than the mean, were classified to have medium emissions intensity. This included all pork items on the menu. Finally, 12 remaining items, with emissions greater than the mean, were classified to have high emission intensity. These items were mainly composed of ruminant meat or dairy products.

The nudge+, which combined the menu labelled with the traffic lighting scheme with an information disclosure is shown in Figure A.5. This menu had explicit symbols at the bottom of the menu which indicated how the menu was labelled. Along with this, participants were explained about the colour scheme in text as well as shown underneath the menu which read the following "Please note that all items on the menu that will be presented to you have been colour coded to indicate their environmental sustainability, where red footprint indicates least environmentally sustainable and green footprint indicates most environmentally sustainable. An environmentally sustainable diet is one with a low environmental impact. Sustainable food items have low carbon emissions associated with their production and consumption."

Figure A.1: Regular Menu

Figure A.2: Green Default

Figure A.3: Green default with Information disclosure

Figure A.4: Labelling Nudge

Figure A.5: Labelling Nudge with Information disclosure

A.1.5 Analysis Plan

In this section, we will specify the interacting and control variables that will be used to test the hypothesis laid out earlier.

Randomisation Checks

Randomisation checks will be run using a balance of covariate means technique conducted across the treatment and control (or, placebo) groups using the demographic variables of age, gender, education, religion, immigrant status, religion, ethnicity, marital and employment status and income levels.

Hypotheses Testing

In testing the research hypotheses across categories 1-6, a multiple linear regression model will be fitted according to the following three specifications, unless otherwise mentioned.

Spec 1: (Outcome) i $= +\beta * TreatmentIndicator)_i + e_i$
Spec 2: (Outcome) i $= +\beta * TreatmentIndicator)_i + \gamma * Controls + e_i$
Spec 3: (Outcome) i $= +\beta * TreatmentIndicator)_i + \gamma * Controls + \rho * Moderating +$ $\sigma * Moderating * TreatmentIndocator_i e_i$

As such, specification 1 will enable us to determine the average treatment effects and yield the comparison across the different classes of interventions, relative to one another and with the control group. Specification 2, by adding the control variables, will allow us to check for the robustness of these different average treatment effects yielded in specification 1. Finally, specification 3, will add to specification 2 different moderating variables, as detailed out in the section on hypotheses, to check for the presence of heterogeneous treatment effects. In testing for categories 1,2, 5 and 5 the outcome variable will be the carbon footprint associated with a menu option which is the primary target behaviour, while in testing for behavioural spill overs in categories 3 and 6 the outcome variable will be amount donated to charities (either as an absolute value of the food voucher or percent of the Amazon coupon) and stated food wastage level, each taken individually as a case in point.

Testing for the research hypothesis in category 1 will entail an F test and a t-test for the nulls; H0—F-test: all 's associated with the treatment indicator are equal to zero against the alternative Ha: one or more 's are significantly different from zero and Ho— t-test: = 0 against Ha: B! = 0 for each of the eleven treatment dummies. The treatment indicator in this case will be a twelve-level categorical

nominal variable with each category representing of the twelve proposed intervention classes.

Testing for the research hypotheses in category 2 entails t-tests only. Across research hypothesis 2a-c, this involves testing for H0: $= 0$ against the alternative Ha: < 0. However, the next two hypotheses are two-sided and hence will be tested again the Ha: $! = 0$. In these tests, the treatment indicator will be a two-level categorical variable assigning binary values 0/1 to either of the two intervention classes under comparison here for relative efficiency. Following the tests for specification 1, we will add the following control variables to check for robustness of these average treatment effects: pre-treatment index of well-being (first principal component of the ONS well-being questions), pre-treatment momentary mood measures (happiness, tiredness, calmness and anxiety), pre-treatment measures of healthy lifestyle (healthiness eating index and index for physical exercise), pre-treatment pro-environmental attitudes (first principal component of the EAI scale), pre-treatment social preferences (risk, trust and time preferences), pre-treatment propensity to waste food, pre-treatment conception of self-esteem and socio-demographics as mentioned in Figure A.8. These pre-treatment measures will ensure that we satisfy the SUTVA assumptions while checking for robustness.

Testing for the research hypotheses in category 4 and 5 builds up on specification 2 as stated earlier by using interaction effects as in specification 3. More precisely, testing for hypotheses through 4a-d involves sub-group analysis where we test for differences in the average treatment effects by sub-grouping agents by their pre-treatment motivation levels and pre-treatment momentary mood measures of tiredness, anxiety and calmness. Another way to achieve this would to use these covariates as moderating variables and testing for the coefficient of its interaction with the treatment indicator using a standard F or t-test. Hypotheses 4e-h involves using a diff-in-diff approach to see the changes in well-being as induced by the proposed interventions. Similarly, the heterogeneity in the uptake of the treatment effects can be checked by interacting the moderating variables with the treatment dummy. These involve a two-sided t-test as noted in the hypotheses. Finally, one must note, that testing for 4a will also involve a mediation analysis with intrinsic motivation being used as a mediator in the standard Baron-Kenny's mediation approach.

Testing for the behavioural spill-overs across categories 3 and 6 involves using either post-treatment level of food wastage or charitable donations as the outcome variable, independently and separately. In assessing the spill over effects, we follow the experimental approach outlined by Galizzi and Whitmarsh (2019). The change

in treatment over control group secondary behaviour (like charitable donation or food wastage levels) can be attributed to the change in treatment over control group primary targeted behaviour (meat consumption, which will give a measure of the behavioural spill over induced by the proposed interventions. If this change in secondary behaviour can be shown to be significantly positive, we would get promoting spill overs, while if it is negative, we get permitting spill overs. In testing for 3a-h, a t-test will check for difference in means of these spill overs across the treatment and control (as defined case wise) groups. Finally, in category 6, we will interact these treatment dummies with the moderating variables as specified to check using t-tests if there's any heterogeneous effects in these spill overs that can be explained by the characteristic profile of these agents.

To account for multiple comparisons in the causal inference, p-values will be adjusted for multiple comparisons using Benjamini-Hochberg (FDR) and Holm's (FWER) correction. This is important because of two reasons: we are testing for multiple hypotheses and using multiple outcomes, and hence adjusting the error-rate to minimise the false positives will be crucial to deduce anything meaningful from these results.

Sr No	Intervention Type	Intervention Sub-Type	Intervention Vehicle	Intervention Description
1.	**Control**	Control	No intervention	Regular Set-Menu with all items
2.	**Classic Nudge**	Defaults	Opt-out Default	A reduced Set-Menu with environmentally sustainable items only; subjects can opt out for regular menu.
		Colour Coding	Traffic Lighting	Regular menu but colour coded for all options in red, amber, green indicating low, medium and high environmental emissions
3.	**Thinks**	Self-reflective tools	Commitment Strategy	A written pledge to follow an environmentally sustainable diet followed by question measuring goal intentions. Subjects then given the option to choose from a regular, environmentally sustainable set or colour coded menu.
4.	**Simultaneous Nudge Plus**	Salience building information plus	Opt-out Default+ One liner plus	Same in 2 but with a salience building information plus emphasising that the default menu includes environmentally sustainable items.
		Salience building information plus	Traffic Lighting +One Liner	Same in 3 but with a salience building information plus emphasising that the colour coding is for sustainable consumption.
5.	**Sequential Nudge Plus (plus is self-reflective)**	Self-reflective plus	Opt-out Default+ Commitment	2 followed by 4, and a follow up question with if people want to revisit choices.
		Self-reflective plus	Commitment + Opt-out default	4 followed by 2, no follow up question needed
6.	**Boosts**	Uncertainty Management/ Non-Motivational	Quick Rules	Set of three food rules provided for sustainable consumption followed by the regular menu.
		Uncertainty Management/ Non-Motivational	Fast and Frugal Trees	Two hierarchical questions indicating subject's existent sustainability with diets. Subjects then given the option to choose from a regular, environmentally sustainable set or colour coded menu.
		Motivational	Implementation Intentions	If-then design with two implementation plans (one for lunch and one for dinner) followed by the regular menu
7.	**Boost plus**	Literacy Boosts	Traffic Lighting+ Skill enhancing information	Same in 3 but with a boost that involves building competencies by training people into understanding the ordering of food items by carbon footprints.

Figure A.6: List of treatments(old)–experiment 1

Sr No	Variable	Source of Question	Use
0.	**Outcome**	Scarborough et al., 2014	Two outcome variables will be used. An ordered logistic regression with categories for increasing carbon footprints. OLS will be repeated with the carbon footprints of the main ingredients of the food items used in the menus
1.	**Well Being**	ONS standardised 11-likert scale questions	Control co-variate used as interaction for heterogeneity.
2.	**Mood question (Happy, Tired, Content and Calm)**	BMIS (2013): 4-Likert scale	Used to test momentary mood changes pre-post treatment (Hypothesis 3a)
3.	**Freedom of Choice**	Modified World Values Survey; 11-point Likert scale	Used to test empowering effects of Boosts and Nudge Pluses (Hypothesis 3b)
4.	**Generalised Trust**	Rosenberg question; World Values Survey	
5.	**Self-reported risk aversion**	Global Preference Survey US, Gallup World Poll 2012	
6.	**Environment and Economy Trade off**	Ecocentric View; World Values Survey	
7.	**Belief in Climate Change**	UK Climate Change Questionnaire	Confirmatory Test for Hypothesis 4. Sub-group analysis (k-step cluster analysis) using chi-squared tests will be performed. Significance levels adjusted for multiple comparisons (Hochberg- Benjamini and Holm's adjustments)
8.	**Willingness to act to mitigate climate change**	UK Climate Change Questionnaire	
9.	**Belief in Command and Control Measures**	Scale 02: 2 question 11-point Likert Scale; Support for interventionist conservation policies (Environmental Attitude Inventory, 2010)	Heterogeneous Treatment effects expected; Questions 7-10 to be reduced into a single component using principal components analysis (PCA with varimax rotation; one factor retained)
10.	**Pro-Environmental Attitude**	Scale 08: 10 question 11-point Likert scale; Personal Conservation Behaviour (Environmental Attitude Inventory, 2010) and WVS	

Figure A.7: List of variables (old)–experiment 1

11.	**Healthy Eating Index**	Modified Eating Choices Index; Pot et al., 2014	
12.	**Intensity of Physical Exercise**	International Physical Activity Questionnaire (IPAQ)	
13.	**Waste Reduction**	Modified Herpen et al., 2019	Used to test for behavioural spill-overs originating from Classic Nudges, Nudge Pluses and Boosts (Hypothesis 2a-c)
14.	**Donation to Charity**	Modified GPS 2012	
15.	**Demographics**		
		Education: UKHLS	Used for randomisation balance checks, and to test for heterogeneity: Exploratory tests only.
		Birthplace: UKHLS	
		Immigrant Status: BHPS	
		Religion: BHPS adapted	
		Ethnicity: 2011 Census England and Wales	
		Marital Status: BHPS	
		Income: BSA 2017, KBT 2019	

Figure A.8: List of variables (old)–experiment 1 contd.

A.1.6 Experiment-I (Pre-registration 2, transparent changes 1)

Amendments to first pre-registration document

Motivation

Change 1.a. The study no longer considers the behavioural spillovers in the form of reduced food wastage. Behavioural spillovers will only be measured as a voluntary contribution to a charitable organisation that the respondents will choose.

Reason: The survey length had to be reduced due to changes in budgetary plans. Hence one of the outcome variables for studying behavioural spillovers had to be dropped. Since levels of food wasted by respondents was a self-reported variable in this study relative to the charitable donations (which was consequential), the decision was made to drop the self-reported variable for reliability of the findings.

Change 1.b. The current experimental study builds on the theoretical framework of nudge+ put forward in Banerjee and John (2020). In the most recent version of their work, Banerjee and John provide a tighter classification of nudge+, where they state that nudge+ can be classified into four different types depending on two factors: the timing of administering the reflective plus to the nudge, and the combination strategy. This replaces their older account that "nudge+ can be "thought to lie on a continuum of agency autonomy, with the left end of the spectrum (no autonomy) being occupied by classic nudges and the right end (complete autonomy) being occupied by pure reflective strategies".

Reason: Change 1.b makes no difference to the design of the current experimental study and is highlighted to be consistent with the theoretical classification of the nudge+ behavioural change intervention. The nudge+ interventions used in this study in line with Banerjee and John's new classification can be typified as follows (all changes are reflected in the new Treatment Design v2.pdf; see Figure A.10)

• Two-part simultaneous nudge+: Opt-out defaults (or Traffic Lighting) with a one liner plus • Two-part sequential nudge+: Default followed (or preceded) by commitment devices.

Research Hypotheses

Change 2.a. Hypotheses 5a-5c have been dropped.

Reason: The outcome variable 'Food Wastage' has now been dropped (see change 1.a). As a result, hypotheses 5a-5c cannot be tested any longer since the outcome variable for testing these hypotheses are not measured.

Design Plan: Study Plan

Change 3.a. The first iteration of the experimental design included a Coller and William (1999) time preference, incentive compatible, task where respondents were presented with a multiple list of 6 different payment schemes with each payment scheme having a binary choice between an immediate and a delayed payoff. An inconsequential self-reported risk aversion game, in line with the Gallup Preference Survey (2012), was also included in this version. These have now been replaced with the INRA risk and time tasks (Antoine Nebout et al., 2020) and a classic self-reported Binswanger, Eckel and Grossman risk-aversion game. In these new set of tasks, the probability of the reward is 1 in 300. These rewards are in the form of amazon vouchers will be given out to respondents chosen at random. The amazon voucher to a respondent will be awarded for a choice made in these tasks selected at random.

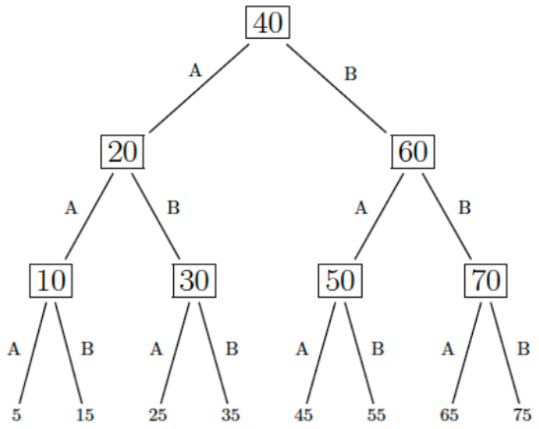

Figure A.9: Payoff structure in INRA task

Reason: The INRA (Antoine Nebout et al., 2020) risk, preference and uncertainty tasks have recently been developed as part of the BE Health Preferences Module and have the added advantage that choices in one scenario are consequential to payoffs in following scenarios of the same task. In the INRA set of questions, the respondents are provided with a battery of four sequentially arranged choices following a titration algorithm. For instance, in the risk module, the respondents get a four choice questions with each choice being binary between a lottery and a safe option. The expected payoff in the subsequent choice questions are dependent on the prior decisions; for instance, choosing a lottery over the safe option in the first round, generates a lottery with a higher expected payoff in the subsequent rounds. This

experimental design is novel in trialling the questionnaire in the United Kingdom.

Change 3.b. The first iteration of the experimental design involved a food choice task where respondents had to choose a main course and a starter item from the set-menu presented to them. This task has now been simplified such that respondents choose only the main course item from the menu presented to them. 1 in 100 respondents will be paid a £15 voucher making their choices in this task quasi-consequential. Furthermore, the design of these menus has changed with the prior symbol representing vegan meals being replaced and indicated by a (v) beside the dish name.

Reason: The pilot study 1 indicated the presence of ordering and moral compensation effects in the choices made by the respondents. To avoid such effects, the task was simplified to include only one menu choice (the mains) by the respondents.

Change 3.c. The first iteration of the experimental design included respondents being presented with a menu on the screen and then making their food choices on a following screen (without the menu, but with the list of all items available). This has now been replaced with a drop-down menu to select their preferred meal embedded in the same screen where the set-menus are displayed to the respondents.

Reason: Making the choice without the menus can inconvenience the choices made by the respondents by inducing an unintended cognitive load on the respondents. To avoid this, the menu display and choice are now combined in the same display screen.

Sampling Plan: Data Collection Procedures

Change 4.a. The probability of winning the Amazon vouchers consequential to their INRA tasks has now been updated from 1 in 3000 to 1 in 300. Similarly, the probability of winning the food vouchers has been updated from 1 in 300 to 1 in 100.

Reason: The probability of the reward has been updated to increase the consequentiality of the task.

Variables

Change 5.a. We manipulate the menu of food items (main course) that will be provided to the participants. As such, twelve different variants of the menu will be presented to the individuals (see Treatment Design v2.pdf; Figure A.10) The menu has been drawn up with mains options only corresponding to a set menu of £15: The new menus consist of 36 main course items, food coded by recipes on Scarborough et al., (2014) carbon emissions scale using Public Health England's recent McCance and Widdowson's CoFID user guide (2019). These are equally divided into 18 options for vegetarian and non-vegetarian items. In the traffic lighting

scheme 18 of these items qualify to be green having the least carbon emissions, 6 are yellow and the remaining 12 items are classified as red having the highest carbon emissions. These scales are devised using the following condition: items with carbon footprint corresponding to less than mean emissions have been classified to have the lowest environmental emissions; these include all plant proteins, fish and poultry meat (chicken, geese, turkey or fowls). Food items with emissions higher than the mean emissions but lower than the median emissions are classified to have medium environmental emissions; these include all pork meat. Finally, all food items with carbon footprint more than the median emissions have been classified to have high environmental emissions.

Reason: The change in the menu corresponds to the ordering and moral compensation effects observed in pilot study 1 (see change 3.b.). As such the list of manipulated variables have been updated to avoid any such effects in future iterations of the survey.

Change 5.b. The life satisfaction index has been omitted from the first iteration of the survey design. New measures have been added in place; these include questions determining the priority of the respondents towards lives versus livelihoods and questions determining changes in income and lifestyle due to the pandemic.

Reason: Questions have been added to assess the effect of the Coronavirus outbreak on the preferences of the respondents. To accommodate these additional questions, the life satisfaction index has been dropped keeping in line with budgetary concerns.

Change 5.c. The healthy eating index has been updated to range from 0 to 25 points with the additionality of a question relative to the first iteration of the survey design. This new question takes into account the consumption of vegetables by the respondents which was missing in the original healthy eating index developed by Pot et al., (2014).

Reason: Consumption of vegetables is recommended by NHS as part of a healthy lifestyle. To reflect this in the survey, the healthy eating index has been updated to include this additional question.

Analysis Plan

Change 6.a. The file with the related carbon emissions has now been uploaded for reference (see Emissions from Menu v2.csv; Table A.1)

Change 6.b. Data units will be dropped only if respondents' choice in selecting the main course meal is absent.

Change 6.c. Exploratory hypotheses 3f-3g are dropped as food waste is no longer measured

Change 6.d. Exploratory hypotheses 5a-5c (subpart 4) are dropped as life satisfaction variable is no longer measured

Change 6.e. Exploratory hypothesis 6e is dropped as life satisfaction is no longer measured.

Sr No	Intervention Type	Intervention Sub-Type	Intervention Vehicle	Intervention Description
1.	**Control**	No Control	No intervention	Regular Set Menu with all items
2.	**Classic Nudge**	Defaults	Opt-out Default	A reduced Set-Menu with environmentally sustainable items only; subjects can opt out for regular menu
		Labelling Scheme (Colour Coding)	Traffic Lights	Regular menu but colour coded for all options in red, amber and green indicating low, medium and high environmental emissions.
3.	**Thinks**	Active mechanism design (Self-reflection toon)	Commitment Strategy.	A written pledge to follow an environmentally sustainable duet followed by questions measuring motivation. Subjects are then given the option to choose from a regular, environmentally sustainable set or colour coded menu.
4.	**Two-part Simultaneous Nudge Plus**	Nudge with salience building information plus	Opt-out Default with Information disclosure	Same in 2 but with a salience building information plus emphasising that the default menu includes environmentally sustainable items only.
		Nudge with salience building information plus	Traffic Lights with Information disclosure	Same in 2 but with a salience building information plus emphasising that the colour coding indicates the corresponding carbon emissions of the items.
5.	**Two-part Sequential Nudge Plus**	Nudge followed by self-reflective plus	Opt-out Default+ Commitment	2 followed by 4, and a follow-up question clarifying if respondents want to revisit their prior choices.
		Nudge preceded by self-reflective plus	Commitment + Opt-out default	4 followed by 2. No follow up question needed.
6.	**Boosts**	Uncertainty management/ Non-motivational boost	Quick Rules	Set of three food rules provided for sustainable consumption followed by the regular menu
		Uncertainty management/ Non-motivational boost	Fast and Frugal Trees	Two hierarchical questions indicating subject's existent sustainability with diets. Subjects are then given the option to choose from a regular, environmentally sustainable set or colour coded menu.
		Motivational boost	Implementation Intentions	If-then design with two implementation plans (one for lunch and one for dinner) followed by the regular menu.
7.	**Boost Plus**	Literacy boosts	Traffic Lights + Skill enhancing information	Same in 2 but with a boost that involves building competencies by training people into understanding the ordering of food items by carbon footprints.

Figure A.10: List of Treatments (new)–experiment I

Sr. No.	Variable	Source of Question	Use
1.	**Outcome**	Scarborough et al., 2014	Two outcome variables will be used. An ordered logistic regression with categories for increasing carbon footprints. OLS will be repeated with the carbon footprints of the main ingredients of the food items used in the menus
2.	**Well Being**	ONS standardised 11-likert scale questions	Control co-variate used as interaction for heterogeneity.
3.	**Mood question (Happy, Tired, Content and Calm)**	BMIS (2013): 4-Likert scale	Used to test momentary mood changes pre-post treatment (Hypothesis 3a)
4.	**Freedom of Choice**	Modified World Values Survey; 11-point Likert scale	Used to test empowering effects of Boosts and Nudge Pluses (Hypothesis 3b)
5.	**Risk and Time Preferences**	Antoine Nebout et al., 2020	Used to calculate the risk aversion and the discounting factor of the individuals to control for them.
6.	**Generalised Trust**	Rosenberg question; World Values Survey	
7.	**Self-reported risk aversion**	Binswanger, Eckel and Grossman risk aversion game	
8.	**Environment and Economy Trade off**	Ecocentric View; World Values Survey	
9.	**Lives and Livelihood Trade off**	Adapted question based on 7.	Confirmatory Test for Hypothesis 4. Subgroup analysis (k-step cluster analysis) using chi-squared tests will be performed. Significance levels adjusted for multiple comparisons (Hochberg- Benjamini and Holm's adjustments)
10.	**Belief in Climate Change**	UK Climate Change Questionnaire	
11.	**Willingness to act to mitigate climate change**	UK Climate Change Questionnaire	Heterogeneous Treatment effects expected; Questions 7-10 to be reduced into a single component using principal components analysis (PCA with varimax rotation; one factor retained)
12.	**Belief in Command and Control Measures**	Scale 02: 2 question 11-point Likert Scale; Support for interventionist conservation policies (Environmental Attitude Inventory, 2010)	

Figure A.11: List of variables (new)–experiment I

13.	**Pro-Environmental Attitude**	Scale 08: 10 question 11-point Likert scale; Personal Conservation Behaviour (Environmental Attitude Inventory, 2010) and WVS	
14.	**Healthy Eating Index**	Modified Eating Choices Index; Pot et al., 2014	
15.	**Intensity of Physical Exercise**	International Physical Activity Questionnaire (IPAQ)	
16.	**Donation to Charity**	Modified GPS 2012	Used to test for behavioural spill-overs originating from Classic Nudges, Nudge Pluses and Boosts (Hypothesis 2a-c)
17.	**Demographics**	Gender: UKHLS Age: BSA 2017 Education: UKHLS Birthplace: UKHLS Immigrant Status: BHPS Religion: BHPS adapted Ethnicity: 2011 Census England and Wales Marital Status: BHPS Employment Status: BHPS Income: BSA 2017, KBT 2019	Used for randomisation balance checks, and to test for heterogeneity: Exploratory tests only.

Figure A.12: List of variables (new)–experiment I contd.

Food Item	CoFID Food Code	CoFID Food Type	Scarborough et al. (2014) emissions
Lentil Linguine Ragu (V)	DB	Beans and Lentils	0.8
Cannelloni (Vg)	AD	Pasta	1
Four Cheese Margherita	A	Pasta	1
Jack Fruit Italian Pasta (V)	AD	Pasta	1
Spaghetti Lentil Ragu (V)	AD	Pasta	1
Supreme Pizza (V)	A	Pasta	1
Aegean Slaw (V)	DR	Vegetables Dishes	1.6
Butternut Squash Salad (V)	DR	Vegetables Dishes	1.6
Harusami Aubergine (V)	DR	Vegetables Dishes	1.6
Inari Taco (Vg)	DR	Vegetables Dishes	1.6
Vegan Meatballs (V)	DR	Vegetables Dishes	1.6
Falafel with Tahini (V)	GA	Nuts and seeds	2.2
Aromatic Duck Rolls	MR	Duck	5.4
Beer battered fish with chips	JR	White Fish	5.4
Butterfly Chicken Burger	MR	Chicken	5.4
Chicken Curry Ramen	MR/WAE	Chicken	5.4
Chicken Katsu Curry	MR	Chicken	5.4
Cured Salmon Sashimi	JR	White Fish	5.4
American Hot Pizza	MR	Pork	7.9
Pepperoni Melt	MR	Pork	7.9
Pork Porchetta	MR	Pork	7.9
Pork Ribs	MR	Pork	7.9
Rustica Chorizo Pizza	MI	Pork	7.9
Wild Boar Polpette	MR	Pork	7.9
Bufala Caprese (Vg)	BL	Cheese	18.58
Cheese Salad (Vg)	BL	Cheese	18.58
Goat's Cheese Calzone (Vg)	BL	Cheese	18.58
Goat's Cheese Salad (Vg)	BL	Cheese	18.58
Halloumi Sticks with Mayo Avocado Dip (Vg)	BL	Cheese	18.58
Panchetta Carbonara (Vg)	BL	Cheese	18.58
Lamb Meat balls with Spaghetti	MR	Lamb	64.2
Beef Angus Burger	MR	Beef	68.8
Beef Bourguignon	MR	Beef	68.8
Beef Brisket and Venison Tagliatelle	MR	Beef	68.8
Slow Cooked Beef in Chianti Sauce	MR	Beef	68.8
Steak	MR	Beef	68.8

Table A.1: Environmental impact of food items

A.1.7 Experiment–I (Pre registration 3, transparent changes 2)

Amendments to second pre-registration document

Purpose: We seek to make a methodological contribution by showing that open-ended questions can provide more insights than multiple-choice questions and can

be analysed with the same rigour by using quantitative text analysis tools. The nature of this project is exploratory.

Design: We plan to ask two open-ended questions. First, we ask subjects to state the factors influencing their choices of meal. Second, we ask subjects to describe their current mood. Questions are framed as if the subjects were sharing their thoughts on social media. These questions are the equivalents to the multiple choice questions asked to subjects about the factors having influenced their meal choices and their current mood.

Analysis plan: Using Latent Dirichlet Allocation (DLA) we seek to elicit prominent topics across answers to the open-ended questions. For each treatment group, we will determine the average probability of occurrence of a given topic and the associated variance.

Exploratory Hypotheses: 1- We expect to observe a significant difference in the variance between the treatment groups. 2- We expect to find a larger range of topics than those covered in the multiple choice questionnaire. 3- We expect to find that the open-ended questions corroborate the answers to the multiple choice questions.

Reasons: 1- Depending on the treatment, subjects will be prompted to think in a given way that would influence their answers to the open-ended questions. Therefore, in some treatments we might observe more homogeneous answers. Given the exploratory nature of this project, we do not make more hypotheses on the average probabilities of occurrence and the variances. 2- Subjects will have more freedom to express their views than in the multiple choice questionnaire. 3- There is no reason for having subjects being incoherent in their answers on average.

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A.2 Experiment-II (Pre-registration 1 & 2)

Title: Too (m)eat or not too (m)eat? When cultural habits and environmental concerns are in conflict in influencing English diets.

Registration Date: January 2022 on Open Science Platform.

Transparent changes date: April 2022 on Open Science Platform.

Authors: Sanchayan Banerjee and Julien Picard

A.2.1 Motivation

Meat-based diets are carbon intensive. Livestock farming contributes to 14.5 percent of global greenhouse gas emissions (Gerber et al., 2013). In the United Kingdom, the livestock sector represents approximately 5 percent of its annual emissions. Consequently, reducing meat consumption offers potential mitigation opportunities to tackle the climate crisis. Yet, the adoption of sustainable diets is challenging. Diets are primarily determined by physiological needs; besides sociological, psychological, and economic factors, which often act as barriers to altering these preferences (Rozin, 1996, Stoll-Kleemann and Schmidt, 2017). In this regard, Van der Linden et al., (2021) claim that behavioural policies, like social norm messages, can be powerful tools to overcome barriers to behavioural changes and promote climate-friendly lifestyles. Yet, little is known about how the hindrances to the adoption of low-carbon diets alter the effectiveness of behavioural interventions.

Social norm interventions consist of informing people about socially acceptable behaviours. They foster behaviour change by triggering a will to conform. Nonetheless if target behaviours are a product of different norms at play, using social norms to facilitate behaviour change becomes challenging. For example, diets are mutually shaped by cultural and environmental norms. By conforming to cultural norms, people signal an attachment to one's social group (Higgs 2015), such as western diets that often tend to be meat-based. On the other hand, environmental norms may suggest reducing meat-based diets. Evidently, there is a trade-off, and ultimately dietary changes are informed by which of these norms are dominant. In our example, cultural norms hinder the adoption of low-carbon diets. We posit that the strength of such hindrances depends on people's degree of familiarity with the choice environment and their social demographic profiles. Following Banerjee and John (2021), we design different social norm messages varying in their salience and in the degree of reflection they induce in respondents' decision-making process. We then compare how their effectiveness vary when used in a neutral choice environment versus an environment made familiar to participants. We develop a simple theoretical

model (in appendix) to lay out the different ways people can react when exposed to a trade-off between their cultural habits and their environmental preferences.

To test its predictions, we design an online survey experiment to study dietary choices. We will administer this online survey experiment to a sample of 5,552 respondents in England. The experiment will follow a 2×4 factorial design with two main dimensions. The first dimension encompasses two conditions corresponding to two different menus displayed to respondents. Namely, they will be randomly allocated to either a familiar condition where the titles of the food items contained in the menu refer to traditional British specialties, or a neutral condition with a descriptive menu. Following the literature on habit formation, we assume that priming respondents with cultural names is likely to trigger habits induced behaviours. The second dimension encapsulates three types of behavioural interventions, plus a control group. The first behavioural intervention consists in displaying the social norm message: "A study published in The Lancet Planetary Health found that the share of British who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly". In the second behavioural intervention arm, respondents are shown the same message and then asked to report the extent to which they are trying to change their diets to make it more climate friendly. Finally, in the third intervention arm, respondents are additionally given the choice to undertake a self-commitment pledge following reflection on the social norm message using their personal norms.

We seek to make three contributions to the scholarly literature of applied environmental and behavioural economics and public policy. First, we will determine whether it is harder to promote the adoption of low-carbon diets when the available options are made more familiar, as such increasing the likelihood to make a choice out of habits, compared to when the available options are presented in a neutral way to decision-makers. More generally, this question will help us explore how factors that are supposed to be orthogonal to pro-environmental decisions can influence the effectiveness of behavioural interventions promoting such decisions. Here, we posit that food choices will be more likely to be made out of habits when facing food items that are part of one's culture, therefore making the adoption of environmentally sustainable diet more complicated. Second, we assess if inducing respondents to reflect on their dietary choices changes the effectiveness of social norm messages. Third, we evaluate indirect behavioural spillover effects triggered by our treatments. By assessing these spillover effects, we seek to shed light on the cognitive processes these treatment interventions trigger.

A.2.2 Design Plan

Survey Design

We will design the survey experiment on Qualtrics and administer it via Prolific. Respondents will consent to participate. They will be rewarded in line with Prolific's standard payment (£5 per hour). Besides this, 1 in 100 respondents will randomly win a £20 restaurant food voucher, of which they will be able to donate up to £10 to an environmental charity of their choice. The timeline of the experiment is presented in Figure A.13. The reader should refer to Figure for more details on the signification of the labels used for the different treatment groups.

Experimental Design

We have two between-subject experiments in this survey. These are detailed below.

Between–subjects experiment I

In the first between-subjects experiment, we randomly assign respondents to 1 in 16 experimental conditions which corresponds to two experimental dimensions as shown below in Table 1. Dimension 1 encapsulates different social norm interventions. Dimension 2 encompasses the four versions of the default menus presented to respondents, varying in their environmental and cultural aspects. It is regrouped in two main categories: familiar menus and neutral menus. The factorial design is shown in Figure A.14 below.

Dimension 1: In this dimension, we allow for four different categories of treatment allocation based on the degree of reflection induced on the social norm interventions.

(1,2,3,4): No social norm intervention. (5,6,7,8): Respondents are presented with a descriptive and dynamic social norm message on the adoption of low-carbon diets, before being shown the default menu.

(9,10,11,12): Respondents are presented with a descriptive and dynamic social norm message on the adoption of low-carbon diets before being asked to state whether they are trying to adapt their diets to reduce their carbon emissions. Then, they are shown the default menu. Here, the treatment prompts people to reflect on the social norm message presented to them.

(13,14,15,16): Respondents are presented with a descriptive and dynamic social norm message on the adoption of low-carbon diets before being asked to state whether or not they are trying to adapt their diets to reduce their carbon

emissions. They are eventually offered to pledge they will adapt their diets to reduce their carbon emissions, before being presented with the default menu. Here, the treatment prompts people to reflect on the social norm message presented to them. If respondents answer "I am not sure" or "No I am not willing to commit to myself", they will be asked to explain what prevents them from making a self-commitment. If they accept to pledge, they will be asked to explain the strategy they would use to hold themselves accountable.

Dimension 2: In this dimension, we allow for four different categories of treatment allocation based on the characteristics of the default menus presented to respondents, as explained below. In each menu, the carbon footprint of food items is made salient by labels to make sure differences are not driven by lack of knowledge about the carbon footprint of food items. To induce respondents to make choices out of habits, we design the familiar menus to closely mimic a typical pub menu. For this, we use the name "Red Lion" as it is the most common pub name according to Pubs Galore, a website containing the largest list of pubs in the UK. We also choose typical cultural names for the food items included in the menu. For the neutral menus, we chose a generic name ("The Cafe") and replaced the names of the food items by the main ingredients written in the description. We also slightly changed the designs of the menus and incorporated pictures of red lions in the familiar menu.

(1,5,9,13): The familiar-made default menu is composed low-carbon items (see Figure A.15). If respondents reject the default menu, they are presented with the full familiar-made menu (see Figure A.16).

(2,6,10,14): The familiar-made default menu is composed of carbon-intensive items (see Figure A.17). If respondents reject the default menu, they are presented with the full familiar-made menu (see Figure A.18)

(3,7,11,15): The neutral default menu is composed of low-carbon items (see Figure A.19). If respondents reject the default menu, they are presented with the full neutral menu (see Figure A.20).

(4,8,12,16): The neutral default menu is composed of carbon-intensive items (see Figure A.21). If respondents reject the default menu, they are presented with the full neutral menu (see Figure A.22).

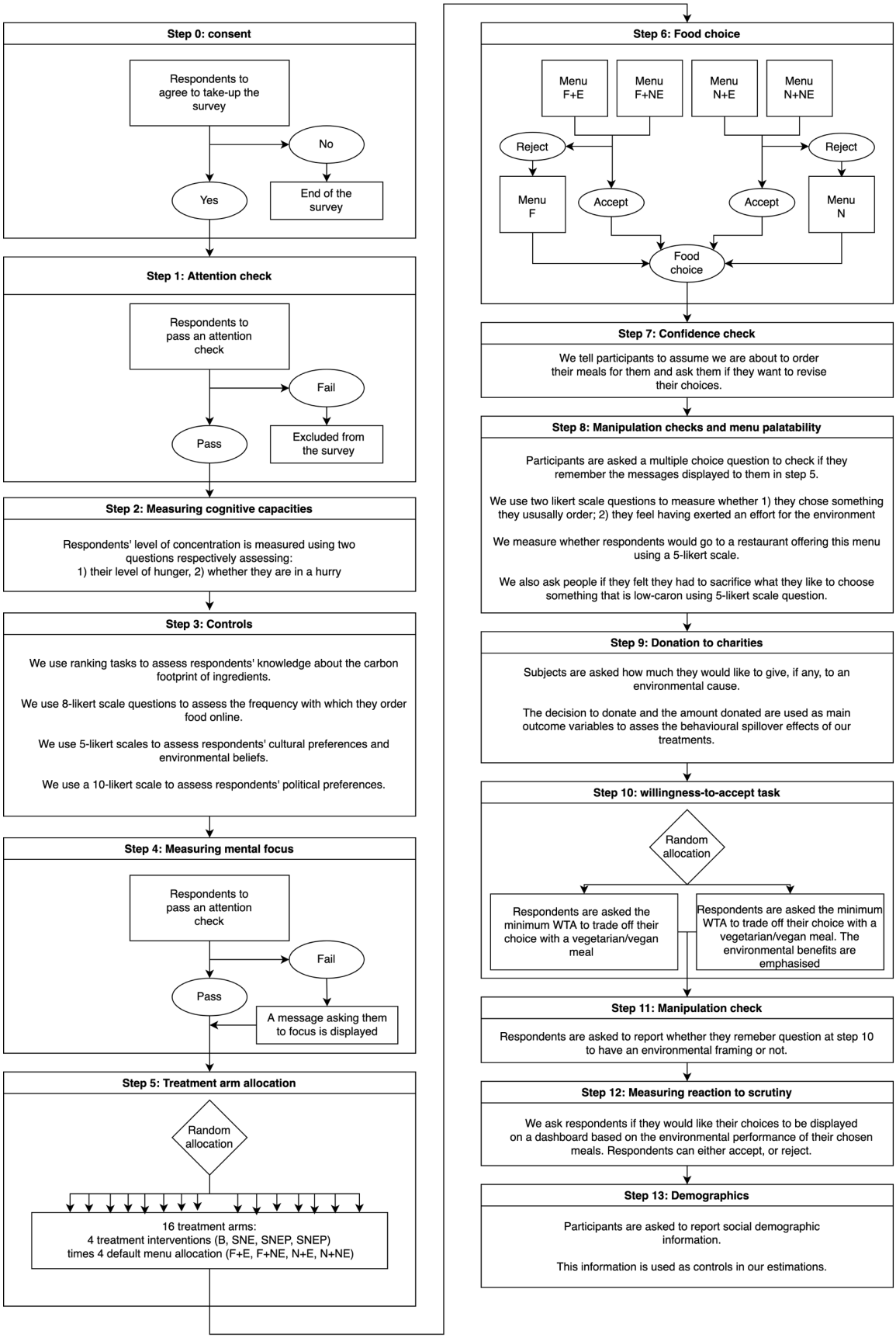
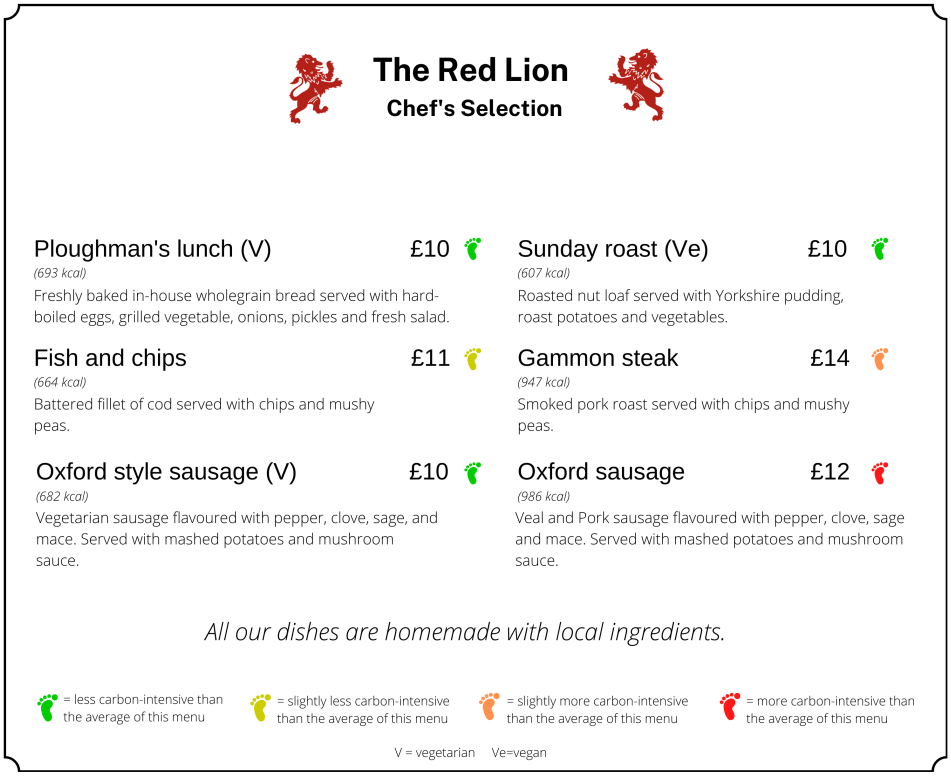


Figure A.13: Survey flow of experiment II

		Default menus (Dimension 2)			
		Familiar menu (habit-inducing)		Neutral (non-habit-inducing)	
		Low-carbon default menu (F+E)	Carbon-intensive default menu (F+NE)	Low-carbon default menu (N+E)	Carbon-intensive default menu (N+NE)
Behavioural interventions (Dimension 1)	Baseline (B)	1	2	3	4
	B + Social norm message (SNE)	5	6	7	8
	BSE + Personal Norm assessment (SNEP)	9	10	11	12
	BSEP + Conformity Pledge (SNEPC)	13	14	15	16

Figure A.14: Factorial design of BS1 experiment



The Red Lion

Chef's Selection

Ploughman's lunch (V) £10
(693 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, grilled vegetable, onions, pickles and fresh salad.

Sunday roast (Ve) £10
(607 kcal)
Roasted nut loaf served with Yorkshire pudding, roast potatoes and vegetables.

Fish and chips £11
(664 kcal)
Battered fillet of cod served with chips and mushy peas.

Gammon steak £14
(947 kcal)
Smoked pork roast served with chips and mushy peas.

Oxford style sausage (V) £10
(682 kcal)
Vegetarian sausage flavoured with pepper, clove, sage, and mace. Served with mashed potatoes and mushroom sauce.

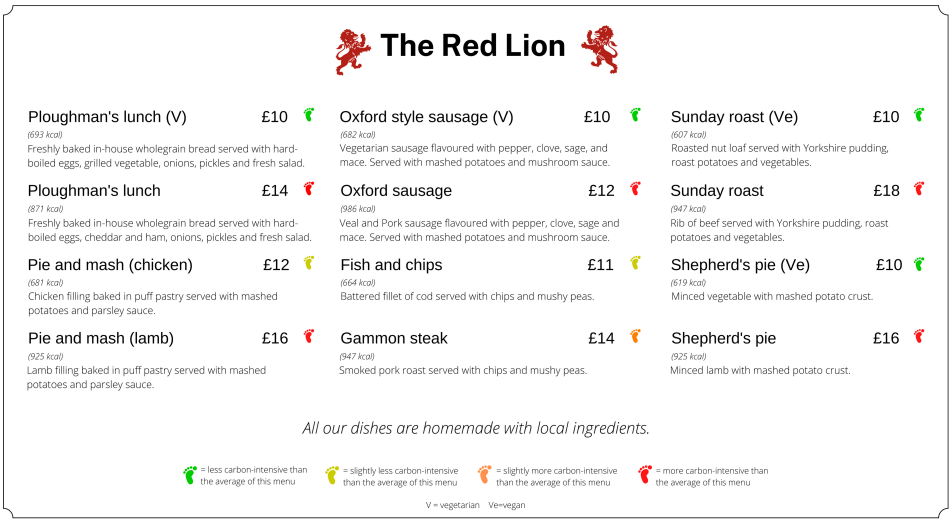
Oxford sausage £12
(986 kcal)
Veal and Pork sausage flavoured with pepper, clove, sage and mace. Served with mashed potatoes and mushroom sauce.

All our dishes are homemade with local ingredients.

= less carbon-intensive than the average of this menu
= slightly less carbon-intensive than the average of this menu
= slightly more carbon-intensive than the average of this menu
= more carbon-intensive than the average of this menu

V = vegetarian Ve=vegan

Figure A.15: Experiment 2, Menu 1



The Red Lion

Ploughman's lunch (V) £10
(693 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, grilled vegetable, onions, pickles and fresh salad.

Oxford style sausage (V) £10
(682 kcal)
Vegetarian sausage flavoured with pepper, clove, sage, and mace. Served with mashed potatoes and mushroom sauce.

Sunday roast (Ve) £10
(607 kcal)
Roasted nut loaf served with Yorkshire pudding, roast potatoes and vegetables.

Ploughman's lunch £14
(871 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, cheddar and ham, onions, pickles and fresh salad.

Oxford sausage £12
(986 kcal)
Veal and Pork sausage flavoured with pepper, clove, sage and mace. Served with mashed potatoes and mushroom sauce.

Sunday roast £18
(947 kcal)
Rib of beef served with Yorkshire pudding, roast potatoes and vegetables.

Pie and mash (chicken) £12
(681 kcal)
Chicken filling baked in puff pastry served with mashed potatoes and parsley sauce.

Fish and chips £11
(664 kcal)
Battered fillet of cod served with chips and mushy peas.

Shepherd's pie (Ve) £10
(619 kcal)
Minced vegetable with mashed potato crust.

Pie and mash (lamb) £16
(925 kcal)
Lamb filling baked in puff pastry served with mashed potatoes and parsley sauce.

Gammon steak £14
(947 kcal)
Smoked pork roast served with chips and mushy peas.

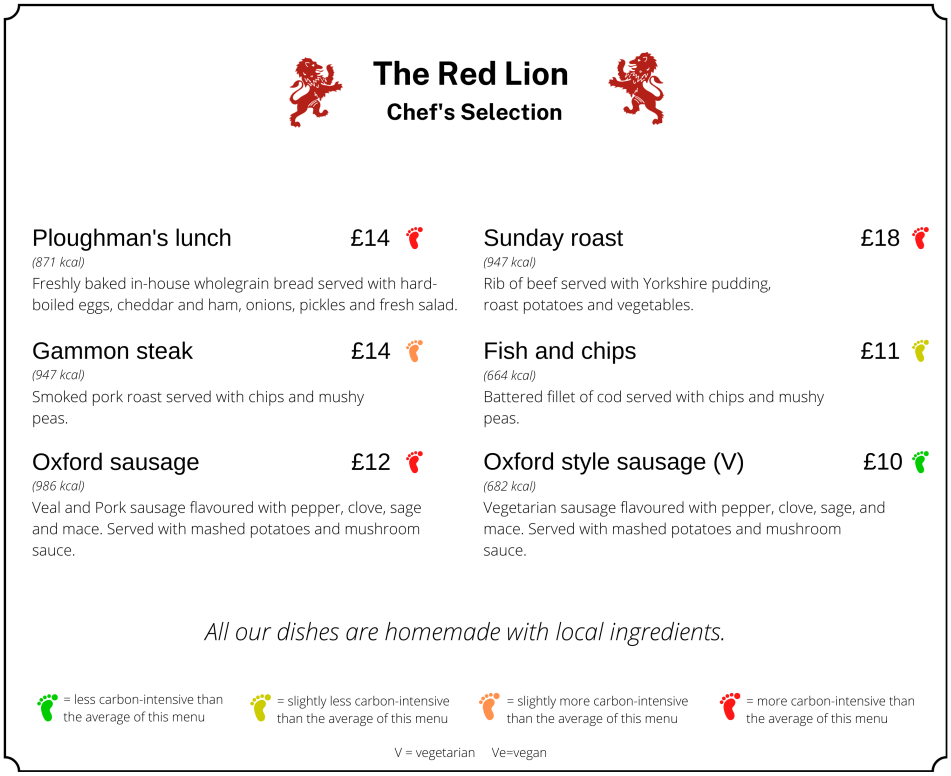
Shepherd's pie £16
(925 kcal)
Minced lamb with mashed potato crust.

All our dishes are homemade with local ingredients.

= less carbon-intensive than the average of this menu
= slightly less carbon-intensive than the average of this menu
= slightly more carbon-intensive than the average of this menu
= more carbon-intensive than the average of this menu

V = vegetarian Ve=vegan

Figure A.16: Experiment 2, Menu 2



The Red Lion

Chef's Selection

Ploughman's lunch £14
(871 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, cheddar and ham, onions, pickles and fresh salad.

Gammon steak £14
(947 kcal)
Smoked pork roast served with chips and mushy peas.

Oxford sausage £12
(986 kcal)
Veal and Pork sausage flavoured with pepper, clove, sage and mace. Served with mashed potatoes and mushroom sauce.

Sunday roast £18
(947 kcal)
Rib of beef served with Yorkshire pudding, roast potatoes and vegetables.

Fish and chips £11
(664 kcal)
Battered fillet of cod served with chips and mushy peas.

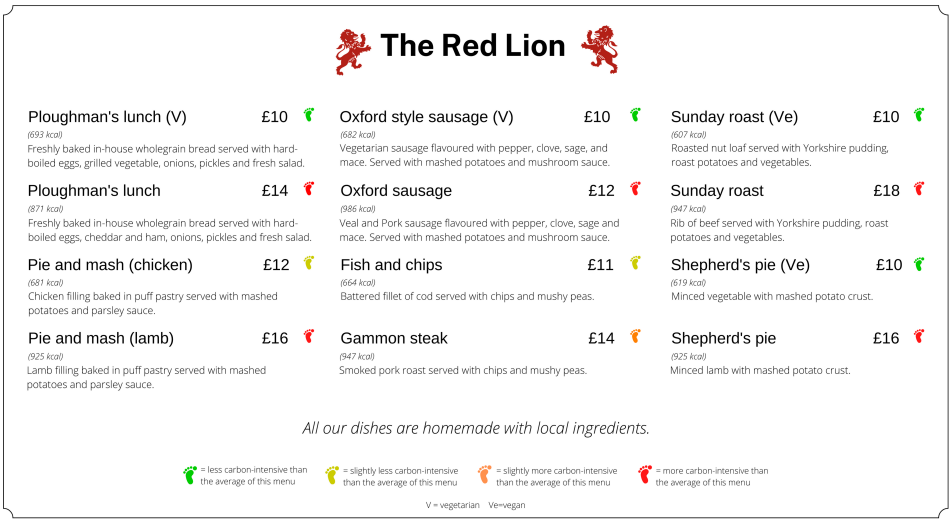
Oxford style sausage (V) £10
(682 kcal)
Vegetarian sausage flavoured with pepper, clove, sage, and mace. Served with mashed potatoes and mushroom sauce.

All our dishes are homemade with local ingredients.

= less carbon-intensive than the average of this menu
= slightly less carbon-intensive than the average of this menu
= slightly more carbon-intensive than the average of this menu
= more carbon-intensive than the average of this menu

V = vegetarian Ve=vegan

Figure A.17: Experiment 2, Menu 3



The Red Lion

Ploughman's lunch (V) £10
(693 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, grilled vegetable, onions, pickles and fresh salad.

Ploughman's lunch £14
(871 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, cheddar and ham, onions, pickles and fresh salad.

Pie and mash (chicken) £12
(681 kcal)
Chicken filling baked in puff pastry served with mashed potatoes and parsley sauce.

Pie and mash (lamb) £16
(925 kcal)
Lamb filling baked in puff pastry served with mashed potatoes and parsley sauce.

Oxford style sausage (V) £10
(682 kcal)
Vegetarian sausage flavoured with pepper, clove, sage, and mace. Served with mashed potatoes and mushroom sauce.

Oxford sausage £12
(986 kcal)
Veal and Pork sausage flavoured with pepper, clove, sage and mace. Served with mashed potatoes and mushroom sauce.

Fish and chips £11
(664 kcal)
Battered fillet of cod served with chips and mushy peas.

Gammon steak £14
(947 kcal)
Smoked pork roast served with chips and mushy peas.

Sunday roast (Ve) £10
(607 kcal)
Roasted nut loaf served with Yorkshire pudding, roast potatoes and vegetables.

Sunday roast £18
(947 kcal)
Rib of beef served with Yorkshire pudding, roast potatoes and vegetables.

Shepherd's pie (Ve) £10
(619 kcal)
Minced vegetable with mashed potato crust.

Shepherd's pie £16
(925 kcal)
Minced lamb with mashed potato crust.

All our dishes are homemade with local ingredients.

= less carbon-intensive than the average of this menu
= slightly less carbon-intensive than the average of this menu
= slightly more carbon-intensive than the average of this menu
= more carbon-intensive than the average of this menu

V = vegetarian Ve=vegan

Figure A.18: Experiment 2, Menu 4

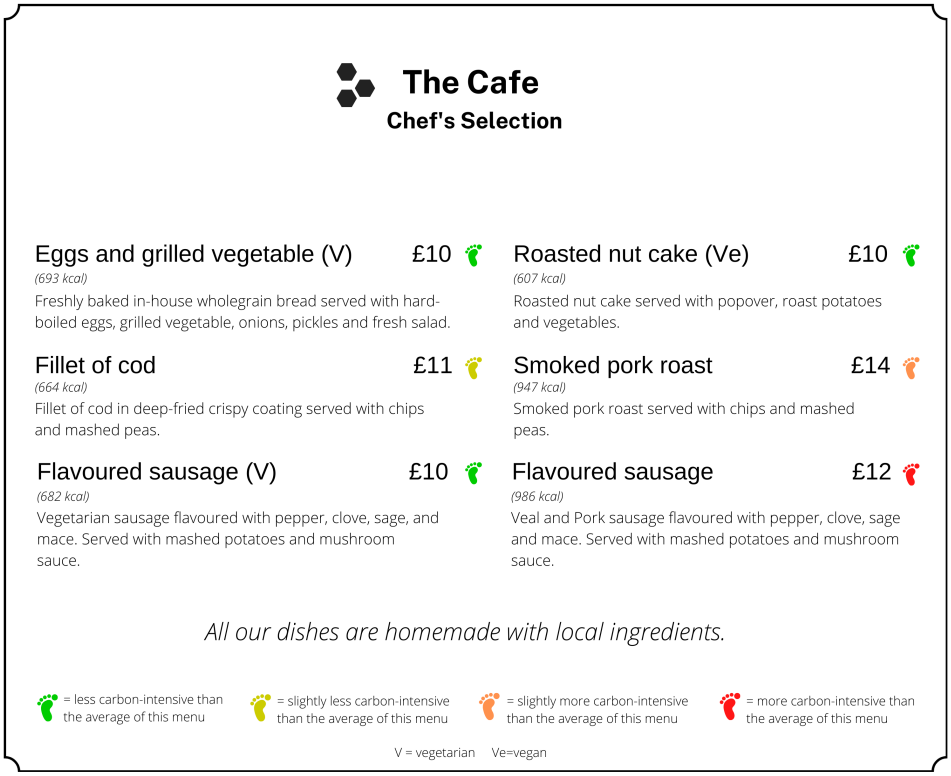


Figure A.19: Experiment 2, Menu 5

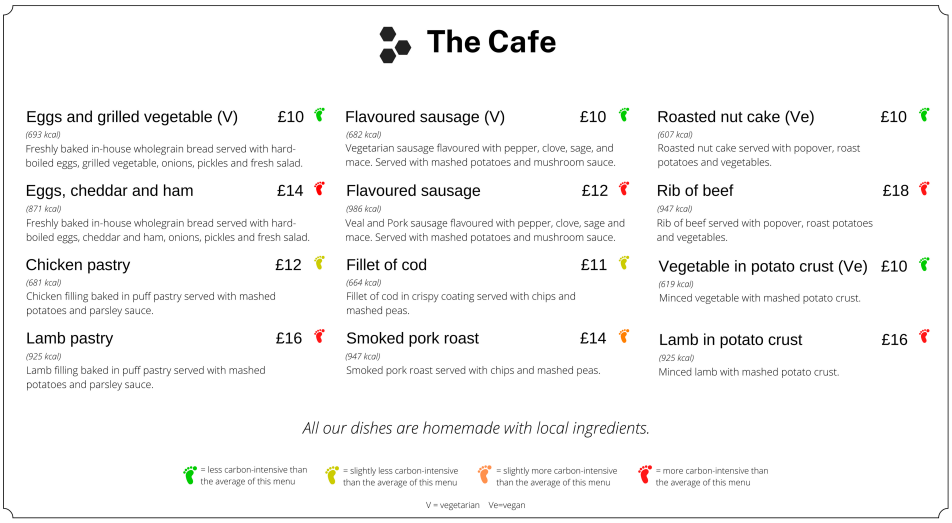
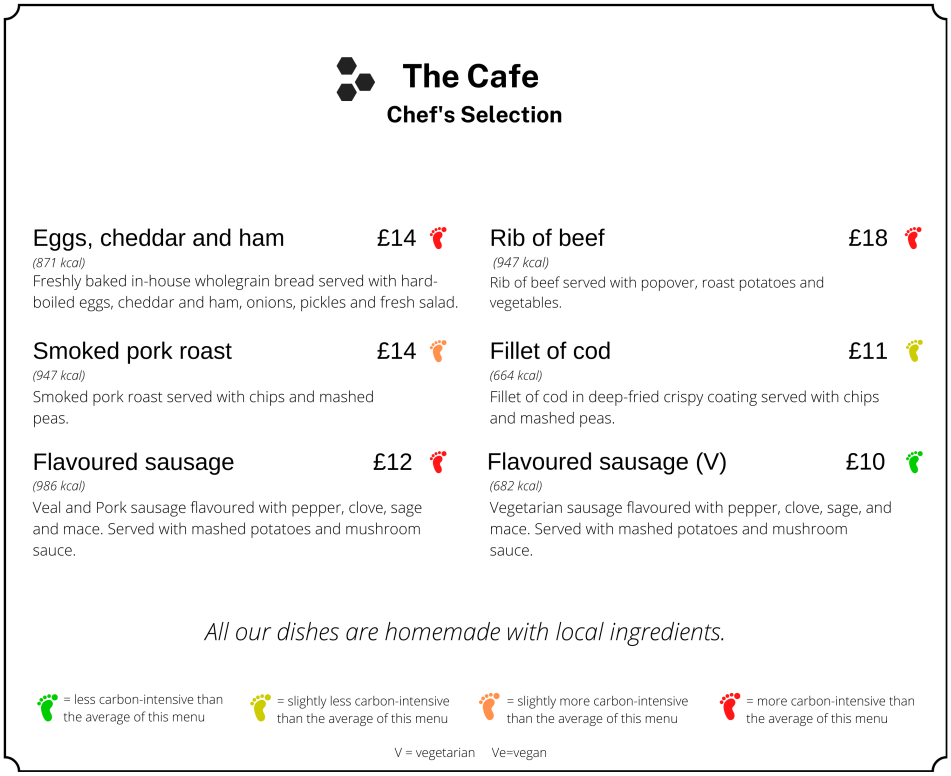


Figure A.20: Experiment 2, Menu 6



The Cafe

Chef's Selection

Eggs, cheddar and ham £14
(871 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, cheddar and ham, onions, pickles and fresh salad.

Rib of beef £18
(947 kcal)
Rib of beef served with popover, roast potatoes and vegetables.

Smoked pork roast £14
(947 kcal)
Smoked pork roast served with chips and mashed peas.

Fillet of cod £11
(664 kcal)
Fillet of cod in deep-fried crispy coating served with chips and mashed peas.

Flavoured sausage £12
(986 kcal)
Veal and Pork sausage flavoured with pepper, clove, sage and mace. Served with mashed potatoes and mushroom sauce.

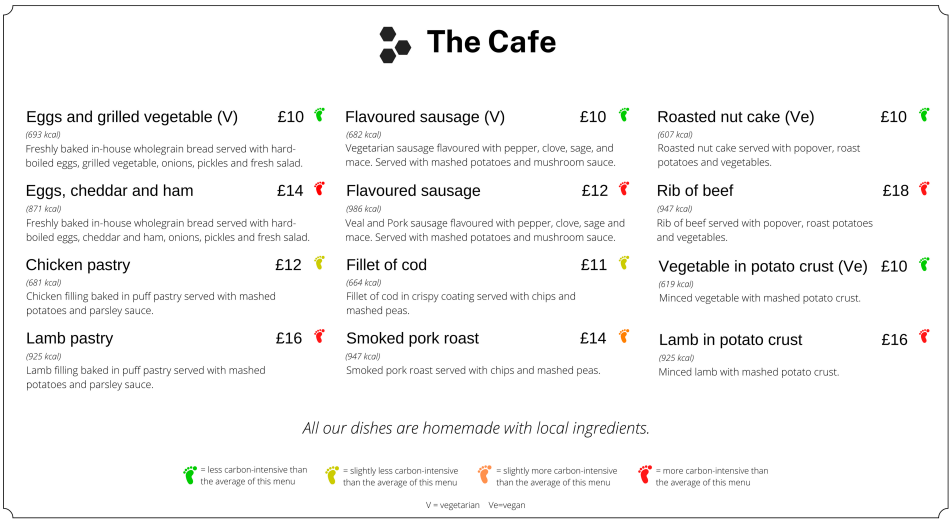
Flavoured sausage (V) £10
(682 kcal)
Vegetarian sausage flavoured with pepper, clove, sage, and mace. Served with mashed potatoes and mushroom sauce.

All our dishes are homemade with local ingredients.

= less carbon-intensive than the average of this menu
= slightly less carbon-intensive than the average of this menu
= slightly more carbon-intensive than the average of this menu
= more carbon-intensive than the average of this menu

V = vegetarian Ve=vegan

Figure A.21: Experiment 2, Menu 7



The Cafe

Eggs and grilled vegetable (V) £10
(693 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, grilled vegetable, onions, pickles and fresh salad.

Flavoured sausage (V) £10
(682 kcal)
Vegetarian sausage flavoured with pepper, clove, sage, and mace. Served with mashed potatoes and mushroom sauce.

Roasted nut cake (Ve) £10
(607 kcal)
Roasted nut cake served with popover, roast potatoes and vegetables.

Eggs, cheddar and ham £14
(871 kcal)
Freshly baked in-house wholegrain bread served with hard-boiled eggs, cheddar and ham, onions, pickles and fresh salad.

Flavoured sausage £12
(986 kcal)
Veal and Pork sausage flavoured with pepper, clove, sage and mace. Served with mashed potatoes and mushroom sauce.

Rib of beef £18
(947 kcal)
Rib of beef served with popover, roast potatoes and vegetables.

Chicken pastry £12
(681 kcal)
Chicken filling baked in puff pastry served with mashed potatoes and parsley sauce.

Fillet of cod £11
(664 kcal)
Fillet of cod in crispy coating served with chips and mashed peas.

Vegetable in potato crust (Ve) £10
(619 kcal)
Minced vegetable with mashed potato crust.

Lamb pastry £16
(925 kcal)
Lamb filling baked in puff pastry served with mashed potatoes and parsley sauce.

Smoked pork roast £14
(947 kcal)
Smoked pork roast served with chips and mashed peas.

Lamb in potato crust £16
(925 kcal)
Minced lamb with mashed potato crust.

All our dishes are homemade with local ingredients.

= less carbon-intensive than the average of this menu
= slightly less carbon-intensive than the average of this menu
= slightly more carbon-intensive than the average of this menu
= more carbon-intensive than the average of this menu

V = vegetarian Ve=vegan

Figure A.22: Experiment 2, Menu 8

Between–subjects experiment II

In the second between-subjects experiment, after respondents decide on their food choices, they are re-randomised into two new experimental conditions to evaluate their willingness to accept a compensation in having to choose between three vegetarian / vegan options. if their preferred choice of food-item, as expressed in experiment 1, is unavailable.

Respondents in the control condition and those having already chosen a vegetarian or vegan meal are shown the following message:

"Imagine the restaurant is running out of ingredients. They cannot offer you [participants' food choice]. Instead, it proposes to replace it with one of the following items:

[Option 1] - GBP 10 [Option 2] - GBP 10 [Option 3] - GBP 10

The restaurant will offer you a refund based on the price difference. It will also offer you an additional discount for the inconvenience caused.

What is the minimum amount of discount that you will be willing to accept to stay and choose one of these items?"

Respondents in the treatment condition who have not chosen a vegetarian or vegan meal are additionally informed about the savings in carbon emissions resulting from this switch to a different food item. They are shown the following message:

"Imagine the restaurant is running out of ingredients. They cannot offer you [participant's food choice]. Instead, it proposes to replace it with one of the following items:

[Option 1] - GBP 10 [Option 2] - GBP 10 [Option 3] - GBP 10

The restaurant will offer you a refund based on the price difference. It will also offer you an additional discount for the inconvenience caused.

The restaurant informs you that choosing any of these three items has an additional benefit of reducing carbon emissions. It estimates your new order to generate [difference between the mean carbon footprint of the three options and respondent's food choice]kg fewer carbon emissions. Xkg of carbon emissions is equivalent to driving [carbon emissions converted in miles drive] miles with a regular petrol car.

What is the minimum amount of discount that you will be willing to accept to stay and choose one of these items?"

Hypotheses

RQ1: Can social norm messages increase the uptake of low-carbon diets?

H1: The uptake of low-carbon foods will be significantly different when people are shown a social norm message compared to the control group. Two-sided test.

RQ2: Can reflection on social norm messages using personal norms increase the uptake of low-carbon diets?

H2: The uptake of low-carbon foods will be significantly different when people reflect on the social norm message using their personal norms compared to the group shown a social norm message. Two-sided test

RQ3: Can reflection on social norm messages using personal norms and commitment devices increase the uptake of low carbon diets?

H3: The uptake of low-carbon foods will be significantly different when people reflect on the social norm message using their personal norms and commitment devices compared to the group asked to reflect on the social norm message using personal norms. Two-sided test.

RQ4: Does making the choice environment appear more familiar and cultural induce people to make a trade-off between their cultural habits and taking up low-carbon diets?

H4a: Self-reported levels of sacrifice will be significantly different when presented with a familiar menu compared to a neutral menu. Two-sided test.

H4b: The difference observed in H4 will be significantly different when people are shown a social norm message compared to the control group. Two-sided test.

H4c: The difference observed in H4 will be significantly different when people reflect on the social norm message using their personal norms compared to the group shown a social norm message. Two-sided test.

RQ5: Can reflection help overcome the cultural habits barriers in the uptake of low-carbon diets?

H5: The difference observed in H1, H2, will be significantly different when presented with a familiar menu compared to a neutral menu. Two-sided test.

RQ6: Can social norm messages affect charitable donations?

H6a: Charitable donations will be significantly different when people are shown a social norm message compared to the control group. Two-sided test.

H6b: Charitable donations will be significantly different when people reflect on the social norm message using their personal norms compared to the group shown a social norm message. Two-sided test.

RQ7: How is the effect of choosing a low-carbon diet on charitable donations affected by social norm interventions?

H7a: The effect of choosing a low-carbon meal on charitable donations will be significantly different when people are shown a social norm message compared to the control group. Two-sided test.

H7b: The effect of choosing a low-carbon meal on charitable donations will be significantly different when people reflect on the social norm message using their personal norms compared to the group shown a social norm message. Two-sided test.

RQ8: Do people reduce their willingness to accept compensation when they are informed about carbon savings resulting from a switchover to a climate-friendly option?

H8a: Respondents who are informed of the carbon savings will be willing to accept lower levels of compensation compared to those who are not informed about it. Two-sided test.

H8b: The effects in H8a will be significantly different for those in the baseline condition (B) relative to the social norm intervention conditions (SNE+ SNEP + SNEPC) as randomly assigned in between-subjects experiment 1.

A.2.3 Sampling Plans

Data Collection plans

We would collect new data. To facilitate this, we would administer a between-subjects online experiment, with randomised treatment arms and non-randomised attitudinal and preference questions, using Prolific. The subjects will be recruited from England. We will use different pre-screeners to filter our target population, detailed hereafter:

- Nationality (UK): England
- Sex: 50%Male, 50% Female
- Place of most time spent before turning 18: In England
- First Language: English
- UK area of birth: North East, England (Tees Valley, Durham, Northumberland and Tyne and Wear), North West, England (Cumbria, Greater Manchester, Lancashire, Merseyside), Yorkshire and the Humber, England (East Riding, North Lincolnshire and Yorkshire), East Midlands, England (Derbyshire and Nottinghamshire, Leicestershire, Rutland and Northamptonshire, Lincolnshire), West Midlands, England (Herefordshire, Worcestershire and Warwickshire, Shropshire and Staffordshire, West Midlands), East of England (East Anglia, Bedfordshire and Hertfordshire, Essex), London, England , South East, England (Berkshire, Buckinghamshire, and Oxfordshire, Surrey, Sussex, Kent, Hampshire and Isle of Wight), South West, England (Gloucestershire, Wiltshire and Bristol/Bath area, Dorset and Somerset, Cornwall and Isles of Scilly, Devon)
- Current UK area of residence: North East, England (Tees Valley, Durham, Northumberland and Tyne and Wear), North West, England (Cumbria, Greater Manchester, Lancashire, Merseyside), Yorkshire and the Humber, England (East Riding, North Lincolnshire and Yorkshire), East Midlands, England (Derbyshire and Nottinghamshire, Leicestershire, Rutland and Northamptonshire, Lincolnshire), West Midlands, England (Herefordshire, Worcestershire and Warwickshire, Shropshire and Staffordshire, West Midlands), East of England (East Anglia, Bedfordshire and Hertfordshire, Essex), London, England , South East, England (Berkshire, Buckinghamshire, and Oxfordshire, Surrey, Sussex, Kent, Hampshire and Isle of Wight), South West, England (Gloucestershire, Wiltshire and Bristol/Bath area, Dorset and Somerset, Cornwall and Isles of Scilly, Devon)
- Diet: I do not follow any diet, Pescatarian diet (your diet includes fish and seafood, but not the flesh of other animals), Weight Watchers Diet, South Beach Diet, Raw Food Diet, Mediterranean Diet, Atkins Diet, The Zone Diet, 5-2 Diet, Ketogenic DietWe will recruit participants who are not vegetarian or vegan, as we cannot make their diets more environmentally friendly than it already is. We will also pre-screen participants according to their nationality, and their country of residence to retain only participants living in England. We seek to investigate whether culture represents a barrier to dietary changes

and as such, we restrict our population of interest to those that share a similar culture.

We will also select participants having reported to Prolific the following information:

- Ethnicity.
- Employment status.
- Brexit vote.
- Food delivery services used.

We will start collecting data on the 02/03/2022. More precisely, we will collect a first wave of 500 participants to assess our survey is operating without any functional glitches. Our data collection will be based on the following stopping rules. (1) We will stop collecting data when we reach our sampling requirements, with the given pre-screeners, in two-weeks' time. (2) If we fail to do so, then we will relax our pre-screeners, starting with 1) "Food Delivery Services UK" (as this is will be partly captured in a question of our survey), 2) "First Language" (as we expect people born in England to be fluent in English), 3) "UK area of birth" (as this can be redundant with the question "Place of most time spent before turning 18"), 4) "Employment status" (as having this information is not instrumental for the analysis and can be highly correlated with the household's income).

Power Analysis

Prior studies (Poškus, 2016) on the use of social norm messages to foster sustainable behaviors have indicated effect sizes in the range of Cohen's d = [0.13,0.57]. However, the effect of varying the appearance of the choice set on the effectiveness of such behavioural interventions has not been tested in a similar setting, preventing us to draw clear inferences on power analysis from these experimental studies. More recently, Banerjee et al. (2021) have tested nudge+ alongside nudges: these behavioural interventions have a mid-large effect size [d=0.5 to 0.75]. Furthermore, the meta-analysis conducted by Maki et al. (2019) on behavioural spillover effects suggest an effect size of d=0.17.

Nonetheless, we adopt a conservative sample size by aiming for a Cohen's d of 0.12, slightly lower than the lowest bound of effect sizes in meta-analyses mentioned above. To account for multiple testing problems, we apply a conservative-ex-ante Bonferroni correction at an initial type-I error probability of 5% level of significance.

With 14 confirmatory hypotheses, our corrected type-I error is 0.00357. We use a two-sided t-test of independent means, with a power of 0.95 (see section 5.2). The total sample size required is N=5, 552. The critical t and the centrality parameter associated with this analysis are respectively 2.915 and 4.56. The sample size calculations were carried out using G*Power 3.1.

A.2.4 Variables

The full questionnaire used in this survey can be accessed in section C.

Manipulated variables

Main independent variables

We will manipulate whether respondents are exposed:(1) to one of the three behavioural interventions plus the control group, and to (2) to a familiar or a neutral menu, which will be framed either as a high- or a low-carbon choice-environment. As such, respondents will be randomly assigned to one of the 16 (4 x 4) experimental conditions. We will use a categorical variable to indicate their treatment status. After this food delivery task, we will re-randomise respondents into 2 conditions to study their willingness to accept for a change in their intended orders. In this, respondents will be manipulated into an environmental condition or a control condition, and this will be indicated by a dummy variable.

Instrumental variables

We will randomly manipulate whether respondents are presented with a default menu containing a majority of low-carbon food items or a majority of carbon-intensive food items. The variable capturing the allocation to one of these conditions will be coded as a dummy and will be used as an instrumental variable when assessing the effect of food choices on charitable donations and on people's decision to publicise their food choices.

Measured variables

- Outcome variables: Respondents' food choices will be converted into their respective carbon footprints, which will be coded as a categorical variable. This will be done as follows: each item on our menu has been food coded by recipes on Scarborough et al., (2014) carbon emissions scale using Public Health England's recent McCance and Widdowson's CoFID user guide (2019). This variable will constitute one of our main outcome variables on which we

will assess the effect of our behavioural interventions, and the effect of the aspect of the menus (familiar versus neutral). For details, see Respondents' decision to make a donation to a charity supporting an environmental cause will be coded as a dummy variable. This variable will be used as one our main outcome variables on which we will assess the behavioural spillover effects of our behavioural interventions.The amount donated by respondents to a charity supporting an environmental cause will be coded as a continuous variable which will be used as an outcome variable on which we will assess the behavioural spillover effects of our behavioural interventions. Respondents will report on a 5-likert scale the extent to which they face a tradeoff between choosing a low-carbon meal and their cultural habits. Answers will be used as an outcome variable on which we will assess the effect of our behavioural interventions, and the effect of the aspect of the menus (familiar versus neutral). We will measure whether respondents would like their food choices to be publicly displayed on a dashboard based on the carbon footprint of food items. Answers to this question will be used as an outcome variable on which we will assess the effect of our behavioural interventions. At the end of the survey, we will ask the minimum amount of money participants are willing to accept for trading-off the meal they chose with a vegetarian or a vegan meal. The amount reported (comprised between 0 and 10) will be coded as a continuous variable. It will be used as part of an exploratory analysis attempting to estimate the price at which people value the disutility from changing diets to reduce their impact on the environment.

- Moderators and interaction variables: We will measure whether respondents' personal norms regarding the uptake of low-carbon diets is aligned with the dynamic social norm message presented to them. This variable will be used as a moderator of the behavioural spillover effects triggered by inducing respondents to reflect on their food choices. It will also be used to conduct robustness checks of our main treatment effects. We will measure respondents' level of concentration by asking them if they have any commitments to attend after the survey (4-likert scale), and how hungry they are (5-likert scale). These variables will be used as moderators of the effect of behavioural interventions. They will also be used to conduct robustness checks of our main treatment effects. We will measure respondents' political orientation using a 10-likert scale. Answers will be used as a moderator of the effect of behavioural interventions, and of the effect of the aspect of the menus (familiar versus neutral). They will also be used to conduct robustness checks of our main treatment effects. We will measure respondents' beliefs about the meat content of cultural and traditional

British food and whether they like eating cultural food using a 5-likert scale. Answers will be coded as an index which will be used as a moderator of the effect of behavioural interventions, and of the effect of the aspect of the menus (familiar versus neutral). They will also be used to conduct robustness checks of our main treatment effects. We will measure respondents' knowledge of the carbon footprint of different ingredients by asking them to rank them in decreasing order of carbon intensity. We will then ask respondents to report the degree of confidence they have about their ranking using a 5-likert scale. Answers will be converted into a score which will be used as a moderator of pro-environmental food choices, and conduct robustness checks of our main treatment effects. We will measure respondents' beliefs about climate change by asking them two questions adapted from Whitmarsh (2021). Answers will be coded as an index which will be used as a moderator of the effect of behavioural interventions. They will also be used to conduct robustness checks of our main treatment effects.

- Covariates Our online panel provider will provide us with a measure of respondents' ethnicity, area of birth and residence, diet, vote for the Brexit referendum, employment status and online delivery app preferences. We will measure the first three digits of respondents' zip code, their age, education, gender, and income. We will use a lasso-based selection technique for these covariates to be controlled in our regressions.

- Manipulation checks: We measure if participants allocated to the treatment arms corresponding to our three behavioural interventions (see section 1) paid attention to the social norm messages displayed to them. This measure will be used to compute the complier average causal effects by instrumenting the dummy variable capturing whether they answered this question correctly by the categorical variable capturing respondents' allocation to one of our treatment interventions. We will measure whether respondents felt they have done their bit for the environment after they chose what to order using a 5-likert scale question. This question will be used to check whether choosing a low-carbon food meal is correlated with the feeling of having exerted an effort. It will also be used as part of an exploratory analysis to determine the effect of the feeling of having exerted an effort on donations. We will measure whether respondents chose something they usually order in a restaurant that would offer similar menus using a 5-likert scale question. We will use answers to this question to check whether being allocated to a familiar condition made people make choices out of habits more often. We will ask respondents if they remember if the framing of the willingness-to-accept task mentioned lowering

carbon emissions. We will use answers to this question to check whether participants paid attention to the treatment intervention. This measure will be used to compute the complier average causal effect by instrumenting the dummy variable capturing whether they answered this question correctly by the categorical variable capturing respondents' allocation to one of the two framings.

- Attention checks: At the beginning of the survey, respondents will be asked to answer a question. If they do not provide the right answer, they will be excluded from the survey. Before the treatment interventions, respondents will be asked another question to check if they are focused. Respondents who do not provide the right answer will be shown a message asking them to stay focused.

- Open–ended questions: We will ask the respondents who are offered the pledge to explain the strategy they will adopt to commit to their pledge if they accept it, or explain the reasons that impeded them to accept the pledge if they refuse it. Answers will be used to conduct an exploratory analysis of the barriers to commitments and strategies for consistency.

- Other variables: After choosing the item they want to order, we will ask respondents whether they would like to revise their order if we were about to place this order to an actual restaurant and deliver it to them. The purpose of this question is to increase the external validity of our survey. If people change their orders, we will keep the new orders as their final choices. We will measure how often respondents order food online using 5-likert scales. Answers will be converted into an index which will be used to inform how externally valid our results are. We will measure whether respondents would go in a restaurant offering the menu displayed to them using a 5-likert scale. Answers will be used to inform how externally valid our results are.

A.2.5 Analysis Plan

Randomisation checks

We will check for randomisation based on balance of means in age, gender, and education. In this, we will conduct parametric (t- or Wald tests) and non-parametric (k-Wallis or Wilcoxon's rank sum tests). We will also check for an overall balance by all covariates, using a propensity score matching method.

Food item	**Scarborough et al. (2014) emissions**
Eggs and grilled vegetable (V)	1.6
Fillet of cod	5.4
Flavoured sausage (vegetarian)	0.8
Roasted nut cake (Ve)	2
Smoked pork roast	7.9
Flavoured sausage (veal & pork)	38.35
Eggs, cheddar and ham	23.88
Chicken pastry	5.4
Lamb pastry	64.2
Rib of beef	68.8
Vegetable in potato crust (Ve)	1.6
Lamb in potato crust	64.2
Ploughman's lunch (vegetable)	1.6
Fish and chips	5.4
Oxford style sausage (vegetarian)	0.8
Sunday roast (roasted nut loaf)	2
Gammon steak	7.9
Oxford sausage (veal & pork)	38.35
Pie and mash (chicken)	5.4
Pie and mash (lamb)	64.2
Ploughman's lunch (ham & cheese)	15.89
Sunday roast (beef)	68.8
Shepherd's pie (vegetable)	1.6
Shepherd's pie (lamb)	64.2

Table A.2: Environmental impact of food items

Statistical models

A multiple linear regression will allow us to investigate research question 1, 2, and 3. The average treatment effects (ATEs) will correspond to the differences in carbon-footprint of food choices between the different classes of treatment interventions (SNE, SNEP, SNEPC), relative to one another and with the control group. For robustness checks, a multinomial ordered logistic regression will be fitted. The ATEs will correspond to the differences in terms of log-odd probabilities to choose a food item with a given carbon footprint between the different classes of treatment interventions (SNE, SNEP, SNEPC), relative to one another and with the control group (3 independent variables). As part of an exploratory analysis, additional models including the full interactions of dummies capturing respondent allocations to treatment interventions (SNE, SNEP, SNEPC) with default menu allocation (low-carbon vs carbon-intensive) will be fitted (6 independent variables). Furthermore, still for exploratory purposes, another analysis will be run separately on the subsample

of respondents being presented with the neutral versus familiar menus.

In investigating research question 4, a multiple linear regression will be fitted. The ATEs will correspond to the differences in the extent to which respondents felt they were trading off choosing a low-carbon meal with their cultural habits between the different menus (neutral versus familiar) and the treatment interventions SNE and SNEP, relative to one another and with the control group. For robustness checks, a multinomial ordered logistic regression will be fitted. The ATEs will correspond to the differences in terms of log-odd probabilities to report trading-off choosing a low-carbon meal with one's cultural habits between the different menus (neutral versus familiar) and the treatment interventions SNE and SNEP, relative to one another and with the control group. These models will include the full interactions of dummies capturing respondent allocations to treatment interventions SNE and SNEP with menu allocation (familiar vs neutral, 5 independent variables). As part of an exploratory analysis, additional models including the full interactions of dummies capturing respondent allocations to treatment interventions (SNE, SNEP) with menu allocation (neutral vs familiar) and the dummy capturing respondents' default menu allocation (low-carbon vs carbon-intensive) will be fitted (11 independent variables). Furthermore, still for exploratory purposes, another analysis will be run by merging intervention SNEP with SNEPC.

In investigating research question 5, a multiple linear regression will be fitted. The ATEs will correspond to the differences in carbon-footprint of food choices between the different menus (familiar versus neutral) for classes of treatment interventions (SNE, SNEP), relative to one another and with the control group. For robustness checks, a multinomial ordered logistic regression will be fitted. The ATEs will correspond to the differences in terms of log-odd probabilities to choose a food item with a given carbon footprint between the different menus (familiar versus neutral) for classes of treatment interventions (SNE, SNEP), relative to one another and with the control group. These models will include the full interactions of dummies capturing respondent allocations to treatment interventions SNE and SNEP with menu allocation (familiar vs neutral, 5 independent variables). As part of an exploratory analysis, additional models including the full interactions of dummies capturing respondent allocations to treatment interventions (SNE, SNEP) with menu allocation (neutral vs familiar) and the dummy capturing respondents' default menu allocation (low-carbon vs carbon-intensive) will be fitted (11 independent variables). Furthermore, still for exploratory purposes, another analysis will be conducted by merging intervention SNEP with SNEPC.

In investigating research questions 6 and 7, a linear probability model will

allow us to measure the behavioural spillover effects triggered by the social norm interventions SNE and SNEP in terms of the decision to donate to a charity. Equivalently, an ordinary least square model will be used to measure the behavioural spillover effects triggered by the social norm interventions SNE and SNEP in terms of the amount donated to charities. More precisely, we seek to distinguish two channels through which interventions can spill over donations, or the decision to donate. First, we want to assess the direct effect of the treatment on donations, or the decision to donate (first channel, RQ6). Second, we will evaluate the effect of making a pro-environmental food choice, fostered by our social norm interventions, on the amount donated, or the likelihood to make a donation (second channel, RQ7). For this purpose, we will regress donations, or the decision to donate, on food choices and treatment allocation using an instrumental variable approach to remove potential sources of endogeneity between pro-environmental donations and pro-environmental food choices which could be caused by unobserved factors. We use the fact that respondents are randomly presented with default menus containing either low-carbon items or carbon intensive items. The dummy capturing this random allocation of default menus would constitute a satisfying instrument as one can reasonably expect this variation in the choice architecture to only influence choices unconsciously. To conduct robustness checks, we will fit a binary logistic model to measure the behavioural spillover effects triggered by the social norm interventions in terms of the decision to donate to a charity. These models will include the full interaction of dummies capturing allocation to treatment interventions SNE and SNEP with the carbon footprint of respondent choices, instrumented by respondents' default menu allocation (5 independent variables). As part of an exploratory analysis, additional models including the full interactions of dummies capturing respondent allocations to treatment interventions (SNE, SNEP) with menu allocation (neutral vs familiar) will be fitted (11 independent variables). Furthermore, still for exploratory purposes, another analysis will be conducted by merging intervention SNEP with SNEPC, and another merging SNE, SNEP and SNEPC.

For research question 8, in investigating the effect of an environmental framing when asking respondents their willingness-to-accept trading off their meal choice with a vegetarian/vegan meal, we will use a multiple linear regression model. We will interact the dummy capturing respondents' allocation to an environmental versus neutral framing with the dummy capturing respondents' menu allocation (neutral vs familiar) and their treatment intervention allocation (SNE, SNEP, SNEPC). The fully interacted model will include a total of 15 independent variables. Additional models will be fitted, adding more covariates and moderators to investigate the heterogeneity in our ATEs.

A linear probability model will allow us to test the influence of social norm messages SNE and SNEP on the effect on respondents' food choices on their decisions to publicise their food choices. The ATEs will be interpreted as the effect of choosing a high-carbon meal on one's decision to publicise one's choices when exposed to social norm interventions SNE and SNEP relative to one another and compared to the control group. To solve for the endogeneity between food choices and the decision to publicise one's choices, we will instrument food choices by the variable capturing respondents' default menu allocation. We will also fit a multinomial logit regression where our ATEs will correspond to the effect of choosing a meal with a given carbon footprint on the differences in terms of log-odds probabilities to choose whether and how to publicise one's food choices between the condition with social norm messages SNE and SNEP and the control group. These models will include the full interaction of dummies capturing allocation to treatment interventions SNE and SNEP with the carbon footprint of respondent choices, instrumented by respondents' default menu allocation (5 independent variables). As part of an exploratory analysis, additional models including the full interactions of dummies capturing respondent allocations to treatment interventions (SNE, SNEP) with menu allocation (neutral vs familiar) will be fitted (11 independent variables). Furthermore, still for exploratory purposes, another analysis will be conducted by merging intervention SNEP with SNEPC, and another merging SNE, SNEP and SNEPC.

By adding the covariates to each specification, we will check for the robustness of these different ATEs. Other robustness checks will also be conducted by including respondents who failed the attention checks. Furthermore, we will add to these specifications different moderating variables to check for the presence of heterogeneous treatment effects. On top of these moderating variables, we will also include interactions between dummies capturing respondents' condition allocation and categorical variables corresponding to respondents' social demographic profiles. To select the demographic and control variables to include in our regression, we will use fit Lasso or Ridge regression models doing cross-validation techniques. We will also fit spatial regression fixed effects models and weighted regression models. To account for multiple comparisons in the causal inference, p-values will be adjusted using Westfall Young stepdown p-value correction (Jones, Molitor and Reif, 2019).

A.2.6 Author contributions

The principal investigators of this study are Julien Picard and Sanchayan Banerjee.

JP: Conceptualization; methodology (including theoretical modelling and instrumental variable strategy); data curation; formal analysis; funding acquisition;

survey coding and design; writing – pre-analysis plan; writing – initial draft; writing – review editing.

SB: Conceptualization; methodology (excluding theoretical modelling and instrumental variable strategy); data curation; formal analysis; funding acquisition; survey design; writing – initial draft; writing – review editing.

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Appendix B

Robustness Checks

B.1 Experiment–I

B.1.1 Ex–post effect sizes

Our experimental evaluation was powered at 80% to detect a minimum effect size of d=0.25 at 5% significance level. Here, we do a sensitivity analysis for our ex-post effect sizes.

Treatment Class	**Treatment Category**	**Effect Size** Cohen's d		**Effect Size Rank** (Highest to Lowest)	
		by type (0.05% LS)	by class (0.05% LS)	by Type	by Class
Purely Reflective	Pledge	**0.62** (0.45,0.78)	**0.66** (0.26,0.52)	3	1
	Implementation Intention	**0.60** (0.44, 0.77)		4	
Purely Heuristic	Quick Rules	**0.28** (0.12,0.44)		9	
	Default	**0.51** (0.35, 0.67)	**0.39** (0.26,0.52)	6	2
	Traffic Lights	**0.32** (0.16,0.49)		8	
Nudge+	Pledge + Default	**0.83** (0.66, 0.99)	**0.66** (0.53,0.79)	1	1
	Default + Pledge	**0.56** (0.39,0.72)		5	
	Default with information	**0.64** (0.47,0.80)		2	
	Traffic Lights with information	**0.33** (0.17,0.49)		7	

Figure B.1: Ex–post effect sizes experiment 1

We estimate these using a random effects model specification following a rectified

maximum likelihood estimation method. The effect on intended GHGe of being randomly assigned to the behavioural economic policies, compared to the control, varies from 0.27 (for quick rule boosts) to 0.83 (nudge+ reflection). Consequently, our experimental evaluation is also sufficiently powered ex-post as our effect sizes are greater than that was anticipated in our power analysis. A detailed summary of these results is below.

B.1.2 Randomisation Checks

We assess balance of means for demographic characteristics, mainly age, gender, and education, across treatment arms to check if participants were randomised effectively. Participants were randomised using the randomiser tool in Qualtrics. To do this, we use both parametric (t- or F-tests) and non-parametric (Kruskal-Wallis) tests either on individual characteristic or by generating a propensity score index. We further check for balancing using a broader set of covariates. We do not find any statistical difference of means in age, gender, and education, across the different experimental conditions. A detailed summary of these results is available below.

Treatment	Obs	Rank sum
Control	298	427283.00
Think	303	434998.50
Boost (II)	297	434869.50
Boost (QR)	302	465095.50
Nudge (Default)	300	447275.50
Nudge Plus (Pledge+Default)	299	462329.50
Nudge Plus (Default+Pledge)	298	444994.50
Nudge Plus (Transparent Default)	298	453080.00
Nudge (TL)	300	454612.50
Nudge Plus (Transparent TL)	296	449997.50

```
chi2(9) =  5.861
  Prob = 0.7537

chi2(9) with ties =  5.863
            Prob = 0.7535
```

Figure B.2: KW test of propensity scores generated using age, gender, and education status

Pairwise comparison for propensity scores	Contrast	Std. err.	t	P>t
Nudge (Default) vs Boost (QR)	-.0003774	.0005193	-0.73	1.000
Nudge Plus (Default+Pledge)				
vs				
Nudge Plus (Pledge+Default)	-.0003334	.0005215	-0.64	1.000
Nudge Plus (Default+Pledge) vs Boost (QR)	-.000312	.0005202	-0.60	1.000
Nudge (TL) vs Nudge Plus (Pledge+Default)	-.000228	.0005206	-0.44	1.000
Nudge (TL) vs Boost (QR)	-.0002066	.0005193	-0.40	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Pledge+Default)	-.0001355	.0005215	-0.26	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Pledge+Default)	-.0001296	.0005224	-0.25	1.000
Nudge Plus (Transparent Default) vs Boost (QR)	-.0001141	.0005202	-0.22	1.000
Nudge Plus (Transparent TL) vs Boost (QR)	-.0001082	.0005211	-0.21	1.000
Nudge (TL) vs Nudge Plus (Transparent Default)	-.0000925	.0005211	-0.18	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Transparent Default)	5.90e-06	.0005228	0.01	1.000
Nudge Plus (Pledge+Default) vs Boost (QR)	.0000214	.0005198	0.04	1.000
Think vs Control	.0000418	.0005198	0.08	1.000
Nudge Plus (Default+Pledge) vs Nudge (Default)	.0000654	.0005211	0.13	1.000
Boost (II) vs Think	.0000763	.0005202	0.15	1.000
Nudge Plus (Transparent TL) vs Nudge (TL)	.0000984	.000522	0.19	1.000
Nudge (TL) vs Nudge Plus (Default+Pledge)	.0001054	.0005211	0.20	1.000
Boost (II) vs Control	.0001181	.0005224	0.23	1.000
Nudge (TL) vs Nudge (Default)	.0001708	.0005202	0.33	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Default+Pledge)	.0001979	.0005219	0.38	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Default+Pledge)	.0002038	.0005228	0.39	1.000
Nudge (Default) vs Boost (II)	.0002273	.0005215	0.44	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge (Default)	.0002633	.0005211	0.51	1.000
Nudge Plus (Transparent TL) vs Nudge (Default)	.0002692	.000522	0.52	1.000
Nudge Plus (Default+Pledge) vs Boost (II)	.0002927	.0005224	0.56	1.000
Nudge (Default) vs Think	.0003035	.0005189	0.58	1.000
Nudge (Default) vs Control	.0003453	.0005211	0.66	1.000
Nudge Plus (Default+Pledge) vs Think	.0003689	.0005198	0.71	1.000
Nudge (TL) vs Boost (II)	.000398	.0005215	0.76	1.000
Nudge Plus (Pledge+Default) vs Nudge (Default)	.0003988	.0005206	0.77	1.000
Nudge Plus (Default+Pledge) vs Control	.0004107	.0005219	0.79	1.000
Nudge (TL) vs Think	.0004743	.0005189	0.91	1.000
Nudge Plus (Transparent Default) vs Boost (II)	.0004905	.0005224	0.94	1.000
Nudge Plus (Transparent TL) vs Boost (II)	.0004964	.0005233	0.95	1.000
Nudge (TL) vs Control	.0005161	.0005211	0.99	1.000
Nudge Plus (Transparent Default) vs Think	.0005668	.0005198	1.09	1.000
Nudge Plus (Transparent TL) vs Think	.0005727	.0005207	1.10	1.000
Boost (QR) vs Boost (II)	.0006046	.0005207	1.16	1.000
Nudge Plus (Transparent Default) vs Control	.0006086	.0005219	1.17	1.000
Nudge Plus (Transparent TL) vs Control	.0006145	.0005228	1.18	1.000
Nudge Plus (Pledge+Default) vs Boost (II)	.0006261	.0005219	1.20	1.000
Boost (QR) vs Think	.0006809	.000518	1.31	1.000
Nudge Plus (Pledge+Default) vs Think	.0007023	.0005193	1.35	1.000
Boost (QR) vs Control	.0007227	.0005202	1.39	1.000
Nudge Plus (Pledge+Default) vs Control	.0007441	.0005215	1.43	1.000

Table B.1: Pairwise comparison of treatments by propensity scores

Treatment	Obs	Rank sum
Control	298	446748.50
Think	303	434379.50
Boost (II)	297	442948.00
Boost (QR)	302	476725.50
Nudge (Default)	300	452441.00
Nudge Plus (Pledge+Default)	299	442203.00
Nudge Plus (Default+Pledge)	298	446187.00
Nudge Plus (Transparent Default)	298	437498.00
Nudge (TL)	300	451936.50
Nudge Plus (Transparent TL)	296	443469.00

```
chi2(9) =  4.888
   Prob = 0.8439

chi2(9) with ties =  4.901
             Prob = 0.8429
```

Figure B.3: KW comparison of age

Pairwise comparison for age	Contrast	Std. err.	t	P>t
Treatment				
Nudge Plus (Pledge+Default) vs Boost (QR)	-1.221921	.87558	-1.40	1.000
Nudge (TL) vs Boost (QR)	-1.081898	.8748464	-1.24	1.000
Nudge Plus (Transparent Default) vs Boost (QR)	-1.030668	.8763179	-1.18	1.000
Nudge Plus (Default+Pledge) vs Boost (QR)	-.997111	.8763179	-1.14	1.000
Nudge (Default) vs Boost (QR)	-.9052318	.8748464	-1.03	1.000
Nudge Plus (Transparent TL) vs Boost (QR)	-.8706372	.8778067	-0.99	1.000
Think vs Control	-.7776264	.8755994	-0.89	1.000
Nudge Plus (Pledge+Default) vs Nudge (Default)	-.316689	.8770308	-0.36	1.000
Boost (II) vs Control	-.2588412	.8799739	-0.29	1.000
Nudge (TL) vs Nudge (Default)	-.1766667	.8762984	-0.20	1.000
Nudge Plus (Pledge+Default) vs Control	-.13085	.8784986	-0.15	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge (Default)	-.1254362	.8777675	-0.14	1.000
Nudge Plus (Default+Pledge) vs Nudge (Default)	-.0918792	.8777675	-0.10	1.000
Nudge (TL) vs Nudge Plus (Default+Pledge)	-.0847875	.8777675	-0.10	1.000
Nudge (TL) vs Nudge Plus (Transparent Default)	-.0512304	.8777675	-0.06	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Default+Pledge)	-.033557	.8792341	-0.04	1.000
Nudge (TL) vs Control	.0091723	.8777675	0.01	1.000
Nudge Plus (Transparent TL) vs Nudge (Default)	.0345946	.8792539	0.04	1.000
Nudge Plus (Transparent Default) vs Control	.0604027	.8792341	0.07	1.000
Nudge Plus (Default+Pledge) vs Control	.0939597	.8792341	0.11	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Default+Pledge)	.1264738	.880718	0.14	1.000
Nudge Plus (Pledge+Default) vs Boost (II)	.1279912	.879239	0.15	1.000
Nudge (TL) vs Nudge Plus (Pledge+Default)	.1400223	.8770308	0.16	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Transparent Default)	.1600308	.880718	0.18	1.000
Nudge (Default) vs Control	.1858389	.8777675	0.21	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Pledge+Default)	.1912527	.8784986	0.22	1.000
Nudge Plus (Transparent TL) vs Nudge (TL)	.2112613	.8792539	0.24	1.000
Nudge Plus (Transparent TL) vs Control	.2204335	.880718	0.25	1.000
Nudge Plus (Default+Pledge)				
vs				
Nudge Plus (Pledge+Default)	.2248098	.8784986	0.26	1.000
Nudge (TL) vs Boost (II)	.2680135	.8785085	0.31	1.000
Nudge Plus (Transparent Default) vs Boost (II)	.3192439	.8799739	0.36	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Pledge+Default)	.3512836	.8799838	0.40	1.000
Nudge Plus (Default+Pledge) vs Boost (II)	.3528009	.8799739	0.40	1.000
Nudge (Default) vs Boost (II)	.4446801	.8785085	0.51	1.000
Nudge Plus (Transparent TL) vs Boost (II)	.4792747	.8814566	0.54	1.000
Boost (II) vs Think	.5187852	.8763422	0.59	1.000
Nudge Plus (Pledge+Default) vs Think	.6467764	.8748609	0.74	1.000
Nudge (TL) vs Think	.7867987	.8741267	0.90	1.000
Nudge Plus (Transparent Default) vs Think	.8380291	.8755994	0.96	1.000
Nudge Plus (Default+Pledge) vs Think	.8715862	.8755994	1.00	1.000
Nudge (Default) vs Think	.9634653	.8741267	1.10	1.000
Nudge Plus (Transparent TL) vs Think	.9980599	.8770895	1.14	1.000
Boost (QR) vs Control	1.091071	.8763179	1.25	1.000
Boost (QR) vs Boost (II)	1.349912	.8770601	1.54	1.000
Boost (QR) vs Think	1.868697	.872671	2.14	1.000

Table B.2: Pairwise comparison of treatment categories by age

Treatment	Obs	Rank sum
Control	300	447574.00
Think	303	451976.00
Boost (II)	302	452025.00
Boost (QR)	304	458694.00
Nudge (Default)	301	446748.00
Nudge Plus (Pledge+Default)	301	464831.00
Nudge Plus (Default+Pledge)	299	442297.00
Nudge Plus (Transparent Default)	299	448287.00
Nudge (TL)	300	450569.00
Nudge Plus (Transparent TL)	300	465544.00

```
chi2(9) =  2.111
   Prob = 0.9896

chi2(9) with ties =  2.807
             Prob = 0.9715
```

Figure B.4: KW comparison of gender

Pairwise comparison for age	Contrast	Std. err.	t	P>t
Treatment				
Nudge Plus (Default+Pledge)				
vs				
Nudge Plus (Pledge+Default)	-.0365337	.0416097	-0.88	1.000
Nudge (TL) vs Nudge Plus (Pledge+Default)	-.0248726	.0415749	-0.60	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Pledge+Default)	-.0231558	.0416097	-0.56	1.000
Nudge Plus (Default+Pledge) vs Boost (QR)	-.0180646	.0415072	-0.44	1.000
Nudge (Default) vs Boost (QR)	-.0147535	.0414377	-0.36	1.000
Nudge Plus (Default+Pledge) vs Boost (II)	-.0082615	.0415753	-0.20	1.000
Nudge Plus (Default+Pledge) vs Think	-.0065786	.0415412	-0.16	1.000
Nudge (TL) vs Boost (QR)	-.0064035	.0414723	-0.15	1.000
Nudge Plus (Default+Pledge) vs Control	-.0049944	.0416442	-0.12	1.000
Nudge (Default) vs Boost (II)	-.0049504	.0415059	-0.12	1.000
Nudge Plus (Transparent Default) vs Boost (QR)	-.0046867	.0415072	-0.11	1.000
Nudge Plus (Default+Pledge) vs Nudge (Default)	-.0033111	.0416097	-0.08	1.000
Nudge (Default) vs Think	-.0032674	.0414717	-0.08	1.000
Nudge (TL) vs Nudge Plus (Transparent Default)	-.0017168	.0416442	-0.04	1.000
Nudge (Default) vs Control	-.0016833	.0415749	-0.04	1.000
Think vs Control	.0015842	.0415063	0.04	1.000
Boost (II) vs Think	.0016829	.0414372	0.04	1.000
Boost (II) vs Control	.0032671	.0415405	0.08	1.000
Nudge (TL) vs Boost (II)	.0033996	.0415405	0.08	1.000
Nudge (TL) vs Think	.0050825	.0415063	0.12	1.000
Nudge Plus (Transparent Default) vs Boost (II)	.0051164	.0415753	0.12	1.000
Nudge (TL) vs Control	.0066667	.0416094	0.16	1.000
Nudge Plus (Transparent Default) vs Think	.0067993	.0415412	0.16	1.000
Nudge (TL) vs Nudge (Default)	.0083499	.0415749	0.20	1.000
Nudge Plus (Transparent Default) vs Control	.0083835	.0416442	0.20	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Pledge+Default)	.0084607	.0415749	0.20	1.000
Boost (QR) vs Boost (II)	.0098031	.0414032	0.24	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge (Default)	.0100668	.0416097	0.24	1.000
Boost (QR) vs Think	.011486	.0413689	0.28	1.000
Nudge (TL) vs Nudge Plus (Default+Pledge)	.0116611	.0416442	0.28	1.000
Boost (QR) vs Control	.0130702	.0414723	0.32	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Default+Pledge)	.0133779	.041679	0.32	1.000
Nudge Plus (Pledge+Default) vs Boost (QR)	.0184691	.0414377	0.45	1.000
Nudge Plus (Transparent TL) vs Boost (QR)	.0269298	.0414723	0.65	1.000
Nudge Plus (Pledge+Default) vs Boost (II)	.0282722	.0415059	0.68	1.000
Nudge Plus (Pledge+Default) vs Think	.0299552	.0414717	0.72	1.000
Nudge Plus (Pledge+Default) vs Control	.0315393	.0415749	0.76	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Transparent Default)	.0316165	.0416442	0.76	1.000
Nudge Plus (Pledge+Default) vs Nudge (Default)	.0332226	.0415403	0.80	1.000
Nudge Plus (Transparent TL) vs Nudge (TL)	.0333333	.0416094	0.80	1.000
Nudge Plus (Transparent TL) vs Boost (II)	.0367329	.0415405	0.88	1.000
Nudge Plus (Transparent TL) vs Think	.0384158	.0415063	0.93	1.000
Nudge Plus (Transparent TL) vs Control	.04	.0416094	0.96	1.000
Nudge Plus (Transparent TL) vs Nudge (Default)	.0416833	.0415749	1.00	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Default+Pledge)	.0449944	.0416442	1.08	1.000

Table B.3: Pairwise comparison of treatment categories by gender

Treatment	Obs	Rank sum
Control	300	464701.50
Think	303	463827.00
Boost (II)	302	464620.00
Boost (QR)	304	454007.00
Nudge (Default)	301	454881.50
Nudge Plus (Pledge+Default)	301	441341.00
Nudge Plus (Default+Pledge)	299	448945.00
Nudge Plus (Transparent Default)	299	441422.50
Nudge (TL)	300	446647.50
Nudge Plus (Transparent TL)	300	448152.00

```
chi2(9) =  2.637
   Prob = 0.9770

chi2(9) with ties =  3.527
             Prob = 0.9397
```

Figure B.5: KW comparison of education

Pairwise comparison for education	Contrast	Std. err.	t	P>t
Nudge Plus (Pledge+Default) vs Control	-.0550055	.0407735	-1.35	1.000
Nudge Plus (Transparent Default) vs Control	-.0483055	.0408415	-1.18	1.000
Nudge Plus (Pledge+Default) vs Boost (II)	-.0480077	.0407058	-1.18	1.000
Nudge Plus (Pledge+Default) vs Think	-.0428933	.0406722	-1.05	1.000
Nudge Plus (Transparent Default) vs Boost (II)	-.0413077	.0407739	-1.01	1.000
Nudge (TL) vs Control	-.04	.0408074	-0.98	1.000
Boost (QR) vs Control	-.0369298	.0406729	-0.91	1.000
Nudge Plus (Transparent TL) vs Control	-.0366667	.0408074	-0.90	1.000
Nudge Plus (Transparent Default) vs Think	-.0361933	.0407404	-0.89	1.000
Nudge (TL) vs Boost (II)	-.0330022	.0407397	-0.81	1.000
Nudge Plus (Default+Pledge) vs Control	-.0315831	.0408415	-0.77	1.000
Boost (QR) vs Boost (II)	-.029932	.0406051	-0.74	1.000
Nudge Plus (Pledge+Default) vs Nudge (Default)	-.0299003	.0407395	-0.73	1.000
Nudge Plus (Transparent TL) vs Boost (II)	-.0296689	.0407397	-0.73	1.000
Nudge (TL) vs Think	-.0278878	.0407062	-0.69	1.000
Nudge (Default) vs Control	-.0251052	.0407735	-0.62	1.000
Boost (QR) vs Think	-.0248176	.0405714	-0.61	1.000
Nudge Plus (Default+Pledge) vs Boost (II)	-.0245853	.0407739	-0.60	1.000
Nudge Plus (Transparent TL) vs Think	-.0245545	.0407062	-0.60	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge (Default)	-.0232003	.0408076	-0.57	1.000
Nudge Plus (Default+Pledge) vs Think	-.0194708	.0407404	-0.48	1.000
Nudge (Default) vs Boost (II)	-.0181074	.0407058	-0.44	1.000
Nudge Plus (Pledge+Default) vs Boost (QR)	-.0180757	.0406389	-0.44	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Default+Pledge)	-.0167224	.0408755	-0.41	1.000
Nudge (TL) vs Nudge (Default)	-.0148948	.0407735	-0.37	1.000
Nudge (Default) vs Think	-.012993	.0406722	-0.32	1.000
Think vs Control	-.0121122	.0407062	-0.30	1.000
Nudge Plus (Transparent TL) vs Nudge (Default)	-.0115615	.0407735	-0.28	1.000
Nudge Plus (Transparent Default) vs Boost (QR)	-.0113756	.0407071	-0.28	1.000
Nudge (TL) vs Nudge Plus (Default+Pledge)	-.0084169	.0408415	-0.21	1.000
Boost (II) vs Control	-.0069978	.0407397	-0.17	1.000
Nudge Plus (Default+Pledge) vs Nudge (Default)	-.0064778	.0408076	-0.16	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Default+Pledge)	-.0050836	.0408415	-0.12	1.000
Nudge (TL) vs Boost (QR)	-.0030702	.0406729	-0.08	1.000
Nudge Plus (Transparent TL) vs Boost (QR)	.0002632	.0406729	0.01	1.000
Nudge Plus (Transparent TL) vs Nudge (TL)	.0033333	.0408074	0.08	1.000
Boost (II) vs Think	.0051144	.0406384	0.13	1.000
Nudge Plus (Default+Pledge) vs Boost (QR)	.0053468	.0407071	0.13	1.000
Nudge Plus (Transparent Default)				
vs				
Nudge Plus (Pledge+Default)	.0067001	.0408076	0.16	1.000
Nudge (TL) vs Nudge Plus (Transparent Default)	.0083055	.0408415	0.20	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Transparent Default)	.0116388	.0408415	0.28	1.000
Nudge (Default) vs Boost (QR)	.0118246	.0406389	0.29	1.000
Nudge (TL) vs Nudge Plus (Pledge+Default)	.0150055	.0407735	0.37	1.000
Nudge Plus (Transparent TL)				
vs				
Nudge Plus (Pledge+Default)	.0183389	.0407735	0.45	1.000
Nudge Plus (Default+Pledge)				
vs				
Nudge Plus (Pledge+Default)	.0234225	.0408076	0.57	1.000

Table B.4: Pairwise comparison of treatment categories by education

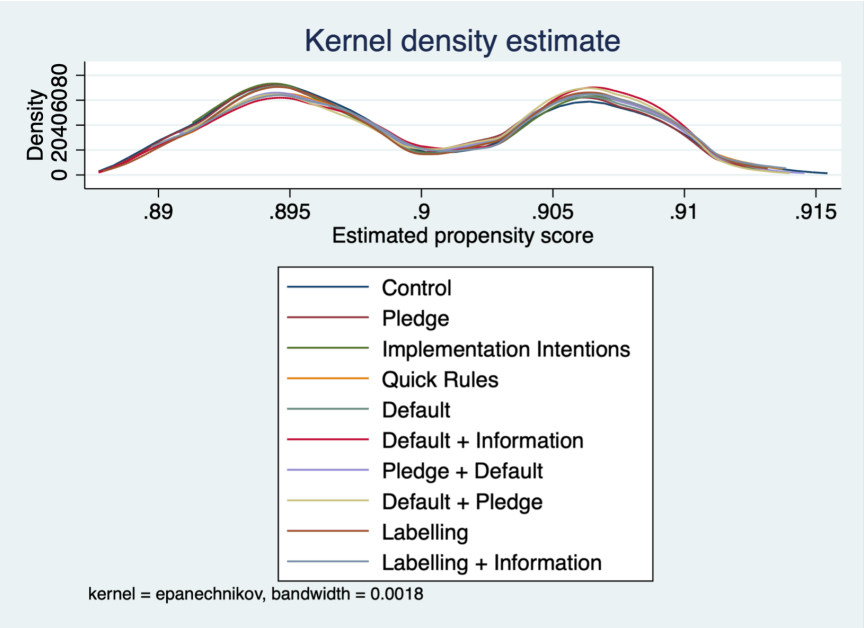

Figure B.6: Density plots of propensity score index across treatment categories

B.1.3 Ordered Logistic Regressions

In this section, we test hypotheses using ordered logistic regression models based on the ordinal outcome variable, the carbon intensity rank. The credibility of an ordered logistic regression depends on the fulfilment of the parallel lines/proportional odds assumption. This posits that the relationship between the different pairs of outcomes measures is similar for all its categories. We test for the proportional odds assumption using a likelihood ratio test, which returns a χ^2 statistic of 51.55 corresponding to a p-value less than 0.0001. As such, we can reject proportional odds assumption, in that, we anticipate that the behavioural interventions have led to differential treatment effects across the food categories varying in their underlying carbon intensities. In relaxing the assumption, however, we find that it is only partially violated across five of the treatment categories.

Hereafter, we use a partial proportional odds model, whereby we impose the proportional odds assumption across three experimental vignettes only, namely the pledge, implementation intentions, and the traffic lighting nudge. The partial proportional odds model (AIC=9894.18; BIC=10248.44) gives us a better fit than a generalised ordered logistic regression model (AIC=9900.03; BIC=10248.44); this is further confirmed by a likelihood ratio test between these nested models which returns

a 2 statistic of 36.15 corresponding to a p-value of 0.021. In re-evaluating hypothesis 1, Table AVII.b presents the results from estimating the partial proportional odds model using carbon intensity rank as the outcome measure. The columns in this table correspond to the nine experimental vignettes, relative to the control group, as a baseline for comparison. The rows correspond to the carbon intensity rank associated with the CoFID food type of all food items in the menu presented to the participants in the survey. As such, an entry in this table corresponds to the odds ratio of choosing a food item with the indicated carbon rank relative to other items that rank higher for a given behavioural intervention; for instance, consider the odds ratio of 0.215 corresponding to the Quick Rules intervention for the carbon intensity rank of level 0. This implies that being subjected to quick rules, relative to the control, reduces the odds of the intention of choosing a food item with a carbon intensity rank greater than 0 by 78 percent. Alternatively, being subjected to the Quick rules, relative to the doing nothing, decreases odds of the intention of choosing an item with a carbon intensity rank higher than 7 by 44 percent. Except for pledges, implementation intentions and traffic lights, we find that being subjected to an intervention decreases the odds of the intention of choosing differently depending on its carbon intensity.

Constraints for parallel-lines assumption imposed on	Significance assessed
Pledge	p-value = 0.0564
Implementation Intentions	p-value = 0.1048
Quick Rules	p-value = 0.00001
Default	p-value <0.00001
Pledge + Default	p-value = 0.00077
Default + Pledge	p-value =0.01728
Default with information	p-value = 0.00098
Traffic Lights	p-value = 0.1189
Traffic Lights with information	p-value = 0.00163

Table B.5: Brent test for proportional odds assumption

The findings from this estimation are in line with my prior results; in that, we find that all experimental vignettes significantly reduce the odds of the intention of choosing carbon intensive foods. In particular, the nudge plus vignette, where the offer to pledge precedes the nudge, offers the highest reduction in the odds of the intention of choosing carbon intensive food items. Nonetheless, the partial proportional odds model gives us three additional takeaways. First, quick rules are most effective in altering dietary patterns towards foods that are at the lowest rung of the carbon intensity ladder. Beyond this, the effectiveness of these uncertainty management boosts decreases, with the least effectiveness in reducing the intended

consumption of ruminant meat. On the contrary, the default nudge and all variants of the nudge plus toolkit are mostly effective in reducing the intended consumption of ruminant meat. Second, the effectiveness of these interventions, as measured by the corresponding reduction in the odds of the intention of choosing foods, displays an inverted U-shaped relationship with their carbon intensiveness; in that their efficacy increases, and then peaks for white meat or fish products, before decreasing once again. Third, unlike the linear regression model results, we find that interventions can be effective only across certain types of food items, depending on their carbon intensity; for instance, quick rules are ineffective in reducing the odds of the intention of choosing food items that have a carbon intensity greater than that associated with pork, while the traffic lights combined with an informational prompt are ineffective in reducing the odds of the intention of choosing of food items that rank higher than beans and lentils. we also compare the effectiveness of the nudge-plus vignettes directly to its nudge, think and boost counterparts. We find no additional significant findings beyond that reported in Table 7.

		Behavioural Intervention Categories (baseline do-nothing) Odds Ratio (se)								
CoFID Food Group Type	**Carbon Intensity Rank (relative to all higher levels)**	**Pledge**	**Implementation Intentions**	**Quick Rules**	**Default**	**Pledge+ Default**	**Default + Pledge**	**Default with information**	**Traffic Lights**	**Traffic Lights with information**
Beans and Lentils	**0**	Odds Ratio= **0.259*****; σ= 0.04	Odds Ratio= **0.279*****; σ= 0.043	**0.215*****	0.321***	0.194***	0.279***	0.542	Odds Ratio= 0.57***; σ= 0.086	1.649
				0.06	0.103	0.054	0.086	0.209		1.003
Pasta	**1**			0.292***	0.29***	0.203***	0.346***	0.388***		0.579*
				0.057	0.056	0.038	0.069	0.079		0.129
Vegetable Dishes	**2**			0.289***	0.315***	0.203***	0.363***	0.376***		0.622*
				0.051	0.057	0.035	0.067	0.069		0.125
Nuts and seeds	**3**			0.293***	0.332***	0.181***	0.355***	0.397***		0.61**
				0.051	0.058	0.031	0.062	0.071		0.116
Poultry and Fish	**4**			0.62**	**0.208*****	**0.08****	**0.183*****	**0.157*****		**0.408*****
				0.102	0.041	0.021	0.038	0.033		0.071
Pork	**5**			0.928	0.313***	0.104***	0.266***	0.201***		0.444***
				0.158	0.066	0.032	0.059	0.049		0.086
Cheese	**6**			0.585*	0.344***	0.089***	0.275***	0.207***		0.53**
				0.112	0.076	0.032	0.065	0.054		0.105
Lamb	**7**			0.551**	0.365***	0.082***	0.259***	0.219***		0.58**
				0.113	0.084	0.033	0.066	0.059		0.118
Constant		0.2931***								
		(0.035)								
Pseudo R^2		0.0384								
N		2994								

* p<0.05; ** p<0.01; *** p<0.001

Figure B.7: Ordered Logistic Regression

B.1.4 Behavioural Spillovers

Definition 1: Behavioural spillover measured as a direct effect of experimental assignment on charitable donations. Estimates from OLS regression (OLS1) including lasso controls (OLS2). Robust standard errors in parentheses. No significant spillover effects from experimental assignment. See table B.6.

Definition 2: Behavioural spillover measured as a direct effect of changes in first behaviour (i.e. emissions from intended dietary choices) mediated by experimental assignment on second behaviour (i.e. charitable donations). Estimates from OLS regression (OLS3) including lasso controls (OLS4). Robust standard errors in parentheses. No significant spillover effects from changes in carbon emissions associated with intended dietary choices. No mediation required, as direct effects are not found. See Table B.7.

Robustness for Definition 2: : Behavioural spillover measured as a direct effect of changes in first behaviour (i.e. emissions from intended dietary choices) on second behaviour (i.e. charitable donations.) using experimental assignment as an instrument to predict random changes in first behaviour (i.e. emissions from intended dietary choices). See Figure B.12 and B.9 for first– and second–stage regressions.

Variable	OLS 1	OLS 2
Control	(base)	(base)
Think	-0.209	-0.209
	(0.311)	(0.311)
Boost (II)	-0.124	-0.124
	(0.311)	(0.311)
Boost (QR)	-0.109	-0.109
	(0.322)	(0.322)
Nudge (Default)	-0.115	-0.115
	(0.315)	(0.315)
Nudge Plus (Pledge+Default)	0.160	0.160
	(0.315)	(0.315)
Nudge Plus (Default+Pledge)	-0.158	-0.158
	(0.317)	(0.317)
Nudge Plus (Transparent Default)	-0.041	-0.041
	(0.310)	(0.310)
Nudge (TL)	0.090	0.090
	(0.318)	(0.318)
Nudge Plus (Transparent TL)	-0.647	-0.647
	(0.315)	(0.315)
Constant	4.760	4.760
	(0.224)	(0.224)
Controls	No	Yes
Observations	3009	3009
Degrees of Freedom	2999.000	2999.000
R–squared	0.003	0.003

Table B.6: OLS Regression of charitable donations on experimental conditions

Variable	OLS 3	OLS 4
GHGemissions	-0.061	-0.061
	(0.034)	(0.034)
Constant	47.204	47.204
	(0.807)	(0.807)
Controls	No	Yes
Observations	3009	3009
Degrees of Freedom	3007.000	3007.000
R–squared	0.001	0.001

Table B.7: OLS Regression of charitable donations on GHG emissions

First-stage regressions

First-stage regression of GHGemain:

Statistics consistent for homoskedasticity only
Number of obs = 3009

GHGemain	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
treat2	-14.50479	1.667125	-8.70	0.000	-17.77362	-11.23597
treat3	-14.17588	1.668498	-8.50	0.000	-17.44739	-10.90436
treat4	-7.230096	1.665761	-4.34	0.000	-10.49624	-3.963947
treat5	-12.47521	1.669879	-7.47	0.000	-15.74943	-9.200984
treat6	-17.90544	1.669879	-10.72	0.000	-21.17966	-14.63122
treat7	-13.39633	1.672664	-8.01	0.000	-16.67602	-10.11665
treat8	-14.7675	1.672664	-8.83	0.000	-18.04719	-11.48782
treat9	-8.3918	1.671267	-5.02	0.000	-11.66875	-5.114854
treat10	-8.4974	1.671267	-5.08	0.000	-11.77435	-5.220454
_cons	23.47727	1.181764	19.87	0.000	21.16012	25.79442

F test of excluded instruments:
F(9, 2999) = 19.15
Prob > F = 0.0000
Sanderson-Windmeijer multivariate F test of excluded instruments:
F(9, 2999) = 19.15
Prob > F = 0.0000

Figure B.8: Stage 1 results from TSLS regression, experiment 1

```
                                                Number of obs =      3009
                                                F(  1,  3007) =      0.13
                                                Prob > F      =    0.7209
Total (centered) SS     =  4427121.901          Centered R2   =    0.0011
Total (uncentered) SS   =     10918600          Uncentered R2 =    0.5950
Residual SS             =  4422270.655          Root MSE      =     38.34
```

prosociald~c	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
GHGemain	-.050978	.1426514	-0.36	0.721	-.3305695	.2286136
_cons	47.07649	1.894228	24.85	0.000	43.36387	50.78911

```
Underidentification test (Anderson canon. corr. LM statistic):         163.554
                                                      Chi-sq(9) P-val =  0.0000

Weak identification test (Cragg-Donald Wald F statistic):               19.153
Stock-Yogo weak ID test critical values:  5% maximal IV relative bias   20.53
                                         10% maximal IV relative bias   11.46
                                         20% maximal IV relative bias    6.65
                                         30% maximal IV relative bias    4.92
                                         10% maximal IV size            36.19
                                         15% maximal IV size            19.71
                                         20% maximal IV size            14.01
                                         25% maximal IV size            11.07
Source: Stock-Yogo (2005).  Reproduced by permission.

Sargan statistic (overidentification test of all instruments):           8.655
                                                      Chi-sq(8) P-val =  0.3722

Instrumented:         GHGemain
Excluded instruments: treat2 treat3 treat4 treat5 treat6 treat7 treat8 treat9
                      treat10
```

Figure B.9: Stage 2 results from TSLS regression, experiment 1

B.1.5 Are treatment effects influenced by time spent in experimental conditions?

We evaluate if our experimental results could be driven by the time spent by participants in the treatment conditions. These results are shown in Figure B.10 below.

```
. reg Time i.Treatment $lassocontrols, r

Linear regression                               Number of obs     =      2,991
                                                F(39, 2951)       =       3.74
                                                Prob > F          =     0.0000
                                                R-squared         =     0.0469
                                                Root MSE          =      571.4
```

Time	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
Treatment						
Think	28.27592	46.8685	0.60	0.546	-63.62234	120.1742
Boost (II)	77.55741	50.24055	1.54	0.123	-20.95267	176.0675
Boost (QR)	41.00306	46.07387	0.89	0.374	-49.33713	131.3432
Nudge (Default)	30.3051	45.52265	0.67	0.506	-58.95425	119.5645
Nudge Plus (Pledge+Default)	14.04609	46.7034	0.30	0.764	-77.52846	105.6206
Nudge Plus (Default+Pledge)	37.21042	47.11997	0.79	0.430	-55.18091	129.6018
Nudge Plus (Transparent Default)	39.18013	46.72567	0.84	0.402	-52.43808	130.7983
Nudge (TL)	-32.13429	44.5965	-0.72	0.471	-119.5777	55.3091
Nudge Plus (Transparent TL)	-81.91347	45.30263	-1.81	0.071	-170.7414	6.914485
dish_1	-2.578814	14.35975	-0.18	0.857	-30.73495	25.57733
dish_3	48.26856	11.13855	4.33	0.000	26.42845	70.10867

Figure B.10: Do reflective treatments take longer to complete? Evidence from Experiment–I

B.2 Experiment–II

B.2.1 Ex–post effect sizes

Our experimental evaluation was powered at 95% to detect a minimum effect size of d=0.12 at 5% significance level corrected for multiple hypotheses correction with Bon Ferroni tests for 14 different hypotheses. Here, we do a sensitivity analysis for our ex-post effect sizes.

We estimate these using a random effects model specification following a rectified maximum likelihood estimation method. The effect on intended GHGe of being randomly assigned to the experimental conditions in the between–subjects experiment 1, compared to the control, varies from 0.11 (for social norms) to 0.19 (nudge+ with reflection via pledge).

Treatment group	Cohen's d	Effect Size Rank
Social Norms	0.1105	3
Social Norms + Personal Norms	0.1158	2
Social Norms + Personal Norms + Pledge	0.1922	1

Table B.8: Ex–post effect sizes experiment 2

B.2.2 Randomisation Checks

We assess balance of means for demographic characteristics, mainly age, gender, and education, across reflective treatment arms to check if participants were randomised effectively. Participants were randomised using the randomiser tool in Qualtrics. To do this, we use both parametric (t- or F-tests) and non-parametric (Kruskal-Wallis) tests either on individual characteristic or by generating a propensity score index. We further check for balancing using a broader set of covariates. We do not find any statistical difference of means in age, gender, and education, across the different experimental conditions. A detailed summary of these results is available below.

Pairwise comparison for age	Contrast	Std. Error	t	P>t
+social norms vs baseline	-.1512559	.0907716	-1.67	0.574
++personal norms vs baseline	-.0888697	.0906419	-0.98	1.000
+++pledge vs baseline	-.0832435	.0908861	-0.92	1.000
+++pledge vs ++personal norms	.0056263	.0906584	0.06	1.000
++personal norms vs +social norms	.0623861	.0905436	0.69	1.000
+++pledge vs +social norms	.0680124	.090788	0.75	1.000

Table B.9: Pairwise comparison of treatments by age

Treatments	Observations	Ranksum
B-CE	345	941069.50
B-CNE	348	955450.00
B-NCE	349	975460.50
B-NCNE	342	1.06e+06
BSE-CE	343	948264.50
BSE-CNE	348	922709.00
BSE-NCE	354	963338.50
BSE-NCNE	345	978244.00
BSEP-CE	352	953324.50
BSEP-CNE	352	993695.00
BSEP-NCE	346	1.00e+06
BSEP-NCNE	348	987031.50
BSEPC-CE	344	960420.50
BSEPC-CNE	341	886714.50
BSEPC-NCE	353	961728.00
BSEPC-NCNE	345	946304.00
	χ^2	24.403
p	value	0.0586

Table B.10: Kruskal Wallis rank sum test of treatments by age

Pairwise comparison for education	Contrast	Std. Error	t	P>t
+++pledge vs baseline	-.0321524	.0189874	-1.69	0.543
+++pledge vs +social norms	-.0320089	.018967	-1.69	0.549
+++pledge vs ++personal norms	-.0296736	.0189399	-1.57	0.703
++personal norms vs baseline	-.0024788	.0189364	-0.13	1.000
++personal norms vs +social norms	-.0023353	.0189159	-0.12	1.000
+social norms vs baseline	-.0001435	.0189635	-0.01	1.000

Table B.11: Pairwise comparison of treatments by education

Treatment	Observations	Rank sum
B-CE	345	977915.00
B-CNE	348	981878.00
B-NCE	349	969311.50
B-NCNE	342	948954.50
BSE-CE	343	941943.00
BSE-CNE	348	948548.00
BSE-NCE	354	1.010000.00
BSE-NCNE	345	989025.00
BSEP-CE	352	981607.00
BSEP-CNE	352	1.010000.00
BSEP-NCE	346	940351.00
BSEP-NCNE	348	979100.50
BSEPC-CE	344	940486.50
BSEPC-CNE	341	919858.50
BSEPC-NCE	353	955153.00
BSEPC-NCNE	345	936252.50
	χ^2	9.760
p	value	0.8345

Table B.12: Kruskal Wallis rank sum test of treatments by education

Pairwise comparison for gender	Contrast	Std. Error	t	P>t
+social norms vs baseline	-.0291168	.0191936	-1.52	0.776
++personal norms vs baseline	-.0279242	.0191554	-1.46	0.870
+++pledge vs baseline	-.0125871	.0192537	-0.65	1.000
++personal norms vs +social norms	.0011926	.0191022	0.06	1.000
+++pledge vs ++personal norms	.0153371	.0191626	0.80	1.000
+++pledge vs +social norms	.0165297	.0192007	0.86	1.000

Table B.13: Pairwise comparison of treatments by gender

Treatment	**Observations**	**Rank sum**
B-CE	336	931329.00
B-CNE	342	955827.00
B-NCE	341	929988.00
B-NCNE	331	919072.50
BSE-CE	339	916383.00
BSE-CNE	343	910959.00
BSE-NCE	346	931366.50
BSE-NCNE	337	910936.50
BSEP-CE	349	943615.50
BSEP-CNE	347	940888.50
BSEP-NCE	337	908217.00
BSEP-NCNE	343	910959.00
BSEPC-CE	339	932700.00
BSEPC-CNE	332	923155.50
BSEPC-NCE	342	931351.50
BSEPC-NCNE	335	897331.50
	χ^2	5.215
p	value	0.9901

Table B.14: Kruskal Wallis rank sum test of treatments by gender

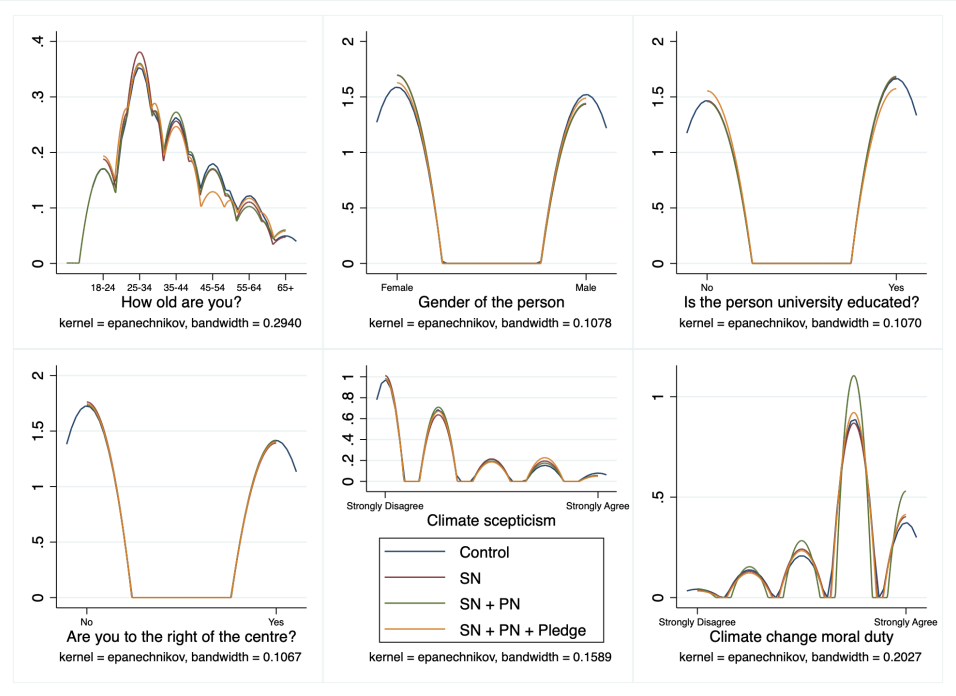

Figure B.11: Density plots of propensity score index across reflective experimental conditions

B.2.3 Behavioural Spillovers

Definition 1: Behavioural spillover measured as a direct effect of experimental assignment on charitable donations. Estimates from OLS regression (OLS1) including lasso controls and locational fixed effects (OLS2). Robust standard errors in parentheses. No significant spillover effects from experimental assignment. See table B.2.3.

Definition 2: : Behavioural spillover measured as a direct effect of changes in first behaviour (i.e. emissions from intended dietary choices) on second behaviour (i.e. charitable donations.) using experimental assignment as an instrument to predict random changes in first behaviour (i.e. emissions from intended dietary choices). See Figure for second–stage regressions.

Variable	OLS1	OLS2
Social Norms	-0.034	-0.139
	(0.152)	(0.171)
	[0.8256]	[0.4167]
Social Norms + Personal Norms	-0.029	-0.030
	(0.153)	(0.172)
	[0.8479]	[0.8621]
Social Norms + Personal Norms + Pledge	0.306	0.298
	(0.155)	(0.177)
	[0.0478]	[0.0916]
Observations	5555	5555
Controls	No	Yes
Fixed Effects	No	Yes
R-squared	0.002	0.174

Table B.15: OLS regression of charitable donations on reflective treatments

```
Estimates efficient for homoskedasticity only
Statistics consistent for homoskedasticity only

                                                Number of obs =      5553
                                                F(965,  4587) =      1.46
                                                Prob > F      =    0.0000
Total (centered) SS     =  90713.43742          Centered R2   =    0.2344
Total (uncentered) SS   =       157383          Uncentered R2 =    0.5587
Residual SS             =  69445.70588          Root MSE      =     3.536
```

amount	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
GHGemissions	-.0277785	.013116	-2.12	0.034	-.0534854	-.0020715
hurry	-.0126737	.0703088	-0.18	0.857	-.1504764	.1251289
Hungry	-.0276655	.0607626	-0.46	0.649	-.146758	.091427
1.confidence	-.1867081	.4417643	-0.42	0.673	-1.05255	.6791341
lrscale						
Yes	-.1509821	.1127535	-1.34	0.181	-.3719748	.0700106
Meatbased	-.0645248	.0696683	-0.93	0.354	-.2010722	.0720226
PrefBritishfood	-.08998	.0535466	-1.68	0.093	-.1949295	.0149695
CCscepticism	-.2005105	.059252	-3.38	0.001	-.3166424	-.0843786
CCmoralduty	.825906	.0768737	10.74	0.000	.6752364	.9765756
random_agecheck						
Above 45 years	.7357989	.1111896	6.62	0.000	.5178713	.9537264

Figure B.12: Stage 2 results from TSLS regression, experiment 1

B.2.4 Are treatment effects influenced by time spent in experimental conditions?

We evaluate if our experimental results could be driven by the time spent by participants in the treatment conditions. These results are shown in Figure B.13 below.

```
. reg duration i.treatment i.zip $lassocontrols, r

Linear regression                               Number of obs     =      5,553
                                                F(803, 4573)      =          .
                                                Prob > F          =          .
                                                R-squared         =     0.1268
                                                Root MSE          =      673.8
```

duration	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
treatment						
B-CNE	10.17449	17.13194	0.59	0.553	-23.41239	43.76136
B-NCE	.1701824	16.96863	0.01	0.992	-33.09653	33.43689
B-NCNE	-19.93482	31.82657	-0.63	0.531	-82.33026	42.46061
BSE-CE	21.23813	21.75766	0.98	0.329	-21.41738	63.89364
BSE-CNE	3.678173	18.18529	0.20	0.840	-31.97378	39.33013
BSE-NCE	44.10909	38.62764	1.14	0.254	-31.61975	119.8379
BSE-NCNE	29.90512	18.22782	1.64	0.101	-5.830212	65.64045
BSEP-CE	-22.01893	58.21052	-0.38	0.705	-136.1397	92.1018
BSEP-CNE	12.84457	19.46203	0.66	0.509	-25.31041	50.99956
BSEP-NCE	10.04929	30.33612	0.33	0.740	-49.42416	69.52273
BSEP-NCNE	174.4727	132.8444	1.31	0.189	-85.9665	434.9119
BSEPC-CE	53.61843	47.90925	1.12	0.263	-40.30683	147.5437
BSEPC-CNE	108.4412	20.4323	5.31	0.000	68.384	148.4984
BSEPC-NCE	76.38658	18.36441	4.16	0.000	40.38347	112.3897
BSEPC-NCNE	91.24538	33.94831	2.69	0.007	24.6903	157.8005

Figure B.13: Do reflective treatments take longer to complete? Evidence from Experiment–II

Appendix C

Experimental Surveys

Experiment—I

Start of Block: Consent Form

Intro Consent Thank you for taking the time to participate in this study! Please note that you need to be 18+ and speak English fluently, otherwise please don't partake. The study should take around 15 minutes to complete. In the study, you will be asked a series of questions and participate in two tasks in which you can earn food vouchers or real money as bonus payment. This works as follows: You will be paid for your participation in the survey. In addition, you will have a chance of earning additional rewards (up to £100) by completing some tasks in the survey. Any additional bonus payments you may win will be paid separately after the end of the survey. Just make sure to read all the instructions carefully and try your best.

NOTE: You can withdraw from the study at any stage without providing an explanation. Your privacy is very important, so we always use anonymised data. Results from this work may be written up for publication in a peer reviewed journal. However, individual data will never be published and we will not hold personal identifiers. This project is in line with the ethical guidelines established by the Research Ethics Committee of the London School of Economics and Political Science.
If you have any questions you would like to ask before starting the survey, please feel free to contact Sanchayan Banerjee at S.Banerjee9@lse.ac.uk.

If you are happy to participate, please choose "I give my consent to participate in this research study"

If you proceed further without consenting, you will not be able to return to this page and your survey will end automatically.

○ I give my consent to participate in this research study (4)

End of Block: Consent Form

Start of Block: Does not consent

Q166 As you do not wish to participate in this study, please return your submission on Prolific by selecting the 'Stop without completing' button.

Skip To: End of Survey If As you do not wish to participate in this study, please return your submission on Prolific by sel... Is Displayed

End of Block: Does not consent

Start of Block: Prolific PID

Q165 Please enter your Prolific ID here:

_____

End of Block: Prolific PID

Start of Block: Part 1: Well being questions, Pre-Treatment

P1 Intro Part One

In this part, you will be asked questions about your feelings on aspects of your life and about your attitudes and preferences in general. There are no right or wrong answers. We are only interested in what you genuinely prefer.

ONS Well-being For each of these questions below, please give an answer on a scale of 0 to 10, where 0 is “not at all” and 10 is “completely"

	Not at all									Completely
	0	1	2	3	4	5	6	7	8	9	10

Overall, how satisfied are you with your life nowadays? ()	
Overall, to what extent do you feel that the things you do in your life are worthwhile? ()	
Overall, how happy did you feel yesterday? ()	
Overall, how anxious did you feel yesterday ()	

Momentary Mood Please select the appropriate response on the scale below that indicates how well each adjective or phrase describes your present mood.

Happy (2)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)
Tired (3)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)
Anxious (4)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)
Calm (5)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)

Control Some people feel they have completely free choice and control over their decisions in life, while other people feel that what they decide upon has no real effect on what happens to

them. Please select the appropriate response on the scale below to indicate how much control you have over your decisions in life.

	Definitely yes (19)	Probably yes (20)	Might or might not (21)	Probably not (22)	Definitely not (23)
I have completely free choice and control over the decisions I make in my life (1)	○	○	○	○	○

End of Block: Part 1: Well being questions, Pre-Treatment

Start of Block: Part 1: Attitudinal Questions: Trust, Risk, IPS, Altruism, and PEB

Trust Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?

○ Most people can be trusted (1)

○ Need to be very careful (2)

SOEP risk Please indicate, using a slider scale from 0 to 10, where 0 means you are "completely unwilling to take risks" and a 10 means you are "very willing to take risks" in general, how willing or unwilling you are to tasks.

Completely unwilling to take risks — Very willing to take risks

0 1 2 3 4 5 6 7 8 9 10

22 ()	

IPS Consider the following six scenarios. Please indicate, using the scale below, how strongly you desire to acquire more information about them.

As part of a semiannual medical checkup, your doctor asks you a series of questions. The answers to these questions can be used to estimate your life expectancy (the age you are predicted to live to). Do you want to know how long you can expect to live? (1)	○ Definitely want to know (1)	○ Probably want to know (2)	○ Definitely don't want to know (3)	○ Probably don't want to know (4)
You provide some genetic material to a testing service to learn more about your ancestors. You are then told that the same test can, at no additional cost, tell you whether you have an elevated risk of developing Alzheimer's. Do you want to know whether you have a high	○ Definitely want to know (1)	○ Probably want to know (2)	○ Definitely don't want to know (3)	○ Probably don't want to know (4)

risk of developing Alzheimer's? (5)				
At your annual check-up, you are given the option to see the results of a diagnostic test, which can identify, among other things, the extent to which your body has suffered long-term effects from stress. Do you want to know how much lasting damage your body has suffered from stress? (6)	○ Definitely want to know (1)	○ Probably want to know (2)	○ Definitely don't want to know (3)	○ Probably don't want to know (4)
You are buying a round-trip flight ticket. At checkout, you are told that your airline company voluntarily offsets the greenhouse gas emissions from your travel by investing in energy-saving activities elsewhere. The airline company	○ Definitely want to know (1)	○ Probably want to know (2)	○ Definitely don't want to know (3)	○ Probably don't want to know (4)

will automatically produce a brief infographic describing the funded energy-saving activities and will include it within the electronic invoice for your trip. Do you want the infographic to also include the information about the amount of greenhouse gas emissions originated from your travel? (19)				
Some people seek out information even when it might be painful. Others avoid getting information that they suspect might be painful, even if it could be useful. How would you describe yourself? (18)	○ Definitely want to know (1)	○ Probably want to know (2)	○ Definitely don't want to know (3)	○ Probably don't want to know (4)
If people know bad things about my life that I don't know, I would prefer to	○ Definitely want to know (1)	○ Probably want to know (2)	○ Definitely don't want to know (3)	○ Probably don't want to know (4)

be told (20)

Growth v/s Environ Here are three statements people sometimes make when discussing the environment and economic growth. Which of them comes closer to your own point of view?

- ○ Protecting the environment should be given priority, even if it causes slower economic growth and some loss of income or jobs. (1)
- ○ Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent. (2)
- ○ Protecting the environment and fostering economic growth with job creation are equally important (4)

Lives v/s Livelihood Here are three statements people sometimes make when discussing the economic growth and public health. Which of them comes closer to your own point of view?

- ○ Public health be prioritised over economic prosperity, even if it causes slower economic growth and some loss of income or jobs. (1)
- ○ Economic growth be prioritised over public health, even if it leads to an increase in morbidity and mortality rates in the population. (2)
- ○ Improving public health and maintaining economic prosperity are equally important. (4)

OECD Mourato-Ganga

For each of the activities/items listed below, please indicate whether during the COVID-19 pandemic you have decreased it, kept it at similar levels or increased it.

	Has decreased (1)	Has stayed the same as before (2)	Has increased (3)
Overall income or purchasing power (2)	○	○	○
Health expenditures (e.g. new health insurance, Personal protective equipment likes masks, visors and sanitisers). (7)	○	○	○
Digital media subscriptions (e.g. Netflix, Amazon prime, Spotify, E-journals and magazines) (5)	○	○	○
Online shopping (3)	○	○	○
Online meal deliveries (4)	○	○	○

CC Beliefs Please indicate, using the scale below, how strongly you relate to the following statements.

Claims that human activities are changing the climate are exaggerated (10)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
I believe climate change is a real problem (11)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
Emissions from livestock farming i.e meat production and consumption is a major contributor to climate change (12)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
We can all do our bit to reduce the effects of climate change (1)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
I would only do my bit to reduce climate change if	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)

everyone else did as well (4)					
Nothing I do on a daily basis contributes to the problem of climate change (7)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)

Command and Control Please indicate, using the scale below, how strongly you relate to the following statements.

Controls should be placed on industry to protect the environment from pollution, even if it means things will cost more (3)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
It is wrong for governments to try and compel business and industry to put conservation before producing goods in the most efficient and cost effective manner. (8)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)

PEB Please indicate, using the scale below, how strongly you relate to the following statements.

I could not be bothered to save water or other natural resources. (1)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
I make sure that during the winter the heating system in my room is not switched on too high. (2)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
In my daily life I'm just not interested in trying to conserve water and/or power. (3)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
Whenever possible, I take a short shower in order to conserve water. (4)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
I always switch the light off when I don't need it on any more. (5)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
I drive whenever it	○ Strongly	○ Somewhat	○ Neither	○ Somewhat	○ Strongly

suits me, even if it does pollute the atmosphere. (6)	agree (1)	agree (2)	agree nor disagree (3)	disagree (4)	disagree (5)
In my daily life I try to find ways to conserve water or power. (7)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
I am NOT the kind of person who makes efforts to conserve natural resources. (8)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
Whenever possible, I try to save natural resources. (9)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)
Even if public transportation was more efficient than it is, I would prefer to drive my car. (10)	○ Strongly agree (1)	○ Somewhat agree (2)	○ Neither agree nor disagree (3)	○ Somewhat disagree (4)	○ Strongly disagree (5)

P1 Thanks Thank You!

Let us move on to the second part of this study where you will participate in a few tasks.

End of Block: Part 1: Attitudinal Questions: Trust, Risk, IPS, Altruism, and PEB

Start of Block: Part 2: Risk 1

1:1 Part Two:

In this part, you will play three different games.

Now consider the first game. In this game, you will have a 1 in 100 chance to win a real monetary payment up to £80 (Amazon voucher). There are no 'right' or 'wrong' answers. as possible. We are only interested in what you genuinely prefer.

Consider this urn which has four balls, namely red, blue, yellow and black. In the questions that follow, you have to choose between two options (A or B) that will give you earnings according to the extraction of a ball from this urn:

○ Option A: you will earn £40 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: 1:1A If Part Two: In this part, you will play three different games. Now consider the first game. In... = Option A: you will earn £40 regardless of the colour of the ball extracted from the urn.

Skip To: 1:1B If Part Two: In this part, you will play three different games. Now consider the first game. In... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1A

Please indicate your preferred choice between two options (A or B) that will give you earnings

according to the extraction of a call from this urn:

○ Option A: you will earn £20 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: 1:1AA If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £20 regardless of the colour of the ball extracted from the urn.

Skip To: 1:1AB If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1AA Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £10 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: 1:1AAA If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £10 regardless of the colour of the ball extracted from the urn.

Skip To: 1:1AAB If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1AAA Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £5 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £5 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1AAB Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £15 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £15 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1AB Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £30 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: 1:1ABA If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £30 regardless of the colour of the ball extracted from the urn.

Skip To: 1:1ABB If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1ABA Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £25 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £25 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1ABB Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £35 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £35 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1B Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £60 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: 1:1BA If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £60 regardless of the colour of the ball extracted from the urn.

Skip To: 1:1BB If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1BA Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £50 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: 1:1BAA If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £50 regardless of the colour of the ball extracted from the urn.

Skip To: 1:1BAB If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1BAA Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £45 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £45 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1BAB Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £55 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £55 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1BB Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £70 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: 1:1BBA If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £70 regardless of the colour of the ball extracted from the urn.

Skip To: 1:1BBB If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1BBA Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £65 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £65 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

1:1BBB Please indicate your preferred choice between two options (A or B) that will give you earnings according to the extraction of a call from this urn:

○ Option A: you will earn £75 regardless of the colour of the ball extracted from the urn. (1)

○ Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow. (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option A: you will earn £75 regardless of the colour of the ball extracted from the urn.

Skip To: End of Block If Please indicate your preferred choice between two options (A or B) that will give you earnings ac... = Option B: you will earn £80 if the ball extracted from the urn is red or blue; you will earn £0 if the ball extracted from the urn is black or yellow.

End of Block: Part 2: Risk 1

Start of Block: Part 2: Risk BEG

Q224 Now consider a second game. You will be presented with six possible gambles and you will be asked to choose your preferred one. Each gamble allows you a chance of winning certain amounts of money, with certain probabilities.
Please choose your preferred gamble from the list below:

- ○ A payoff of £28 with 50% chance and a payoff of £28 with 50% chance (10)
- ○ A payoff of £24 with 50% chance and a payoff of £36 with 50% chance (11)
- ○ A payoff of £20 with 50% chance and a payoff of £44 with 50% chance (12)
- ○ A payoff of £16 with 50% chance and a payoff of £52 with 50% chance (13)
- ○ A payoff of £12 with 50% chance and a payoff of £60 with 50% chance (14)
- ○ A payoff of £2 with 50% chance and a payoff of £72 with 50% chance (15)

End of Block: Part 2: Risk BEG

Start of Block: Part 2: Time 1

T1:1 Now consider the third game. In the questions that follow you have to choose between two payment options (A or B) that will give you earnings in future dates.

- ○ Option A: you will earn £40 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: T1:1A If Now consider the third game. In the questions that follow you have to choose between two payment... = Option A: you will earn £40 tomorrow

Skip To: T1:1B If Now consider the third game. In the questions that follow you have to choose between two payment... = Option B: you will earn £80 in 3 months

T1:1A Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £20 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: T1:1AA If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £20 tomorrow

Skip To: T1:1AB If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1AA Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £10 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: T1:1AAA If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £10 tomorrow

Skip To: T1:1AAB If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1AAA Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £5 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £5 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1AAB Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £15 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £15 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1AB Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £30 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: T1:1ABA If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £30 tomorrow

Skip To: T1:1ABB If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1ABA Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £25 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £25 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1ABB Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £35 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £35 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £35 tomorrow

T1:1B Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £60 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: T1:1BA If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £60 tomorrow

Skip To: T1:1BB If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1BA Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £50 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: T1:1BAA If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £50 tomorrow

Skip To: T1:1BAB If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1BAA Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £45 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £45 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1BAB Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £55 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £55 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1BB Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £70 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: T1:1BBA If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £70 tomorrow

Skip To: T1:BBB If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:1BBA Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £65 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £65 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

T1:BBB Please indicate your preferred choice between two options (A and B) that will give you earnings in future dates.

- ○ Option A: you will earn £75 tomorrow (1)
- ○ Option B: you will earn £80 in 3 months (2)

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option A: you will earn £75 tomorrow

Skip To: End of Block If Please indicate your preferred choice between two options (A and B) that will give you earnings i... = Option B: you will earn £80 in 3 months

End of Block: Part 2: Time 1

Start of Block: Part 3: Health and Lifestyle

Q344 If you win the Amazon Cash Voucher (for your choice in the draw of balls from the urn), what percent, of this Amazon voucher, will be you be willing to donate to a charity of your choice. Please answer as realistically as possible. In case of a real win, your chosen percent will be deducted from your Amazon Cash Voucher and will be donated to the charity of your choice. I am willing to donate (1)

▼ 0 percent (1) ... 100 percent (11)

Q226 Which of the following charities are you willing to donate to?

Please note that you can choose upto a maximum of two charities.

- ☐ British Heart Foundation (1)
- ☐ WWF (3)
- ☐ Keep Britain Tidy (4)
- ☐ Samaritans (5)
- ☐ Children in Need (6)
- ☐ UNICEF (7)
- ☐ Greenpeace (9)
- ☐ PETA (10)
- ☐ Friends of the Earth (11)
- ☐ LGBT Foundation (12)
- ☐ Abortion Rights (13)
- ☐ Other (Please Specify) (14)

Q193 Thank You!

Let us move on to the third part of this study.

Part 3

In this part you will be asked a few questions about your lifestyle. There are no right or wrong answers. We are only interested in what you genuinely prefer.

Diet Style

Please indicate the dietary style that suits yourself best.

I usually follow a (1)

▼ Vegan diet (1) ... Balanced Diet (8)

HEI Q1 How many days a week do you usually eat breakfast?

- ○ No days (1)
- ○ Some days but not all days (2)
- ○ All days (3)

HEI Q2 Including tinned and packed fruit, on how many days in a usual week, on an average, do you eat fruit?

- ○ No days (1)
- ○ Some days but not all days (2)
- ○ All days (3)

Skip To: HEI Q3 If Including tinned and packed fruit, on how many days in a usual week, on an average, do you eat fr... = No days

Skip To: HEI Q2a If Including tinned and packed fruit, on how many days in a usual week, on an average, do you eat fr... != No days

HEI Q2a On the days when you eat fruit, on an average, how many portions (e.g. an apple, an orange, some grapes) do you eat?

I eat (1)

▼ One portion (1) ... More than five portions (6)

HEI Q3 Including tinned, frozen and fresh vegetables, on how many days in a usual week, on an average, do you eat vegetables? Do not include potatoes, crisps or chips.

- ○ No days (1)
- ○ Some days but not all days (2)
- ○ All days (3)

Skip To: HEI Q4 If Including tinned, frozen and fresh vegetables, on how many days in a usual week, on an average, d... = No days

Skip To: HEI 3b If Including tinned, frozen and fresh vegetables, on how many days in a usual week, on an average, d... != No days

HEI 3b On the days when you eat vegetables, on an average, how many portions (i.e. 3 tablespoons) do you eat? Please do not include potatoes.
I eat (1)

▼ One portion (1) ... More than five portions (6)

HEI Q4 Can you tell me the type of milk that you usually use?

- ○ Whole only (1)
- ○ Sometimes whole, sometimes semi-skimmed (2)
- ○ Semi-skimmed only (3)
- ○ Sometimes semi-skimmed, sometimes skimmed (4)
- ○ Skimmed only (5)
- ○ Do not use Milk (6)
- ○ Other (7)

HEI Q5 What type of bread do you usually eat?

- ○ White only (1)
- ○ Sometimes white, sometimes brown or granary (2)
- ○ Brown or granary only (3)
- ○ Sometimes white, sometimes wholemeal (4)
- ○ Sometimes brown or granary or sometimes wholemeal (5)
- ○ Wholemeal only (7)
- ○ Do not eat bread (6)

PreTreat FoodWastage On an average, how much uneaten food, overall, would you say you generally end up throwing away?

	Quite a lot (8)	A reasonable amount (9)	Some (10)	A small amount (11)	Hardly any (12)	None (13)	Don't know (14)
How much uneaten food, overall, would you say you generally end up throwing away? (1)	○	○	○	○	○	○	○

Exercise Intensity I am going to ask you about the time you spent being physically active in business as usual scenario. Please answer each question even if you do not consider yourself to be an active person. Think about the activities you do, like being in your house and doing gardening, to get from place to place, and in your spare time for recreation, exercise or sport. Please indicate below, during the last 7 days, on how many days did you engage in the following physical activities.

Vigorous Physical Activity (eg, hiking, fast biking, running or a soccer game) (4)	○ No day of the week (1)	○ 1 day a week (2)	○ 2-3 days a week (3)	○ 4-5 days a week (4)	○ More than 5 days a week (5)
Moderate Physical Activity (eg, brisk walking, mowing lawn or heavy cleaning) (5)	○ No day of the week (1)	○ 1 day a week (2)	○ 2-3 days a week (3)	○ 4-5 days a week (4)	○ More than 5 days a week (5)
Light Physical Activity (eg, slow walking, playing instruments or doing chores) (6)	○ No day of the week (1)	○ 1 day a week (2)	○ 2-3 days a week (3)	○ 4-5 days a week (4)	○ More than 5 days a week (5)

Q175 Thank You!! Your responses have now been recorded. Let us move on to the fourth part of this study.

End of Block: Part 3: Health and Lifestyle

Start of Block: Part 4: Presenting Menus Introductory Text

Q4
Part Four

Now we have a task which will give you the chance to win a real monetary payment (£20 food voucher). This food voucher is generated by Restaurant Choice and will give you the opportunity to order a meal at eight different restaurant chains in the UK, including Nandos, Pizza Hut Restaurants, YO! Sushi, Ask Italian, Café Rouge, PizzaExpress, The Real Greek, and Zizzi. There is no 'right' or 'wrong' answer. We are only interested in what you genuinely prefer.

Payoff: You will be automatically entered in a lucky draw to win 1 in 100 food vouchers.
If successful, you can actually order the same food in real life from an actual restaurant near you. The restaurants will strictly follow contactless delivery options in light of Covid19.

Rules of the task

You will be asked to choose a main course from a menu that will be presented to you. Before choosing, please imagine that you have actually won the £20 food voucher. Now imagine you are at home and want to redeem the voucher by placing an online order for food delivery. Please ensure that you answer as realistically as possible.The menu is comprised of main course items . Please select one main course. You can submit your choice after viewing the menu.

Note that after this question, you will not be able to return to any previous segment of this survey to edit your answers.

End of Block: Part 4: Presenting Menus Introductory Text

Start of Block: Regular Menu Choice

RM Time Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

RM Menu Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (43)

End of Block: Regular Menu Choice

Start of Block: Commitment Device

CD Time Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Pledge Dear Participant,

To reduce the impact on the environment, one can consume an environmentally sustainable diet. An environmentally sustainable diet is one with a low environmental impact. Sustainable food items have low carbon emissions associated with their production and consumption.

You can contribute to sustainability by pledging to choose an environmentally sustainable diet in order to reduce your carbon footprint. Please indicate if you would like to pledge towards this cause.

Thank you for your cooperation.

- ○ I pledge to follow an environmentally sustainable diet (4)
- ○ I do not pledge to follow an environmentally sustainable diet (5)
- ○ I do not know if I would like to pledge to follow an environmentally sustainable diet (7)

Skip To: CD Motivation If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I do not know if I would like to pledge to follow an environmentally sustainable diet

Skip To: CD Motivation If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I pledge to follow an environmentally sustainable diet

Skip To: CD Menu1 If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I do not pledge to follow an environmentally sustainable diet

CD Motivation Please indicate your willingness in favour of the following statements using the scale below

I intend to consume an environmentally sustainable diet in my next meal (1)	○ Yes (1)	○ Don't Know (2)	○ No (3)
I intend to reduce my consumption of environmentally unsustainable food over the next week. (2)	○ Yes (1)	○ Don't Know (2)	○ No (3)

CD Menu1 Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑

CD Sust Choice Please indicate if you would like to place an order from an environmentally sustainable menu.

- ○ I would like to place an order from the environmentally sustainable set-menu (1)
- ○ I would like to see the full menu with the environmentally sustainable items marked for convenience (3)
- ○ No, I would like to place an order from the regular menu (4)

Skip To: CD Menu2 If Please indicate if you would like to place an order from an environmentally sustainable menu. = I would like to place an order from the environmentally sustainable set-menu

Skip To: CD Menu3 If Please indicate if you would like to place an order from an environmentally sustainable menu. = I would like to see the full menu with the environmentally sustainable items marked for convenience

Skip To: RM Choice If Please indicate if you would like to place an order from an environmentally sustainable menu. = No, I would like to place an order from the regular menu

RM Choice Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (43)

Display This Question:

If Please indicate if you would like to place an order from an environmentally sustainable menu. = I would like to place an order from the environmentally sustainable set-menu

CD Menu2 Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (23)

Display This Question:

If Please indicate if you would like to place an order from an environmentally sustainable menu. = I would like to see the full menu with the environmentally sustainable items marked for convenience

CD Menu3 Please consider the menu with the environmentally sustainable items colour coded in red, amber and green where green indicates most environmentally sustainable and red indicates least environmentally sustainable. To enlarge, simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

End of Block: Commitment Device

Start of Block: Implementation Intentions

II Time Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

II Goal Building
Dear Participant,

To reduce the impact on the environment, one can consume an environmentally sustainable

diet. An environmentally sustainable diet is one with a low environmental impact. Sustainable food items have low carbon emissions associated with their production and consumption.

You can contribute to sustainability by pledging to choose an environmentally sustainable diet in order to reduce your carbon footprint.

Thank you for your cooperation.

II Motivation Please indicate your willingness in favour of the following statements using the scale below.

I intend to consume an environmentally sustainable diet in my next meal (1)	○ Yes (1)	○ Don't Know (2)	○ No (3)
I intend to reduce my consumption of environmentally unsustainable food over the next week (2)	○ Yes (1)	○ Don't Know (2)	○ No (3)

II Intention Eg To help you follow a sustainable diet, we would like you to plan exactly HOW you will eat your choice of environmentally sustainable diet every day. Research has shown that planning is more effective if you first identify a situation and time, and then decide what you will do in that situation. You are free to choose how you will do this in any given situation, but we want you to form your plans. Please pay particular attention to the situations in which you will implement these plans.

An example is as follows: If it is time for brunch AND I order a takeaway, then I will add an apple to my meal.

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*

II Task Lunch

Now consider making a plan for your lunchtime. You can do this by sorting the words in the blank spaces below.

Strategy 1: If I go to a restaurant	Strategy 2: If I cook myself a meal	Strategy 3: If I order a takeaway
_____ Then, I will look up a vegetarian recipe (1)	_____ Then, I will look up a vegetarian recipe (1)	_____ Then, I will look up a vegetarian recipe (1)
_____ Then, I will choose poultry meat (2)	_____ Then, I will choose poultry meat (2)	_____ Then, I will choose poultry meat (2)
_____ Then, I will cut back on my processed/red meat consumption (3)	_____ Then, I will cut back on my processed/red meat consumption (3)	_____ Then, I will cut back on my processed/red meat consumption (3)
_____ Then, I will choose fish whenever available (11)	_____ Then, I will choose fish whenever available (11)	_____ Then, I will choose fish whenever available (11)
_____ Then, I will add a portion of vegetables to my meal (12)	_____ Then, I will add a portion of vegetables to my meal (12)	_____ Then, I will add a portion of vegetables to my meal (12)

---

*

II Task Dinner

Now consider making another plan for your dinner. You can do this by sorting the words in the blank spaces below.

Strategy 1: If I go to a restaurant	Strategy 2: If I cook myself a meal	Strategy 3: If I order a takeaway
_____ Then, I will look up a vegetarian recipe (1)	_____ Then, I will look up a vegetarian recipe (1)	_____ Then, I will look up a vegetarian recipe (1)

_____ Then, I will choose poultry meat (2)	_____ Then, I will choose poultry meat (2)	_____ Then, I will choose poultry meat (2)
_____ Then, I will cut back on my processed/red meat consumption (3)	_____ Then, I will cut back on my processed/red meat consumption (3)	_____ Then, I will cut back on my processed/red meat consumption (3)
_____ Then, I will choose fish whenever available (11)	_____ Then, I will choose fish whenever available (11)	_____ Then, I will choose fish whenever available (11)
_____ Then, I will add a portion of vegetables to my meal (12)	_____ Then, I will add a portion of vegetables to my meal (12)	_____ Then, I will add a portion of vegetables to my meal (12)

II Sust Choice Thank You for forming your plans to follow an environmentally sustainable diet. Please choose the appropriate option

- ○ I would like to place an online order from the full menu (1)
- ○ I would like to place an online order from the environmentally sustainable set-menu (2)
- ○ I would like to place an online order from full menu but colour coded to indicate the environmentally sustainable dishes. (3)

Skip To: II Regular Menu If Thank You for forming your plans to follow an environmentally sustainable diet. Please choose the... = I would like to place an online order from the full menu

Skip To: II Set Menu If Thank You for forming your plans to follow an environmentally sustainable diet. Please choose the... = I would like to place an online order from the environmentally sustainable set-menu

Skip To: II Colour Menu If Thank You for forming your plans to follow an environmentally sustainable diet. Please choose the... = I would like to place an online order from full menu but colour coded to indicate the environmentally sustainable dishes.

Display This Question:

If Thank You for forming your plans to follow an environmentally sustainable diet. Please choose the... = I would like to place an online order from the environmentally sustainable set-menu

II Set Menu Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (23)

Display This Question:

If Thank You for forming your plans to follow an environmentally sustainable diet. Please choose the... = I would like to place an online order from full menu but colour coded to indicate the environmentally sustainable dishes.

II Colour Menu Please consider the menu with the environmentally sustainable items colour coded in red, amber and green where green indicates most environmentally sustainable and red indicates least environmentally sustainable. To enlarge, simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

Display This Question:

If Thank You for forming your plans to follow an environmentally sustainable diet. Please choose the... = I would like to place an online order from the full menu

II Regular Menu Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

End of Block: Implementation Intentions

Start of Block: Quick Rules

QR Time Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Rules
Food rules help you in choosing a sustainable diet quickly. Please consider the following three sustainable food rules before placing your order for the online delivery.

Rule #1: Eat a balanced diet.
Rule #2: Eat meat occasionally.
Rule #3: Eat mostly vegetarian items.

Remembering Rules Please select the appropriate option to place your order for the online delivery.

- ○ Yes, I remember the rules and would like to place my online order (4)
- ○ No, I would like to read the rules again. (5)

Skip To: Regular Menu If Please select the appropriate option to place your order for the online delivery. = Yes, I remember the rules and would like to place my online order

Skip To: Recap Rules If Please select the appropriate option to place your order for the online delivery. = No, I would like to read the rules again.

Recap Rules
Recap of the rules!

Rule #1: Eat a balanced diet.
Rule #2: Eat meat occasionally.
Rule #3: Eat mostly vegetarian items.

Regular Menu Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

End of Block: Quick Rules

Start of Block: Sustainable Default Menu Choice

D Time Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

Set Menu Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑

Skip To: Default Choice If Please consider the menu with the environmentally sustainable items. To enlarge, simply click on... Is Displayed

Default Choice Would you like to order from the set-menu?

- ○ Yes, I would like to place an order from the set-menu (2)
- ○ No, I would like to see the full menu offered by the restaurant (3)

Skip To: Regular Menu If Would you like to order from the set-menu? = No, I would like to see the full menu offered by the restaurant

Skip To: Sustainable Menu If Would you like to order from the set-menu? = Yes, I would like to place an order from the set-menu

Display This Question:

If Would you like to order from the set-menu? = Yes, I would like to place an order from the set-menu

Sustainable Menu Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (23)

Display This Question:

If Would you like to order from the set-menu? = No, I would like to see the full menu offered by the restaurant

Regular Menu Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

End of Block: Sustainable Default Menu Choice

Start of Block: Sustainable Default with One Liner

Q519 Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

One Line Dear Participant,

Please note that all items on the set-menu that will be presented to you are environmentally sustainable. An environmentally sustainable diet is one with a low environmental impact. Sustainable food items have low carbon emissions associated with their production and consumption.

Q520 Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑

Skip To: Q521 If Please consider the menu with the environmentally sustainable items. To enlarge, simply click on... Is Displayed

Q521 Would you like to order from the set-menu?

- ○ Yes, I would like to place an order from the set-menu (2)
- ○ No, I would like to see the full menu offered by the restaurant (3)

Skip To: Q523 If Would you like to order from the set-menu? = No, I would like to see the full menu offered by the restaurant

Skip To: Q522 If Would you like to order from the set-menu? = Yes, I would like to place an order from the set-menu

Display This Question:

If Would you like to order from the set-menu? = Yes, I would like to place an order from the set-menu

Q522 Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑

Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (23)

Display This Question:

If Would you like to order from the set-menu? = No, I would like to see the full menu offered by the restaurant

Q523 Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑

Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

End of Block: Sustainable Default with One Liner

Start of Block: Commitment Device + Opt Out Default

CDD Time Timing

First Click (1)

Last Click (2)

Page Submit (3)

Click Count (4)

CDD Pledge Dear Participant,

To reduce the impact on the environment, one can consume an environmentally sustainable diet. An environmentally sustainable diet is one with a low environmental impact. Sustainable food items have low carbon emissions associated with their production and consumption.

You can contribute to sustainability by pledging to choose an environmentally sustainable diet in order to reduce your carbon footprint. Please indicate if you would like to pledge towards this cause.

Thank you for your cooperation.

- ○ I pledge to follow an environmentally sustainable diet (4)
- ○ I do not to pledge to follow an environmentally sustainable diet (5)
- ○ I do not know if I would like to pledge to follow an environmentally sustainable diet (7)

Skip To: CDD Motivation If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I pledge to follow an environmentally sustainable diet

Skip To: CDD Motivation If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I do not know if I would like to pledge to follow an environmentally sustainable diet

Skip To: CDD Set Menu If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I do not to pledge to follow an environmentally sustainable diet

CDD Motivation Please indicate your willingness in favour of the following statements using the scale below.

I intend to consume an environmentally sustainable diet in my next meal (1)	○ Yes (1)	○ Don't Know (2)	○ No (3)
I intend to reduce my consumption of environmentally unsustainable food over the next week. (2)	○ Yes (1)	○ Don't Know (2)	○ No (3)

CDD Set Menu Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑

Skip To: CDD Default Choice If Please consider the menu with the environmentally sustainable items. To enlarge, simply click on... Is Displayed

CDD Default Choice Would you like to order from the set-menu of environmentally sustainable dishes?

○ Yes, I would like to place an order from the set-menu (2)

○ No, I would like to see the full menu offered by the restaurant (3)

Skip To: CDD Regular Menu If Would you like to order from the set-menu of environmentally sustainable dishes? = No, I would like to see the full menu offered by the restaurant

Skip To: CDD Menu Choice If Would you like to order from the set-menu of environmentally sustainable dishes? = Yes, I would like to place an order from the set-menu

Display This Question:

If Would you like to order from the set-menu of environmentally sustainable dishes? = Yes, I would like to place an order from the set-menu

CDD Menu Choice Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑

Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (23)

Display This Question:

If Would you like to order from the set-menu of environmentally sustainable dishes? = No, I would like to see the full menu offered by the restaurant

CDD Regular Menu Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑

Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

End of Block: Commitment Device + Opt Out Default

Start of Block: Opt Out Default + Commitment Device

DCD Time Timing

First Click (1)

Last Click (2)

Page Submit (3)

Click Count (4)

DCD Set Menu Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑

Skip To: DCD Default Choice If Please consider the menu with the environmentally sustainable items. To enlarge, simply click on... Is Displayed

DCD Default Choice Would you like to order from the set-menu?

- ○ Yes, I'd like to place an order from the set-menu (2)
- ○ No, I'd like to see the full menu offered by the restaurant (3)

Skip To: DCD Regular Menu If Would you like to order from the set-menu? = No, I'd like to see the full menu offered by the restaurant

Skip To: DCD Set Menu If Would you like to order from the set-menu? = Yes, I'd like to place an order from the set-menu

DCD Set Menu Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (23)

DCD Regular Menu Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

DCD Pledge Dear Participant,

To reduce the impact on the environment, one can consume an environmentally sustainable diet. An environmentally sustainable diet is one with a low environmental impact. Sustainable food items have low carbon emissions associated with their production and consumption.

You can contribute to sustainability by pledging to choose an environmentally sustainable diet in order to reduce your carbon footprint. Please indicate if you would like to pledge towards this cause.

Thank you for your cooperation.

- ○ I will like to pledge to follow an environmentally sustainable diet (4)
- ○ I would not like to pledge to follow an environmentally sustainable diet (7)
- ○ I do not know if I would like to pledge to follow an environmentally sustainable diet (8)

Skip To: DCD Revisit Choice If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I will like to pledge to follow an environmentally sustainable diet

Skip To: End of Block If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I would not like to pledge to follow an environmentally sustainable diet

Skip To: DCD Motivation If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I do not know if I would like to pledge to follow an environmentally sustainable diet

Skip To: DCD Motivation If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I will like to pledge to follow an environmentally sustainable diet

Skip To: DCD Revisit Choice If Dear Participant, To reduce the impact on the environment, one can consume an environmentally... = I do not know if I would like to pledge to follow an environmentally sustainable diet

DCD Motivation Please indicate your willingness in favour of the following statements using the scale below.

I intend to consume an environmentally sustainable diet in my next meal (1)	○ Yes (1)	○ Don't Know (2)	○ No (3)
I intend to reduce my consumption of environmentally unsustainable food over the next week. (2)	○ Yes (1)	○ Don't Know (2)	○ No (3)

DCD Revisit Choice Given your pledge, would you like to revisit your order for online delivery?

- ○ Yes, I would like to revisit my online order (4)
- ○ No, I am happy with my online order (5)

Skip To: End of Block If Given your pledge, would you like to revisit your order for online delivery? = No, I am happy with my online order

Skip To: DCD Revisit Sust Cho If Given your pledge, would you like to revisit your order for online delivery? = Yes, I would like to revisit my online order

DCD Revisit Sust Cho Please indicate if you would like to choose from a set-menu of environmentally sustainable items.

- ○ I would like to choose from the environmentally sustainable set-menu (1)
- ○ I would like to choose from the full menu (2)

Skip To: DCD Regular Menu If Please indicate if you would like to choose from a set-menu of environmentally sustainable items. = I would like to choose from the full menu

Skip To: DCD Set Menu If Please indicate if you would like to choose from a set-menu of environmentally sustainable items. = I would like to choose from the environmentally sustainable set-menu

Display This Question:

If Please indicate if you would like to choose from a set-menu of environmentally sustainable items. = I would like to choose from the full menu

DCD Regular Menu Please consider the following menu to order for online delivery. To enlarge the menu simply click on the menu ↑

Please choose your new preferred main course to order for online delivery from the drop down list here. (35)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (43)

Display This Question:

If Please indicate if you would like to choose from a set-menu of environmentally sustainable items. = I would like to choose from the environmentally sustainable set-menu

DCD Set Menu Please consider the menu with the environmentally sustainable items. To enlarge, simply click on the menu ↑

Please choose your new preferred main course to order for online delivery from the drop down list here. (55)

▼ Chicken Curry Ramen (1) ... Inari Taco (Veg) (23)

End of Block: Opt Out Default + Commitment Device

Start of Block: Traffic Lighting Menu Choice

TL Time Timing

First Click (1)

Last Click (2)

Page Submit (3)

Click Count (4)

TL Menu Please consider the menu with the environmentally sustainable items colour coded in red, amber and green where green indicates most environmentally sustainable and red indicates least environmentally sustainable. To enlarge, simply click on the menu ↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (43)

End of Block: Traffic Lighting Menu Choice

Start of Block: Traffic Lighting Menu Choice with One Liner

TLL Time Timing
First Click (1)
Last Click (2)
Page Submit (3)
Click Count (4)

TLL One Liner Dear Participant,

Please note that all items on the menu that will be presented to you have been colour coded to indicate their environmental sustainability, where red footprint indicates least environmentally sustainable and green footprint indicates most environmentally sustainable.An environmentally sustainable diet is one with a low environmental impact. Sustainable food items have low carbon emissions associated with their production and consumption.

TLL Menu Please consider the full Please consider the menu with the environmentally sustainable items colour coded in red, amber and green where green indicates most

environmentally sustainable and red indicates least environmentally sustainable. To enlarge, simply click on the menu↑
Please choose your preferred main course to order for online delivery from the drop down list here. (4)

▼ Chicken Curry Ramen (1) ... Inari Taco (43)

End of Block: Traffic Lighting Menu Choice with One Liner

Start of Block: Part Four: Donations and Choice Determinants

Q156 If you win the £20 food voucher, what amount of this food voucher, if anything, will be you be willing to donate to a charity of your choice. Please answer as realistically as possible. In case of a real win, your chosen amount deducted from your food voucher and will be donated to the charity of your choice.
I am willing to donate (1)

▼ 0 GBP (1) ... 10 GBP (11)

Q172 Which of the following charities are you willing to donate to?

Please note that you can choose upto a maximum of two charities.

- ☐ British Heart Foundation (1)
- ☐ WWF (3)
- ☐ Keep Britain Tidy (4)
- ☐ Samaritans (5)
- ☐ Children in Need (6)
- ☐ UNICEF (7)
- ☐ Greenpeace (9)
- ☐ PETA (10)
- ☐ Friends of the Earth (11)
- ☐ LGBT Foundation (12)
- ☐ Abortion Rights (13)
- ☐ Other (Please Specify) (14)

_____

Q93 Now think about the factors that influenced your order for the online delivery of the main course item. Please score the importance to you for each of the following factors, with 0 being not important at all and 5 being the most important.

I like the dish (2)	○ Not at all important (1)	○ Slightly important (2)	○ Moderately important (3)	○ Very important (4)	○ Extremely important (5)
I like the description of the dish (3)	○ Not at all important (1)	○ Slightly important (2)	○ Moderately important (3)	○ Very important (4)	○ Extremely important (5)
I am concerned about the environmental impact of the dish (5)	○ Not at all important (1)	○ Slightly important (2)	○ Moderately important (3)	○ Very important (4)	○ Extremely important (5)
I have not eaten the dish recently (6)	○ Not at all important (1)	○ Slightly important (2)	○ Moderately important (3)	○ Very important (4)	○ Extremely important (5)
I was eager to try a new dish (7)	○ Not at all important (1)	○ Slightly important (2)	○ Moderately important (3)	○ Very important (4)	○ Extremely important (5)
I tried the least bad of all available options (8)	○ Not at all important (1)	○ Slightly important (2)	○ Moderately important (3)	○ Very important (4)	○ Extremely important (5)

Q87 Thank you once again!

You have now made your food choice and we have recorded your answers. If you are successful in winning the random lottery of a £10 food voucher, you will be able to actually order these items from a restaurant near you. We will now move on to the fifth and final part of the study, where you will be asked a few questions about yourself. There are no 'right' or 'wrong' answers in this section. Please be as honest as possible about how you feel about them.

End of Block: Part Four: Donations and Choice Determinants

Start of Block: Part 5: Well being questions, Post-Treatment

Part 5
Part Five

In this part, you will be asked to re-evaluate your feelings on aspects of your life. There are no 'right' or 'wrong' answers. We are only interested in what you genuinely prefer.

Momentary Mood Post Please select the appropriate response on the scale below that indicates how well each adjective or phrase describes your present mood.

Happy (2)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)
Tired (3)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)
Anxious (4)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)
Calm (5)	○ Definitely do not feel (1)	○ Do not feel (2)	○ Slightly feel (3)	○ Definitely feel (4)

Choice Post Some people feel they have completely free choice and control over their decisions in life, while other people feel that what they decide upon has no real effect on what happens to them. Please select the appropriate response on the scale below to indicate how much control you have over your decisions in life.

	Definitely yes (19)	Probably yes (20)	Might or might not (21)	Probably not (22)	Definitely not (23)
I have completely free choice and control over the decisions I make in my life (1)	○	○	○	○	○

End of Block: Part 5: Well being questions, Post-Treatment

Start of Block: Part Five: Demographics

Education Please indicate the highest educational or school qualification you have obtained.

- ○ None of the above (11)
- ○ Completed primary school (10)
- ○ Completed secondary school (9)
- ○ Post-secondary vocational training up to 2 years (8)
- ○ Post-secondary vocational training up to 1 year (7)
- ○ Post-secondary academic (Below Degree level) qualification up to 2 years (6)
- ○ Post-secondary academic (Below Degree level) qualification up to 1 year (5)
- ○ Bachelors or equivalent first degree qualification (4)
- ○ Postgraduate diploma (Below Masters level) qualification (3)
- ○ Masters or equivalent higher degree qualification (2)
- ○ PhD or equivalent doctoral level qualification (1)
- ○ Prefer Not to Say (12)

Birth Country In which country were you born?
I was born in (1)

▼ Afghanistan,,,, (1) ... Zimbabwe,,,, (195)

Skip To: Religion If In which country were you born? = United Kingdom,,,,

UK Year In what year did you first come to this country to live, even if you have spent time abroad since?

Help: Definition of 'living in UK' is 3 months or more or a stay with an indefinite period of duration e.g. someone may have arrived in last week with an intention to settle indefinitely.
I first came to live in the UK in the year (1)

▼ 1940 (1) ... 2019 (80)

Religion What is your religion, even if you are not practising?
I am (1)

▼ Catholic (1) ... Atheist (18)

Ethnic Group What is your ethnic group?
I am (1)

▼ British/English/Scottish/Welsh/Northern (1) ... Prefer Not to Say (19)

Marital Status What is your current legal marital status?

	Not married (2)	Separated (3)	Divorced (4)	Widowed (5)	Married (6)	Civil Partnership (7)
I am (5)	○	○	○	○	○	○

Disclaimer Please note: Your answer to the next question will be kept completely confidential and will be used for statistical purposes only.

Income What is your annual earnings from all employment before taxes and other deductions? Please include any tips, bonuses, overtime pay or commissions.
I earn (undefined)

▼ Less than or equal to 20,000 pounds (1) ... More than £140,000 (10)

End of Block: Part Five: Demographics

Start of Block: Survey Conclusion and Note of Thanks

Note of thanks Thank you very much for your participation in this study!
We have recorded your answers. You will be now automatically enrolled in the random lottery draw to win 1 in 100 food vouchers worth £20 each and to win 1 in 100 Amazon cash vouchers worth your outcome in task 2. However, if you do not want to to be enrolled in the random lottery draw, please tick the box below.

○ I do not want to be enrolled in the random lottery draw to win a voucher. (4)

Skip To: Follow Up If Thank you very much for your participation in this study! We have recorded your answers. You will... = I do not want to be enrolled in the random lottery draw to win a voucher.

Skip To: Random Lottery Email If Thank you very much for your participation in this study! We have recorded your answers. You will... != I do not want to be enrolled in the random lottery draw to win a voucher.

Random Lottery Email Please enter your valid email address for correspondence regarding the random lottery draw

Follow Up You can also get a chance to win ONE in THREE £20 Amazon Vouchers by taking part in a follow-up survey. The follow-up survey will take less than a minute to answer and will

be sent out to you in one month's time from today. Please indicate your willingness to participate in the follow-up survey.

Please note, your chance to win the current 1 in 100 food vouchers and 1 in 100 Amazon vouchers are not dependent on your participation in the follow-up survey.

- ○ Yes, I would like to participate in the follow-up survey (1)
- ○ No, I would not like to participate in any additional follow-up survey (2)

Skip To: Followup Email If You can also get a chance to win ONE in THREE £20 Amazon Vouchers by taking part in a follow-up s... = Yes, I would like to participate in the follow-up survey

Skip To: End Note If You can also get a chance to win ONE in THREE £20 Amazon Vouchers by taking part in a follow-up s... = No, I would not like to participate in any additional follow-up survey

Followup Email Please enter your valid email address for correspondence regarding the follow-up survey.

_____

End Note Thank You for volunteering to take part in the additional survey. On completing the additional survey, you will be automatically entered into a random lottery draw to win three £20 Amazon vouchers.

End of Block: Survey Conclusion and Note of Thanks

Experiment—II

Start of Block: Consent

Consent Thank you for participating in this study. The study should take around 8 minutes to complete. You will be paid for your time in the survey at standard Prolific reward rates. In addition, you will get a chance to win 1 out of 60 vouchers (£20) when you finish the survey. Make sure to read all the instructions carefully. NOTE: You can withdraw from the study at any stage without providing an explanation. If you have any queries about the survey, please contact Julien Picard (j.r.picard@lse.ac.uk). Your privacy is very important, so we always use anonymised data. This project is in line with the ethical guidelines established by the Research Ethics Committee of the London School of Economics and Political Science. If you are happy to participate, please choose "I give my consent to participate in this research study" If you proceed further without consenting, you will not be able to return to this page and your survey will end automatically.

○ I consent to participating in the survey (4)

Skip To: Q7 If Thank you for participating in this study. The study should take around 8 minutes to complete. ... != I consent to participating in the survey

Skip To: End of Block If Thank you for participating in this study. The study should take around 8 minutes to complete. ... = I consent to participating in the survey

Q7 As you do not wish to participate in this study, please return your submission on Prolific by selecting the 'Stop without completing' button.

Skip To: End of Survey If As you do not wish to participate in this study, please return your submission on Prolific by sel... Is Displayed

End of Block: Consent

Start of Block: Prolific ID

Q9 Please enter your Prolific ID here:

_____

End of Block: Prolific ID

Start of Block: Attention checks

Check1 People are very busy these days and many do not have time to follow what goes on in the government. We are testing whether people read questions. To show that you've read this much, answer both "extremely interested" and "very interested":

- ☐ Not at all interested (4)
- ☐ Slightly interested (9)
- ☐ Moderately interested (10)
- ☐ Very interested (11)
- ☐ Extremely interested (12)

End of Block: Attention checks

Start of Block: Controls

Hurry* Do you have any other commitments that you need to attend to immediately after you finish this survey?

- ○ Yes, I am in a hurry now (1)
- ○ Yes, but I can be flexible about them. (2)
- ○ Yes, and I am currently multi-tasking. (4)
- ○ No (5)

Hungry How hungry are you at this very moment?

- ○ Extremely hungry (5)
- ○ Very hungry (4)
- ○ Moderately hungry (3)
- ○ Slightly hungry (2)
- ○ Not hungry at all (1)

Page Break

rank-env Rearrange the following food items in decreasing order of their carbon emissions.

For example, if you think item X generates more carbon emissions than item Y, then rank Item X as #1 and Item Y as #2.

If you are unsure, please make your best guess.

_____ 100g of ruminant meat (e.g., beef, lamb) (1)
_____ 100g of pork (3)
_____ 100g of poultry (e.g., chicken, duck) (4)
_____ 100g of white fish (e.g., cod, sea bass) (5)
_____ 100g of vegetables (6)
_____ 100g of cheese (7)
_____ 100g of eggs (9)

conf_env How confident are you about the ranking you just made?

- ○ Extremely confident (5)
- ○ Very confident (4)
- ○ Moderately confident (3)
- ○ Slightly confident (2)
- ○ Not confident at all (1)

Page Break

control Please tell us whether you agree with the following statements:

	Strongly agree (5)	Somewhat agree (4)	Neither agree nor disagree (3)	Somewhat disagree (2)	Strongly disagree (1)
When I think of a typical British dish, I usually think of it to be meat-based. (14)	○	○	○	○	○
I generally prefer eating British food. (15)	○	○	○	○	○

Page Break

Environmental belief Please tell us whether you agree with the following statements:

	Strongly agree (5)	Somewhat agree (4)	Neither agree or disagree (3)	Somewhat disagree (2)	Strongly disagree (1)
Claims that human activities are changing the climate are exaggerated. (1)	○	○	○	○	○
I feel a moral duty to do something about climate change. (2)	○	○	○	○	○

Page Break

ordering On average how frequently do you order your food using an online delivery service?

- ○ Once a year or less (8)
- ○ More than once a year but less than once a month (2)
- ○ Once a month (3)
- ○ More than once a month but less than once a week (4)
- ○ Once a week (5)
- ○ More than once a week but not daily (6)
- ○ Daily (7)

Page Break

political spectrum In political matters, people talk of "the left" and "the right." How would you place your views generally speaking?

	Left	Centre	Right	Skip question
	0		10	
()				

End of Block: Controls

Start of Block: Focus check

JS

Check2 (+code) Most modern theories of decision making recognize that decisions do not take place in a vacuum. Individual preferences and knowledge, along with situational variables can greatly impact the decision process. To demonstrate that you've read this much, just go ahead and select both red and green among the alternatives below.

Based on the text you read above, what colour have you been asked to select?

- ☐ White (1)
- ☐ Black (4)
- ☐ Red (5)
- ☐ Pink (6)
- ☐ Green (7)
- ☐ Blue (8)

Page Break

Display This Question:

If Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... != Red

And Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... != Green

Or If

Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... = Red

And Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... != Green

Or If

Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... != Red

And Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... = Green

Or If

Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... = White

Or Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... = Black

Or Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... = Pink

Or Most modern theories of decision making recognize that decisions do not take place in a vacuum. I... = Blue

Focus The last question was here to check if you are being attentive. You did not answer it correctly. We are really interested in what you genuinely prefer. We kindly request you to read the questions more attentively.

End of Block: Focus check

Start of Block: BSEPC-NC+NE1

BSEPC-NCNE-P

A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-

friendly.

Are you trying to change your diet to become more climate-friendly as well?

- ○ No, I am not trying now, and I do not intend to try in future (1)
- ○ No, I am not trying now, but I might consider changing my diet to be more-climate-friendly in future (4)
- ○ Yes, I am trying to change my diet now to become more climate-friendly (5)
- ○ Yes, I have already changed my diet to be more climate-friendly (6)

Page Break

BSEPC-NCNE-C You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to make this self-commitment?

- ○ Yes I am willing to commit to myself to try and adopt a climate-friendly diet (1)
- ○ No I am not willing to commit to myself to try and adopt a climate-friendly diet (2)
- ○ I am not sure (4)

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = I am not sure

Or You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = No I am not willing to commit to myself to try and adopt a climate-friendly diet

*

BSEPC-NCNE-no What prevents you from making this commitment? In one or two sentences, please write down your thoughts in the text box below.

_____

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = Yes I am willing to commit to myself to try and adopt a climate-friendly diet

BSEPC-NCNE-yes How will you hold yourself accountable to follow through with your commitment? In one or two sentences, please write down your strategy in the text box below.

Page Break

Instructions

Imagine you are in a restaurant. You will be presented with a menu to place an order for a meal. Please choose an item that you would like to eat for real.

By completing this task, you will get a chance to win a food voucher worth £20 that you can use after this survey to place an actual order.

Page Break

BSEPC-NCNE-default1

Click to zoom

Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEPC-NCNE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Eggs, cheddar and ham (19) ... Lamb in potato crust (59)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEPC-NCNE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

Page Break

BSEPC-NCNE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (9)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEPC-NCNE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: BSEPC-NC+NE1

Start of Block: BSEPC-C+NE1

BSEPC-CNE-P A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

Are you trying to change your diet to become more climate-friendly as well?

- ○ No, I am not trying now, and I do not intend to try in future (1)
- ○ No, I am not trying now, but I might consider changing my diet to be more-climate-friendly in future (4)
- ○ Yes, I am trying to change my diet now to become more climate-friendly (5)
- ○ Yes, I have already changed my diet to be more climate-friendly (6)

Page Break

BSEPC-CNE-C You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to make this self-commitment?

- ○ Yes I am willing to commit to myself to try and adopt a climate-friendly diet (1)
- ○ No I am not willing to commit to myself to try and adopt a climate-friendly diet (2)
- ○ I am not sure (4)

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = No I am not willing to commit to myself to try and adopt a climate-friendly diet

Or You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = I am not sure

*

BSEPC-CNE-no What prevents you from making this commitment? In one or two sentences, please write down your thoughts in the text box below.

_____

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = Yes I am willing to commit to myself to try and adopt a climate-friendly diet

BSEPC-CNE-yes How will you hold yourself accountable to follow through with your commitment? In one or two sentences, please write down your strategy in the text box below.

Page Break

Instructions

Imagine you are in a restaurant. You will be presented with a menu to place an order for a meal. Please choose an item that you would like to eat for real.

By completing this task, you will get a chance to win a food voucher worth £20 that you can use after this survey to place an actual order.

Page Break

BSEPC-CNE-default1

Click to zoom

Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEPC-CNE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (vegetable) (7) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEPC-CNE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

BSEPC-CNE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEPC-CNE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (13) ... ${e://Field/choice12c} (36)

End of Block: BSEPC-C+NE1

Start of Block: BSEPC-NC+E1

BSEPC-NCE-P A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

Are you trying to change your diet to become more climate-friendly as well?

- ○ No, I am not trying now, and I do not intend to try in future (1)
- ○ No, I am not trying now, but I might consider changing my diet to be more-climate-friendly in future (4)
- ○ Yes, I am trying to change my diet now to become more climate-friendly (5)
- ○ Yes, I have already changed my diet to be more climate-friendly (6)

Page Break

BSEPC-NCE-C You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to make this self-commitment?

- ○ Yes I am willing to commit to myself to try and adopt a climate-friendly diet (1)
- ○ No I am not willing to commit to myself to try and adopt a climate-friendly diet (2)
- ○ I am not sure (4)

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = No I am not willing to commit to myself to try and adopt a climate-friendly diet

Or You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = I am not sure

*

BSEPC-NCE-no What prevents you from making this commitment? In one or two sentences, please write down your thoughts in the text box below.

_____

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = Yes I am willing to commit to myself to try and adopt a climate-friendly diet

BSEPC-NCE-yes How will you hold yourself accountable to follow through with your commitment? In one or two sentences, please write down your strategy in the text box below.

Page Break

Instructions

Imagine you are in a restaurant. You will be presented with a menu to place an order for a meal. Please choose an item that you would like to eat for real.

By completing this task, you will get a chance to win a food voucher worth £20 that you can use after this survey to place an actual order.

Page Break

BSEPC-NCE-default1

Click to zoom

Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEPC-NCE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Eggs and grilled vegetable (V) (13) ... Lamb in potato crust (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEPC-NCE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (47)

Page Break

BSEPC-NCE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEPC-NCE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: BSEPC-NC+E1

Start of Block: BSEPC-C+E1

BSEPC-CE-P A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

Are you trying to change your diet to become more climate-friendly as well?

- No, I am not trying now, and I do not intend to try in future (1)
- No, I am not trying now, but I might consider changing my diet to be more-climate-friendly in future (4)
- Yes, I am trying to change my diet now to become more climate-friendly (5)
- Yes, I have already changed my diet to be more climate-friendly (6)

Page Break

BSEPC-CE-C You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to make this self-commitment?

- ○ Yes I am willing to commit to myself to try and adopt a climate-friendly diet (1)
- ○ No I am not willing to commit to myself to try and adopt a climate-friendly diet (2)
- ○ I am not sure (4)

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = No I am not willing to commit to myself to try and adopt a climate-friendly diet

Or You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = I am not sure

*

BSEPC-CE-no What prevents you from making this commitment? In one or two sentences, please write down your thoughts in the text box below.

_____

Page Break

Display This Question:

If You can make a commitment to yourself to try to adopt climate-friendly diets. Are you willing to... = Yes I am willing to commit to myself to try and adopt a climate-friendly diet

BSEPC-CE-yes How will you hold yourself accountable to follow through with your commitment? In one or two sentences, please write down your strategy in the text box below.

Page Break

Instructions

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Page Break

BSEPC-CE-default1

Click to zoom

Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEPC-CE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (vegetable) (1) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEPC-CE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

BSEPC-CE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEPC-CE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (13) ... ${e://Field/choice12c} (36)

End of Block: BSEPC-C+E1

Start of Block: BSEP-NC+NE1

BSEP-NCNE-P A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

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- ○ No, I am not trying now, and I do not intend to try in future (1)
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- ○ Yes, I am trying to change my diet now to become more climate-friendly (5)
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Page Break

Instructions

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Page Break

BSEP-NCNE-default1

Click to zoom

Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEP-NCNE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Eggs, cheddar and ham (19) ... Lamb in potato crust (48)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEP-NCNE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

Page Break

BSEP-NCNE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

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Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEP-NCNE-rev1

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Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: BSEP-NC+NE1

Start of Block: BSEP-C+NE1

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Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEP-CNE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (ham & cheese) (7) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEP-CNE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

BSEP-CNE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEP-CNE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (13) ... ${e://Field/choice12c} (36)

End of Block: BSEP-C+NE1

Start of Block: BSEP-NC+E1

BSEP-NCE-P A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

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If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEP-NCE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Eggs and grilled vegetable (V) (13) ... Lamb in potato crust (47)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEP-NCE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

Page Break

BSEP-NCE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEP-NCE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: BSEP-NC+E1

Start of Block: BSEP-C+E1

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BSEP-CE-default1

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If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSEP-CE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (vegetable) (1) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSEP-CE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

BSEP-CE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSEP-CE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (13) ... ${e://Field/choice12c} (36)

End of Block: BSEP-C+E1

Start of Block: BSE-NC+NE1

BSE-NCNE-SE A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

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Page Break

BSE-NCNE-default1

Click to zoom

Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSE-NCNE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Eggs, cheddar and ham (19) ... Lamb in potato crust (48)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSE-NCNE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

Page Break

BSE-NCNE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSE-NCNE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: BSE-NC+NE1

Start of Block: BSE-C+NE1

BSE-CNE-SE A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

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Page Break

BSE-CNE-default1

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Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSE-CNE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (ham & cheese) (7) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSE-CNE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

BSE-CNE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSE-CNE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (13) ... ${e://Field/choice12c} (36)

End of Block: BSE-C+NE1

Start of Block: BSE-NC+E1

BSE-NCE-SE A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

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Page Break

BSE-NCE-default1

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Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
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Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSE-NCE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Eggs and grilled vegetable (V) (13) ... Lamb in potato crust (47)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSE-NCE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

Page Break

BSE-NCE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
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Page Break

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If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

BSE-NCE-rev1

Please consider the menu with all the available options below:

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Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: BSE-NC+E1

Start of Block: BSE-C+E1

BSE-CE-intro1 A study published in The Lancet Planetary Health found that the share of British people who stopped eating meat has increased by more than 50% from 2008 to 2019. More and more people are choosing plant-based dishes that are kinder to the planet and in turn are becoming climate-friendly.

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Page Break

BSE-CE-default1

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Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

BSE-CE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (vegetable) (1) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

BSE-CE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

BSE-CE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

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BSE-CE-rev1

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Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (13) ... ${e://Field/choice12c} (36)

End of Block: BSE-C+E1

Start of Block: B-NC+NE1

Instructions

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Page Break

B-NCNE-default1

Click to zoom

Would you like to choose an item from this menu?

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Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

B-NCNE-optin1

Click to zoom

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B-NCNE-optout1

Please consider the menu with all the available options below:

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Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

Page Break

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JS

B-NCNE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: B-NC+NE1

Start of Block: B-C+NE1

Instructions

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Page Break

B-CNE-default1

Click to zoom

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Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

B-CNE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (ham & cheese) (7) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

B-CNE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

B-CNE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

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JS

B-CNE-rev1

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End of Block: B-C+NE1

Start of Block: B-NC+E1

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B-NCE-default1

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- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

B-NCE-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Eggs and grilled vegetable (V) (13) ... Lamb in potato crust (47)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

B-NCE-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

Page Break

B-NCE-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

B-NCE-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1nc} (13) ... ${e://Field/choice12nc} (36)

End of Block: B-NC+E1

Start of Block: B-E+C1

Instructions

Imagine you are in a restaurant. You will be presented with a menu to place an order for a meal. Please choose an item that you would like to eat for real.

By completing this task, you will get a chance to win a food voucher worth £20 that you can use after this survey to place an actual order.

Page Break

B-EC-default1

Click to zoom

Would you like to choose an item from this menu?

- ○ Yes, I would like to choose an item from this menu (1)
- ○ No, I would like to see the whole menu (0)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = Yes, I would like to choose an item from this menu

JS

B-EC-optin1

Click to zoom

Please choose your food item in the dropdown menu below:

▼ Chef's selection: Ploughman's lunch (vegetable) (1) ... Shepherd's pie (lamb) (58)

Page Break

Display This Question:

If Click to zoom Would you like to choose an item from this menu? = No, I would like to see the whole menu

JS

B-EC-optout1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (1) ... ${e://Field/choice12c} (46)

Page Break

B-EC-confiden1 If we contact the restaurant now to place this order for you, will you be happy for us to proceed?

- ○ Yes, please place this order for me (1)
- ○ No, I would like to change my choice (0)

Page Break

Display This Question:

If If we contact the restaurant now to place this order for you, will you be happy for us to proceed? = No, I would like to change my choice

JS

B-EC-rev1

Please consider the menu with all the available options below:

Click to zoom

Please choose your food item in the dropdown menu below:

▼ ${e://Field/choice1c} (13) ... ${e://Field/choice12c} (36)

End of Block: B-E+C1

Start of Block: Follow-up

JS

manip Before being shown the restaurant menu, you were shown a message. What was the message about?

- People changing diets to become climate-friendly (5)
- People changing their diets to lose weight (6)
- People changing their diets to respect animals' well-being (7)
- I was not shown any specific message (8)
- I do not remember any specific message displayed (9)

Page Break

palatability Please indicate whether you agree with the following statements.

	Strongly agree (5)	Somewhat agree (4)	Neither agree nor disagree (3)	Somewhat disagree (2)	Strongly disagree (1)
I will go to a restaurant that offers this menu. (12)	○	○	○	○	○
I usually choose something similar to ${e://Field/option4} when I am in restaurants that offer similar menus. (8)	○	○	○	○	○
I feel I have done my bit for the environment. (14)	○	○	○	○	○

Page Break

Tradeoff

Think of your food choice and how you arrived at it. Did you feel that choosing a climate friendly food item meant you had to sacrifice something you liked?

- ○ Strongly agree (5)
- ○ Somewhat agree (4)
- ○ Neither agree nor disagree (3)
- ○ Somewhat disagree (2)
- ○ Strongly disagree (1)

Page Break

spill-yn If you win a £20 voucher, would you like to donate some of it to a charity that supports climate-friendly causes? You will have the opportunity to donate to a charity of your choice.

Please answer realistically. If you choose to donate and win the voucher, your donation will be automatically deducted from the total value of the voucher.

- ○ Yes (1)
- ○ No (0)

Page Break

Display This Question:

If If you win a £20 voucher, would you like to donate some of it to a charity that supports climate-... = Yes

spill Which of the following charities would you like to support?

- World Wide Fund (WWF) (1)
- Friends of the Earth (3)
- Carbon Fund (4)
- Campaign against Climate Change (11)
- The Vegetarian Society (12)
- The Vegan Society (13)
- Extinction Rebellion (14)
- Woodland Trust (15)
- Other (please specify) (10)

Page Break

Display This Question:

If If you win a £20 voucher, would you like to donate some of it to a charity that supports climate-... = Yes

spill-d How much are you willing to donate from your voucher? You can donate up to £10.

▼ £1 (45) ... £10 (54)

End of Block: Follow-up

Start of Block: WTA

Display This Question:

If feedback = 1

WTA_high
Imagine the restaurant is running out of ingredients. They cannot offer you ${e://Field/option4}. Instead, it proposes to replace it with one of the following items:

${e://Field/option1} - £10
${e://Field/option2} - £10
${e://Field/option3} - £10

The restaurant will offer you a refund based on the price difference. It will also offer you an additional discount for the inconvenience caused.

The restaurant informs you that choosing any of these three items has an additional benefit of reducing carbon emissions. It estimates your new order to generate ${e://Field/CO2}kg fewer carbon emissions. ${e://Field/CO2}kg of carbon emissions is equivalent to driving ${e://Field/mile} miles with a regular petrol car.

What is the minimum amount of discount that you will be willing to accept to stay and choose one of these items?

- ○ £0 (4)
- ○ £1 (5)
- ○ £2 (6)
- ○ £3 (7)
- ○ £4 (8)
- ○ £5 (9)
- ○ £6 (10)
- ○ £7 (11)
- ○ £8 (12)
- ○ £9 (13)

- ○ £10 (14)
- ○ I do not like any of these options, I want to leave. (15)

Display This Question:

If feedback = 0

WTA_low

Imagine the restaurant is running out of ingredients. They cannot offer you ${e://Field/option4}. Instead, it proposes to replace it with one of the following items:

${e://Field/option1} - £10
${e://Field/option2} - £10
${e://Field/option3} - £10

The restaurant will offer you a refund based on the price difference. It will also offer you an additional discount for the inconvenience caused.

What is the minimum amount of discount that you will be willing to accept to stay and choose one of these items?

- ○ £0 (4)
- ○ £1 (5)
- ○ £2 (15)
- ○ £3 (6)
- ○ £4 (7)
- ○ £5 (8)
- ○ £6 (9)
- ○ £7 (10)
- ○ £8 (11)
- ○ £9 (12)
- ○ £10 (13)
- ○ I do not like any of these options, I want to leave. (14)

End of Block: WTA

Start of Block: WTA_control

WTA

Imagine the restaurant is running out of ingredients. They cannot offer you ${e://Field/option4}. Instead, it proposes to replace it with one of the following items:

${e://Field/option1} - £10
${e://Field/option2} - £10
${e://Field/option3} - £10

The restaurant will offer you a refund based on the price difference. It will also offer you an additional discount for the inconvenience caused.
What is the minimum amount of discount that you will be willing to accept to stay and choose one of these items?

- ○ £0 (4)
- ○ £1 (5)
- ○ £2 (6)
- ○ £3 (7)
- ○ £4 (8)
- ○ £5 (9)
- ○ £6 (10)
- ○ £7 (11)
- ○ £8 (12)
- ○ £9 (13)
- ○ £10 (14)
- ○ I do not like any of these options, I want to leave. (15)

End of Block: WTA_control

Start of Block: ManipCheck_WTA

Manip_check_WTA
Please indicate whether the following statement is true or false.

In the previous question, the restaurant informed you that the three remaining items have lower carbon emissions than your initial choice.

- True (1)
- False (0)

End of Block: ManipCheck_WTA

Start of Block: Scrutiny

Scrutiny
Imagine we create a dashboard at the end of this survey. This dashboard will be publicly visible to all respondents participating in this survey. It will have the following information: (a) respondent's name (b) respondent's food choice and its climate impact.

Would you like us to include your name and your choice, ${e://Field/option4}, in creating this dashboard?

- Yes (1)
- No (0)

End of Block: Scrutiny

Start of Block: Demographics

Zipcode digits Please enter the first three digits of your postcode:
1 (1)

▼ AL1 (1) ... YO8 (1108)

Age How old are you?

- ○ Under 18 (1)
- ○ 18-24 years old (2)
- ○ 25-34 years old (3)
- ○ 35-44 years old (4)
- ○ 45-54 years old (5)
- ○ 55-64 years old (6)
- ○ 65+ years old (7)

Education Please indicate the highest educational or school qualification you have obtained.

- ○ Completed primary school (10)
- ○ Primary education (14)
- ○ Lower secondary education (15)
- ○ Upper secondary education (16)
- ○ Post-secondary non-tertiary education (17)
- ○ Short-cycle tertiary education (18)
- ○ Bachelor or equivalent (19)
- ○ Master or equivalent (20)
- ○ Doctoral or equivalent (21)
- ○ None of the above (11)

Gender How do you describe yourself?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer to self-describe (4) _____
- ○ Prefer not to say (5)

Income What is your total personal income per year (after tax) in GBP?

- ○ Less than £10,000 (1)
- ○ £10,000 - £15,999 (2)
- ○ £16,000 - £19,999 (3)
- ○ £20,000 - £29,999 (4)
- ○ £30,000 - £39,999 (5)
- ○ £40,000 - £49,999 (6)
- ○ £50,000 - £69,999 (7)
- ○ £70,000 - £89,999 (9)
- ○ £90,000 - £119,999 (11)
- ○ £120,000 - £149,999 (12)
- ○ More than £150,000 (13)
- ○ Rather not say (14)

End of Block: Demographics