Blinded by worries: sin taxes and demand for temptation under financial worries

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Abstract

Imposing "sin" taxes has been the preferred way governments tried to discourage the over-consumption of temptation goods for decades. However numerous evidence shows that consumers exhibit behavioral biases which can affect their reaction to taxes. This paper investigates a potential bias and how it affects demand for temptation: financial worries associated with poverty have been shown to shift attention towards pressing needs, often at the expense of forward-looking decisions. In an online experiment with UK participants, we randomly induce financial worries and ask participants to allocate a budget between basic necessities and temptation goods in an experimental market. We randomly impose "taxes" on temptation by increasing its price. We find that, in the absence of any tax, inducing financial worries lowers demand for temptation, effect stronger for lower-income participants. However, when financial concerns are salient, increasing the tax does not lower demand among lower-income participants. While financial worries might protect against over-consumption of temptation in the absence of tax changes, they also might hurt the poor the most when additional taxes are introduced.

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1 Introduction

The shift in behavior concerning the over-consumption of *temptation* (addictive) goods, such as alcohol and tobacco, has been a goal of policy makers for decades. One of the main methods employed by governments is the so called *sin taxes*—a mechanism levied on goods that produce negative health effects and tend to be over-consumed. However, evidence shows that consumption of goods such as as junk food, sugary drinks, or tobacco, has a strong disproportionate socioeconomic concentration (Gruber, 2001; Allcott et al., 2019b; Colman and Remler, 2008; Maclean et al., 2014), which implies that low-income consumers might carry a bigger tax burden. Using US cigarette consumption data, Gruber and Kőszegi (2004) show that overall benefits from averted internalities offset the incurred costs and overturn the regressivity[1]. However, the overall welfare gains from sin taxes can end up being lower than expected solely because of behavioral aspects that are not considered in the classical economic models of addiction.

The last few decades have seen numerous studies documenting differences in behaviors by low socioeconomic status consumers. Financial deprivation has been found to have a negative emotional impact on consumers (Zhou & Fishbach, 2016; Kristofferson et al., 2017; Botti et al., 2008) and through time alter their self-beliefs in an unfavourable way (Botti et al., 2008; Sharma and Alter 2012). Such feelings of financial inferiority cause willingness to counteract it by engaging in e.g. selfish acts (Roux et al. 2015), status- (Griskevicius & Kenrick, 2013; Chaplin et al., 2014; Hill et al., 2012b) or exclusivity- (Sharma & Alter, 2012) seeking behaviors. In addition to this, a separate stream of works on *the psychology of poverty* has found financial deprivation to affect cognitive functioning, attention (Mullainathan & Shafir, 2013; Mani et al., 2013), memory (Tomm & Zhao, 2016), investment in human capital (Lichand et al., 2018; Burlacu et al., 2019), productivity (Kaur et al., 2019), risk and time preferences (Haushofer & Fehr, 2014). When contemplating such evidence, one is certain to ask whether these behaviors would alter the normative response to taxes. A handful of works on tax salience have found consumers to under-react to not-fully-salient taxes (Morrison & Taubinsky, 2019; Feldman et al., 2015; Chetty et al., 2009; Taubinsky & Rees-Jones 2017). However, in line with studies showing that consumers who face resource scarcity also tend to make more attentive decisions (Shah et al., 2012, 2015) and be more efficient with the use of those resources (Mullainathan and Shafir 2013; Mehta & Zhu, 2016; Rosa et al., 2012), Goldin and Homonoff (2013) suggest that low income consumers might be more attentive to non-salient taxes levied on tobacco.

This paper explores a behavioral bias emerging from the psychology of poverty literature which has not been studied in the context of consumption of temptation and sin taxes[2]. Poverty, scarcity of financial resources, has been shown to affect

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[1] This is an empirical exercise and cannot be generalized, the exact outcome depends on various behavioral biases. Furthermore, they only consider time inconsistency as bias in their models, while there is evidence that other biases may also affect disproportionately the poor.

[2] For theoretical work on relationship between poverty and temptation, see Banerjee and Mullainathan (2010) and Bernheim et al. (2015). Banerjee and Mullainathan (2008) explores theoretically the link between poverty and limited attention.

cognitive performance (Mani et al., 2013) and investment decisions in human capital (Lichand et al., 2018; Burlacu et al., 2019). The proposed channel is scarcity shifting focus towards the scarce resource (Shah et al., 2018), often at the expense of forward-looking decisions. One feature of poverty not explored until now is that it also implies scarcity of immediate gratification. A person experiencing poverty has much stricter constraints when it comes to the choices she or he can make. Shopping for groceries means carefully selecting necessary items, not allowing much slack for goods that offer immediate pleasure. Temptation goods may serve this need and are much harder to substitute given a limited budget (low income individuals cannot afford going to cultural events, dining out or going on holidays as easily as higher-income individuals can). If low-income people perceive temptation goods as scarce, attention may be redirected towards them which could be a channel explaining why they over-consume them. In this paper, we investigate which of the two forms of scarcity is more likely to drive the behavior of low-income people when financial worries are salient. In addition, we investigate if such psychological mechanisms may change how people respond to sin taxes.

In an online experiment in the UK, 808 participants are first assigned to a psychological manipulation which aims to mimic the mental burden of poverty by making thoughts associated with economic vulnerability and lack of financial resources salient. For brevity, we will refer to this as increasing financial worries (*FW* henceforth). Adapted from Mani et al. (2013), the treatment consists of asking participants to ponder how their household could cope if they had to face various economic shocks. The treatment varies the severity of the shock, from mild for control group participants (Easy Scenarios—*Easy group/condition*) to severe for the treatment group (Hard Scenarios—*Hard group/condition*).

Next, participants are endowed with a £30 budget to be spent on basic necessities (food, household products) or on temptation (alcohol, tobacco, sugary drinks, sweets, unhealthy snacks and personal luxury goods). At this stage a second treatment is introduced by exogenously varying the price of temptation: a random share of participants face the market price while the rest face higher prices by 10% or 20%. We will refer to this treatment group as the *Tax group* throughout the paper.

We find that increasing FW decreases the demand for temptation when no additional tax is applied. The magnitude of the effect is the equivalent of a 10% price increase, suggesting that the shift in focus towards necessities may actually protect against the over-consumption of temptation. However, in line with Shah et al. (2012), Zhu and Ratner (2015) and Burlacu et al. (2019), we find that the shift in focus comes at a price: participants become far less sensitive to other relevant information, in our design this being the increase in prices. For the Hard group, the effect of the tax is statistically insignificant at all tax levels. In contrast, demand for temptation is highly elastic in the Easy group.

We check if results vary by tertiles of income. As expected, both effects are stronger for lower-income participants. Increasing FW has a large effect on their demand in the absence of the tax. However, it also makes them unresponsive to taxes. When FW are not made salient, lower-income participants decrease demand only in response to the 20% tax. Averaging the tax effects in the Easy and Hard conditions results in a flat demand curve for the lower-income group. In contrast,

higher-income participants respond strongly to the tax, especially in the Easy condition. However, increasing FW also appears to decrease demand and to dampen their response to the tax. Among the middle tertile, increasing FW does not have any significant impact on demand at any tax level.

We investigate several mechanisms suggested by the literature for the observed effects (lower demand for temptation and non-response to increases in prices when FW are salient): the hypothesized *shift-in-focus* channel (proxied through through two survey questions), cognitive reflection, risk and time preferences, and affective states. Only the first channel explains a substantial share of both effects.

Welfare implications are not straightforward and should be treated only as suggestive given the absence of a normative counterfactual. Independently of the Easy and Hard condition, we find the elasticity of demand with respect to price to be increasing in income which would suggest such taxes to be potentially regressive. Looking at the dynamics by Easy and Hard condition, we again find that the elasticity increases with income when FW are not salient. Increasing FW reduces demand by the highest amount for lower-income participants when no additional tax is added, but at the expense of making them unresponsive to taxes. From a policy perspective, the results suggest that low-income individuals may not respond optimally to sin tax increases in periods of economic instability.

This paper speaks to several literature. To our knowledge, this is the first paper to study addictive goods in the psychology of poverty framework and to provide causal evidence that perceived financial worries associated with poverty can lower the demand for addictive goods, while distorting how people respond to sin taxes. In these lines, the paper contributes to the vast behavioral economics literature documenting the role played by psychological factors on (i) addiction (Gruber 2001; Gruber and Kőszegi 2004; Allcott et al. 2019a) and (ii) public policy in general (Amir et al. 2005; Bernheim and Rangel 2007; Chetty et al. 2009; Congdon et al. 2011; Chetty 2015; Bernheim and Taubinsky 2018). Furthermore, the paper contributes to the growing literature on the psychology of poverty (Mani et al. 2013; Mullainathan and Shafir 2013) and in particular strengthening the finding that poverty shifts focus to pressing needs at the cost of under-weighting other relevant information (Shah et al. 2012, 2018; Tomm and Zhao 2016; Lichand et al. 2018; Burlacu et al. 2019). Finally, the paper contributes to the growing experimental literature using laboratory or field experiments to study public policies (Alm 2010; Rees-Jones and Taubinsky 2016; Mullainathan and Shafir 2013; Taubinsky and Rees-Jones 2017; Lunn and Choisdealbha 2018).

The paper is organized as follows. Section 2 reviews the recent literature on sin taxes and psychology of poverty. Section 3 presents the hypotheses, experimental design, data details, descriptive statistics and balance checks, while Sect. 4 discusses the manipulation check and main results. Finally, Sect. 5 provides a discussion and concludes.

2 Literature

Deviations from behavioral norms due to financial deprivation have gained momentum in various literatures of a recent decade. Studies on resource scarcity and consumer behavior have underlined an array of such examples. In general, consumers tend to continuously make upward social comparisons (Corcoran et al., 2011; Hill et al., 2012a), which can result in feelings of inferiority (Sharma & Alter, 2012) when they are relatively deprived in finances. To counteract it people may develop a wish to establish status (Griskevicius and Kenrick 2013), usually manifested through higher level of materialism (Chaplin et al., 2014). Status-seeking has also been observed through higher consumption of beauty products by women facing financial constraints (Hill et al., 2012; Netchaeva & Rees, 2016). Feeling relatively deprived of finances in comparison to others also pushes consumers to mitigate this by directing their attention to scarce goods, especially if they make your ownership more exclusive (Sharma & Alter, 2012). Conversely, Karlsson et al. (2005) find that households which feel comparatively worse-off in financial terms report less acquisitions of durable goods and tend to plan their purchases in greater details (Karlsson et al., 2005).

A restricted choice set, i.e. a smaller number of available products and services, due to lower financial resources, can also have an emotional impact on decision making (Zhu & Ratner, 2015) causing feelings of aggression (Kristofferson et al., 2017), anger, depression or stress (Botti et al., 2008). Limited availability of products can trigger the need to consume more of them; moreover, the amount consumed can go unnoticed while trying to meet this new higher level of satiation (Sevilla & Redden, 2014). Chronic choice restriction can decrease self-esteem, efficacy and autonomy (Bone et al., 2014). When reminded of scarce resources, consumers tend to engage in selfish acts, directing resources towards their own needs; even generosity is exhibited only in cases where it is also possible to achieve personal gains (Roux et al., 2015). A study on scarcity, consumer choice, and neuroimaging by Huijsmans et al. (2019) has suggested that the increased focus on scarce resources decreases the activity in the brain centre associated with goal-directed decision making and the effect is strongest when scarcity is preceded by the period of abundance, which would suggest that focus on financial deprivation interferes with the ability to follow goals in decision making.

A stream of empirical studies on *psychology of poverty* and its impact on economic decision-making ties into the previously mentioned examples: by shifting individual attention to that which is lacking, scarcity of resources is found to affect cognitive functioning (Mullainathan & Shafir, 2013). This leads people to overlook certain information when making a decision (Mullainathan & Shafir, 2013) or keep monetary concerns on top of their mind even when it is not explicitly linked to the situation one is supposed to think of Shah et al. (2018). For example, in an experiment by Tomm and Zhao (2016) participants with smaller endowment spent more time looking at the prices when asked to choose from a menu in a restaurant and were able to remember them more accurately as compared to "richer" participants; however this came at a cost of unnoticed discount announcements that

could have helped them to save money. Financial concerns were also linked to cognitive functioning in a work by Mani et al. (2013). In a first study carried out in a shopping mall in the US, participants were asked to reflect how they would cope with hard financial situations as compared with easy ones. People of lower income performed much worse in unrelated cognitive tasks when prior exposed to hard financial scenarios, while people of higher income were found to exhibit no difference in their scores. In a natural experiment carried out in sugarcane farmers' villages in India, farmers performed worse in cognitive tasks before harvests (period of higher financial scarcity) than after harvest. In a similar design to the sugarcane farmers' experiment, Carvalho et al. (2016) administered before and after payday surveys to US households. Results indicate stronger present bias in decisions involving monetary rewards in the before-payday survey, although no differences are found in regard to risk preferences, cognitive functions, and quality of other decisions. Burlacu et al. (2019) suggest that, when faced with financial worries, parents tend to overlook the opportunity to invest in the human capital of their child by choosing necessities, such as groceries, instead of highly subsidized educational materials for children.

Although some of the purchasing decisions might look sub-optimal when made under a financial constraint, consumers facing resource scarcity are also found to be more focused on the greatest needs when evaluating the trade-offs in their consumption decisions, react less to framing (Shah et al., 2015), and be more attentive and engaged (Shah et al., 2012). People with low income show higher efficiency in the use of resources (Mullainathan and Shafir 2013) and choose necessities more as compared with discretionary goods (which are chosen more by people that are relatively financially unconstrained) (Cole et al., 2008). Restricted choice of available purchases can also foster more creative problem solving (Botti et al., 2008), such as thinking of more uses for the product as compared to its intended function (Mehta & Zhu, 2016; Rosa et al., 2012).

This plethora of consumer behaviors comes into focus when discussing such matters as the effect of price increases. Certain policies can have the intention to tackle the over-consumption of particular products, however, as highlighted above, lack of financial resources or monetary concerns can interact with purchasing decisions. Evidence tends to point out that the consumption of tobacco, sugar-sweetened beverages, or junk food is prevalent among lower socioeconomic status individuals (Gruber, 2001; Colman & Remler, 2008; Maclean et al., 2014; Allcott et al., 2019a, 2019b; Dubois et al., 2017; Wang, 2015). These products are—in many cases—also subject to so called *sin taxes*, i.e. taxes put on goods that are associated with over-consumption and negative effects to both consumer and society. However, if low-income consumers tend to consume more temptation goods, they might carry a bigger tax burden on their shoulders. As Allcott et al. (2019b) point out, we need a clear distinction between the weight of tax burden and the overall harms and benefits. First, consumption decision depends on price elasticity of demand, meaning that although poorer individuals might consume more temptation goods *per se*, they may be more price elastic. Moreover, if poorer households decrease their consumption of temptation goods such as tobacco or sugary drinks, this results in better health outcomes and, in turn, lower medical

expenditures, increase productivity and life expectancy, thus overturning the regressivity argument (Gruber & Kőszegi, 2004; Allcott et al., 2019b). The problem arises when we discuss behavioral biases: the choice of consuming temptation goods can stem from such issues as misinformation or self-control and it can bias the estimated positive impact of sin taxes downward. Allcott et al. (2019a) estimate that, for example, sugar-sweetened beverage tax designed without addressing behavioral issues can result in $1 billion a year less of welfare gains in the United States.

Poverty itself may amplify such biases. Recent theoretical work building on the framework of time-inconsistent preferences (Thaler & Shefrin, 1981; Laibson, 1997; O'Donoghue & Rabin, 1999) suggests a causal relationship between poverty and temptation. Banerjee and Mullainathan (2010) allow for good specific discount factors by defining temptation as goods providing utility only in the present. The present-self does not want future-selves to consume and as a result prefers consuming more today, leading to apparently higher observed discount factors. Assuming that temptation has a lower share of marginal expenditure as income increases (temptation does not rise proportionally with income), the structure of temptation described above is much more consequential for the poor by causing more severe self-control issues. This can help explain a wide range of puzzling behaviors, from savings, credit and investment behaviors to the emergence of poverty traps conditional on initial wealth. In a different theoretical setting concerning savings and credit constraints, Bernheim et al. (2015) demonstrate a similar perpetuating causal relationship between poverty and self-control. According to their model, below a certain asset level self-control is even impossible to exert.

To our knowledge, there are only a handful of experimental studies looking at the behavioral response to taxes. A stronger focus was dedicated to the issue of tax salience. Feldman and Ruffle (2015) run a series of experiments to look at how different tax schemes - tax-inclusive, -exclusive, and -rebate - impact final demand of products in the experimental market. The results imply that consumers tend to overweight posted prices and exhibit higher demand when taxes are calculated at the checkout. Feldman et al. (2015) elaborate further on this matter by asking how different tax levels affect this failure to account for taxes which are not included in the posted price; they do not observe a decline in good purchases when tax levels increase. Taubinsky and Rees-Jones (2017) look at this matter from a perspective of consumer mistakes. According to the results of their experiment, although the reaction to not-fully-salient taxes is very heterogeneous among the sample, on average consumers under-react to taxes, i.e. they respond to sales tax as if its size was just 25% of the original tax level. Moreover, as underlined by Morrison and Taubinsky (2019), consumers use rules of thumb for reacting to taxes (which are very heterogeneous among the experimental population), but once taxes increase they pay for increased attention with higher mental cost. To put tax salience to test in a field setting, Chetty et al. (2009) run an experiment where they compared demands for products with normal and tax-inclusive price tags. They find that tax salience reduces consumption by 8%. Moreover, in their observational study on alcohol consumption, increase in taxes which are posted on price tags is found to

have a higher effect on lowering alcohol consumption when compared to taxes applied in the register. Similarly to Chetty et al. (2009), Goldin and Homonoff (2013) checked for the effect of tobacco tax salience by income levels. All consumers reacted to taxes in the posted prices, but lower-income individuals were more attentive and reactive to taxes applied in the register.

The gap this study is trying to fill is investigating temptation consumption decisions under financial worries. Previous studies have focused on time inconsistency as a main bias, affecting dis-proportionally the poor, and leading to over-consumption of temptation (Gruber 2001; Gruber & Kőszegi, 2004; Allcott et al., 2019a, 2019b). The attention reallocation caused by focusing on monetary concerns may be an important additional factor affecting to a larger magnitude the consumption decisions of the poor.

The setting of this study is the United Kingdom, which has a long history of tobacco and alcohol duties. Among European Union countries, UK has one of the highest rates of beverage taxes among all categories (Angus et al., 2019). Duty rates differ based on the type of beverage (beer, cider, wine, or spirit) and the strength of it, where drinks with higher strength are taxed more. On the demand side, Sousa (2014) finds that in the UK a great majority of alcohol products have an inelastic demand and the elasticity estimates do not change significantly between low, medium, and high income households (data from 2007 to 2012). Moreover, national data suggests the presence of the so-called "alcohol harm paradox": although low socioeconomic status individuals consume lower quantities of alcohol compared to other groups, they experience significantly more health problems related to alcohol use, which are possibly aggravated due to worse health choices in other domains (smoking, unhealthy diet, lack of exercise, etc.) (Bellis et al., 2016). For tobacco products the UK government uses a so-called "tobacco tax escalator" which means that tax rises automatically by 2% above the inflation level every year since 2010 (Fuchs et al., 2019). Although overall smoking rates and cigarette consumption have been gradually decreasing in the last decades, not all tobacco products are price elastic; in particular, rolling tobacco has an estimated price elasticity of -0.57 (Whitaker, 2019). Among OECD countries, in 2016 UK exhibited one of the highest average cigarette prices (Whitaker, 2019), yet the prevalence of smoking and, more importantly, inequality in smoking habits, remains high: the difference between smoking rates of individuals with low education levels compared to high reaches 15–20% points and is expected to keep growing for the next decade (Song et al., 2020). To combat child obesity problem, in 2018 the United Kingdom has implemented a new type of *sin tax*—sugar-sweetened beverage tax (SSB). A drink containing 8g or more of sugar per 100 ml is taxed by 24p per liter, and 18p per liter if sugar content is between 5–8 g of sugar, with the exception of fruit juices with natural sugars and drinks high in calcium. In 2017–2018, obesity problem affected around 10% of children aged 4–5 and 20% children aged 11–12; moreover, obesity prevalence in most deprived areas was twice as high as in least deprived areas (NHS, 2019). This problem affects also the adult population: in 2017, 64% of adults in England were considered overweight or obese (NHS, 2019). Previous attempts to tackle SSB consumption in UK with price increase on individual restaurant level have shown positive results—drop in SSB purchases—in short and medium term

(Cornelsen et al., 2017); however, a nation-wide models on SSB tax effects suggest that a regressive impact on low income consumers can be particularly strong due to prevalence of sugary drink purchases among this socioeconomic group (Tiffin et al., 2015). Other sugar-sweetened products such as cakes, confectionery, and sweet snacks, are not yet subject to taxation. According to the study on price sensitivity for these product groups in the UK by Smith et al. (2018), price increase due to fiscal measures is likely to reduce purchases, especially for low-income consumers.

3 Empirical strategy

This section presents the empirical strategy starting with the hypotheses and experimental design in Sect. 3.1, followed by the description of the data collection in Sect. 3.2. Section 3.3 presents descriptive statistics, and checks for balance and selective attrition across treatment arms.

3.1 Hypotheses and experimental design

The study has been run in May 2019, on Prolific, a crowdworking platform which has been noted for its better representativeness at national level (UK) compared to other widely used platforms (Peer et al., 2017; Palan & Schitter, 2017). Participants are paid on hourly wage basis with potential bonuses conditional on their performance in given experimental tasks. The study was pre-registered on the Open Science Framework (OSF) platform[3]. Sections of the analysis that deviate from the pre-registration are highlighted throughout the paper.

The main motivation of this study is to understand how financial worries (*FW*) affect: (i) the trade-off between addressing pressing needs (purchasing necessities for the household) and falling into temptation (purchasing temptation goods) and (ii) the response to potential policies which aim to discourage the consumption of temptation, in particular to sin taxes. Treatment effects are expected to be much stronger among low-income individuals, however, the ex-ante hypotheses are not straightforward for several reasons. The mental bandwidth/scarcity framework lacks a testable theoretical model[4]. Empirically, financial worries are expected to lower mental bandwidth (induce cognitive load) while also redirecting it towards what is perceived as scarce (the so-called tunneling effect) (Lichand & Mani, 2020). The former effect may lead to a higher likelihood of falling to temptation due to reduced cognitive control of impulses (see Mani et al., 2013). The latter effect is expected to shift focus towards necessities if necessities are perceived as relatively more scarce than temptation, thus reducing demand for temptation. As a result, the net effect is an empirical question. How financial worries may interact with sin taxes is even a more complex issue. This is because increasing the price of temptation may increase the perception of its scarcity. Temptation goods provide immediate gratification which may be perceived as scarce by low-income people, since they cannot afford

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[3] To view the pre-registrations access https://osf.io/fpkjw.

[4] Banerjee and Mullainathan (2008) build a simple attention model which provides a good reference point but is not easily testable empirically.

the same substitutes as high-income individuals (e.g. restaurants, cultural events, holidays). As a result, financial worries and sin taxes may interact in complex ways. This paper is limited in its testable predictions and is to an extent exploratory.

In practice, we manipulate the perceived FW through exposure to hypothetical financial scenarios and observe purchasing decisions in an experimental market where participants can choose to spend a fixed budget on necessities and temptation. A random subset of participant face higher prices of temptation goods than the retail prices. This treatment aims to mimic taxes on temptation—or "sin taxes"—how they are commonly referred to. We will refer to this treatment as the Tax condition throughout the paper. These two treatments are also interacted to observe if higher FW may change how individuals respond to sin taxes. The rate of the price increase was also assigned randomly to either 10% or 20% level relative to the baseline prices [5]. Throughout the analysis, we will also explore this heterogeneity. To summarise, the experiment was structured as follows[6]:

Financial scenarios treatment ⇒ Manipulation check ⇒ Experimental market and Tax treatment ⇒ Survey section[7].

In what follows we describe the treatments, the manipulation check and the experimental market.

Financial Scenarios Participants were asked to reflect how their household would cope with two-income shocks: (i) a large one time shock and (ii) a deterioration in economic conditions at national-level leading to higher costs of living. Adapted from Mani et al. (2013)[8], the scenarios aim to trigger mental thoughts of economic vulnerability which participants from low-income households are likely to experience often in their daily lives. Participants were asked to answer both open questions and questions with Likert scales. What varies between conditions is the severity of the situations presented[9]. Participants in the control group were presented with easy scenarios (henceforth Easy group/condition). For the treatment group scenarios were much more severe (henceforth Hard group/condition). The order of the two scenarios was randomized at an individual level.

Manipulation Check After completing the two scenarios, all participants were asked to state, on a Likert scale, how worried they are about (i) their financial situation and (ii) about not being able to find money in case of need (adapted from

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[5] We randomly assigned 40% of participants to the no Tax group and 60% to the Tax group (half to 10% tax and half to 20% tax). This was to have more power in detecting differences between the no-tax and the Tax group, than to detect differences between the two tax levels.

[6] See also Fig. 5 in Appendix B for a graphical representation of the design.

[7] This section included the measurement of the proposed mediators (further discussed in Sect. 4.3 and socio-economic information (income, employment status and household size). Other socio-economic variables were measured by the experimental platform when participants registered.

[8] Differently from Mani et al. (2013) we reduced the number of scenarios to 2 (from 3), and increased the severity of the scenarios for the treated group while decreasing it for the control group, based on qualitative evidence from a previous pilot study suggesting that the control group scenarios were too difficult, triggering high financial worries.

[9] See Appendix 2.

Abraham and Haushofer 2015). The aim of these questions is to test if the hard financial scenarios successfully triggered the response we described above.

Experimental market Next, participants proceeded to the main task. Each participant received an endowment of £30 which they could spend in the experimental market. They could choose from 66 items sold by one of the largest low-cost retailers in the United Kingdom. The products were chosen based on their popularity on the online store platform of the retailer. Half of the items were basic necessities (e.g. bread, eggs, milk, fruits, vegetables etc.), or household items, such as washing liquid or cleaner[10]. The prices ranged between £0.59 and £6. The other half were temptation goods, such as alcohol, tobacco, unhealthy foods (sweets, sugar-sweetened beverages, chips etc.) and personal luxury products, with prices ranging from £1 to 20. Each product had a picture, name, price and a link to the retailer's online shop web-page with additional information on the product[11]. The interface looked very similar to a typical online shop. Participants could add goods to their shopping cart, increase quantities and revise their selection at any time. They had to spend at least £28 to advance to the next stage; the remainder from £30 were sent as bonus payment[12]. The order of the goods was randomised. The task is weakly incentivized: 1 out of every 100 participants was randomly selected to receive the goods they selected on a date of their choice[13]. In spite of the weak incentives, 87.5% of participants reported that they chose what they would normally choose when they do the groceries[14].

Tax treatment Participants assigned to the Tax condition were informed that some of the goods have higher prices than the retail price (not by how much)[15]. In the experiment we did not frame this price increase as a tax because we aimed to

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[10] See Table 12 in Appendix 2 for the full list of products.

[11] See Figs. 6 and 7 in Appendix 2 for screenshots of the task.

[12] The £2 margin was chosen so that participant spent most of the endowment in the task while also not being too restrictive and cognitively demanding.

[13] Although other experimental studies on consumer behavior and taxation also administered monetary incentives only to a subset of participants (see Taubinsky & Rees-Jones, 2017; Morrison & Taubinsky, 2019), there is a lack of evidence on differences in hypothetical vs incentivized consumer choice in similar experimental markets. A review by Charness et al. (2016) suggests that paying a subset of participants might not decrease their motivations in the tasks substantially and could work as efficiently as paying all, although this depends on the theoretical framework behind the experimental task. Some works on choice experiments with real market goods have found that the introduction of monetary incentives does not significantly alter product preferences as compared to purely hypothetical choices (Mørkbak et al., 2014; Yue & Tong, 2009).

[14] At the end of the study participants were asked to describe their motivations during the shopping task. 8 out of 808 participants described making choices in the experimental market randomly and 2 participants mentioned that they perceived shopping budget as windfall or bonus money. The majority of experimental subjects (87.5%) described choosing goods based on their routine product choices, current household needs or personal preferences. The remaining 11.3% did not provide informative enough answers. This question was administered after the shopping task and participants were not told in advance about it.

[15] Which goods had a price increase was not made explicit to reduce the risk of demand effects. We acknowledge that the way the price changes were presented might be perceived as noisy. To minimize such possibility, as described previously, we aimed to design shopping task to closely resemble a real online shop, and offered several opportunities for participants to observe the prices of selected goods: (i) both old and new prices were presented, while (ii) the decision process required a minimum of two

focus on the price channel driving changes in behavior. Standard economic theory predicts that taxes change behavior only by increasing prices. Rees-Jones and Rozema (2019) show that, in practice, tax changes are accompanied by other non-price interventions (information provision, attempts at persuasion, etc.). While we expect the absence of the frame to reduce the influence of such non-price channels, we note that the price increase itself may signal the desired behavior and could lead to experimental demand effects[16]. In the task, participants could see the old price crossed out next to the new price. While this lacks realism as price and tax increases are rarely made salient in the posted price[17], we did not want visual salience effects (not noticing the higher prices) (as in Chetty et al., 2009) or effort (to discover which products have higher prices than the retail prices) to interact with the psychological treatment.

After completing the task, participants proceeded to the survey section of the experiment. The variables measured are presented in Sects. 3.2 and 4.3.

Limitations While the experimental market featured products familiar to participants and had an easy-to-use interface that made it feel like an ordinary online purchasing platform, there are several concerns regarding the extent to which the task can capture its real-world counterpart. The first concern is that participants can substitute "extra-taxed" products in the experimental market with identical products at lower prices in the real world market. Thus participants in the Tax condition could avoid the tax by simply re-optimizing their household consumption plans (e.g. buy more groceries in the experiment and more temptation outside the experiment). With this in mind, it is possible that the elasticities of demand estimated are upward biased but we do not have strong reasons to expect this to vary by treatment status. Second, participants could choose goods which have a higher reselling value to exchange them for cash outside the experiment. In our setting, such goods would likely be the temptation goods. However, we would expect a higher demand for temptation goods if this would be the case which does not match our data. Finally, whether the endowment was earned or not can matter in some settings (Harrison, 2007; Cherry et al., 2005; Luccasen & Grossman, 2017; Ackert et al., 2006). It is not clear, however, if in our setting this would lead to a higher or lower demand for temptation or how it would interact with the psychological treatment.

3.2 Data and power

Participants could not take part in the experiment if they were (i) below the age of 24, (ii) heavy drinkers (more than 14 units per week) or (iii) have undergone therapy for alcohol abuse. These variables are included in the Prolific's pre-screening

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Footnote 15 continued

steps: goods were first added to the basket followed by a review of the shopping cart (modify quantities, remove goods, the option of going back to the goods selection step).

[16] Given their reduced social acceptance, for temptation goods it is very challenging to eliminate the influence of non-price channels.

[17] In the UK, sin taxes are already included in the posted price and are not made explicit.

Table 1 Descriptive statistics and balance checks

	(1) Easy	(2) Hard	(3) Tax	(4) Hard tax	(5) p-value
Female	0.72	0.64	0.70	0.68	0.41
Age	42.88	42.77	43.26	42.08	0.76
High education	0.58	0.53	0.57	0.57	0.85
Student	0.10	0.05	0.04	0.06	0.12
Employed	0.71	0.76	0.73	0.77	0.57
Nationality UK	0.94	0.93	0.96	0.91	0.23
Overweight	0.61	0.56	0.62	0.50	0.04
Alcohol consumption	3.43	3.40	3.22	3.15	0.80
Smoker	0.20	0.18	0.15	0.18	0.53
Household size	2.75	2.68	2.86	2.82	0.52
Parent	0.61	0.50	0.65	0.61	0.03
Subjective SES	5.20	5.18	5.16	5.35	0.60
Income	22.47	22.23	23.51	23.36	0.77
Observations	179	163	244	222	

Columns (1)–(4) show the means across treatment arms. Column (5) displays the p-value associated with the F test of joint orthogonality across treatment arms. Easy defines the control group exposed to easy scenarios and no Tax. Hard defines the treatment group exposed to the hard financial scenarios and no Tax. Tax defines the treatment group exposed to the 10% or 20% increase in prices. Subjective SES is measured on a scale (ladder) from 1 to 10, with 10 being represented by the the people who are better off (in terms of education, money and jobs) in the UK. Alcohol consumption is measured in units of alcohol (1 unit of alcohol = 1 small glass of wine; half pint of beer; pub measure of spirits). Income is computed by dividing total yearly household income by the square root of the household size and is expressed in thousand pounds. The higher number of observations in the Tax conditions is due to our sampling strategy (40% No Tax, 60% Tax) which allows more power to detect difference between the two tax levels

database which means participants could not lie to be able to participate in our study. We decided to impose an age limit to screen out participants which may not be financially independent. Eligibility criteria (ii) and (iii) were added for ethical concerns. At the end of the study, participants received a debriefing. The sample size (808 participants) was chosen, motivated by estimates from a previous study, to detect effects above £3 by income subgroup at 5% significance level with 80% power. For the whole sample, the estimated minimum detectable effect is around £1.5.

3.3 Descriptive statistics, balance checks and selective attrition

Random assignment into treatment groups leads to causal inference if attrition was not influenced by treatment assignment and if the randomization was successful in

terms of observable (and unobservable—not testable) characteristics. In this subsection, we evaluate both concerns and also present descriptive statistics.

Attrition Online experiments often suffer from high rates of attrition, which when left unattended, can lead to flawed causal inferences (Zhou and Fishbach 2016; Horton et al. 2011). Taking part in online experiments has lower fixed costs than laboratory experiments which usually require registering ahead of time and going in person to the lab. Furthermore, participants can exit at any time without fearing any social punishment, from other participants or the experimenters. In our setting, both treatments could induce participants to exit the experiment before completion. Reflecting on one's financial vulnerability and facing price increases could trigger negative emotions which may increase the likelihood of dropping out of the study. If this were to happen, causal inference would be challenged since treated participants leaving the survey may be systematically different from those who opt to stay. We evaluate this by regressing the decision to drop out on treatment status. We consider only cases where participants left the survey when assigned or after being assigned to one of the treatments. Some participant left the survey prior to this and are not considered in the analysis. Only 39 participants dropped out, which represent less than 5% attrition rate, remarkable in an online experiment. Table 3 in Appendix 1 shows the results. Participants are slightly more likely to drop out when exposed to hard scenarios and taxed but the differences are small and statistically insignificant. Overall, the results show attrition is not a major concern for causal inference.

Balance Checks Given the 2×2 experimental design, we need to evaluate whether randomization was successful for both treatments, accounting also for the interaction between the treatments. Table 1 shows means for the Easy group in Column (1), Hard group in Column (2), Tax group in Column (3) and Hard condition and Tax group in Column (4). The last Column displays the *p*-value associated with the *F*-test of joint significance of the differences between the treatment arms. Out of 14 comparisons, we find 2 variables to be significantly different across treatment groups. The Hard Tax group, in particular, has a lower share of overweight participants whereas the Hard group has fewer participants which are parents. Neither variable is a strong predictor of behavior in the task. Nonetheless, to alleviate concerns, we include them as covariates in all models. Notably, yearly income per adult equivalent[18], which is our explored source of heterogeneity in treatment effects, is very well balanced across treatment arms. We also evaluate whether randomization was successful within the Tax group, across the two levels. Table 4 in Appendix 1 shows the means for the three tax level groups and the p-value of the differences. Only the share of parents is statistically significant at 10% level and other 3 differences have low *p*-values. Again, to mitigate concerns, we also control for them throughout the analysis.

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[18] We followed Mani et al. (2013) and used the OECD square root equivalence scale, dividing total yearly household income by the square root of household size (OECD, 2008, 2011). We had two measures of income: (i) one measured after the main task in the survey section of the experiment, and (ii) one reported by participants when they registered on Prolific. Given that the latter is possibly outdated, we used the former in the analysis. Nonetheless, they are strongly correlated (Pearson correlation coefficient = 0.79).

Descriptive statistics Females are over-represented in our sample with 68% of participants. The age of participants range from 26 to 86 with a mean of roughly 43 years. 56% attended university and about 72% are employed either full or part-time. Less than 7% are immigrants, 57% self-report being overweight and 17% are smokers. On average, participants report consuming around 3.3 units of alcohol a week. The average household size is 2.8, 60% of the sample are parents and the average total yearly household income is £36,800 with a median of £32,500, both higher than the national levels in the UK in 2019. The large share of females is a major concern regarding the representativeness of our sample[19]. We also acknowledge that the profile of the participant in the online experiment might exclude certain relevant categories of people. Even though our experiment was mobile friendly, registering on the platform requires some level of proficiency with mobile and internet use, and having a bank account.

The main outcome variable we will use throughout the paper is the total expenditure on temptation using baseline (no Tax) prices. The distribution of the variable is strongly censored at 0, with about 37% of participants purchasing no temptation. Only 3%, spent all the budget on temptation[20]. Pooling together all conditions, participants spent 73% of their budget on necessities but there is substantial variation. Across the subcategories of temptation goods, unhealthy food products and alcohol had the higher demands with mean expenditures at baseline price of £3.4 and £2.2 respectively. Tobacco and luxury items were demanded only by 2.35% and 3.74% of participants. We check to what extent income is associated with higher consumption of temptation using (i) self-reported behaviors and (ii) behavior in the experimental market. Panel A in Table 7 in Appendix 1 presents the correlation between income and self-reported consumption of temptation. Since we do not have information on the consumption of unhealthy foods, we use weight as a proxy. We find that income predicts a lower probability of being overweight or a smoker, but higher weekly alcohol consumption. Panel B in Table 7 presents the correlation between income and expenditure in the task by subcategories of temptation goods, controlling for treatment assignment. Despite the fact that income predicts a lower probability of being overweight, it does not predict higher demand for unhealthy foods in the task. On the other had, income does predict higher demand for alcohol and lower demand for tobacco, consistent with the correlations with the self-reported behaviors presented above.

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[19] The demand for temptation good is roughly twice as large for males than for female. Treatment effects are also stronger for males (results available upon request). This is possibly due to stronger floor effects for females: 35.6% do not demand any temptation in the baseline condition. If our samples of women and men are representative for their Prolific sub-populations, we could expect even larger treatment effects in a more representative sample with respect to gender. However, outside the lab, the size of treatment effects will depend on the degree of income pooling and relative decision power of women and men in the household.

[20] See Fig. 3 in Appendix 1.

4 Results

This section begins with manipulation checks in Sect. 4.1. Section 4.2 presents the main results while Sect. 4.3 investigates potential mechanisms explaining the main effects.

4.1 Manipulation check

We begin by examining if being asked to reflect on difficult financial scenarios increases the salience of FW. In the baseline condition, 34% of participants report not being worried at all about their financial situation. 14.5% are very or desperately worried, the rest being somewhat worried. Similar proportions are observed for worries about not being able to find money in case of need. Among treated participants, the distribution shifts to the right. 21% report being worried or desperately worried and only 26% not being worried at all. Figure 1 summarizes these finding. We compute a standardized index of the two variables and plot means with 95% confidence intervals.

The differences between treated participants and control participants are large and highly statistically significant. Table 5 in Appendix 1 shows regression results of the two variables and the standardized index of them on treatment assignment, including covariates. The treatment leads to 0.25 standard deviations higher index of FW. Such an increase in FW is equivalent to having a lower total yearly household incomes by £17,000.

Several of the covariates included have high explanatory power. Females, younger participants, immigrants, smokers, lower SES and lower-income participants report significantly higher FW. Other variables associated with higher FW which are only marginally insignificant are being overweight and being a parent. These results suggest a potential relationship between FW and variables indicating higher consumption of temptation goods. Drinking, however, is not associated with higher FW.

Next, we check if treatment effects vary by income. Previous research has shown that inducing FW impacts behavior only among lower-income people (Mani et al., 2013; Burlacu et al., 2019). Given the large sample size for a laboratory experiment and the fact that our sample has a higher income than the UK mean, we split our sample into three income groups - low, medium and high[21]. The average yearly household income is £16,600 for the lower income group (close to the UK relative and absolute poverty line), £33,000 for the medium income group (close to the UK mean) and £60,000 for the higher income group.

Figure 1 also plots treatment means and 95% confidence intervals for each income group. Looking at the reference group (Easy), there are stark differences,

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[21] This deviates from the median split strategy specified in the pre-analysis plan. Based on previous studies performed on Prolific, we expected participants to have lower incomes than what we obtained in the sample. Since the focus of this research is households living in poor condition or at risk of falling into poverty, a median split for our sample would include a large number of households falling outside these categories.
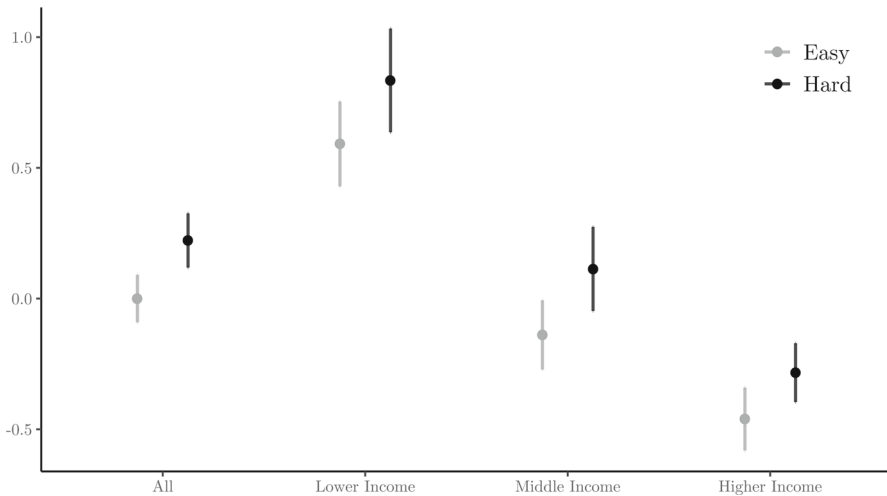
Fig. 1 Manipulation checks: treatment effects on financial worries index. The outcome variables is an index of worries computed using the inverse covariance weighting method in Anderson (2008), standardized using the control group mean and standard deviation. The variable used to compute the index are: (i) worries about financial situation and (ii) worries about not being able to find money in case of need. Both variables are coded as: 0 "not worried as all", 1 "somewhat worried", 2 "very worried" and 3 "desperately worried". The labels on the horizontal axis indicate the samples used: the entire sample (left) followed by the sample divided by income tertiles. The dots indicate the means while the vertical lines indicate 95% confidence intervals. Easy indicates participants assigned to the easy scenarios, while Hard indicates participants assigned to the hard scenarios

larger than 0.5 standard deviations, between the lower and other income groups[22]. While statistically significant, the differences between the medium and the higher income group are smaller in magnitude, despite the fact that gap in average incomes between these group is much higher. This suggests that FW are particularly salient at lower income levels and reduce at increasing rates at higher income levels. Even though the effect of the treatment is largest among the lower-income group, it is not statistically significant from the other two groups as evidenced in Table 6 in Appendix 1. The scenarios adapted from Mani et al. (2013) were augmented in severity for the treatment group. This may have contributed to increased financial worries also at higher levels of income.

It is worth mentioning that even though we experimentally manipulate only transitory worries, our paper explores permanent worries as a relevant source of treatment heterogeneity. Given the large differences in baseline levels of worries by income group (a proxy of permanent worries at group level), when analysing

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[22] It should be noted however than comparisons between income groups within the Easy scenario group may not reflect differences in financial worries which we would observe if no scenarios were administered. Qualitative and quantitative evidence from the answers of participants to scenarios' items suggest that the easy scenarios may have induced FW to lower-income participants. Lower-income participants are significantly more likely to report that even these hypothetical scenarios may significantly impact their lives. As a result, all comparisons between income groups within the easy scenario group may suffer from this issue.

treatment effects by income group[23] in the following subsection, we are comparing differences between groups with large differences in average permanent worries[24]. Even though the literature is scarce on the impact of permanent financial worries given that it is difficult to manipulate experimentally, other more permanent features of life in poverty (such as stress, depression, happiness, life satisfaction) which are likely correlated with financial worries (possibly caused by them), were studied to a greater extent (see Haushofer & Fehr, 2014, for a review).

4.2 Main results

We begin the analysis by estimating the change in demand as a result of price increases independently of the Easy and Hard condition using the following specification:

$$Y_i = \alpha + \text{Tax}_i'\beta + X_i'\gamma + \epsilon_i, \tag{1}$$

where Y_i is expenditure on temptation at baseline prices (or demand for temptation)[25] and Tax_i is a vector of tax levels (0%, 10% and 20%). X_i is a vector of individual and household characteristics[26].

Next, we introduce the Easy and Hard condition in the model and allow it to interact it with the tax using the following specification:

$$Y_i = \alpha + \gamma\text{Hard}_i + \text{Tax}_i'\beta + \text{Hard} \times \text{Tax}_i'\delta + X_i'\gamma + \epsilon_i, \tag{2}$$

where $Hard = 1$ if assigned to the Hard condition and 0 if assigned to the Easy condition. $\hat{\gamma}$ indicates the estimated effect of increasing FW in the no Tax condition, the vector $\hat{\beta}$ gives the effect of the taxes in the Easy condition while $\hat{\delta}$ indicates if the effect of the tax varies by Easy and Hard condition. We will interpret the estimates both in levels but also in percentage changes relative to the baseline no Tax condition in order to compute elasticities. All models are estimated through OLS and use robust standard errors.

Table 2 reports the results across Easy and Hard condition (Eq. 1), in Column (1) without covariates and Column (2) including covariates[27]. We note that including covariates does not alter the estimates, expected since randomization was successful. Turning to the results, we observe that being assigned to any of the

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[23] We can not use the index of worries as a source of heterogeneity in treatment effects because the variable is endogenous to the treatment.

[24] Notably, other characteristics which are different by income group could be potential confounders.

[25] In Appendix 1, Table 8 and 9 we report also the results by subcategories of temptation goods, by income tertile. We do not discuss the findings since we are under-powered to detect differences by subgroups of products.

[26] Covariates include: gender, age, education (1 if attended university and 0 otherwise), student status (1 if currently studying and 0 otherwise), employment status (1 if employed full or part time and 0 otherwise), whether the participant is overweight, medium-heavy drinker and smoker (all self-reported), parental status, household size, subjective socio-economic status (1–10 scale) and income per adult equivalent (income divided by the square root of household size).

[27] See Fig. 4 in Appendix 1 for a graphical representation of results in Table 2. The lines report the means while the bars indicate the 95% confidence intervals.

Table 2 Treatment effect on demand for temptation

	Demand for Temptation: total expenditure at baseline prices					
	(1)	(2)	(3)	(4) Lower	(5) Middle	(6) Higher
Tax 10% (10%)	−1.21* (0.66)	−1.14* (0.65)	−1.88** (0.93)	0.17 (1.76)	−0.86 (1.61)	−3.88** (1.70)
Tax 20% (20%)	−2.40*** (0.67)	−2.40*** (0.68)	−3.85*** (0.93)	−3.23* (1.68)	−2.38 (1.79)	−6.39*** (1.59)
Hard (H)			−2.12** (0.94)	−3.13** (1.55)	−0.44 (1.64)	−1.98 (1.84)
Hard × Tax 10% ($H \times 10\%$)			1.57 (1.29)	0.39 (2.33)	0.63 (2.35)	1.66 (2.44)
Hard × Tax 20% ($H \times 20\%$)			3.08** (1.37)	5.36** (2.50)	−0.94 (2.35)	5.05** (2.45)
Control Mean	7.33	7.33	8.23	7.06	7.74	10.06
Controls	No	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.01	0.04	0.05	0.04	0.03	0.07
Observations	808	808	808	271	268	269
p-values-tests						
(i) $10\% = 20\%$	0.08	0.06	0.04	0.06	0.39	0.08
(ii) $10\% + H \times 10\% = 20\% + H \times 20\%$			0.64	0.41	0.06	0.63
(iii) $10\% + H \times 10\% = 0$			0.73	0.69	0.89	0.21
(iv) $20\% + H \times 20\% = 0$			0.44	0.24	0.04	0.47
(v) $H + H \times 10\% = 0$			0.54	0.11	0.91	0.85
(vi) $H + H \times 20\% = 0$			0.34	0.25	0.42	0.04

Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively. All models control for individual and household characteristics

The sample used is the entire sample in Columns (1)–(3) and the first, second and third teriles of income in Columns (4)–(6). Hard indicates participants assigned to the hard scenarios condition. Tax 10% and 20% indicate participants assigned to the treatment groups where the prices of temptation goods were increased by 10% and 20%, respectively. The control means in Columns (1)–(2)/(3)–(6) are the means of the outcome variable in the no Tax groups/Easy scenario no Tax group. Tests (iii)–(iv) test for the effect of taxes in the Hard condition. Tests (v)–(vi) test for difference between the Easy and Hard condition at each Tax level

Tax conditions lowers demand for temptation. The 10% tax level decreases demand by £1.1 (14.4%), while the drop is roughly twice as large with the 20% tax (£2.4 or 32.7%). Thus, across the entire sample and Easy and Hard conditions, participants display an elastic demand as a response to the taxes. Note also that elasticities are roughly constant at the two tax levels.

In Column (3) we estimate Eq. 2 allowing tax responses to vary by the Easy and Hard condition. The first two estimates (Tax 10% and Tax 20%) are interpreted as the effect of the tax in the baseline (Easy scenarios) condition, that is the effect of the taxes when FW are less salient. We observe larger estimates than the ones in Columns (1) and (2) (£1.88 or 22.7% at 10% Tax and £3.85 or 46.7% at 20% Tax) indicating demand elasticities of close to 2.

The estimate on the Hard condition indicates the difference in demand for temptation relative to the Easy condition, when experimental taxes are absent, and responds to our first research question. Increasing FW leads to a large and significant drop of £2.1 (26%) in the demand for temptation when no tax is added. The effect is roughly equivalent to increasing prices by 10% in the Easy condition and suggests that FW may potentially limit the over-consumption of temptation[28].

Finally, we move to the estimates on the interaction terms which respond to our second research question. The estimates are interpreted as differences in tax responsiveness in the Hard condition relative to the Easy condition. For instance, a positive estimate indicates a lower response to the tax in the Hard condition. This is what we observe. While the previously discussed finding suggested a potentially protective role of FW, the results on the interaction with taxes point to a more nuanced picture. Increasing FW greatly attenuated the elasticities of demand with respect to price. The estimates on the interaction terms offset almost completely the effect of the tax, at each level. Specifically, in the Hard condition, a 10% Tax lowers demand by only £0.31 (5%)[29], while the effect of the 20% Tax reduces demand by only £0.77 (12.6%), both inelastic responses. In fact, at 20% Tax the participants in the Hard condition actually demand more temptation than the Easy group, albeit the difference is not statistically significant (p-value = 0.34).

We now turn to the question of whether treatment effects vary by income. In Sect. 4.1, we have shown that the psychological manipulation increase FW for all income groups by roughly the same level. However, it is unlikely that the effect of FW on behavior is linear. A FW "shock" for someone already experiencing a lot of FW will probably have a different impact than an equivalent shock for someone with little FW. Previous research by Mani et al. (2013) and Burlacu et al. (2019)[30] find effects only on the behaviors of low-income participants. In these lines, we test if the effects described previously vary by income tertile[31].

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[28] We stray from making normative statements given than we do not observe the normative counterfactual of each participant.

[29] This value is obtained by summing the estimates on $Tax10\%$ and Hard $\times$ Tax 10%, $-1.88 + 1.57 = 0.31$

[30] The study did not sample high income participants on Prolific. Their comparison by income group is roughly equivalent to our comparison of the lower- and middle-income groups.

[31] We note that the study is under-powered to measure difference among income groups with statistical precision. We are also under-powered to detect heterogeneous effects by the continuous measure of

First, looking at the means of the control group (Easy and not Tax) we note that demand for temptation increases with the income group. The response to taxes in the Easy condition also varies substantially by income group. At 10% Tax, the lower-income group does not respond to the tax. The strongest demand drop comes from the higher income group (£3.88 or 38.5%). At 20% tax, the lower income reduce demand by £3.23 (45.8%), more than the middle-income group (£2.38 or 39.7%), but again lower than the higher income group (£6.39 or 63.5%).

Next, looking at the estimate for the Hard condition, we observe that increasing FW lowers demand by the highest amount for the lower income group (£3.13 or 44.3%), roughly the equivalent of the 20% Tax. No effect is found for the middle-income group, while the estimate for higher income group is negative and close to £2 though imprecisely estimated.

Turning to the estimates on the interaction terms, among the lower income group we observe that increasing FW leads to a non-downward sloping demand curve. Demand remains roughly constant at 10% Tax (p-value = 0.69) and actually increases at 20% Tax (p-value = 0.24). In line with results in Burlacu et al. (2019), this finding suggests that policies aiming to (dis)incentivize consumption of certain types of goods may not have the intended results when FW are top of mind. For the middle-income group, the differences between the demand curves across the two Easy and Hard conditions are small and statistically insignificant. Finally, turning to the high-income group, we observe that being assigned to the Hard condition, attenuates the response to the taxes. The demand curves for the Easy and Hard condition cross each other. At 20% tax demand becomes statistically higher in the Hard condition than in the Easy condition (p-value = 0.04).

Averaging across the Easy and Hard conditions, the elasticities of demand with respect to price are increasing with income. In addition, we observe the same pattern focusing on baseline (Easy) condition, suggesting that for this sample "sin taxes" show signs of being regressive. Increased FW leads to the largest drop in demand for the lower income group, but only when no additional tax is introduced. When coupled with an increase in tax, they appear to harm lower income participants the most. Note than one of the main limitation of the task, discussed in a previous section, is that participants could just substitute taxed temptation goods in the experimental market with the same goods at lower price outside the experiment. This observation makes even more striking the fact that averaging across both Easy and Hard conditions, the lower-income group is insensitive to price increases.

Robustness checks We perform several robustness checks and report the results in Table 11 in Appendix A. First, given the censored distribution of the outcome variable at 0, we report also Tobit models estimates in Columns (1)–(4). Results are consistent across models.

Second, we investigate if results are robust to the amount left by participants as bonus payment in the task (of the £30 endowment). We remind that participants

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Footnote 31 continued

income. In addition: (i) income is likely to be measured with error, (ii) other factors besides income (such as assets, credit access, social capital) are likely to be very important in determining one's self perceived economic vulnerability and financial worries and, (ii) including income linearly would not suffice to capture the observed pattern by income group.

were not constrained to spend the entire endowment in the task and were allowed a £2 margin to advance to the next experimental section (see Sect. 3.1 for further details). Under some conditions, this feature could be problematic. For instance, in response to the price increase, participants may decrease demand for temptation but in the same time leave a higher amount as bonus payment. Assuming the amount would be spent on temptation outside the experiment[32], this would imply that the impact of the tax is over-estimated. We perform two analyses to investigate if this is indeed a concern, running the specification in Eq. 2 using as outcome variables: (i) the amount left as bonus payment and (ii) a sum of demand for temptation and the amount left as bonus payment. The former is used to investigate treatment effects on the amount left, while the latter corrects for any distortions caused by this design feature when assessing treatment effects on demand for temptation. Results are reported in Columns (5)–(12) and indicate that our results are highly robust to this design feature.

Third, we test if the inclusion of two moisturizing creams in the temptation basket, goods which do not comply with our definition of temptation, affected our main results. These goods fit more in the category of personal luxury goods (especially for low income participates) but are not goods with negative externalities. Their demand in the task is low (about 2% of participants purchased any of the two and only 4 participants purchased two items). Nonetheless, as a robustness check we re-did the main analysis excluding these goods from the basket of temptation and report the results in Columns (13)–(16). Again, we see that results are robust, generally becoming larger in absolute terms.

Finally, one relevant design concern is that lower-income participants exposed to the Hard scenarios, due to higher mental preoccupations may have perceived the crossed out prices as discounts, ignoring actual prices. This could explain why they exhibit a non-negative demand curve. We can not rule out that it did not affect at least some participants. But if that would be a major concern, we should not observe differences by tax level, given that the two groups received exactly the same information. We would expect an upper trend from the baseline Hard condition to the Hard and 10% Tax condition, followed by a relatively flat curve at 20% Tax. Instead, we observe a roughly flat curve from the baseline to the 10% followed by a positive (though non significant, p-value = 0.4) increase in the 20% condition. In addition to this result, it is worth noting that the sequential design of the task allowed participants several instances to observe prices. Moreover, since the goods were selected from a low-cost retailer, low-income participants are expected to be more familiar with the prices of the products and observe with higher ease if certain products are priced higher[33].

We conclude this section by briefly summarizing the main results. First, across the entire sample and Easy and Hard condition, we find that an elastic demand for temptation, which hides substantial heterogeneity by the psychological

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[32] This is a strong and conservative assumption. In response to the price increases or the hard scenarios, participants may also lower demand for temptation and increase the amount left on the table in an attempt to save money or spend it outside the experiment on non-temptation goods.

[33] In addition, the qualitative evidence from the survey question on their choice motivation suggest a high attentiveness to price.

manipulation. Increasing FW significantly lowers the responses to the tax leading to an inelastic demand curve. Furthermore, in the baseline no Tax condition, increasing FW lowers demand for temptation by the equivalent of a 10% price increase. Results vary by income group. In the Easy condition, the higher income group shows the largest elasticities while the lower-income group reduces demand only in response to the 20% Tax. With no additional taxes, increasing FW decreases demand more for the lower-income group, the equivalent of a 20% price increase. Among the middle income, increasing FW does not affect behavior. A puzzling U-shape pattern is observed—the behavior of the higher income group is similar to the lower-income group when FW are made salient, though slightly lower in magnitude.

4.3 Mechanisms

Up to this point, we interpreted the results in light of the mental bandwidth (scarcity) theory. We assumed that reflecting on the hard financial scenarios lead to mental preoccupations which shift attention towards necessities[34] at the cost of failing to respond to the increase in prices. In this subsection, we explore the validity of our hypothesis, considering also several alternative channels in light of main results from the literature. We try to answer which channels appear to be better at explaining our main findings: (i) increased FW lowers demand for temptation and (ii) increased FW reduces elasticities of demand with respect to price.

Much of the work in the field of mental bandwidth/scarcity has paid little attention to alternative channels which may explain how similar psychological manipulations may affect behavior. For instance, reflecting on potential future economic shocks may change risk attitudes, affective states, how individuals discount the future, or the cognitive systems employed when making decisions. All these channels may be particularly relevant when deciding how much temptation to consume and are potential confounders for our proposed channel. For this reason, after the task we measured several potential mediators: (i) an index proxying the shift of focus towards necessities, (ii) cognitive reflection, (iii) life satisfaction, (iv) risk attitudes, and (v) temporal discounting. We proceed by first motivating the choice of each variable individually, explaining how they were measured, followed by the mediation analysis.

Focus on pressing needs First, we compute a proxy for our proposed mediator— shift in attention towards pressing needs—by asking participants to state on a 4 item Likert scale if, in the experimental market, they chose goods which gives them pleasure or if instead they chose goods which are necessary for the household. We reverse code the first item and compute a standardized index of the two.

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[34] These effects are often referred to as tunneling.

Cognitive reflection In Mani et al. (2013), asking participants to go through hard financial scenarios reduced both fluid intelligence and inhibitory control. We measure cognitive reflection, which relates to both fluid intelligence and inhibitory control, and is generally used as an indicator of System 1–System 2 thinking. Schilbach et al. (2016) argue that when mentally taxed, people are less likely to use the reflective, System 2 thinking (Kahneman 2011). We measure cognitive reflection using 3 items from the CRT-2 in Thomson and Oppenheimer (2016) which has the advantage requiring only minimal numeracy skills[35]. A higher score is considered to indicate higher use of System 2 reflective thinking.

Life satisfaction In a review, Haushofer and Fehr (2014) propose affective states as one causal channel through which poverty can impact decision making among the poor. Given that our financial scenarios may have induced negative affect, we measure participant's life satisfaction by asking how satisfied they are with their lives on a 1–10 scale (Bjørnskov 2010).

Temporal discounting Consumption of temptation is generally modelled in a dynamic framework (Becker & Murphy, 1988; Gruber, 2001; Gruber & Kőszegi, 2004; O'Donoghue & Rabin, 2003, 2006). With time-consistent agents, one's discount rate will influence consumption decisions today. With time-inconsistent agents, besides the discount rate, one's degree of present bias and sophistication will also weight in. As a measure of time preferences, we ask participants what would be the minimum amount of money they would prefer to receive today instead of receiving £200 in 2 months. The task has its limitations since it was not incentivized and does not allow to distinguish between discount rates and present bias.

Risk attitudes Risk preferences are not usually included in models of addiction. However they are likely to play a role since the discounted negative effects vary by individual and are uncertain. Indeed, several studies, including this one, find a strong association between risk attitudes and consumption of temptation even though causality can not be established (Anderson & Mellor, 2008; Dave & Saffer, 2008). We measure self-reported risk attitudes using an item from SOEP (Wagner et al., 2007). Participants are asked to reflect, on a scale from 1 to 10, in general, how willing they are to take risks, with 10 indicating the highest willingness.

We estimate the Average Controlled Direct Effect (ACDE) for each proposed mediator following the sequential two stage g-estimation procedure in Acharya et al. (2016)[36]. In the first stage, treatment effects are estimated conditioning on the mediator, covariates and potentially confounding mediators. Using the estimates from the first stage, the outcome is demediated by partialling out the mediator. Then, in the second stage the demediated outcome is regressed on the treatment

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[35] The questions and the proportions of participants solving them correctly are the following: (i) "If you're running a race and you pass the person in second place, what place are you in? Please write the place as a number." (57.43%), (ii) "A farmer had 15 sheep and all but 8 died. How many are left?" (73.27%), and (iii) "Emily's father has three daughters. The first two are named April and May. What is the third daughter's name?" (71.04%).

[36] In the setting of an experiment, the procedure rests on the assumption of sequential unconfoundedness, that is, conditional on covariates and potentially confounding mediators, there are no omitted variables for the effect of the mediator on outcomes. This assumption is credible in our setting given that we include a relevant set of potentially confounding channels indicated by the literature, conditioning also on individual and household characteristics.
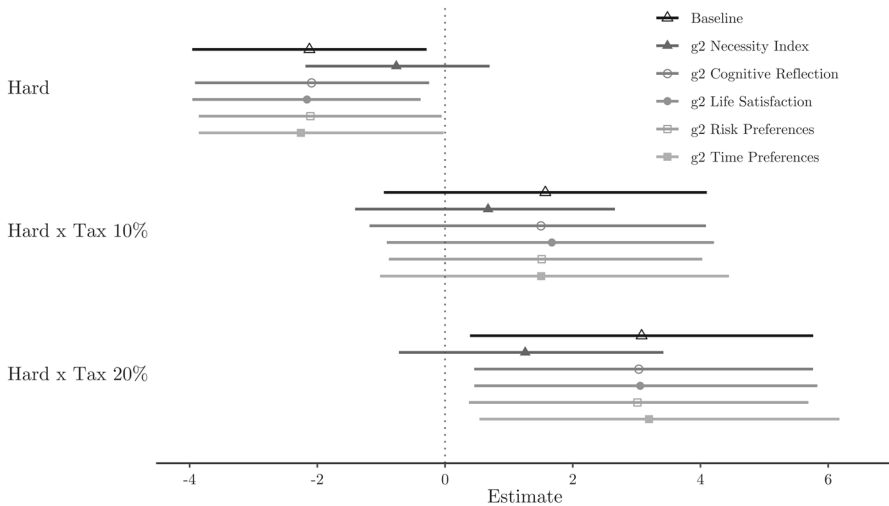
Fig. 2 Mediation analysis: baseline effects and ACDE for each proposed mediator. The outcome variable is total expenditure on temptation at baseline prices. Symbols indicate treatment indicators' estimates, while the lines indicate 95% confidence intervals (bootstrapped for all the sequential g estimates). Hard indicates participants assigned to the hard scenarios. Tax 10% and 20% indicate participants assigned to the treatment groups where the prices of temptation goods were increased by 10% and 20% respectively

indicators and covariates. If treatment estimates in the 2nd stage change significantly, then the variable is a relevant mediator. We report full-sample treatment assignment estimates and 95% confidence intervals for the baseline model for reference and the sequential estimation models for each proposed mediator in Fig. 2. Confidence intervals for the ACDE are constructed using bootstrapped standard errors with 1000 repetitions.

Results are straightforward. The only mediator having a meaningful impact on the estimated treatment effects is the *change in focus towards necessities* channel. The estimates on both the main treatment effect and the two interactions with the tax levels effects are driven towards zero after demediating the effect that operates through the shift in focus. In other words, financial worries shift focus towards pressing needs reducing demand for temptation but at the same time reducing the responsiveness to the increase in price levels. For all the other mediators considered, the estimates remain largely unchanged relative to the baseline model. Table 10 in Appendix 1 reports the results estimated separately by income tertile. Generally, the results are consistent with what was observed for the full sample, especially for the lower and the higher income group; the shift of focus towards necessities being the only mediator having a strong influence on treatment effects[37].

The results are only suggestive and should be interpreted with caution. We acknowledge that at least some of the proposed mediators are likely to be measured with error. None of the tasks were incentivized and some rely on simple measures.

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[37] The only exception is the *Hard × Tax*10% estimate for the lower income group. The necessity index ACDE is actually larger that the baseline effect. However, both estimates have very wide and overlapping confidence intervals.

In addition, they were measured after the main task which means that we need to assume treatment effects on the mediators lasted throughout the experiment and were not affected by the task itself. There is the possibility that this is not true, at least for some of the participants. In spite of these limitations, this is one of the first studies backing up with suggestive evidence the *shift in focus* mechanism behind the effect of financial worries on behavior.

5 Conclusion

In an online experiment with UK participants, we investigate if inducing financial worries impacts purchasing decisions across two categories of goods: necessities and temptation. Additionally, we randomly increase the price of temptation to try to capture if financial worries might affect how people respond to "sin" taxes. In the absence of any price increase, financial worries appear to protect against the over-consumption of temptation, reducing its demand by the equivalent of a 10% price increase. In contrast, when the price of temptation increases, financial worries reduce the elasticity of demand with respect to price, suggesting that the protective effect comes at the cost of not fully processing or responding to other relevant information. Consistent with our hypotheses, we explore several potential mechanisms. We find that increasing financial worries appears to shift focus towards necessities, the mediator capturing a significant share of both effects.

Estimating the two effects by income tertile, we find both to be stronger among lower-income participants. Among them, increasing financial worries significantly reduces the demand for temptation in the absence of any tax, while making them completely unresponsive to taxes. No effect is found for the middle-income group. In contrast, among higher-income participants increasing financial worries appears to lower demand for temptation while also decreasing their elasticity of demand with respect to price. The U-shaped relationship by income group is puzzling. The manipulation check shows a similar increase in worries regardless of income group, while the mediation analysis does not point to significant differences in the underlying channels. We can only speculate that such mental preoccupations, as the ones produced by the manipulation, may not occupy the minds of the high-income individuals as often as for low-income people. As a result, since possibly it is something the higher income individuals are not commonly used to doing, it may have triggered a stronger cognitive or emotional response not fully captured by the manipulation check. This result should also be viewed in relationship to the external validity of the study. In this experiment worries were manipulated only once. However, in real life, the number of times one experiences such "shocks" is likely to vary with income. If for low income individuals this takes place on a regular basis while for those with high income it is rather an unlikely event, then overall the impact on behavior will be stronger for the former group, in spite of the fact that a one-time shock has a similar effect. Since we do not have the data to support these claims, we suggest this as a relevant topic for further research in the field.

Since we did not measure the normative counterfactual, we advise caution in drawing strong policy implications. Our results suggest that increasing sin taxes

may hurt low-income individuals the most if they are experiencing high financial worries. Absent of any tax increase, financial worries reduce demand for temptation, thus possibly protecting low-income people from over-consuming such goods. But if additional sin taxes are introduced, they may not decrease their demand further. While we can only speculate, it might be that high financial worries bring increased feelings of economic vulnerability and stress which are likely to produce disutility. Consumption of temptation goods may be a way to compensate such disutility, especially since lower-income individuals can afford fewer substitutes (holidays, social and cultural events, etc.). Introducing higher taxes on temptation makes them even harder to afford which may increase their desirability since they are even scarcer than before.

The study has other limitations. First, we do not know if the finding that low-income individuals fail to respond to taxes when worried is short-lived or not. If the effect is only temporary and they end up adjusting their demand, then financial worries may end up protecting them from over-consuming temptation. This is a relevant question for future research. Secondly, as mentioned above, we are unable to explain the similar pattern for the higher income group. Thirdly, common to most of the existing literature in the subfield, the degree of external validity is a concern. We are unable to inform on the dynamics of financial worries: how frequent they manifest in the daily lives of low-income individuals, how sophisticated they are to anticipate them, or how they can lead to more permanent shifts in worries (possibly manifesting in chronic stress, anxiety, depression or other mental issues). Lastly, in our experimental setting we taxed all temptation goods which is rarely the case in reality. Thus, we can not generalize our results to situations when only some types of temptation goods are taxed, allowing people to substitute them with other un-taxed goods.

Appendix

Appendix 1

See Tables 3, 4, 5, 6, 7, 8, 9, 10 and 11 (see Figs. 3, 4).

Table 3 Attrition by treatment status

	(1)	(2)	(3)	(4)
Hard	0.015 (0.015)			− 0.012 (0.021)
Tax		0.0070 (0.014)		
Tax 10%			0.0070 (0.017)	− 0.0047 (0.023)
Tax 20%			0.0069 (0.018)	− 0.030 (0.020)
Hard Tax 10%				0.0077 (0.026)
Hard Tax 20%				0.032 (0.030)
Control mean	0.039	0.042	0.042	0.048
Adj. R^2	0.00	− 0.00	− 0.00	0.00
Observations	847	847	847	847

Results obtained via OLS regressions. Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively. The outcome variable equals 1 if the participant left the study from the first scenario onwards and 0 if the participant completed the survey

Hard indicate participants assigned to the hard scenarios. Tax indicates participates assigned to any of the two Tax levels. Hard Tax 10%/20% indicate treatment groups assigned to both hard scenarios and Tax, and are not defined as interaction terms in this analysis

Table 4 Balance checks across treatment groups assigned to different Tax levels

	(1) No Tax	(2) Tax 10%	(3) Tax 20%	(4) p-value
Female	0.68	0.70	0.68	0.88
Age	42.83	42.17	43.31	0.58
High education	0.56	0.55	0.59	0.55
Student	0.07	0.06	0.03	0.15
Employed	0.73	0.78	0.71	0.27
Nationality UK	0.94	0.92	0.95	0.45
Overweight	0.58	0.57	0.55	0.77
Alcohol consumption	3.42	3.13	3.25	0.58
Drinks moderate/high	0.28	0.24	0.24	0.38
Smoker	0.19	0.16	0.17	0.58
Household size	2.72	2.76	2.95	0.11
Parent	0.56	0.61	0.66	0.08
Subjective SES	5.19	5.25	5.25	0.88
Income	22.36	23.86	22.94	0.46
Observations	342	252	214	

Columns (1)–(3) show the means across treatment arms

Column (4) displays the p-value associated with the the F test of joint orthogonality across treatment arms. Subjective SES is measured on a scale (ladder) from 1 to 10, with 10 being represented by the the people who are better off (in terms of education, money and jobs) in the UK. Income is computed by dividing total yearly household income by the square root of the household size and is expressed in thousand pounds. Alcohol consumption is measured in units of alcohol (1 unit of alcohol = 1 small glass of wine; half pint of beer; pub measure of spirits). The higher number of observations in the Tax conditions is due to our sampling strategy (40% No Tax, 60%) which allows more power to detect difference between the two tax levels

Table 5 Manipulation check—treatment effects on financial worries

	(1) Financial situation	(2) Finding money	(3) Index
Hard	0.19 ∗ ∗ ∗ (0.049)	0.20∗ ∗ ∗ (0.055)	0.25∗ ∗ ∗ (0.062)
Female	0.11∗ (0.055)	0.14∗∗ (0.061)	0.16∗∗ (0.069)
Age	− 0.0077∗ ∗ ∗ (0.0026)	− 0.013∗ ∗ ∗ (0.0029)	− 0.013∗ ∗ ∗ (0.0033)
High education	0.075 (0.054)	0.053 (0.063)	0.083 (0.070)
Student	0.019 (0.11)	− 0.0049 (0.12)	0.0095 (0.14)
Employed	− 0.051 (0.062)	− 0.016 (0.073)	− 0.044 (0.080)
Nationality UK	− 0.22∗∗ (0.11)	− 0.26∗∗ (0.12)	− 0.31∗∗ (0.13)
Overweight	0.040 (0.051)	0.11∗ (0.057)	0.094 (0.064)
Smoker	0.14∗∗ (0.066)	0.21∗ ∗ ∗ (0.079)	0.23∗ ∗ ∗ (0.087)
Medium/high drinker	− 0.024 (0.054)	− 0.055 (0.061)	− 0.049 (0.068)
Parent	0.0041 (0.063)	0.20∗ ∗ ∗ (0.069)	0.12 (0.078)
Household size	0.0016 (0.022)	0.0053 (0.025)	0.0043 (0.028)
Subjective SES	− 0.12∗ ∗ ∗ (0.019)	− 0.13∗ ∗ ∗ (0.021)	− 0.16∗ ∗ ∗ (0.025)
Income	− 0.013∗ ∗ ∗ (0.0026)	− 0.018∗ ∗ ∗ (0.0025)	− 0.020∗ ∗ ∗ (0.0031)
Adj. R^2	0.21	0.26	0.26
Observations	808	808	808

All estimates are obtained via OLS regressions. Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively

The outcome variables are worries about the financial situations: How worried do you feel about your financial situation? and worries about finding money in case of need: How worried do you feel about not being able to find money in case you really need it?. Both variables are coded as: 0 not worried as all, 1 somewhat worried, 2 very worried and 3 desperately worried. The index variable in the last column is computed through the inverse covariance weigthing procedure in Anderson (2008) and standardized using the control group mean and standard deviation. Subjective SES is measured on a scale (ladder) from 1 to 10, with 10 being represented by the the people who are better off (in terms of education, money and jobs) in the UK. Income is computed by dividing total yearly household income by the square root of the household size and is expressed in thousand pounds

Table 6 Manipulation check—treatment effects on financial worries—by income group

	(1) Financial situation	(2) Finding money	(3) Index
Hard	0.22** (0.096)	0.27** (0.11)	0.31** (0.12)
Middle income	$-0.42***$ (0.086)	$-0.47***$ (0.099)	$-0.57***$ (0.11)
Higher income	$-0.50***$ (0.11)	$-0.56***$ (0.12)	$-0.68***$ (0.13)
Hard × Middle income	0.00073 (0.12)	-0.055 (0.14)	-0.033 (0.16)
Hard × Higher income	-0.091 (0.12)	-0.17 (0.13)	-0.16 (0.15)
Control mean	0.83	0.87	-0.02
Controls	Yes	Yes	Yes
Adj. R^2	0.24	0.29	0.29
Observations	808	808	808

Estimates are obtained via OLS regressions. Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively

The dependent variables are worries about the financial situations: *How worried do you feel about your financial situation?* and worries about finding money in case of need: *How worried do you feel about not being able to find money in case you really need it?*. Both variables are coded as: 0 not worried as all, 1 somewhat worried, 2 very worried and 3 desperately worried. The index variable in the last column is computed through the inverse covariance weighting procedure in Anderson (2008) and standardized using the control group mean and standard deviation. All models include individual and household characteristics. Hard indicates being assigned to the hard scenarios. Reference category is the lower-income group. Income is computed by dividing total yearly household income by the square root of the household size and is expressed in thousand pounds

Table 7 Correlation between income, self-reported "sin" behaviors and demand for subcategories of temptation goods in the experimental market

Panel A: Self-reported behaviors	(1) Overweight	(2) Alcohol consumption	(3) Smoker
Income	$-0.0021*$ (0.0012)	$0.024***$ (0.0085)	$-0.0037***$ (0.00082)

Panel B: Expenditure in the task	(1) Unhealthy foods	(2) Alcohol	(3) Tobacco
Income	0.0012 (0.012)	0.029** (0.013)	$-0.0085***$ (0.0031)

Estimates are obtained via OLS regressions. Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively

Outcome variables are listed in column headers. Outcome in Panel A are computed using survey items in Prolific's database. Alcohol consumption is expressed in units of alcohol per week. Outcomes in Panel B are total expenditures in the experimental market for each category of goods expressed at baseline prices. Panel B regressions include variables indicating treatment assignment as covariates. Income is computed by dividing total yearly household income by the square root of the household size and is expressed in thousand pounds

Table 8 Treatment effects of prime and tax by income tertile on demand for temptation by subgroups of temptation goods

	Alcohol			Tobacco			Junk food	
	(1) Lower	(2) Middle	(3) Higher	(4) Lower	(5) Middle	(6) Higher	(7) Lower	(8) Middle
Tax 10% (10%)	−0.10 (1.00)	−0.10 (1.06)	−1.07 (1.22)	−0.34 (0.37)	−0.014 (0.26)	−0.43 (0.27)	0.099 (0.40)	−0.39 (0.31)
Tax 20% (20%)	−0.23 (1.16)	−0.64 (1.11)	−2.84** (1.10)	−0.51* (0.27)	−0.0065 (0.29)	−0.40 (0.29)	−0.43 (0.31)	−0.59* (0.31)
Hard (H)	−1.53* (0.90)	0.82 (1.18)	−0.24 (1.36)	−0.17 (0.37)	0.46 (0.39)	−0.29 (0.25)	−0.28 (0.31)	−0.50 (0.31)
Hard × Tax 10% ($H \times 10\%$)	1.29 (1.31)	−0.60 (1.75)	0.89 (1.81)	−0.050 (0.47)	−0.29 (0.40)	0.39 (0.30)	−0.062 (0.50)	0.63 (0.42)
Hard × Tax 20% ($H \times 20\%$)	1.98 (1.56)	−1.24 (1.70)	2.45 (1.84)	0.68 (0.51)	−0.021 (0.54)	0.33 (0.32)	0.38 (0.47)	0.25 (0.37)
Control Mean	1.64	2.46	4.07	0.47	0.20	0.39	1.07	1.21
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	−0.01	0.04	0.06	0.13	0.02	0.12	−0.00	0.18
Observations	271	268	269	271	268	269	271	268
p-values- tests:								
(i) 10% = 20%	0.91	0.64	0.09	0.51	0.95	0.83	0.18	0.46
(ii) 10% + $H \times 10\%$ = 20% + $H \times 20\%$	0.64	0.32	0.89	0.13	0.51	0.76	0.81	0.03
(iii) 10% + $H \times 10\%$ = 0	0.13	0.60	0.90	0.15	0.32	0.70	0.90	0.40
(iv) 20% + $H \times 20\%$ = 0	0.08	0.14	0.79	0.71	0.95	0.57	0.87	0.11
(v) $H + H \times 10\%$ = 0	0.81	0.85	0.63	0.44	0.34	0.28	0.38	0.66
(vi) $H + H \times 20\%$ = 0	0.72	0.72	0.06	0.14	0.25	0.78	0.78	0.31

	Junk food	Sugary drinks			Sweets		
	(9) Higher	(10) Lower	(11) Middle	(12) Higher	(13) Lower	(14) Middle	(15) Higher
Tax 10% (10%)	−0.12 (0.25)	−0.13 (0.42)	−0.041 (0.32)	−0.27 (0.38)	0.23 (0.99)	−1.85** (0.73)	−2.18** (0.92)
Tax 20% (20%)	−0.089 (0.31)	−0.67* (0.38)	−0.18 (0.34)	−0.016 (0.48)	−1.16 (1.01)	−0.73 (1.04)	−2.72*** (0.86)
Hard (H)	−0.26 (0.24)	−0.81** (0.32)	0.021 (0.34)	−0.074 (0.37)	−0.80 (0.86)	−1.74** (0.73)	−1.81* (0.95)
Hard × Tax 10% ($H \times 10\%$)	0.31 (0.39)	0.74 (0.53)	0.44 (0.50)	−0.051 (0.51)	−0.37 (1.25)	2.65** (1.04)	1.08 (1.21)
Hard × Tax 20% ($H \times 20\%$)	0.48 (0.44)	1.16* (0.61)	−0.34 (0.41)	−0.57 (0.55)	1.20 (1.38)	1.06 (1.18)	2.90** (1.20)

Table 8 continued

	Sugary drinks				Sweets		
	(9) Higher	(10) Lower	(11) Middle	(12) Higher	(13) Lower	(14) Middle	(15) Higher
Control Mean	0.79	1.00	0.78	0.94	2.52	2.69	3.48
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.03	0.02	0.05	−0.01	0.02	−0.01	0.07
Observations	269	271	268	269	271	268	269
p-values- tests:							
(i) $10\% = 20\%$	0.93	0.17	0.68	0.59	0.19	0.20	0.34
(ii) $10\% + H \times 10\% = 20\% + H \times 20\%$	0.61	0.83	0.01	0.35	0.84	0.53	0.08
(iii) $10\% + H \times 10\% = 0$	0.49	0.05	0.33	0.32	0.84	0.31	0.18
(iv) $20\% + H \times 20\% = 0$	0.16	0.29	0.05	0.05	0.96	0.62	0.81
(v) $H + H \times 10\% = 0$	0.86	0.86	0.25	0.70	0.21	0.20	0.28
(vi) $H + H \times 20\% = 0$	0.51	0.52	0.26	0.12	0.71	0.47	0.09

Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively

All models control for individual and household characteristics. The outcome variables are expenditure levels at baseline—no Tax prices—on the subcategories of temptation goods in the column headers. The sample used are divided by income tertiles. Hard indicates participants assigned to the hard scenarios condition. Tax 10% and 20% indicate participants assigned to the treatment groups where the prices of temptation goods were increased by 10% and 20% respectively. The control means are the means of the outcome variables in the Easy scenario no Tax group. Tests (iii)-(iv) test for the effect of taxes in the Hard condition. Tests (v)-(vi) test for difference between the Easy and Hard condition at each Tax level

Table 9 Treatment effects of prime and tax by income tertile on demand for temptation by subgroups of temptation good aggregating all food products into one category

	Alcohol				Tobacco				Sugary and junk foods			
	(1) All	(2) Lower	(3) Middle	(4) Higher	(5) All	(6) Lower	(7) Middle	(8) Higher	(9) All	(10) Lower	(11) Middle	(12) Higher
Tax 10% (10%)	-0.53 (0.62)	-0.10 (1.00)	-0.10 (1.06)	-1.07 (1.22)	-0.26 (0.16)	-0.34 (0.37)	-0.014 (0.26)	-0.43 (0.27)	-1.82*** (0.59)	0.20 (1.27)	-2.28** (0.96)	-2.57** (1.07)
Tax 20% (20%)	-1.10* (0.64)	-0.23 (1.16)	-0.64 (1.11)	-2.84*** (1.10)	-0.30** (0.15)	-0.51* (0.27)	-0.0065 (0.29)	-0.40 (0.29)	-2.20*** (0.65)	-2.26* (1.23)	-1.50 (1.26)	-2.83*** (1.05)
Hard (H)	-0.50 (0.64)	-1.53* (0.90)	0.82 (1.18)	-0.24 (1.36)	0.028 (0.20)	-0.17 (0.37)	0.46 (0.39)	-0.29 (0.25)	-2.15*** (0.60)	-1.89* (1.09)	-2.21** (0.93)	-2.14* (1.09)
Hard × Tax 10% (H × 10%)	0.65 (0.90)	1.29 (1.31)	-0.60 (1.75)	0.89 (1.81)	-0.023 (0.23)	-0.050 (0.47)	-0.29 (0.40)	0.39 (0.30)	2.35*** (0.82)	0.30 (1.63)	3.72*** (1.32)	1.34 (1.47)
Hard × Tax 20% (H × 20%)	0.95 (0.94)	1.98 (1.56)	-1.24 (1.70)	2.45 (1.84)	0.32 (0.26)	0.68 (0.51)	-0.021 (0.54)	0.33 (0.32)	2.24*** (0.86)	2.74 (1.73)	0.97 (1.44)	2.81* (1.44)
Control mean	2.67	1.64	2.46	4.07	0.36	0.47	0.20	0.39	4.81	4.58	4.68	5.20
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.04	-0.01	0.04	0.06	0.06	0.13	0.02	0.12	0.05	0.04	0.06	0.09
Observations	808	271	268	269	808	271	268	269	808	271	268	269
p-values- tests:												
(i) 10% = 20%	0.37	0.91	0.64	0.09	0.63	0.51	0.95	0.83	0.51	0.06	0.48	0.76
(ii) 10% + H × 10% = 20% + H × 20%	0.70	0.64	0.32	0.89	0.11	0.13	0.51	0.76	0.42	0.98	0.05	0.20
(iii) 10% + H × 10% = 0	0.86	0.13	0.60	0.90	0.07	0.15	0.32	0.70	0.34	0.59	0.15	0.22
(iv) 20% + H × 20% = 0	0.83	0.08	0.14	0.79	0.93	0.71	0.95	0.57	0.94	0.69	0.52	0.98
(v) H + H × 10% = 0	0.82	0.81	0.85	0.63	0.96	0.44	0.34	0.28	0.72	0.19	0.12	0.39
(vi) H + H × 20% = 0	0.52	0.72	0.72	0.06	0.04	0.14	0.25	0.78	0.89	0.52	0.28	0.45

Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively

All models control for individual and household characteristics. The outcome variables are expenditure levels at baseline—no Tax prices—on the subcategories of temptation goods in the column headers. The sample used are divided by income tertiles. Hard indicates participants assigned to the hard scenarios condition. Tax 10% and 20% indicate participants assigned to the treatment groups where the prices of temptation goods were increased by 10% and 20% respectively. The control means are the means of the outcome variables in the Easy scenario no Tax group. Tests (iii)-(iv) test for the effect of taxes in the Hard condition. Tests (v)-(vi) test for difference between the Easy and Hard condition at each Tax level

Table 10 Sequential g-estimates by income group for all the selected candidate mediators

	(1) Baseline	(2) Necessity Index	(3) Cognitive Reflection	(4) Life Satisfaction (1-10)	(5) Time Preferences	(6) Risk (1-10)
Hard						
All	−2.12 (−3.96, −0.29)	−0.76 (−2.19, 0.7)	−2.09 (−3.91, −0.25)	−2.16 (−3.96, −0.38)	−2.26 (−3.86, −0.02)	−2.11 (−3.86, −0.05)
Low income	−3.13 (−6.18, −0.09)	−1.83 (−4.48, 0.74)	−2.99 (−5.95, 0.51)	−3.07 (−6.11, −0.21)	−3.17 (−6.17, −0.03)	−3.15 (−6.41, −0.09)
Middle income	−0.44 (−3.66, 2.78)	1.06 (−1.6, 3.7)	−0.48 (−3.63, 2.77)	−0.48 (−3.43, 3.2)	−0.92 (−3.95, 2.43)	−0.3 (−3.4, 3.15)
High income	−1.98 (−5.61, 1.65)	−0.86 (−3.68, 1.26)	−1.95 (−5.68, 1.3)	−1.95 (−5.73, 1.64)	−1.9 (−5.84, 1.54)	−1.81 (−6.24, 1.47)
Hard x Tax 10%						
All	1.57 (−0.96, 4.1)	0.67 (−1.41, 2.66)	1.5 (−1.18, 4.09)	1.67 (−0.91, 4.21)	1.51 (−1.02, 4.45)	1.51 (−0.88, 4.03)
Low income	0.39 (−4.21, 4.99)	1.52 (−2.51, 5.3)	0.32 (−4.36, 5.11)	0.48 (−4.49, 5.23)	0.21 (−4.52, 4.66)	0.3 (−3.73, 4.86)
Middle income	0.63 (−3.99, 5.25)	−0.94 (−4.4, 2.76)	0.69 (−3.64, 5.75)	0.79 (−3.88, 5.51)	1.03 (−4.18, 5.41)	0.28 (−4.8, 4.61)
High income	1.66 (−3.15, 6.46)	0.16 (−3.32, 4.35)	1.52 (−3.04, 6.32)	1.76 (−2.83, 6.26)	1.65 (−3.36, 6.62)	1.64 (−3.35, 6.3)
Hard x Tax 20%						
All	3.08 (0.39, 5.77)	1.26 (−0.72, 3.42)	3.03 (0.46, 5.76)	3.05 (0.46, 5.83)	3.19 (0.54, 6.18)	3.01 (0.37, 5.69)
Low income	5.36 (0.44, 10.28)	3.23 (−0.14, 7.39)	5.24 (0.48, 10.18)	5.41 (0.45, 10.46)	5.08 (0.33, 10.14)	5.53 (0.72, 10.09)
Middle income	−0.94 (−5.57, 3.7)	−1.71 (−5.83, 1.7)	−0.76 (−6.19, 3.44)	−0.79 (−5.94, 3.48)	−0.43 (−5.6, 4)	−0.89 (−6.27, 3.16)
High income	5.05 (0.22, 9.88)	2.19 (−0.69, 5.82)	4.72 (−0.36, 10.29)	4.87 (−0.13, 9.64)	4.81 (0.6, 11.19)	4.77 (0.43, 10.32)

The outcome variable in all models is expenditure on temptation, expressed at baseline—being assigned to hard scenarios (Hard), Hard interacted with the 10% Tax and Hard interacted with the 20% Tax, for the baseline OLS model [Column (1)] and sequential g-estimation procedures for the candidate mediators [(Columns (2)–(6)]. 95% confidence intervals in parentheses [bootstrapped (1000 repetitions) BCA confidence intervals in columns (2) –(6)]. All models control for individual and household characteristics and the levels of the Tax

Table 11 Robustness checks

	Temptation (Tobit)				Left as bonus payment (0-2£)			
	(1) All	(2) Lower	(3) Middle	(4) Higher	(5) All	(6) Lower	(7) Middle	(8) Higher
Tax 10% (10%)	−2.10 (1.29)	1.12 (2.35)	−0.45 (2.25)	−4.90** (2.24)	0.18** (0.075)	0.35*** (0.14)	0.16 (0.14)	0.12 (0.13)
Tax 20% (20%)	−6.01*** (1.46)	−5.20** (2.52)	−3.74 (2.70)	−9.41*** (2.35)	−0.026 (0.082)	0.071 (0.14)	0.050 (0.16)	−0.091 (0.15)
Hard (H)	−2.86** (1.29)	−4.93** (2.25)	−0.13 (2.15)	−2.68 (2.38)	0.068 (0.073)	0.11 (0.12)	−0.032 (0.13)	0.21 (0.13)
Hard × Tax 10% (H × 10%)	1.50 (1.88)	0.50 (3.37)	−0.75 (3.24)	1.64 (3.40)	−0.27** (0.11)	−0.30 (0.19)	−0.13 (0.19)	−0.50** (0.19)
Hard × Tax 20% (H × 20%)	4.73** (2.09)	8.53** (3.69)	−1.64 (3.55)	7.54** (3.47)	0.058 (0.12)	0.046 (0.21)	0.090 (0.22)	−0.038 (0.21)
Control Mean	8.23	7.06	7.74	10.06	1.03	0.95	1.02	1.13
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo % Adj. R^2					0.02	0.03	0.02	0.05
Observations	808	271	268	269	808	271	268	269
p-values- tests:								
(i) 10% = 20%	0.01	0.02	0.23	0.06	0.01	0.06	0.49	0.15
(ii) 10% + H × 10% = 20% + H × 20%	0.66	0.54	0.11	0.60	0.20	0.74	0.48	0.12
(iii) 10% + H × 10% = 0	0.66	0.47	0.61	0.20	0.26	0.68	0.84	0.01
(iv) 20% + H × 20% = 0	0.40	0.22	0.03	0.47	0.73	0.48	0.38	0.38
(v) H + H × 10% = 0	0.33	0.07	0.72	0.68	0.01	0.21	0.23	0.05
(vi) H + H × 20% = 0	0.25	0.22	0.54	0.05	0.19	0.39	0.75	0.30

	Temptation + Left as bonus				Temptation excluding moisturizers			
	(9) All	(10) Lower	(11) Middle	(12) Higher	(13) All	(14) Lower	(15) Middle	(16) Higher
Tax 10% (10%)	−1.70 (0.93)	0.52 (1.74)	−0.70 (1.60)	−3.76** (1.71)	−2.60*** (0.85)	−0.24 (1.66)	−2.40* (1.45)	−4.07*** (1.56)
Tax 20% (20%)	−3.88*** (0.94)	−3.16* (1.65)	−2.33 (1.78)	−6.48*** (1.61)	−3.59*** (0.92)	−3.00* (1.66)	−2.14 (1.74)	−6.07*** (1.51)
Hard (H)	−2.06** (0.94)	−3.02** (1.54)	−0.47 (1.64)	−1.77 (1.88)	−2.63*** (0.88)	−3.58** (1.44)	−0.94 (1.54)	−2.68 (1.73)
Hard × Tax 10% (H × 10%)	1.30 (1.30)	0.093 (2.33)	0.50 (2.35)	1.16 (2.47)	2.98** (1.21)	1.55 (2.22)	2.82 (2.20)	2.62 (2.27)
Hard × Tax 20% (H × 20%)	3.14** (1.38)	5.40** (2.47)	−0.85 (2.38)	5.01** (2.49)	3.50** (1.32)	5.39** (2.42)	−0.29 (2.28)	5.59** (2.36)
Control Mean	9.26	8.01	8.76	11.19	7.84	6.69	7.34	9.66
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 11 continued

	Temptation + Left as bonus				Temptation excluding moisturizers			
	(9) All	(10) Lower	(11) Middle	(12) Higher	(13) All	(14) Lower	(15) Middle	(16) Higher
Pseudo % Adj. R^2	0.05	0.05	0.04	0.08	0.06	0.07	0.05	0.09
Observations	808	271	268	269	808	271	268	269
p-values- tests:								
(i) 10% = 20%	0.02	0.04	0.36	0.05	0.25	0.11	0.87	0.14
(ii) $10\% + H \times 10\% = 20\% + H \times 20\%$	0.73	0.39	0.07	0.55	0.63	0.56	0.08	0.59
(iii) $10\% + H \times 10\% = 0$	0.66	0.66	0.91	0.15	0.66	0.33	0.80	0.38
(iv) $20\% + H \times 20\% = 0$	0.46	0.21	0.05	0.44	0.92	0.17	0.12	0.79
(v) $H + H \times 10\% = 0$	0.40	0.09	0.99	0.71	0.68	0.22	0.22	0.97
(vi) $H + H \times 20\% = 0$	0.28	0.22	0.45	0.04	0.37	0.35	0.47	0.05

Robust standard errors in parentheses.*, **, *** denote significance at the 10%, 5% and 1% levels respectively

All models control for individual and household characteristics. Pseudo R^2 reported is in Columns (1)–(4), while Adjusted Pseudo R^2 in Columns (5) to (16). The outcome variables is expenditure on temptation at baseline - no Tax - prices, the amount left as bonus payment in the experimental market (out of £30), the sum of the previous two, expenditure on temptation at baseline - no Tax - prices excluding two moisturizing creams. The sample used is the entire sample or the sample divided by income tertile as listed in the column headers . Hard indicates participants assigned to the hard scenarios condition. Tax 10% and 20% indicate participants assigned to the treatment groups where the prices of temptation goods were increased by 10% and 20% respectively. The control means in Columns (1)-(2)/(3)-(6) are the means of the outcome variable in the no Tax groups/Easy scenario no Tax group. The control means in Column (5) reports the average expenditure in the group exposed to easy scenarios and no price increase. Tests (iii)-(iv) test for the effect of taxes in the Hard condition. Tests (v)-(vi) test for difference between the Easy and Hard condition at each Tax level
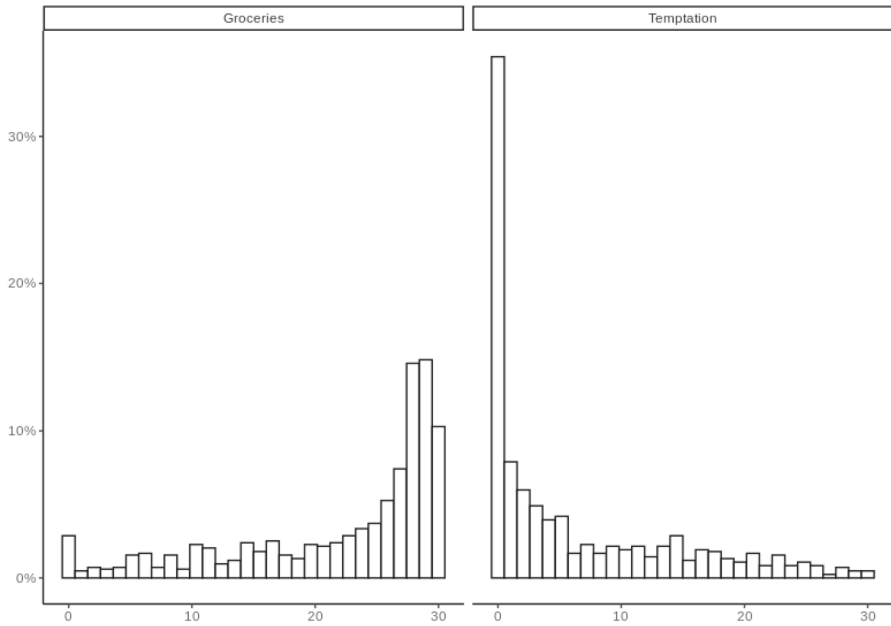
Fig. 3 Demand for temptation and necessities—total expenditure at baseline prices. The outcome variable is total expenditure on groceries and temptation goods, at baseline prices—no Tax—prices
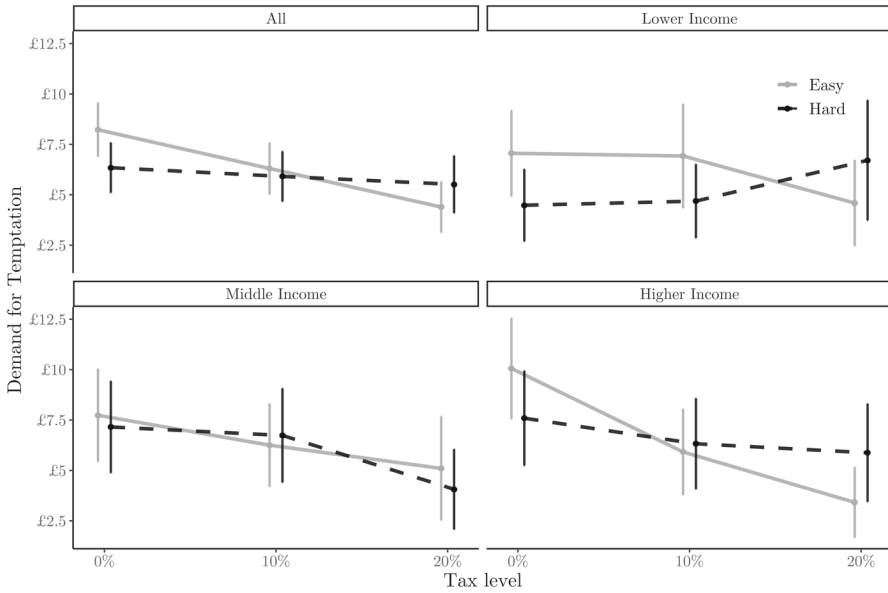
Fig. 4 Demand for temptation goods at different Tax levels by financial scenarios condition and income group. The outcome variable is expenditure on temptation at baseline—no Tax—prices. Dots indicate means by financial scenarios condition at each level of the tax, while the vertical lines indicate 95% confidence intervals. The labels on each plot indicate the samples used: the entire sample (upper left) and samples divided by income tertiles. Easy indicate participants assigned to the easy scenarios, while Hard indicate participants assigned to the hard scenarios

Appendix 2

Procedure

See Figs. 5, 6 and 7.
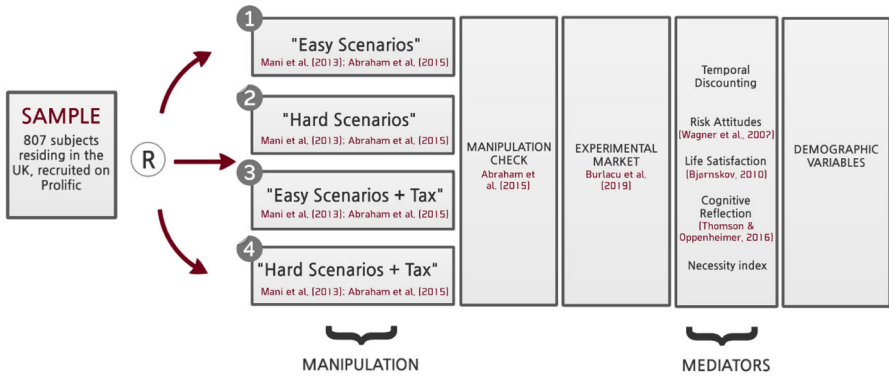
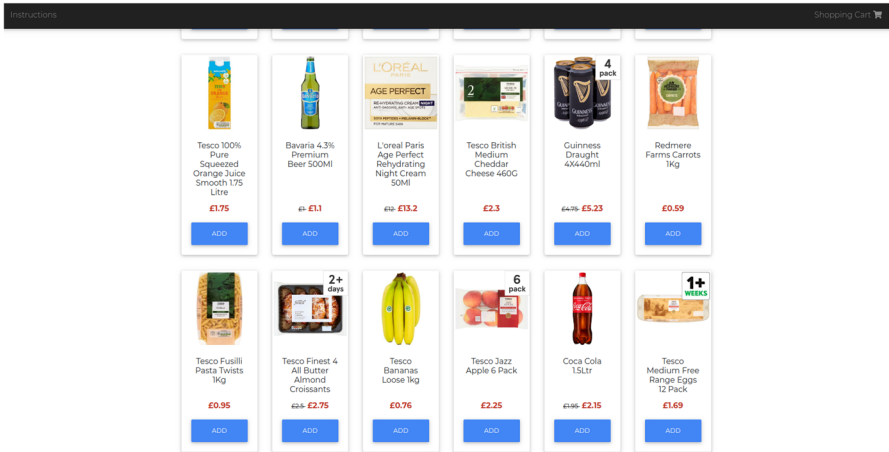**Fig. 5** Flowchart describing the procedure of the experiment

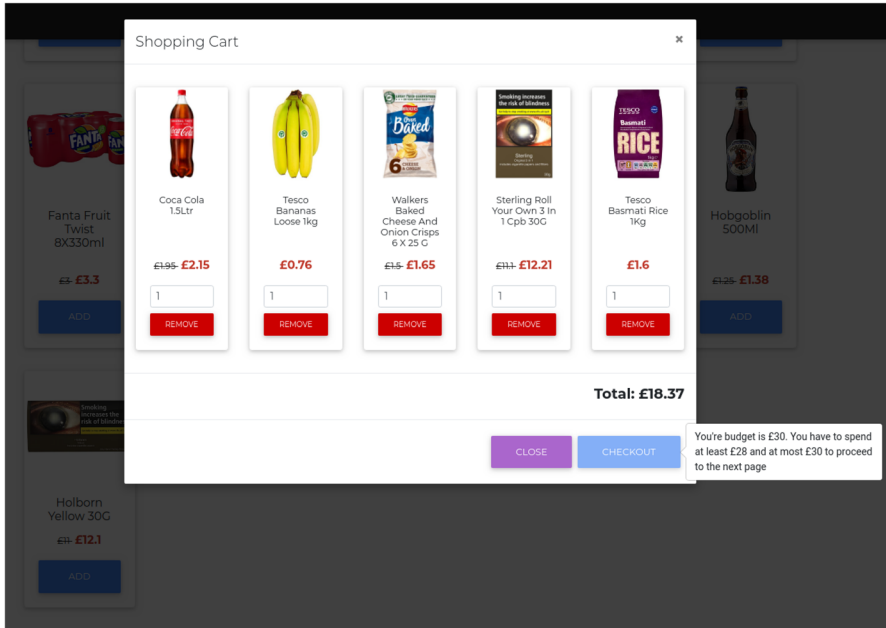**Fig. 6** Main screen of the purchasing task

Fig. 7 Checkout screen of the purchasing task

Experimental task

Financial scenarios

Instructions In the following section you will be presented 2 scenarios and asked to answer how you would go about dealing with the situations if they were to happen to you. Please take your time answering the questions. Try to have at least 3 sentences in your open question answers.

1. Imagine that an unforeseen event requires of you an immediate (£2000/£100) expense. You need to raise the money in less than a week.

   - Are there ways in which you may be able to come up with that amount of money on a very short notice? (yes/no)
   - How would you go about getting (£2000/£100) on a very short notice? Three sentences should be enough. (open)
   - To what extent do you agree with the following statements? (4 item Likert: strongly disagree - strongly agree)

     (a) "Coming up with (£2000/£100) on a very short notice would cause me long-lasting financial hardship."
     (b) "Coming up with (£2000/£100) on a very short notice would require me to make sacrifices that have long-term consequences."

2. Imagine that the economy is going through difficult times. Your household's monthly expenses increase by (£300/£15) due to higher energy and housing prices.

- Please indicate to what extent do you agree with the following statement: "Given my situation, I would be able to maintain roughly the same lifestyle under those new circumstances." (4 item Likert: strongly disagree–strongly agree)
- In what ways would the (£300/£15) increase in your monthly expenses would impact your leisure, housing or travel plans? What changes would you need to make? Three sentences should be enough. (open)
- To what extent do you agree with the following statement: "The (£300/£15) increase in our monthly expenses would strongly impact our leisure, housing, or travel plans." (4 item Likert: strongly disagree–strongly agree)

Purchasing task

Instructions In the following task you have to choose what goods to purchase with a budget of £30 (see Table 12).

You will see a list of available goods, with a picture, title and the price displayed for each of them. The price of the goods is the retail price including the discounts offered by the retailer. If you need additional information on the goods, by clicking on the picture a new window will open with further details from the website of the retailer.

Some of the goods have a higher price than that of the retailer.

By clicking on the *ADD button*, the goods will be added to the shopping cart. You can edit the shopping cart content at any time by clicking on the *Shopping Cart* section in the top-right side of your screen.

A new window will open with the goods already selected. You can modify the quantities of each good or remove them from the shopping cart. You can return to the main window at anytime by clicking on close, or anywhere outside the shopping cart window.

When you are satisfied with your selection, click on *Checkout* in the shopping cart window to proceed to the next page. Try to spend as close to the £30 budget as possible. To proceed to the next page you need to spend a minimum of £28. Any remainder will be added as bonus payment on Prolific.

You can access these instructions at any time by clicking on the *Instructions* section in the top-left side of the page.

1 out of every 100 participants will be selected for payment. If you are selected, the goods will be delivered to a collection location of your choice at a date and time that is convenient for you. You can pick up your goods with the code we will send you.

Table 12 List of products and their prices from the experimental market task

	Temptation		Groceries	
	Product	Price £	Product	Price £
1	Moisturiser Cream 50 Ml	10.50	Semi Skimmed Milk 2.272 L	1.09
2	Night Cream 50 Ml	12.00	Eggs 12 Pack	1.69
3	Dry Gin 70Cl	18.00	Medium Bread 800 G	1.10
4	Pale Ale Pack 12X330 ml	13.00	Yogurt 500 G	0.90
5	Rolling Tobacco 30 G	11.00	Peas 1 Kg	1.60
6	Rolling Tobacco 30 G	11.10	Mixed Vegetables1 Kg	1.50
7	Cigarettes 20	8.60	Bananas 1kg	0.76
8	Cigarettes 20 Pack	8.70	Beef Mince 500 G 5% Fat	3.39
9	Lager 4 X 440 Ml	3.35	Chicken Breast Portions 650 G	3.80
10	Beer 15 X 440 Ml	13.00	Toilet Tissue 2 Packs	3.35
11	Chocolate Treats 12 Pack 170 G	2.79	Cleaner Spray 500Ml	0.70
12	Boxed Chocolate 305 G	13.00	Body Wash 250Ml	1.80
13	Boxed Chocolates 172 G	5.00	Washing Liquid 1995 Ml	6.00
14	Doughnuts 12 Pack	2.50	100% Orange Juice 1.75 L	1.75
15	Croissants	2.50	Cheddar Cheese 460 G	2.30
16	Chocolate Selection 200 G	5.00	Carrots 1 Kg	0.59
17	Whisky 35 Cl	9.00	Pasta 1 Kg	0.95
18	Cheese Pizza 555G	3.00	Spaghetti 1Kg	0.95
19	Beer 4 X 440 ml	4.75	Basmati Rice 1Kg	1.60
20	Beer 4 X 568 ml	5.25	Baked Beans 4 X 415 g	2.00
21	Apple Cider 12 X 440Ml Can	7.00	Tuna Chunks 4 X 160G	3.25
22	Cola Soft Drink 12 X 330Ml	4.50	Mackerel Fillets 125G	1.40
23	Cola Soft Drink 1.5 L	1.95	Oats 1 Kg	1.10
24	Soft Drink 8 X 330 Ml	3.00	Sunflower Oil 1 L	1.10
25	Soft Drink 8 X 330 ml	3.00	Olive Oil 1 L	3.60
26	Crisps 200G	2.25	Spinach 500G	2.00
27	Crisps 6 X 25 G	1.50	Potatoes 2.5 Kg	2.00
28	Microwave Popcorn 3X60g	1.50	Washing Liquid 1.33 L 38 Washes	6.00
29	Chocolate Bars 7 Pack 291.9 G	2.50	Chicken 1 Kg	4.00
30	Chocolate Bars 7 X28.5 G	2.50	Mushrooms 300 G	0.95
31	Beer 500 Ml	1.00	Apple 6 Pack	2.25
32	Beer 500 Ml	1.25	Salmon Fillets 330G	3.70
33	Beer 12X330 ml	16.50	Brown Rice 1 Kg	1.50

Additional variables

- *Life Satisfaction* All things considered, how satisfied are you with your life as a whole these days? On a scale from 1 to 10, where 1 means you are "completely dissatisfied" and 10 means you are "completely satisfied" where would you put your satisfaction with life? (Bjørnskov 2010)
- *Risk* In general, how willing or unwilling you are to take risks? Please use a scale from 0 to 10, where 0 means completely unwilling to take risks and a 10 means you are very willing to take risks (Wagner et al. 2007)
- *Time Preferences* What is the smallest amount of money to be received today that you would prefer to receiving £200 in 2 months?
- *Cognitive reflection* 3 questions from Thomson and Oppenheimer (2016)

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