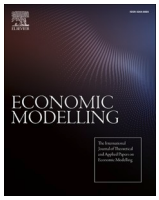
Economic Modelling 126 (2023) 106384



Contents lists available at ScienceDirect

Economic Modelling

journal homepage: www.journals.elsevier.com/economic-modelling





Do rational people sometimes act irrationally? A dynamic self-regulation model of sustainable consumer behavior

Alistair Ulph [a], Luca Panzone [b,*], Denis Hilton [c]

[a] Economics Division, School of Social Sciences, University of Manchester, UK
[b] Applied Economics and Social Science, School of Natural and Environmental Sciences, Newcastle University, UK
[c] Department of Psychology, University of Toulouse, France

ARTICLE INFO

Handling Editor: Angus Chu

JEL classification:
D11
H41
M31
Q56
Q58

Keywords:
Behavioral consistency
Moral self-regulation
Moral licensing (cleansing)
Dynamic model of consumer behavior
Sustainable consumption

ABSTRACT

Significant literature in behavioral economics and psychology has examined why an individual's moral decisions sometimes appear irrational. For example, an individual may display "moral licensing", whereby performing a good act licenses a subsequent less moral act. Another example is the "foot-in-the-door effect," whereby an individual makes a substantial increase in the likelihood of a pro-social behaviour when there has been no change in the circumstances under which the decision is made. Both forms of behavior seem to violate economists' assumption of rational consumer behavior. This paper constructs a simple dynamic model of rational consumer behavior and shows that this can generate both moral licensing (or moral cleansing) and foot-in-the-door effects. We also discuss the implications for government policy.

1. Introduction

How can society act to make the consumption decisions of households more environmentally sustainable? Retailers present consumers with a wide range of products, some of which offer significantly reduced environmental impacts of their consumption and disposal, such as low-energy lightbulbs or bio-degradable packaging. Modern shopping repeatedly confronts consumers with choices (both within a single shopping trip and over a sequence of trips) that have potential moral implications (e.g., protecting animal welfare or the environment) (Panzone et al. 2021b, 2021c). Furthermore, there is evidence that consumers view pro-environmental consumption as a moral choice that is informative about their ethical standards (Bolderdijk et al., 2013; Cornelissen et al. 2008, 2013; Mazar and Zhong, 2010). The psychology literature presents two main frameworks for analyzing individual behavior framworks that lead to differing predictions about the moral choices made by the same individual over different periods (Dolan and Galizzi, 2015; Truelove et al., 2014). First, a value-expression model predicts consistency in a sequence of moral choices; second, a dynamic self-regulation model predicts an alternating sequence of moral and immoral choices (Monin and Jordan, 2009).

We propose a simple dynamic self-regulation model of consumer environmental choices involving moral implications of purchase decisions in which consumers have concerns for their stock of moral self-worth, which can be augmented by the flow of moral self-worth derived from purchases made in each period. The model makes the standard economic assumption of rational behavior and draws on the concept of "moral credits" (Miller and Effron, 2010). That is, whenever consumers engage in a moral activity, they earn credits that can be used in the current consumption choice, or saved, likened to a "moral bank account" (Gneezy et al., 2014; Merritt et al., 2010; Milkman and Beshears, 2009). We show that the decision to spend them or save them critically depends on how far the consumer's current stock of moral self-worth is from their desired, or steady-state, stock of moral self-worth: they save the credits when they are below the desired state (the consumer feels they have not done enough) and spend them if above the desired state (the consumer feels they can indulge).

We show that this model can provide a unified explanation of how, in

* Corresponding author.
E-mail address: luca.panzone@newcastle.ac.uk (L. Panzone).

https://doi.org/10.1016/j.econmod.2023.106384
Received 11 October 2022; Received in revised form 11 May 2023; Accepted 22 May 2023
Available online 23 May 2023
0264-9993/© 2023 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

the same shopping episode, a rational individual may display both inter-act consistencies, in the sense of making shopping choices that continue to move their stock of moral self-worth toward their steady-state stock of moral self-worth, and moral licensing (cleansing). Furthermore, a positive (negative) exogenous shock to their sense of moral self-worth before a shopping trip leads a consumer to make purchases in a way that reduces (increases) their flow of moral self-worth compared to what it would have been in the absence of this shock. The intuition behind our result is that the extent of moral licensing (cleansing) is strictly bounded; thus, moral licensing cannot offset the underlying desire to move their self-worth toward their target stock.

Understanding moral consistency and inconsistency in consumer behavior may be important analytically to advise on policies to achieve environmental targets, such as those set by the EU or the UK, to reduce carbon emissions (Fankhauser et al., 2022). Businesses may set objectives to ensure the sustainability of the goods they produce or purchase along the supply chain, from sourcing sustainable raw materials to reducing emissions from production, transport, and storage. UK estimates indicate that 70% of greenhouse gas emissions depend on consumer choices, at the point of purchase, as well as subsequent decisions, such as how products are used in daily life (Gough et al., 2011). Designing policy to influence such consumer behavior is inherently complex, making it essential that policymakers pay attention to the behavioral factors that drive consumers' choices concerning the sustainability of their consumption.

Section 2 briefly reviews relevant literature in social psychology, focusing on the different frameworks discussing moral behavior in a sequence of decisions. Section 3 outlines our model and how it relates to the broader behavioral economics literature and presents the key theoretical implications, and Section 4 suggests steps for future research.

2. Social psychological frameworks for understanding consistency in moral behavior

The social psychological literature presents two main frameworks for understanding moral behavior: the classical value-expression model of self-regulation and a more recent dynamic model of self-regulation. While sharing the same psychological basis in the relationship between the underlying attitude to behavior and the resulting decision, these two models differ when observing sequences of decisions. This section briefly reviews the literature on these two models to lay the foundations for the model in Section 3.

2.1. Value-expression model of moral self-regulation

The first approach to understanding the consistency of behavior is a value-expression model of moral self-regulation. This model presents a personological perspective of morality, where "moral people perform moral acts" (Aquino and Reed, 2002); consumers holding positive environmental values and attitudes always express these through engaging in socially desirable ("moral") pro-environmental acts (Hurst et al., 2013; Steg et al., 2014). This strong link between moral values and moral behavior exists because the failure to express value-congruent behavior would result in the consumer experiencing negative feelings caused by cognitive dissonance (Freedman and Fraser, 1966). As a result, each choice situation is an opportunity to express one's moral values independent of the memory of any past choices (Fujii, 2006; Poortinga et al., 2013; Tabernero and Hernández, 2011; Whitmarsh, Seyfang, and O'Neill, 2011). In this framework, behavior reliably reveals underlying attitudes and values (Ajzen and Fishbein, 2000): a "green" consumer must express their values in all choices (attitude-behavior consistency) (Fujii, 2006; Poortinga et al., 2013; Tabernero and Hernández, 2011; Thøgersen and Ölander, 2003; Whitmarsh et al., 2011). By implication, a researcher observing (im)moral behavior can infer the presence of (im)moral values and attitudes. The link between attitudes and behavior is presumed to be stable and long-lasting; therefore, this model predicts ceteris paribus inter-act consistency when the consumer faces a sequence of decisions, e.g., taking public transport rather than a car to work in the morning and also taking a train rather than a plane in the afternoon from work to their conference.

2.2. Dynamic value-expression models of self-regulation

The value-expression model just outlined is an essentially static model: decisions in one period do not affect decisions in a subsequent period. For example, in their well-known theory of planned behaviour, Ajzen and Fishbein (2000) indicate that actions are determined by attitudes towards the action itself (for example, the value attached to the outcome and the perceived probability of attaining it) and normative concerns (for example, whether the action is well regarded by a valued reference group). In this view, the decision to invest in more sustainable behavior is determined by the perceived effectiveness of the investment in attaining desired outcomes (reducing carbon footprint, saving money) and whether it will be well regarded by people whose opinion matter (friends, family, and neighbors; (Ahmed et al., 2021; Chan, 1998; Saari et al., 2021). The theory of planned behavior has no memory for previous decisions; it does not require the consumer to recall any of their previous relevant behaviors that modify the perceived desirability of the present action to be taken. As we show below, dynamic moral models of self-regulation require the decision-maker to be aware, at some level, of their previous decisions.

In a well-known demonstration of how previous decisions can influence future ones, Freedman and Fraser (1966) demonstrated an influence technique based on the "foot-in-the-door" effect. In their experiment, Freedman and Fraser (1966) theorized that activating moral attitudes by asking individuals to undertake a small moral act (i.e., placing a small pro-environmental sign in their window) in one period induces the individual to conduct a larger subsequent moral act (i.e., placing a larger pro-environmental sign in their garden). This inter-act consistency can be explained using self-perception theory (Bem, 1972). Individuals who behave morally in response to a first request are more likely to behave morally in response to a second request. Performing the first action generates a self-perception as "the kind of person who does this sort of thing" that then guides the target's response to the second request. However, many studies have failed over time to replicate this foot-in-the-door effect (Beaman et al., 1983; Burger, 1999), and some have even found evidence for a "reverse" foot-in-the-door effect (Guadagno et al., 2001). As a result, a model is needed to explain why the foot-in-the-door effect sometimes appears, sometimes does not appear, and sometimes appears in "reverse" form; this model – presented next – can incorporate dynamics to explain how earlier moral actions influence later moral actions.

2.3. Dynamic moral self-regard model of self-regulation

More recent research on moral self-regulation presents a dynamic moral self-regard model of self-regulation (Monin and Jordan, 2009), whereby individuals seek a positive self-concept and are driven by the pursuit of both a positive sense of moral self-worth as well as by self-interest (e.g., Monin and Jordan, 2009; Zhong et al., 2009). Specifically, this model allows a first preparatory act to have spillover effects that influence a second concluding act. According to this framework, consumers may attain a desired level of positive moral self-worth through an initial choice (e.g., taking public transport rather than a car to work). When making a subsequent decision, the consumer may manifest consistency (e.g., by taking a train rather than a plane to go from work to a conference); however, they may also manifest behavioral inconsistency and license the second choice (e.g., by taking a plane rather than a train to go from work to a conference), a phenomenon sometimes referred to as "moral licensing" (Blanken, van de Ven, and Zeelenberg, 2015; Effron and Conway, 2015; Mullen and Monin, 2016) or the "reverse" foot-in-the-door effect (Guadagno et al., 2001).

This model of self-regulation can be applied to explain inter-act consistency and inter-act inconsistency. As noted above, Freedman and Fraser (1966) theorized that activating moral attitudes by asking individuals to undertake a small moral act in one period induces the individual to conduct a larger subsequent moral act. They suggest that individuals engage in metacognitive thinking and infer they have moral (pro-environmental) values because they engaged in a moral (pro--environmental) act (Bem, 1972; Khan and Dhar, 2006); however, this kind of metacognitive process can result in moral consistency, as well as moral licensing (Khan and Dhar, 2006; Khan et al., 2005). For example, an individual's perception of being moral in response to the first request may give the consumer moral credentials or credits, which represent sufficient evidence of the individual's inner predisposition for morality and reduce the need to demonstrate one's moral qualities in the concluding act (Miller and Effron, 2010). Along with moral licensing effects, where individuals feel they earned the right to do something bad after having done something good[1] (Khan and Dhar, 2006), the literature also presents evidence of moral cleansing effects, whereby a person feels they must make reparations for earlier having done something bad (Sachdeva et al., 2009). Mazar and Zhong (2010) show that moral licensing is driven by the actual act, not by priming effects caused by the initial moral good or act[2]; the effect may be stronger in individuals with stronger pro-environmental attitudes (Gholamzadehmir et al., 2019).

Dynamic models of moral self-regulation (Joosten et al., 2014) have sought to explain when one might expect to observe consistent or inconsistent behavior. For example, homeostatic moral self-regulation models assume that people are motivated to consistently produce pro-social behavior up to a critical threshold (e.g., a steady state or goal state) but are less motivated to furnish the effort necessary beyond this point. For instance, if an individual has not yet attained some ideal level of moral self-worth after a first green choice, they would be expected to carry on producing green choices until they feel they have "done their bit." Research suggests that context influences whether the same population of consumers makes choices consistent or inconsistent with their previous ones (Effron and Conway, 2015; Mullen and Monin, 2016). To this extent, meta-analytic research (Blanken et al., 2015; Simbrunner and Schlegelmilch, 2017) and literature reviews on moral licensing (Effron and Conway, 2015; Mullen and Monin, 2016; Sachdeva et al., 2015) have sought to identify moderating variables that can explain why a second action may be either consistent or inconsistent with the first action.

3. Explaining inter-act (in)consistency in a dynamic model of moral self-regulation

This section presents our model of dynamic moral self-regulation that builds on the theory of dynamic moral self-regulation outlined in Monin and Jordan (2009) and Mullen and Monin (2016), as discussed in Section 2.3. In each period, a consumer chooses between goods that affect their well-being regarding moral and hedonic benefits. The moral credits from these choices affect their current flow and stock of moral self-worth. Understanding how moral self-perception affects their stock of moral self-worth requires the consumer to have a memory of previous acts, which fades over time, and the benefits of these acts for moral self-regard can be influenced by attribution processes and goal framing. In each period, the consumer seeks to maximize their current and expected future flows of well-being while considering the effort involved in making such choices. The outcome of this dynamic process is that the consumer determines a steady-state level of moral self-worth that influences consumption decisions depending on how far the moral self-worth currently in the "moral bank account" is from this target.

Section 3.1 describes our theoretical model and its properties, while Section 3.2 describes our three main results, with proofs provided in the Appendix. We show that our model allows the consumer to display both inter-act consistency, where consumers construct a basket of goods whose environmental characteristics cause their stock of moral self-worth to move toward a steady-state stock; and inter-act inconsistency, where an exogenous positive (negative) shock to their stock of moral self-worth in any period can lead the individual to choose a basket of shopping that is less (more) moral (i.e., environmentally friendly), thus exhibiting moral licensing (cleansing). Moreover, we show that individuals can also display foot-in-the-door effects. Importantly, our model produces testable hypotheses about the extent of moral licensing (cleansing) that might be observed.

Bénabou and Tirole (2011) have also developed a dynamic model of individual behavior in which an individual has standard preferences, extended to include identity concerns (as in Dolan and Galizzi, 2015), which they use to explain psychological features, including moral licensing and the foot-in-the-door effect. A key assumption of their model is that individuals have an imperfect understanding of their identity, and this imprecision causes inconsistent behavior. In contrast, the dynamic model we present in this paper employs a model of rational behavior in which consumers have preferences for both their stock and flow of moral worth and perfectly understand these preferences. Nevertheless, we show that even with perfect knowledge of their preferences and identity, consumers engage in consistent behavior (in the sense that they wish to ensure the stock of moral self-worth moves toward their desired steady-state stock) and inconsistent behavior (in the sense that unanticipated boost to their flow of moral self-worth reduces the flow of moral self-worth obtained from their subsequent choices). This inconsistency in actions is driven by the standard assumption of diminishing marginal utility from increases in the flow and stock of moral self-worth.

3.1. A simple dynamic model of moral self-regulation

A consumer makes choices over many goods (a typical UK supermarket contains tens of thousands of products), and we assume that the consumer is concerned about the moral implications of buying some of these goods. For example, the consumer may care about the negative impact of their choices on climate change, as measured by their carbon footprint, or their health (and the resulting pressure on health services) as measured by the calorie or sugar content of foodstuffs. For simplicity, we assume that all the commodities in the market can be aggregated into just two goods: a moral good and a hedonic good. We denote the amounts consumed (purchased) of these two goods in period t by x_t and h_t.

The consumer faces several constraints on these choices. First, the standard budget constraint, where any government policies to deal with environmental or health issues, such as a carbon tax (Panzone et al. 2021b, 2021c) or limits on sugar consumption (Allcott et al., 2019; Zizzo et al., 2021). Second, a constraint on the time available to search for moral goods (Panzone et al., 2021b). Finally, the consumer has psychological constraints, such as bounded willpower (Panzone, Auch, and Zizzo, 2021a). We capture all these constraints by a single effort constraint $h_t = \varphi(x_t)$, where $\varphi' < 0, \varphi'' < 0$, which shows an increasing marginal cost of consumption of the moral good, x_t, in terms of the required reduction in consumption of good h_t. The consumer has a

[1] The inverse foot-in-the-door effect of Guadagno et al. (2001) resembles moral licensing, as this effect shows that an initial prosocial act reduces moral effort in a second task.

[2] Priming, induced by drawing people's attention to "green" products in an online shop (by rating their design and description), can motivate subsequent consistent moral behavior (i.e., generosity in a dictator game).

standard[3] utility function $U(m_t,h_t)$, capturing the flow of well-being the consumer derives in period t from both the consumption of the hedonic good, h_t, and m_t, the flow of moral self-worth the individual experiences in period t. The flow of moral self-worth, m_t, derives from the stock of moral self-worth, M_t, and the purchase of the moral good, x_t.

The individual enters period t with a current stock of moral self-worth, M_t, resulting from consumption decisions made in all previous time-periods (Merritt et al., 2010; Miller and Effron, 2010). This stock of moral self-worth is a metricized version of the concept of moral identity in Bénabou and Tirole (2011) and Kaplow and Shavell (2007). Unlike Bénabou and Tirole (2011), our model assumes that the individual perfectly knows the sense of moral self-worth. Before making consumption decisions in period t, the consumer's flow of moral self-worth can be affected by an exogenous self-esteem shock denoted by θ_t, which may be positive or negative. The shock to the consumer's self-esteem could occur in several forms: (a) they may receive a negative shock by being called antisocial (Steele, 1988); (b) a positive shock by being reminded of past good deeds (Khan and Dhar, 2006); (c) they may be asked to think about future good or bad deeds (Cascio and Plant, 2015; Khan and Dhar, 2007; or (d) they may buy a desirable (e.g., environmentally friendly) product (Mazar and Zhong, 2010). At the start of period t, θ_t is unknown and is a random variable whose distribution is the same each period, with expected value 0, and lies in the range $(-\widehat{\theta}, \widehat{\theta})$. Once θ_t is known, the consumer can assess the impact of any given choice of x_t on the stock of moral self-worth at the start of period t+1, $M_{t+1}(x_t)$ and the flow of moral self-worth in period t, $m_t(x_t,\theta_t)$:

$$M_{t+1}(x_t) = \rho M_t + x_t \tag{1}$$

$$m_t(x_t,\theta_t) = \gamma M_t + \lambda x_t + \theta_t \tag{2}$$

In (1), the stock of moral self-worth erodes at a rate given by the parameter ρ, $0 < \rho < 1$, which accounts for memory effects: individuals may forget good deeds undertaken in the past, or may consider them no longer relevant to future periods (Conway and Peetz, 2012). M_{t+1} is bolstered by the current consumption of the moral good, x_t. In (2) the consumer derives a flow of moral self-worth from three paths: (i) the current stock of self-worth, M_t, where $\gamma, 0 < \gamma < 1$, measures how much a unit of the stock of moral self-worth contributes to the current flow of self-worth; (ii) the current consumption of x_t, which adds x_t units of moral self-worth to next period's stock and affects the current flow of moral self-worth given by the parameter λ, $0 < \lambda < 1$; (iii) the shock to moral self-worth in period t, θ_t.

The consumer takes (M_t, θ_t) as given and chooses x_t to maximize the value function:

$$V(M_t,\theta_t) \equiv \max_{x_t}\left\{U[(\gamma M_t + \lambda x_t + \theta_t), \varphi(x_t)] + \delta \underset{\theta_{t+1}}{E} V[\rho M_t + x_t, \theta_{t+1}]\right\} \tag{3}$$

where δ, $0 < \delta < 1$, is the discount factor; the future value of θ_{t+1} is unknown at time t. Let $x^*(M_t,\theta_t)$ be the value of x_t, which maximizes (3), so that $x^*(M_t,\theta_t)$ satisfies the first-order condition:

$$\lambda U_m + U_h \varphi' + \delta E(V_1) = 0 \tag{4}$$

Thus, $x^*(M_t,\theta_t)$ defines the level of purchase of the moral good selected by the consumer for any value of M_t and θ_t. To simplify the analysis, we define $\widetilde{\theta}_{t+1}$ as the value of θ_{t+1}, such that:

$$V[\rho M_t + x^*(M_t,\theta_t), \widetilde{\theta}_{t+1}] = E_{\theta_{t+1}} V[\rho M_t + x^*(M_t,\theta_t), \theta_{t+1}]. \tag{5}$$

[3] By a standard utility function, we mean that there is positive but diminishing marginal utility for the consumption of each good $\mathbf{U_i} > \mathbf{0}, \mathbf{U_{ii}} < \mathbf{0}, \mathbf{i} = \mathbf{m_t}, \mathbf{h_t}$; because we want to focus on how the consumption of the hedonic good is affected by the consumption of the moral good through the effort constraint and the stock of moral self-worth, we assume for simplicity that $\mathbf{U_{mh}} = \mathbf{0}$.

Then, (3) can be written as follows:

$$V(M_t,\theta_t) \equiv \{U[(\gamma M_t + \lambda x^*(M_t,\theta_t) + \theta_t), \varphi(x_t)] + \delta V[\rho M_t + x_t, \widetilde{\theta}_{t+1}]\} \tag{6}$$

and (4) can be written as follows:

$$\lambda U_m + U_h \varphi' + \delta V_1 = 0 \tag{7}$$

It is straightforward to show that the value function $V(M,\theta)$ has the following properties:

Result 1. Given our assumptions on the utility function, the value function has the properties $V_M > 0, V_{MM} < 0$.

To derive sharp implications for moral consistency and moral licensing, we make a further mild assumption about parameter values. We define (i) $\psi \equiv \frac{U_{hh}(\varphi')^2 + U_h\varphi''}{\lambda U_{mm}} > 0$ and (ii) $\chi_1 \equiv \lambda\left(\frac{\gamma}{\rho} - \lambda\right)$; (iii)) $\chi_2 \equiv \lambda(1-\lambda) - \frac{\delta\gamma^2}{(1-\delta\rho^2)}$. We make the following assumption.

Assumption A. $\psi > \max[\chi_1, \chi_2]$

To justify our assertion that this is a mild restriction on parameter values, we note that since $\psi > 0$ – a sufficient, but by no means necessary, condition for Assumption A to hold – is that $\boldsymbol{max}[\boldsymbol{\chi_1}, \boldsymbol{\chi_2}] \langle \mathbf{0}$. In turn, this sufficient condition requires that γ lies within the range $\left[\underline{\gamma}, \overline{\gamma}\right]$, where: $\overline{\gamma} = \boldsymbol{\lambda\rho}$, and $\underline{\gamma} = \sqrt{[\boldsymbol{\lambda}(\mathbf{1}-\boldsymbol{\lambda})(\mathbf{1}-\boldsymbol{\delta\rho^2})]/\boldsymbol{\delta}}$.

We believe that this restriction on values of γ is plausible. Standard cost-benefit analysis (e.g., Nordhaus, 2013) employs real long-run market discount rates of around 5%, implying $\boldsymbol{\delta} = 0.95$. Regarding the rate at which the stock of moral worth erodes, ρ, we consider our argument that we must focus on the stock of moral self-worth, not just the flow; thus, assuming that $\rho = 0.9$ would ensure that at least 20% of an initial stock would remain after 15 years. At the same time, for the flow of moral self-worth to matter, we want the proportion of the current purchase of the moral good that contributes to the current flow of moral self-worth, λ, also to be significant. We think a plausible value is $\lambda = 0.75$. These parameter values yield $\underline{\gamma} = 0.2133$, $\overline{\gamma} = \mathbf{0.675}$. We think this is a plausible range within which λ might lie. In summary, Assumption A is a relatively mild restriction on parameter values, which derives our results on moral consistency and moral licensing in the next section.

3.2. The key results from the model

We present the three key results from the model in the previous section.

3.2.1. Consistent inter-act behavior

By inter-act consistency, we mean that the individual's stock of moral self-worth, $\boldsymbol{M_t}$, converges to a steady state. We begin by assuming no shocks to moral self-worth, i.e., $\boldsymbol{\theta_t} = \mathbf{0}\forall \boldsymbol{t}$, and define the steady-state stock of moral self-worth by $\widehat{\boldsymbol{M}}$, where:

$$\widehat{\boldsymbol{M}} = \boldsymbol{\rho}\widehat{\boldsymbol{M}} + \boldsymbol{x}^*(\widehat{\boldsymbol{M}}, \mathbf{0}) \tag{8}$$

Thus, in each period, the depreciation in the stock of moral self-worth, $(\mathbf{1}-\boldsymbol{\rho})\widehat{\boldsymbol{M}}$, is exactly offset by the additional moral self-worth generated by the consumption of the moral good, $\boldsymbol{x}^*(\widehat{\boldsymbol{M}}, \mathbf{0})$, keeping the stock constant. To ensure that the stock of moral self-worth converges to $\widehat{\boldsymbol{M}}$, we require that $\mathbf{0} < \frac{\partial M_{t+1}}{\partial M_t} < \mathbf{1}$, i.e., from (1):

$$\mathbf{0} < \boldsymbol{\rho} + \frac{\partial \boldsymbol{x}^*(\boldsymbol{M_t}, \mathbf{0})}{\partial \boldsymbol{M_t}} < \mathbf{1}. \tag{9}$$

Result 2. (a) $\frac{\partial x^*(M_t,\mathbf{0})}{\partial M_t} < \mathbf{0}$, so $\boldsymbol{\rho} + \frac{\partial x^*(M_t,\mathbf{0})}{\partial M_t} < \mathbf{1}$; (b) under Assumption A, $\mathbf{0} < \boldsymbol{\rho} + \frac{\partial x^*(M_t,\mathbf{0})}{\partial M_t}$; hence, under Assumption A, condition (9) is satisfied.

The intuition for Result 2(a) is that when the stock of self-worth

increases, the flow of moral self-worth also increases, as shown in equation (2). There is less need to increase the flow of moral self-worth by buying as much of the moral good as the consumer would have done if there had been no increase in the stock. Fig. 1 shows the situation of Result 2(b). When the stock of moral self-worth is low, the depreciation of the stock, $(\mathbf{1}-\rho)\boldsymbol{M}_t$, is low compared to the consumption of the moral good, x_t; thus, the stock grows. This growth causes the depreciation of the stock to rise and consumption of the moral good to fall; however, as long as (9) is satisfied, a positive but smaller increase remains in the stock of the moral self-worth. This process continues until the steady state, $\widehat{\boldsymbol{M}}$, is reached. Conversely, if the stock of moral self-worth is above the steady state, then depreciation is high relative to the low level of consumption of the moral good, x_t. Therefore, the stock falls, causing depreciation to fall and consumption to rise, which slows the rate of decline of the stock until steady state is reached.

Result 2 and Fig. 1 capture the underlying trends of $\boldsymbol{x}^*(\boldsymbol{M}_t,\mathbf{0})$ and $\boldsymbol{M}_t$, i.e., on the assumption $\boldsymbol{\theta}_t=\mathbf{0}\forall t$. Non-zero shocks, $\boldsymbol{\theta}_t$, cause fluctuations in $\boldsymbol{x}^*(\boldsymbol{M}_t,\boldsymbol{\theta}_t)$ and $\boldsymbol{M}_t$ around these trends.

3.2.2. Inter-act inconsistency: The case of moral licensing

We now examine the effect of non-zero shocks on $\boldsymbol{x}^*(\boldsymbol{M}_t,\boldsymbol{\theta}_t)$ and moral licensing, by which we mean that:

$$-\mathbf{1}<\frac{\partial \boldsymbol{x}^*(\boldsymbol{M}_t,\boldsymbol{\theta}_t)}{\partial \boldsymbol{\theta}_t}<\mathbf{0} \tag{10}$$

Result 3. (a) $\frac{\partial x^*(M_t,\theta_t)}{\partial \theta_t}<\mathbf{0}$; (b) under Assumption A, $-\mathbf{1}<\frac{\partial x^*(M_t,\theta_t)}{\partial \theta_t}$, so (10) is satisfied.

This result indicates that if the individual experiences positive random shock to their flow of self-worth ($\boldsymbol{\theta}_t>\mathbf{0}$), they respond by choosing $\boldsymbol{x}^*(\boldsymbol{M}_t,\boldsymbol{\theta}_t)$ which is lower than the value they would have chosen if $\boldsymbol{\theta}_t=\mathbf{0}$. In this sense, they display moral licensing; the increase in moral self-worth causes a reduction in the amount of moral good purchased. This result follows from the standard economic assumption of diminishing marginal utility; the consumer gets a free boost to the flow of moral self-worth, which they use to cut the amount of the moral good purchased and buy a bit more of the hedonic good. Notably, the reduction in the purchase of the moral good is less than the positive shock; the consumer still increases the flow of moral self-worth but uses the shock to increase consumption of both the moral and hedonic good. A key implication of Result 3 is that it gives a testable implication for whether moral licensing is an effect compatible with a model of rational behavior.

Combining our analyses of moral licensing and moral consistency, we note that because a positive shock ($\boldsymbol{\theta}_t$) results in $\boldsymbol{x}^*(\boldsymbol{M}_t,\boldsymbol{\theta}_t)<\boldsymbol{x}^*(\boldsymbol{M}_t,\mathbf{0})$, then M_{t+1} will be lower than it would have been without a shock. (i) If $\boldsymbol{M}_t>\widehat{\boldsymbol{M}}$, then $\boldsymbol{M}_{t+1}$ will fall faster toward steady state. Furthermore, (ii) if $\boldsymbol{M}_t$ is well below the steady state, $\widehat{\boldsymbol{M}}$, then $\boldsymbol{M}_{t+1}$ will rise more slowly toward steady state. Finally, (iii) if $\boldsymbol{M}_t$ lies in the intermediate range, then M_{t+1} will fall rather than rise.

The discussion in the last two paragraphs referred to a positive shock and moral licensing; the discussion can be straightforwardly interpreted to deal with a negative shock by using $\theta_t<0$, which leads to moral cleansing effects (i.e., an increase in x_t).

3.2.3. The foot-in-the-door effect

We define the foot-in-the-door effect of Freedman and Fraser (1966) as an effect whereby a small moral act leads an individual to undertake a subsequent significantly larger moral act. Result 2 shows that our model predicts that if the current stock of moral self-worth is higher than the steady state, then consumption of the moral good increases as the stock falls to a steady state; however, this increase is gradual. There are (at least) two possible ways of augmenting the present model to allow for a significant foot-in-the-door effect. A first possibility is that a consumer is initially uncertain about how much moral credit is associated with the consumption of some good, λ, because either it is a new good or the consumer is just unsure of how moral the good is. For example, a consumer may think that driving a sport-utility vehicle (SUV) is not particularly damaging to the environment. Because our model assumes that the individual is risk-averse, they would initially try to consume small amounts of the good (or, in the case of the SUV, gather small amounts of information) to assess how much moral credit the good yields. They then increase their consumption if the good is found to yield a significant amount of moral credit. This account is compatible with self-perception theory (Bem, 1972), whereby the individual learns about their preferences for a specific good through its consumption.

A second, and arguably more direct, route for establishing the foot-in-the-door effect is to assume that the consumer is fully aware of the value of λ; however, similar to Bénabou and Tirole (2011), instead of λ being a constant, it is a particular function of the stock of moral self-worth, $\lambda(\boldsymbol{M})$. Specifically, as shown in Fig. 2, we assume values of λ and M, namely $\underline{\lambda},\overline{\lambda},\underline{\boldsymbol{M}},\overline{\boldsymbol{M}},\mathbf{0}.\mathbf{5}<\underline{\lambda}<\overline{\lambda},\mathbf{0}<\underline{\boldsymbol{M}}<\overline{\boldsymbol{M}}$, such that: (i) for $\mathbf{0}\le\boldsymbol{M}\le\underline{\boldsymbol{M}},\lambda(\boldsymbol{M})=\underline{\lambda}$; (ii) for $\boldsymbol{M}\ge\overline{\boldsymbol{M}},\lambda(\boldsymbol{M})=\overline{\lambda}$; (iii) for $\underline{\boldsymbol{M}}<\boldsymbol{M}<\overline{\boldsymbol{M}}$, λ(M) takes the sigmoid shape shown in Fig. 2, where, around some value $\widetilde{\boldsymbol{M}}$, $\underline{\boldsymbol{M}}<\widetilde{\boldsymbol{M}}<\overline{\boldsymbol{M}}$, $\lambda'(\boldsymbol{M})\longrightarrow\infty$. As noted above, the rationale for such an assumption stems from self-perception theory (Bem, 1972). The consumer starts by attributing a relatively modest weight, $\underline{\lambda}$, to the flow of moral self-worth they attribute to their consumption of moral goods; however, once their stock of moral self-worth reaches a critical level, $\underline{\boldsymbol{M}}$, they realize that consuming in a moral fashion is an important part of their identity, and start to attribute a higher weight to the flow of moral self-worth from consumption of the moral good. Hence, λ rises from level $\underline{\lambda}$ quite rapidly; however, this process slows as the consumer

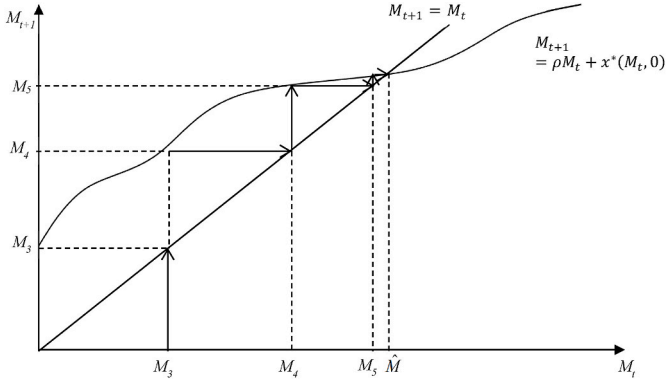


Fig. 1. Optimal path of $\boldsymbol{M}_t$.

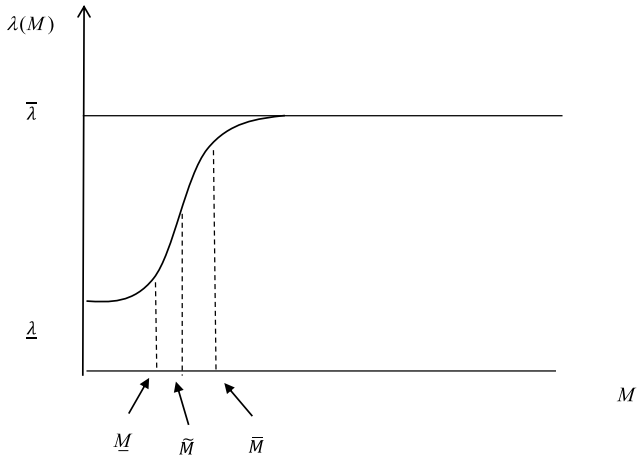


Fig. 2. Shape of $\lambda(\boldsymbol{M})$.

becomes accustomed to this new self-perception, stopping at the level $\overline{\lambda}$ when their stock of moral self-worth reaches $\overline{M}$.

Before presenting our result on the foot-in-the-door effect, we note an implication of our assumptions on the function λ(M). Result 1 stated that the value function $V(M_t, \theta_t)$ has the properties $V_1 > 0, V_{11} < 0$, which ensures that there is a unique steady-state value, $\widehat{M}$. However, the properties of $\lambda(M)$ mean that while $V_1 > 0$, values of M can exist close to $\widetilde{M}$, such that $V_{11} > 0$.[4] This result implies that there may now be three steady-state values of M, of which two are stable and one unstable[5]; however, because we focus on the implications of our assumptions on the function λ(M) for the foot-in-the-door effect, this is unaffected by the number of steady-states.

Result 4: If (i) M_t lies in the range $[\underline{M}, \overline{M}]$ sufficiently close to $\widetilde{M}$; (ii) the condition $U_m > -x^*(M_t, \theta_t)\lambda(M_t)U_{mm} > 0$ holds, then $\frac{\partial x^*(M_t, \theta_t)}{\partial M_t} > 0$.

Thus, suppose the purchase of the moral good in period t–1, $x^*(M_{t-1}, \theta_{t-1})$ was such that the stock of moral self-worth in period t rose within the range $[\underline{M}, \overline{M}]$, sufficiently close to $\widetilde{M}$, and such that condition (ii) is satisfied. In this case, purchases of the moral good in period t, $x^*(M_t, \theta_t)$, would be significantly larger than in the previous period. It is important to emphasize that conditions (i) and (ii) must be satisfied to ensure that the foot-in-the-door effect occurs; otherwise, the foot-in-the-door effect may not occur. This result is consistent with the extant literature (Burger, 1999; Chartrand et al., 1999).

4. Discussion and future research

A key point of this article is developing a behavior model that incorporates inter-act consistency, inter-act inconsistency (moral licensing/cleansing), and the foot-in-the-door effect (Section 3). The model also produces testable hypotheses about the extent of moral licensing that might occur. Depending on stimuli and context, this model can provide a tool for empirically testing whether rational, consistent individuals can display instances of moral licensing or moral cleansing (Joosten et al., 2014). This section contextualizes and discusses the implications of this model and identifies avenues for future research.

4.1. Empirical evaluation of the model

The model presented in this article incorporates aspects of moral licensing in a conventional economic model of rational decision-making; however, it crucially identifies boundary conditions for parametrically testing whether or not moral licensing is consistent with rational consumer behavior. The next essential step is to conduct empirical research on shopping behavior to assess whether moral licensing is observed and satisfies the boundary condition we have derived, under which moral licensing is consistent with rational behavior.

A key consideration for empirical testing is ecological validity; empirical evidence on moral licensing is limited mainly to laboratory experiments that neatly manipulate the orthogonality between external stimuli and behavior (Cascio and Plant, 2015; Conway and Peetz, 2012; Jordan et al., 2011; Khan and Dhar, 2006, 2007; Mazar and Zhong, 2010; Sachdeva et al., 2009). However, effects from laboratory experiments may not be replicable in real-life decision-making because consumers make choices facing many competing external stimuli that may limit or accentuate the occurrence of moral licensing. Conversely, experiments have the advantage of allowing tailored interventions on different sub-samples.

A compromise could be an incentive-compatible "virtual shopping" (Demarque et al., 2015; Kanay et al., 2021; Panzone et al. 2021a, 2021b, 2021c), which uses an experimental framework while making findings "real" by ensuring consumers pay for their purchases. To this extent, Panzone et al. (2021c) found that a positive shock (caused by the recall of recent pro-environmental behavior) led to behavioral consistency, in line with the results of Section 3.2.2. Alternatively, previous research detected moral licensing, in terms of antisocial behavior following pro-social behavior using an ecological momentary assessment technique (Hofmann et al., 2014). The use of multiple methods would benefit research on moral licensing by cross-validating the findings obtained so far.

4.2. Definition of a shopping episodes and basket

An important factor in the analysis of consumption is a clear definition of what constitutes a shopping episode. Much of the psychology and marketing literature cited above tests for effects such as moral licensing using a series of single, well-defined choices restricted by a temporal boundary, e.g., selecting a dish during dinner in a restaurant (e.g. the choice of dish at a dinner in a restaurant in Dhar and Simonson, 1999); however, consumers make a (possibly long) sequence of choices in a single supermarket trip (Panzone et al., 2021b) and may plan their shopping over two or more episodes (Khan and Dhar, 2006). For example, they may plan to buy some goods at a supermarket and others at a farm shop. Similarly, there is a lack of an agreed definition of the time horizon used to analyze moral licensing, as consumers may decide on present choices based on a "historical" record, for instance purchases they made in the previous week (Khan and Dhar, 2006), expectations of future behaviors (Cascio and Plant, 2015), or all of these. Previous research (Effron et al., 2015) has shown that in a finite horizon (t < 20), individuals are likely to cheat in the last choice rather than in earlier choices, an indication that time is a critical variable to determine the impact of moral licensing and related effects. The definition of the shopping episode has a fundamental methodological implication: a shopping episode consisting of a full temporal dimension would lead to an analytical framework analogous to that presented in this article, where the consumer uses and acquires credits that are spent over an approximately infinite (i.e., very long) time horizon. Alternatively, the same model can be seen as the sum of several micro-level choices, so consumers might be seen as balancing individual choices within a consumption episode rather than balancing baskets across the period.

A second dimension of an appropriate shopping episode is the issue of an appropriate basket because of possible cross-domain effects. This distinction is relevant when comparing moral credentials – seen as domain-specific – and moral credits, which can be used across domains (Miller and Effron, 2010). The first aspect of this problem is whether behavior, such as moral licensing, occurs within each category domain of shopping (e.g., food and clothing choices) or whether moral credits earned in one domain can license choices in another. The domain specificity may also be defined spatially so that moral credentials may work everywhere within one store, balancing choices across different aisles (Panzone et al., 2021b), but may not transfer to other stores. The second aspect is whether there are effects across different moral domains – for example, moral credits or credentials earned from reduced water consumption license an increase in electricity consumption (Tiefenbeck et al., 2013). More broadly, decisions on environmental preservation, which has been the focus of this paper, may license choices concerned with health, poverty, or threats to specific communities or ways of life. The third aspect is whether the balances struck across these two domains differ across consumer types (Dolan et al., 2015). These are important areas for further research.

[4] $V_1 = \frac{[U_m(\gamma + \lambda' x^*)]}{1-\delta\rho} > 0$; $V_{11} = \frac{[U_{mm}(\gamma^2 + \gamma\lambda' x^* + \lambda'' x^*)]}{1-\delta\rho^2} \Longrightarrow V_{11} > 0 \Longleftrightarrow \lambda'' < -(\gamma^2 + \lambda' x^*)/x^*$.

[5] With respect to the unstable steady-state, which lies in the range $[\underline{M}, \overline{M}]$, the random shocks θ_t will ensure that the stock does not persist at that level, which is why we emphasize that the foot-in-the door effect is not a recurring phenomenon. We are grateful to an anonymous referee for drawing our attention to this implication.

4.3. Consumer heuristics in perception of morality

As indicated above, the model presented in this article assumes that consumers can perfectly assess their moral self-worth at any given time. We noted that Bénabou and Tirole (2011) present a different model where moral identity is estimated but not known. At the same time, behavioral ethics has often indicated that ethical preferences are malleable, and influenced by context (Bazerman and Gino, 2012; Gino et al., 2016). This assumption could be relaxed in future research by allowing for an estimated value of M_t. Estimates could differ from the exact value of M_t on two grounds: 1) consumers might be unable to determine how moral they have been (e.g., due to poor memory or lack of attention) or may be biased in their assessment (Gino et al., 2016); and 2) consumers might not know the number of moral credits associated with a specific act or choice.

If we focus on the second problem, research has shown that consumers cannot determine the environmental impact of their choices (Attari, 2014; Attari et al., 2010; Camilleri et al., 2019; Panzone et al., 2020), an indication that moral credits are unlikely to be an accurate representation of behavior. In particular, consumers may have a systematic bias that underestimates the environmental impact (i.e., carbon footprint) of food products (Panzone et al., 2020). For instance, consumers expect a high-carbon product (e.g., a hamburger) to be more sustainable – to have a lower carbon footprint – when presented with a low-carbon product (e.g., a salad), whereas the additional good increases the emission of the bundle (Gorissen and Weijters, 2016). This behavior might imply that consumers use moral credits from the purchase of virtue goods (e.g., a salad) to "morally subsidize" vice goods (e.g., a hamburger); however, the evaluation of moral credits is exposed to biases that can lead to an inaccurate level of current moral self-worth. A systematic error in estimating moral credits may influence the propensity to license or be consistent. For instance, an individual with an upward bias might expect their moral self-worth at time t to be above their desired state (despite being actually below it), causing them to license behavior when they would have done otherwise with an unbiased assessment.

The number of moral credits may depend on the information available during the moral decision task. For instance, research on moral licensing indicates that acts targeting a pro-social and trusted institution (e.g., a charity) remove the self-attribution (Khan and Dhar, 2006; Mulder et al., 2009), which in turn would reduce the number of credits that the consumer estimates from the act. Similarly, consumers might determine the number of credits collected by assessing the perceived effort associated with moral behavior (Kivetz, 2003; Kivetz et al., 2006). Because behavioral change favoring pro-social options requires effort (e.g., a loss in private consumption benefits to the advantage of often unknown others), consumers might consider acts that require a larger perceived loss in personal benefits (e.g., taste) as being more moral. This bias might disappear if the agent had perfect information on the actual moral benefit of the act, e.g., through carbon labeling (Camilleri et al., 2019; Panzone et al., 2020) or using technology to measure behavior (Etkin, 2016; Novan et al., 2022).

5. Conclusions

This article presents a model of consumer behavior that generalizes previous research by simultaneously incorporating moral licensing and moral consistency. This model allows current economic models to more precisely represent and predict behavior where consumers face a sequence of decisions involving a virtuous product. Moreover, this model applies to consumer choices in retailing and other fields where morality or the protection of the public good is relevant.

Declaration of competing interest

None.

Data availability

No data was used for the research described in the article.

Acknowledgments

We regret to announce that our highly esteemed colleague, Denis Hilton, died while this version of our joint paper was being finalized. He was a leading figure in many fields, especially social psychology and behavioral economics, and we benefited enormously from the lively discussions we had with him. He is sorely missed.

The results reported in this paper are derived from a project undertaken by the Sustainable Consumption Institute, University of Manchester, and funded by Unilever. We are grateful to Anna Thomas and Ilse Gortemaker (Unilever) for their support for this project and comments on earlier versions of this paper. We are also grateful to Doron Cohen, Celine Nauges, Grischa Perino, Dan Rigby, Andrew Stewart, Deborah Talmi, Kelly Tate, Nicolas Treich, and Ada Wossink for their useful comments and conversations. We are particularly grateful to an Associate Editor and two anonymous referees for insightful comments on an earlier version of this paper.

APPENDIX

Proof of Result 1:

Totally differentiating (6) with respect to M_t and applying the envelope theorem yields

$$V_1 = \frac{\gamma U_m}{1-\delta\rho} > 0; \quad V_{11} = \frac{\gamma^2 U_{mm}}{1-\delta\rho^2} < 0 \qquad \text{QED}$$

Proof of Result 2: moral consistency

Results 2**(a).**

Totally differentiating (7) with respect to M_t we get:

$$\frac{\partial x^*()}{\partial M_t} = \left\{\frac{\lambda\gamma U_{mm} + \delta\rho V_{11}}{\lambda^2 U_{mm} + U_{hh}(\varphi')^2 + U_h\varphi'' + \delta V_{11}}\right\} = \left\{\frac{\lambda\gamma U_{mm} + \delta\rho V_{11}}{\Delta}\right\} \tag{A1}$$

where $\Delta \equiv \lambda^2 U_{mm} + U_{hh}(\varphi')^2 + U_h\varphi'' + \delta V_{11} < 0$.

Given Result 1 and our assumptions regarding the properties of U and φ, all the terms in the numerators and denominators of (A1) are negative. Hence, $\frac{\partial x^*(.)}{\partial M_t} < \mathbf{0}$.

Results 2(b).

We ask under what condition is $\left|\frac{\partial x^*}{\partial M_t}\right| < \rho$. From (A1), $\left|\frac{\partial x^*}{\partial M_t}\right| < \rho$ iff

$$\lambda\gamma|U_{mm}| + \rho\delta|V_{11}| < \rho\lambda^2|U_{mm}| + \rho|U_{hh}|(\varphi')^2 + \rho U_h|\varphi''| + \rho\delta|V_{11}| \tag{A2}$$

Define $\psi = \frac{U_{hh}(\varphi')^2 + U_h\varphi''}{\lambda U_{mm}} > \mathbf{0}$. Then

$$\left|\frac{\partial x^*}{\partial M_t}\right| < \rho \text{ iff } \gamma < \rho(\lambda + \psi). \tag{A3}$$

Note that under Assumption A, $\gamma < \rho\lambda$; thus, this is a sufficient, though not necessary, condition for (A3) to be satisfied. QED

Proof of Result 2: Moral Licensing

Results 3(a).

Totally differentiate (7) w.r.t θ_t to get:

$$\frac{\partial x^*(M_t, \theta_t)}{\partial \theta_t} = -\frac{\lambda U_{mm}}{\Delta} \tag{A4}$$

The numerator and denominator of (A3) are both negative; therefore, the denominator is unequivocally larger in absolute value than the numerator, so $\frac{\partial x^*(M_t, \theta_t}{\partial \theta_t} < \mathbf{0}$.

Results 3(b)

$$\frac{\lambda U_{mm}}{\Delta} < \mathbf{1} \Longleftrightarrow \lambda < \lambda^2 + \psi + \delta\frac{V_{11}}{U_{mm}} \tag{A5}$$

From Result 1, the second inequality in (A5) becomes

$$\lambda - \lambda^2 - \frac{\delta\gamma^2}{\mathbf{1} - \delta\rho^2} < \psi \tag{A6}$$

Under Assumption A, the LHS of (A6) is negative; thus, this is a sufficient, though not necessary, condition to ensure (A6) is satisfied. QED.

Proof of Result 4: The Foot-in-the-Door Effect.

The first-order condition for the optimal choice of $\mathbf{x}^*(\mathbf{M_t}, \boldsymbol{\theta_t})$ now becomes

$$\boldsymbol{\lambda}(\mathbf{M_t})\mathbf{U_m} + \mathbf{U_h}\boldsymbol{\varphi}' + \boldsymbol{\delta}\mathbf{V_1} = \mathbf{0} \tag{A7}$$

Totally differentiating (A) with respect to M_t yields:

$$\frac{\partial \mathbf{x_t}}{\partial \mathbf{M_t}} = -\frac{\boldsymbol{\lambda}'(\mathbf{M_t})[\mathbf{U_m} + \mathbf{x}^*(\mathbf{M_t}, \boldsymbol{\theta_t})\boldsymbol{\lambda}(\mathbf{M_t})\mathbf{U_{mm}}] + \{\boldsymbol{\lambda\gamma}\mathbf{U_{mm}} + \boldsymbol{\rho\delta}\mathbf{V_{11}}\}}{\{\Delta\}} \tag{A8}$$

The terms in curly brackets in the numerator and the denominator are the same as in (A1). Therefore, when M_t lies outside the range of values $[\mathbf{M}, \overline{\mathbf{M}}]$ around $\widetilde{M}$, $\boldsymbol{\lambda}'(\mathbf{M})$ is effectively zero, and (A4) still pertains, i.e., $\boldsymbol{\rho} < \boldsymbol{\mu_t}\frac{\partial x(\mathbf{M_t}, \boldsymbol{\theta_t}, \boldsymbol{\mu_t})}{\partial \mathbf{M_t}} < \mathbf{0}$. When $\mathbf{M_t} \cong \widetilde{\mathbf{M}}$ and the term in square brackets in the numerator is positive, i.e., $\mathbf{U_m} > -\mathbf{x}^*(\mathbf{M_t}, \boldsymbol{\theta_t})\boldsymbol{\lambda}(\mathbf{M_t})\mathbf{U_{mm}} > \mathbf{0}$, then, for large enough values of $\boldsymbol{\lambda}'(\mathbf{M_t})$, $\frac{\partial \mathbf{x_t}}{\partial \mathbf{M_t}} > \mathbf{0}$; i.e., the foot-in-the-door effect holds. QED

References

Ahmed, N., Li, C., Khan, A., Qalati, S.A., Naz, S., Rana, F., 2021. Purchase intention toward organic food among young consumers using theory of planned behavior: role of environmental concerns and environmental awareness. J. Environ. Plann. Manag. 64 (5), 796–822.

Ajzen, I., Fishbein, M., 2000. Attitudes and the attitude-behavior relation: reasoned and automatic processes. Eur. Rev. Soc. Psychol. 11 (1), 1–33.

Allcott, H., Lockwood, B.B., Taubinsky, D., 2019. Should we tax sugar-sweetened beverages? An overview of theory and evidence. J. Econ. Perspect. 33 (3), 202–227.

Aquino, K., Reed, A.I., 2002. The self-importance of moral identity. J. Personal. Soci. Psychol. 83 (6), 1423–1440.

Attari, S.Z., 2014. Perceptions of water use. Proc. Natl. Acad. Sci. USA 111 (14), 5129–5134.

Attari, S.Z., DeKay, M.L., Davidson, C.I., Bruine de Bruin, W., 2010. Public perceptions of energy consumption and savings. Proc. Natl. Acad. Sci. USA 107 (37), 16054–16059.

Bazerman, M.H., Gino, F., 2012. Behavioral ethics: toward a deeper understanding of moral judgment and dishonesty. Annu. Rev. Law Soc. Sci. 8 (1), 85–104.

Beaman, A.L., Cole, C.M., Preston, M., Klentz, B., Steblay, N.M., 1983. Fifteen years of foot-in-the door research: a meta-analysis. Pers. Soc. Psychol. Bull. 9 (2), 181–196.

Bem, D.J., 1972. Self-perception theory. Adv. Exp. Soc. Psychol. 6, 1–62.

Bénabou, R., Tirole, J., 2011. Identity, morals, and taboos: beliefs as assets. Q. J. Econ. 126 (2), 805–855.

Blanken, I., van de Ven, N., Zeelenberg, M., 2015. A meta-analytic review of moral licensing. Pers. Soc. Psychol. Bull. 41 (4), 540–558.

Bolderdijk, J.W., Steg, L., Geller, E.S., Lehman, P.K., Postmes, T., 2013. Comparing the effectiveness of monetary versus moral motives in environmental campaigning. Nat. Clim. Change 3 (4), 413–416.

Burger, J.M., 1999. The foot-in-the-door compliance procedure: a multiple-process analysis and review. Pers. Soc. Psychol. Rev. 3 (4), 303–325.

Camilleri, A.R., Larrick, R.P., Hossain, S., Patino-Echeverri, D., 2019. Consumers underestimate the emissions associated with food but are aided by labels. Nat. Clim. Change 9 (1), 53–58.

Cascio, J., Plant, E.A., 2015. Prospective moral licensing: does anticipating doing good later allow you to Be bad now? J. Exp. Soc. Psychol. 56, 110–116.

Chan, K., 1998. Mass communication and pro-environmental behaviour: waste recycling in Hong Kong. J. Environ. Manag. 52 (4), 317–325.

Chartrand, T., Pinckert, S., Burger, J.M., 1999. When manipulation backfires: the effects of time delay and requester on the foot-in-the-door technique. J. Appl. Soc. Psychol. 29, 211–221.

Conway, P., Peetz, J., 2012. When does feeling moral actually make you a better person? Conceptual abstraction moderates whether past moral deeds motivate consistency or compensatory behavior. Pers. Soc. Psychol. Bull. 38 (7), 907–919.

Cornelissen, G., Pandelaere, M., Warlop, L., Dewitte, S., 2008. Positive cueing: promoting sustainable consumer behavior by cueing common environmental behaviors as environmental. Int. J. Res. Market. 25 (1), 46–55.

Cornelissen, G., Bashshur, M.R., Rode, J., Le Menestrel, M., 2013. Rules or consequences? The role of ethical mind-sets in moral dynamics. Psychol. Sci. 24 (4), 482–488.

Demarque, C., Charalambides, L., Hilton, D.J., Waroquier, L., 2015. Nudging sustainable consumption: the use of descriptive norms to promote a minority behavior in a realistic online shopping environment. J. Environ. Psychol. 43, 166–174.
Dhar, R., Simonson, I., 1999. Making complementary choices in consumption episodes: highlighting versus balancing. J. Market. Res. 36 (1), 29–44.
Dolan, P., Galizzi, M.M., 2015. Like ripples on a pond: behavioral spillovers and their implications for research and policy. J. Econ. Psychol. 47, 1–16.
Dolan, P., Galizzi, M.M., Navarro-Martinez, D., 2015. Paying people to eat or not to eat? Carryover effects of monetary incentives on eating behaviour. Soc. Sci. Med. 133, 153–158.
Effron, D.A., Conway, P., 2015. When virtue leads to villainy: advances in research on moral self-licensing. Curr. Opinion Psychol. 6, 32–35.
Effron, D.A., Bryan, C.J., Murnighan, J.K., 2015. Cheating at the end to avoid regret. J. Pers. Soc. Psychol. 109 (3), 395–414.
Etkin, J., 2016. The hidden cost of personal quantification. J. Consum. Res. 42 (6), 967–984.
Fankhauser, S., Smith, S.M., Allen, M., Axelsson, K., Hale, T., Hepburn, C., Kendall, J.M., Khosla, R., Lezaun, J., Mitchell-Larson, E., Obersteiner, M., Rajamani, L., Rickaby, R., Seddon, N., Wetzer, T., 2022. The meaning of net zero and how to get it right. Nat. Clim. Change 12 (1), 15–21.
Freedman, J.L., Fraser, S.C., 1966. Compliance without pressure: the foot-in-the-door technique. J. Personal. Soci. Psychol. 4 (2), 195–202.
Fujii, S., 2006. Environmental concern, attitude toward frugality, and ease of behavior as determinants of pro-environmental behavior intentions. J. Environ. Psychol. 26 (4), 262–268.
Gholamzadehmir, M., Sparks, P., Farsides, T., 2019. Moral licensing, moral cleansing and pro-environmental behaviour: the moderating role of pro-environmental attitudes. J. Environ. Psychol. 65, 101334.
Gino, F., Norton, M.I., Weber, R.A., 2016. Motivated bayesians: feeling moral while acting egoistically. J. Econ. Perspect. 30 (3), 189–212.
Gneezy, U., Imas, A., Madarász, K., 2014. Conscience accounting: emotion dynamics and social behavior. Manag. Sci. 60 (11), 2645–2658.
Gorissen, K., Weijters, B., 2016. The negative footprint illusion: perceptual bias in sustainable food consumption. J. Environ. Psychol. 45, 50–65.
Gough, I., Abdallah, S., Johnson, V., Ryan-Collins, J., Smith, C., 2011. The distribution of total greenhouse gas emissions by households in the UK, and some implications for social policy. In: LSE STICERD Research Paper No. CASE152. SSRN.
Guadagno, R.E., Asher, T., Demaine, L.J., Cialdini, R.B., 2001. When saying yes leads to saying No: preference for consistency and the reverse foot-in-the-door effect. Pers. Soc. Psychol. Bull. 27 (7), 859–867.
Hofmann, W., Wisneski, D.C., Brandt, M.J., Skitka, L.J., 2014. Morality in everyday life. Science 345 (6202), 1340–1343.
Hurst, M., Dittmar, H., Bond, R., Kasser, T., 2013. The relationship between materialistic values and environmental attitudes and behaviors: a meta-analysis. J. Environ. Psychol. 36, 257–269.
Joosten, A., Dijke, M., Hiel, A., Cremer, D., 2014. Feel good, do-good!? On consistency and compensation in moral self-regulation. J. Bus. Ethics 123 (1), 71–84.
Jordan, J., Mullen, E., Murnighan, J.K., 2011. Striving for the moral self: the effects of recalling past moral actions on future moral behavior. Pers. Soc. Psychol. Bull. 37 (5), 701–713.
Kanay, A., Hilton, D., Charalambides, L., Corrégé, J.-B., Inaudi, E., Waroquier, L., Cézéra, S., 2021. Making the carbon basket count: goal setting promotes sustainable consumption in a simulated online supermarket. J. Econ. Psychol. 83, 102348.
Kaplow, L., Shavell, S., 2007. Moral rules, the moral sentiments, and behavior: toward a theory of an optimal moral system. J. Polit. Econ. 115 (3), 494–514.
Khan, U., Dhar, R., 2006. Licensing effect in consumer choice. J. Market. Res. 43 (2), 259–266.
Khan, U., Dhar, R., 2007. Where there is a way, is there a will? The effect of future choices on self-control. J. Exp. Psychol. Gen. 136 (2), 277–288.
Khan, U., Dhar, R., Wertenbroch, K., 2005. A behavioral decision theory perspective on hedonic and utilitarian choice. In: Ratneshwar, S., Glen Mick, David (Eds.), Inside Consumption: Consumer Motives, Goals, and Desires. Routledge, Abingdon, Oxon (UK).
Kivetz, R., 2003. The effects of effort and intrinsic motivation on risky choice. Market. Sci. 22 (4), 477–502.
Kivetz, R., Urminsky, O., Zheng, Y., 2006. The goal-gradient hypothesis resurrected: purchase acceleration, illusionary goal progress, and customer retention. J. Market. Res. 43 (1), 39–58.
Mazar, N., Zhong, C.-B., 2010. Do green products make us better people? Psychol. Sci.
Merritt, A.C., Effron, D.A., Monin, B., 2010. Moral self-licensing: when being good frees us to Be bad. Soc. Personal. Psychol. Compass 4 (5), 344–357.
Milkman, K.L., Beshears, J., 2009. Mental accounting and small windfalls: evidence from an online grocer. J. Econ. Behav. Organ. 71 (2), 384–394.
Miller, D.T., Effron, D.A., 2010. Chapter three - psychological license: when it is needed and how it functions. In: Zanna Mark, P., Olson James, M. (Eds.), Advances in Experimental Social Psychology, ume 43. Academic Press, pp. 115–155.
Monin, B., Jordan, A.H., 2009. The dynamic moral self: a social psychological perspective. In: Narvaez, Darcia, Lapsley, Daniel K. (Eds.), Personality, Identity, and Character: Explorations in Moral Psychology. Cambridge University Press, New York (USA), pp. 341–354.
Mulder, L.B., Verboon, P., De Cremer, D., 2009. Sanctions and moral judgments: the moderating effect of sanction severity and trust in authorities. Eur. J. Soc. Psychol. 39, 255–269.
Mullen, E., Monin, B., 2016. Consistency versus licensing effects of past moral behavior. Annu. Rev. Psychol. 67 (1), 363–385.
Nordhaus, W., 2013. The Climate Casino: Risk, Uncertainty, and Economics for a Warming World. Yale University Press.
Novan, K., Smith, A., Zhou, T., 2022. Residential building codes do save energy: evidence from hourly smart-meter data. Rev. Econ. Stat. 104 (3), 483–500.
Panzone, L.A., Sniehotta, F.F., Comber, R., Lemke, F., 2020. The effect of traffic-light labels and time pressure on estimating kilocalories and carbon footprint of food. Appetite 155, 104794.
Panzone, L., Auch, N., Zizzo, D., 2021a. Voluntary vs forced commitment to reduce the carbon footprint of food shopping. In: Working Paper. Newcastle University.
Panzone, L.A., Ulph, A., Hilton, D., Gortemaker, I., Tajudeen, I.A., 2021b. Sustainable by design: choice architecture and the carbon footprint of grocery shopping. J. Publ. Pol. Market. 40 (4), 463–486.
Panzone, L.A., Ulph, A., Zizzo, D.J., Hilton, D., Clear, A., 2021c. The impact of environmental recall and carbon taxation on the carbon footprint of supermarket shopping. J. Environ. Econ. Manag. 109, 102137.
Poortinga, W., Whitmarsh, L., Suffolk, C., 2013. The introduction of a single-use carrier bag charge in wales: attitude change and behavioural spillover effects. J. Environ. Psychol. 36, 240–247.
Saari, U.A., Damberg, S., Frömbling, L., Ringle, C.M., 2021. Sustainable consumption behavior of Europeans: the influence of environmental knowledge and risk perception on environmental concern and behavioral intention. Ecol. Econ. 189, 107155.
Sachdeva, S., Iliev, R., Medin, D.L., 2009. Sinning saints and saintly sinners: the paradox of moral self-regulation. Psychol. Sci. 20 (4), 523–528.
Sachdeva, S., Jordan, J., Mazar, N., 2015. Green consumerism: moral motivations to a sustainable future. Curr. Opinion Psychol. 6, 60–65.
Simbrunner, P., Schlegelmilch, B.B., 2017. Moral licensing: a culture-moderated meta-analysis. Manag. Rev. Quart. 67 (4), 201–225.
Steele, C.M., 1988. The Psychology of Self-Affirmation: Sustaining the Integrity of the Self," in Advances in Experimental Social Psychology, 21. Academic Press, Leonard Berkowitz, pp. 261–302.
Steg, L., Perlaviciute, G., van der Werff, E., Lurvink, J., 2014. The significance of hedonic values for environmentally relevant attitudes, preferences, and actions. Environ. Behav. 46 (2), 163–192.
Tabernero, C., Hernández, B., 2011. Self-efficacy and intrinsic motivation guiding environmental behavior. Environ. Behav. 43 (5), 658–675.
Thøgersen, J., Ölander, F., 2003. Spillover of environment-friendly consumer behaviour. J. Environ. Psychol. 23 (3), 225–236.
Tiefenbeck, V., Staake, T., Roth, K., Sachs, O., 2013. For better or for worse? Empirical evidence of moral licensing in a behavioral energy conservation campaign. Energy Pol. 57, 160–171.
Truelove, H.B., Carrico, A.R., Weber, E.U., Raimi, K.T., Vandenbergh, M.P., 2014. Positive and negative spillover of pro-environmental behavior: an integrative review and theoretical framework. Global Environ. Change 29, 127–138.
Whitmarsh, L., Seyfang, G., O'Neill, S., 2011. Public engagement with carbon and climate change: to what extent is the public 'carbon capable. Global Environ. Change 21 (1), 56–65.
Zhong, C.-B., Liljenquist, K.A., Cain, D.M., 2009. Moral self-regulation. In: De Cremer, David (Ed.), Psychological Perspectives on Ethical Behavior and Decision Making. Information Age Publishing, INC., Charlotte, NC, pp. 75–89.
Zizzo, D.J., Parravano, M., Nakamura, R., Forwood, S., Suhrcke, M., 2021. The impact of taxation and signposting on diet: an online field study with breakfast cereals and soft drinks. Exp. Econ.