Are transparent nudges effective in influencing savings decisions?\*

# Marcia Machado

School of Economics and Management, University of Minho

Campus de Gualtar, 4710-553 Braga – Portugal

# Cristiana Cerqueira Leal<sup>†</sup>

School of Economics and Management & NIPE – Center for Research in Economics and Management, University of Minho

Campus de Gualtar, 4710-553 Braga – Portugal

ccerqueira@eeg.uminho.pt

# Stefano Calboli

CEPS & ILCH, University of Minho

Campus de Gualtar, 4710-553 Braga - Portugal

\* This paper is financed by National Funds of the FCT – Portuguese Foundation for Science and Technology within the projects «UIDB/03182/2020» and «2022.07029.PTDC».

<sup>&</sup>lt;sup>†</sup> Corresponding author.

# Are transparent nudges effective in influencing savings decisions?

#### Abstract

This paper studies the effectiveness of transparent and non-transparent nudges in influencing saving decisions while exploring their impact on experienced autonomy and choice satisfaction, moderated by psychological reactance traits. Using an experimental design, participants were randomly assigned to one of three groups: non-transparent nudge, transparent nudge, and a control group. The results show that nudges are effective in influencing saving behavior. Moreover, the findings reveal that transparency does not reduce the effectiveness of nudges but enhances experienced autonomy and choice satisfaction. Transparent nudges—those that explicitly disclose their purpose—significantly enhance experienced autonomy and choice satisfaction, particularly among individuals with higher trait reactance. These findings provide insights into the effects of nudging transparency and contribute to the ethical discourse on decision-making in savings, highlighting that nudging efficacy can be achieved without compromising individual autonomy.

*Keywords:* nudges, transparent nudges, experienced autonomy, choice satisfaction, psychological reactance, defaults, savings decisions.

#### 1. Introduction

Nudges have emerged as powerful tools in behavioral public policy, employed by policymakers and organizations worldwide to steer individuals' decisions across diverse domains. Despite this success, the ethical dimensions of nudges, particularly S1-nudges that leverage automatic cognitive processes like the default effect, have sparked significant debate. A primary concern lies in the potential misalignment between nudged behavior and individual preferences, thereby challenging the principle of respecting agency—the ability of individuals to form and *act* upon their own preferences. For example, in savings decisions, default-based nudges like those in the SMarT program (Thaler & Benartzi 2004) may inadvertently drive choices that diverge from an individual's preferred allocation of resources, creating tension between behavioral effectiveness and respect for agency. Scholars have criticized the defense of nudges' ethical status based on the ability to "opt out" as insufficiently robust (Hansen & Jespersen, 2013), prompting efforts to develop alternatives or modify nudges to better align with ethical principles.

One such modification is the introduction of transparency. By making salient aspects of the nudge—for instance its presence, purpose, and underlying mechanisms—explicit at the point of decision, transparency aims to preserve agency while maintaining effectiveness. However, a key question remains: does transparency compromise the effectiveness of nudges? While existing empirical studies suggest that transparency often does not undermine effectiveness (Loewenstein et al., 2015; Michaelsen et al., 2021; Casal et al., 2024), critiques have highlighted methodological limitations (Michaelsen, 2023) and the need for further exploration in underexamined domains like savings.

The motivation behind this study is to investigate the impact of transparency in a default-based nudge on savings decisions. Specifically, we explore how transparency affects both the effectiveness of the nudge and key aspects of decision-making ethics—namely, the experience of autonomy and choice satisfaction—which are also crucial for the reputation of institutions and the trust placed in them.

In addition to evaluating these ethical dimensions, we investigate the role of individual psychological traits—specifically psychological reactance—in moderating the effects of transparency, an aspect yet to be explored in the domain of savings decisions. This investigation aligns with recent calls for a "heterogeneity revolution" in nudge theory (Bryan et al., 2021), which underscores the importance of considering individual differences in the design of nudges, potentially tailoring them to personal characteristics (Mills, 2022). In summary, by examining the impact of transparency on nudge effectiveness, autonomy, and choice satisfaction, as well as its interaction with individual traits, we aim to contribute to the development of savings strategies that effectively balance behavioral impact with respect for individual agency and institutional accountability.

We aim to address key research gaps by contributing to two specific areas: (1) the scarcity of studies examining transparency in savings-related nudges. The mixed evidence on the effectiveness of transparent nudges in different contexts stresses the need for further investigation, as the current findings are insufficient to draw generalizable conclusions. (2) In an era marked by increasingly personalized nudging—driven by AI-based profiling techniques—it is needed to extend our understanding of the heterogeneity of nudge effectiveness. This includes exploring how individual traits and features of the choice environment influence outcomes. To this end, our study examines the moderating role of psychological reactance traits on nudge effectiveness, extending the exploration of heterogeneity to the context of nudge transparency.

Our empirical strategy aims to address these research gaps. We use an experiment to investigate the role of default nudges as deliberates modifications to the choice environment aimed to influence participants' savings behavior. The experiment design focuses on nudge transparency and its effectiveness (drawing on insights from Bruns et al., 2018). Participants were randomly assigned to one of three experimental conditions: a non-transparent nudge group, a transparent nudge group, and a control group with no nudge. In the control group, participants were asked to select a percentage of their income to save without any additional guidance (no nudge condition). In the non-transparent nudge group, a default savings rate of 10% was pre-selected, subtly nudging participants to save this amount. In the transparent nudge group, the same default savings rate of 10% was presented, accompanied by explicit information about the presence of the default nudge and its purpose, which was to encourage participants to prioritize saving. Following the experiment, we collected data on participants' perceptions of their decision-making experience, specifically in terms of experienced autonomy and choice satisfaction. Additionally, we incorporated an analysis of psychological reactance, a factor stemming from the perception that nudges may intrude upon autonomous decision-making, potentially undermining their effectiveness (Brehm, 1966; Bruns et al., 2018). By assessing participants' psychological reactance traits, we aimed to evaluate how these traits influence the effectiveness of nudges across different conditions, particularly within the context of transparent nudges. We also gathered data on participants' sociodemographic characteristics, market participation, risk profile, and financial literacy to account for individual heterogeneity, thereby enriching the analysis of nudge effectiveness.

Our results show that nudges are effective in influencing saving behavior. Moreover, findings reveal that transparency does not reduce the effectiveness of nudges. but enhances experienced autonomy and choice satisfaction. Transparent nudges—those that disclose their purpose—significantly enhance experienced autonomy and choice satisfaction, particularly among individuals with higher trait reactance. These findings provide insights into the effects of nudging transparency and contribute to the ethical discourse on decision-making in savings, highlighting that efficacy can be achieved without compromising individual autonomy.

This paper makes several contributions to both academia and the banking and fintech industries. Academically, it advances the literature on behavioral public policy by addressing the underexplored ethical dimensions of nudge transparency, particularly in the context of savings decisions. It provides empirical evidence that transparency in default-based nudges improves experienced autonomy and choice satisfaction without compromising effectiveness, thereby contributing to the ongoing debate on balancing behavioral impact and ethical considerations. Additionally, the study responds to calls for a "heterogeneity revolution" in

nudge theory by exploring the moderating role of psychological reactance traits, enriching our understanding of how individual differences shape nudge outcomes. For the banking industry and fintechs, the findings underscore the viability of implementing transparent nudges to encourage savings behavior, offering actionable insights for designing customer-centric financial products that align with ethical standards and build trust. The research also highlights the potential of leveraging psychological traits to personalize interventions, tracing the path for innovative, Al-driven solutions in financial decision-making.

The remainder of this paper is structured as follows: Section 2 presents the theoretical framework; Section 3 presents the methodology and the data; Section 4 presents the empirical results; and Section 5 concludes.

# 2. Theoretical framework

# 2.1 Nudges as an instrument for shaping savings behavior

In the pursuit of behavioral change, the integration of behavioral instruments emerges as crucial. Nudges, as highlighted by García and Vila (2020), offer subtle yet influential interventions that steer individuals towards better financial decisions. By leveraging behavioral psychology principles, nudges gently encourage individuals to adopt behaviors that lead to improved financial outcomes. In this era of financial digitalization, the incorporation of digital nudges into financial apps and banking websites can significantly impact user behavior and promote positive financial habits.

The prevalent belief that financial education should enhance individuals' decision-making has prompted governments and businesses globally to develop interventions aimed at improving financial literacy. However, findings from the study conducted by Fernandes et al. (2014) indicate that the impact of financial education interventions, in terms of explaining variance in studied financial behaviors, is notably limited, accounting for only approximately 0.1%. Furthermore, the study suggests that interventions targeted at low-income populations exhibit even weaker average effects compared to those directed at the general population. Considering these findings, it becomes crucial to reconsider and explore alternative approaches like nudges that can more effectively enhance financial decision-making outcomes.

Nudging has played a dominant role in the field of savings decisions obtaining effective results (Thaler & Benartzi, 2004; Dur et al, 2021; Blake, 2022). The "Save More Tomorrow" program, introduced by behavioral economists Thaler and Benartzi (2004), is a 401(k) pension plan

designed to positively influence individuals' savings behaviors, specifically retirement savings. A key element of the program is its incorporation of automatic enrolment, a feature that starts participants on the path of saving for retirement without requiring any proactive steps. Notably, the "Save More Tomorrow" program respects individual autonomy by allowing participants the freedom to opt-out of automatic enrolment if they so choose. Similar nudging initiatives have seen widespread adoption globally, with varying levels of implementation and broad applications (Hertwig & Grüne-Yanoff, 2017; Thaler & Sunstein, 2021).

However, besides all the positive and effective outcomes of nudging, nudges have raised ethical debates centered around its potentially manipulative and paternalistic tendencies (Bovens, 2009). The subtle alteration of choice architecture, frequently without explicit disclosure, raises concerns about transparency and the integrity of the autonomous decision-making process (Michaelsen et al., 2020). The criticism leveled against nudging revolves around its perceived manipulative nature. Critics assert that nudges, by subtly influencing decisions, can compromise individuals' rational decision-making abilities. However, it is essential to note that awareness alone may not be sufficient to deem nudges non-manipulative. The concern lies in the possibility that individuals might find them challenging or impossible to resist despite being aware of nudges, questioning the ethical implications of their manipulative potential (Bruns et al. 2018). This can lead individuals towards outcomes that might not align with their genuine preferences (Hansen & Jespersen, 2013).

#### 2.2 The Ethics of Nudging Planning Decisions and the role of transparency

The significant success of the nudging movement has also been met with considerable reservations from scholars and practitioners, particularly those attentive to ethical concerns. Specifically, S1-nudges, such as those based on the default effect, have raised concerns regarding the principle of respecting individual agency—that is, the principle that agents must retain the ability to form their preferences and act accordingly.

Choice environments designed using insights from behavioral and cognitive sciences leverage automatic, fast, intuitive, and unconscious cognitive processes that bypass rational deliberation. As a result, these environments can lead to behavior driven by automatic processes rather than by a mental state considered personal and well-reasoned.

This situation conflicts with the principle of respecting agency, as the way in which automatic cognitive processes are exploited may prevent individuals from acting in alignment with their preferences. Consider the application of the default effect in saving choices, such as in the SMarT case, where the default mechanism is one of the key cognitive tools employed by this

pension plan. If the default allocation of a percentage of salary between the present self (preretirement) and the future self (post-retirement) differs from the agent's preferred distribution and the default succeeds, a misalignment arises. The heterogeneity of preferences, on the one hand, and the strength of S1-nudges—particularly those based on the default effect—on the other, create conditions under which such misalignments can undermine the decisionmakers agency.

In fact, in the literature on the ethics of nudges, concerns regarding agency represent one of the most significant issues (Kuyer & Gordijn, 2023). This highlights that the response by Thaler and Sunstein, for which citizens can always opt-out and deviate from the behavior or decision steered by the nudge(r) —has not been sufficiently convincing. While the strength of nudges and their success in influencing behavior are widely acknowledged, many scholars have found the defense of their ethical status based on the ease of opting out to be inadequate (Hansen & Jespersen 2013).

Dissatisfaction with the impact of nudges on agency has prompted two distinct responses within behavioral public policy. On one hand, new policy tools have been developed that are still informed by insights from cognitive and behavioral psychology but differ from S1-nudges by being agency-enhancing. Examples include boosts, debiasing techniques and self-nudging (Cf. Banerjee et al. 2024). On the other hand, nudges have been retained but paired with measures designed to preserve agency while maintaining their effectiveness.

One such measure is the introduction of transparency about certain salient aspects of the nudge—such as its presence, its effect, its overarching goal, and the psychological mechanisms underpinning it — at the moment the decision-maker enters the choice environment characterized by the nudge ((Bruns & Paunov 2021). Furthermore, some types of nudge+, that is, policy tools that introduce a reflective element alongside the nudge through making transparent its structure and purpose, have been proposed (Cf. Banerjee et al. 2023).

In nudge+, the element intended to encourage reflection and lead to informed decision-making may also take the form of a suggestion by the policymaker for the nudgee to pledge to the desired behavior. However, transparency regarding the nudge's features, unlike a pledge, appears to carry an additional ethically positive collateral effect. Specifically, transparency not only helps preserve the individual's agency but also creates conditions for public scrutiny of these tools. Nudges, more so than traditional policies, can easily escape the radar of even the most attentive citizens (Calboli, forthcoming) and, therefore, risk not being critically evaluated as is expected in contemporary liberal democracies.

Moreover, the question of whether transparent nudges are effective remains central to the debate on nudging ethics. Upon realizing they are being nudged, a primary concern is that individuals may intentionally reject the recommended option. Bovens (2009) argues that watchfulness alone enables individuals to detect nudges, while Calboli and Fano (2022) suggest that without prior knowledge of cognitive mechanisms, individuals cannot easily identify nudges, emphasizing the need for explicit transparency. They further highlight the ethical implications of individuals' lack of awareness of these mechanisms, suggesting that transparent nudging aligns with the ethical principles of liberal democracies.

Advocates for transparency argue that it upholds ethical standards by explicitly disclosing the nudge's intent (Michaelsen et al., 2020). Critics, however, caution that nudges may lose efficacy when disclosed, as they often "work best in the dark" (Bovens, 2009). Yet, empirical evidence suggests otherwise: transparency does not significantly diminish nudge effectiveness (Loewenstein et al., 2015; Bruns et al., 2018; Paunov et al., 2019; Wachner et al., 2020; Michaelsen et al., 2020). Transparent nudges, conveyed through written information, allow individuals to consciously engage with the intervention (Michaelsen et al., 2020), potentially mitigating reliance on heuristics.

Transparency also addresses concerns about autonomy and trust in decision-making processes. While psychological reactance—defined as adverse reactions to perceived manipulation (Brehm, 1966)—is a key concern, studies indicate that transparent nudging does not elicit such responses (Bruns et al., 2018). For example, transparency in default nudges had little to no impact on perceived threats to freedom of choice (Bruns et al., 2018; Michaelsen et al., 2020). Similarly, Wachner et al. (2020) found that despite perceptions of default nudges as potentially autonomy-violating, transparency had no measurable effect on autonomy or choice satisfaction, which remained consistently high across experimental conditions.

To sum up, transparency in the context of nudges is one of the measures introduced to leverage their effectiveness while simultaneously protecting the agency of citizens. Additionally, it has the positive side effect of facilitating public scrutiny. However, if the transparency associated with a nudge were to reduce its effectiveness, it would no longer be possible to satisfy both objectives. This could eventually suggest a preference for alternative forms of policy, whether behavioral or not.

The empirical evidence on such trade-offs, and therefore on the feasibility of introducing transparent nudges, is relatively abundant and initially led the community to claim that the transparency of nudges, in fact, does not undermine their effectiveness. This conclusion, for

instance, emerges from the work of Loewenstein et al. (2015), which focuses on the transparency of default-based nudges in steering decision-makers dealing with advance medical directives. Similarly, the study by Michaelsen et al. (2021) on prosocial behaviors does not suggest that transparency compromises the effectiveness of nudges. A similar finding is observed in the work of Casal et al. (2024), which examines the impact of a transparent default aimed at shaping decision-making in the evaluation of grid task performance, where optimism bias plays a significant role.

In the systematic literature review conducted by Bruns and Paunov (2021), the authors analyzed 87 tests on the impact of transparency. They identified only two cases—accounting for 2.30% of the tests—where effectiveness was compromised, while transparency had a positive effect on it in 37.93% of cases. These findings seem to suggest that concerns regarding the transparency of nudges may be unfounded. On the other hand, Michaelsen (2023), in a recent overview of the empirical literature on the effects of transparency on the choices of nudged individuals, highlights several conceptual and methodological issues. For instance, the messages conveying transparency often also carry additional features (such as timing and visibility), introducing methodological confounds. This raises questions about the reliability of the conclusions that empirical studies have reached. Moreover, certain decision-making domains—such as savings —have been largely overlooked despite their importance and the widespread use of nudges in those contexts.

The extent to which individuals are aware of the influence of nudges on their choices raises intriguing questions about their autonomy and overall satisfaction with the decision-making process (Pauvov et al., 2020; Wachner et al., 2020). Further research on the impact of transparency on nudging effectiveness, individual autonomy, and satisfaction with nudging interventions is needed to understand how it affects the influence of such behavioral interventions.

#### 3. Methodology

#### 3.1 Hypothesis

Our study investigates the impact of transparency in a default-based nudge on a savings decision. Furthermore, we explore how individual characteristics—specifically, a propensity toward psychological reactance—may moderate the effect of transparency on the nudge's effectiveness in this specific domain. This investigation is akin to the work conducted by Bruns

et al. (2018) on individual reactance traits, but in the context of voluntary contributions to climate protection. Moreover, it is motivated by recent literature on the heterogeneity of nudge effectiveness with respect to individual psychological traits (cf. De Ridder et al. 2022). In light of this emerging perspective in nudge theory, which calls for the development of personalization techniques in nudge delivery and a heterogeneity revolution (Mills, 2022; Bryan et al., 2021), it seems essential to take a similar direction in examining how individual psychological characteristics influence the impact of transparency on nudge effectiveness in such an important domain as saving.

Hence, the principal aim of this research is to investigate whether transparent nudges are effective in influencing savings decisions. The study begins by analyzing whether a default value of savings presented in the nudge conditions influences savings compared to the control condition with no nudge. Then, it investigates the effectiveness of the transparent nudge compared to the non-transparent nudge and identifies individuals' characteristics that may influence this effectiveness. In this setting, effectiveness pertains to the capacity to prompt individuals to select the pre-defined default value, even when the purpose of this influence is transparently disclosed.

The debate surrounding transparent nudging is closely linked to concerns about autonomous decision-making (Bovens, 2009, Leal and Oliveira, *forthcoming*). Consequently, the study examines whether experienced autonomy and choice satisfaction differ across nudge conditions while moderating for psychological reactance traits. This allows to address heterogeneity and advance the understanding of how individual differences shape the perception and effectiveness of nudges. Such insights enable the refinement of personalized nudging strategies by tailoring interventions to align with specific psychological profiles and behavioral tendencies, ensuring both ethical adherence and enhanced efficacy.

Thus, this study aims to analyze the following hypotheses:

H<sub>i</sub>: Default nudges are effective in influencing saving behavior.

H<sub>2</sub>: Transparent nudges do not reduce the effectiveness of nudges in influencing saving behavior.

H<sub>33</sub>: Transparent nudges improve experienced autonomy compared to non-transparent nudges.

H<sub>3b</sub>: Transparent nudges improve choice satisfaction compared to non-transparent nudges.

H<sub>4</sub>: Transparent nudges improve experienced autonomy and choice satisfaction among individuals with higher trait reactance.

# 3.2. The Experimental Design

The questionnaire was divided into seven sections, collecting the following data: (A) Experimental Conditions, (B) Experienced Autonomy, (C) Choice Satisfaction, (D) Psychological Reactance, (E) Market Participation, (F) Risk Profile, (G) Financial Literacy, and (H) Participants' Sociodemographic Characteristics.

# A. The experiment

The participants were randomly divided into three groups—non-transparent nudge, transparent nudge, and a control group.

# Control Group

A hypothetical scenario was constructed in which participants were tasked with making a simulated real-life financial decision. Although this method does not involve actual financial amounts, this approach serves as a practical way to gain insights into participants' choices and behaviors under controlled conditions, contributing to a comprehensive understanding of the research objectives despite resource limitations.

In this control group, participants were instructed to fill out the percentage of their hypothetical monthly net income to be automatically allocated every month to savings using the following text:

"You have a monthly net income of 1000€. You are presented with the following opportunity by your bank: Every month when you receive your income, you can commit to setting aside a percentage of it for your savings. The unique feature is that this certain percentage of your income will be automatically allocated to savings the day you receive your income. You are in control over the process and can adjust the percentage to suit your needs or disenroll the plan anytime. Please feel free to choose the percentage that you would like to allocate to your savings."

The amount for the monthly net income was set at  $1000 \in$  by its proximity to the average monthly net total income in Portugal (INE, 2024) and to simplify the mental calculation of savings percentages for participants.

Non-transparent nudge

For participants in the non-transparent nudge condition, a pre-selected default option of 10% was presented for the monthly automatic allocation to savings incorporating a nudge in the form of a default.

The magnitude of the default value holds significant importance. In successful 401(k) default studies, the typical contribution rate is approximately 3% of income (Thaler and Benartzi, 2004). The study by Madrian and Shea (2001) denoted that a substantial majority of new enrolees opted for the default saving rate of 3%. However, the analysis further revealed that many of these participants would have chosen a higher saving rate if not guided by the default. In a study investigating retirement savings, an unusually high default contribution rate of 12% of before-tax income was tested. This study found that relatively few employees adhered to this extreme default, suggesting that the efficacy of defaults diminishes as they are set towards more extreme values (Beshears et al., 2013).

Considering this, the default percentage tested in this study was set at 10%. The 10% default option serves as a pre-determined saving percentage that participants can opt in for without actively selecting. Furthermore, participants were allowed to specify an alternative percentage ranging from 0% to 100% in an open text box. Within this context, a fixed percentage of 10% of their income would be directed to savings by default unless they actively chose to opt out. Participants can choose a different percentage (including zero that represents no defaults savings), respecting the nudge pillars of guiding individuals' decisions while maintaining their freedom of choice. In this scenario, the default option is presented with explicit consent, meaning that individuals are informed that they have the opportunity to opt-out or make a different choice (Thaler & Sunstein, 2021).

# Transparent nudge

In the transparent nudge condition, participants were provided with an additional message preceding the default nudge to raise awareness about the purpose of the upcoming action. The transparency message concerns the purpose of the default nudge and was adapted based on insights from previous studies on nudge transparency (Bruns et al., 2018; Wachner et al., 2020; Michaelsen et al., 2020). Participants were able to read about the purpose of the nudge by the following underlined statement: "*Please note the preselected default option. This default is meant to encourage people to prioritize saving.*"

The following sections, C, D, and E were only presented to the nudge conditions to assess their perception of the nudge condition.

B. Experienced Autonomy

For ethical nudging practices, transparent nudges harmonize the dual objectives of providing informed guidance while safeguarding individual autonomy (Michaelsen et al., 2020). In this sense, it is crucial to assess the experiences and perceptions of people subjected to nudges, especially the experienced autonomy (Wachner et al., 2020).

Autonomy was assessed from the original autonomy subscale of the Basic Psychological Needs in Exercise Scale (Vlachopoulos & Michailidou, 2006) adapted to autonomy in decision-making in a nudging context, as in Wachner et al. (2020). The scale consists of four statements: (1) My decision is highly compatible with my goals and interests; (2) I feel very strongly that my decision perfectly fits my taste; (3) I feel that my decision is definitely an expression of myself; (4) I feel that I had the opportunity to have influence on my decision, with participants rating their level of agreement on a five-point Likert scale. The four individual scores were averaged to create a single autonomy score, ranging from 1 to 5.

C. Choice satisfaction

Prior research has demonstrated that when individuals perceive a nudge as potentially compromising their autonomy, they anticipate a corresponding decrease in choice satisfaction (Paunov et al., 2020). This study empirically assesses whether this anticipated reduction in satisfaction translates into actual feelings of lower choice satisfaction.

Choice satisfaction was measured with the satisfaction with choice subscale of the Decision Attitude Scale (Sainfort & Booske, 2000), used in prior nudge research by Wachner et al. (2020). The subscale comprised 5 statements: (1) My decision is sound; (2) I am comfortable with my decision; (3) My decision is the right one for my situation; (4) I am satisfied with my decision; (5) It was difficult to make a choice [reversed scale], where participants rated their level of agreement on a 5 points Likert scale, which was then averaged to a single-choice satisfaction scale.

#### D. Psychologic reactance

Psychological reactance refers to the emotional and cognitive response individuals experience when they perceive that their freedom of choice is being restricted or threatened (Brehm, 1966). This response is characterized by an increased desire to reassert autonomy and resistance to the perceived attempt to influence or control their behavior. Psychological reactance may be triggered by the belief that nudges might affect autonomous decision-making and it might undermine the desired impact of the nudge (Bruns et al., 2018). This was considered by assessing the trait reactance of participants following Bruns et al. (2018) study.

The trait reactance was measured using the Hong Psychological Reactance Scale (Hong & Faedda, 1996), consisting of 14 statements to assess individuals' trait propensity to experience psychological reactance, where participants were asked to rate their level of agreement, in a five points Likert scale (from totally disagree to totally agree). The 14 scores were averaged to one trait reactance score on a scale from one to five.

E. Market participation

The ownership of diverse financial instruments has a significant influence on assessing individuals' financial role in the market. These factors substantially impact individuals' financial choices and willingness to participate in savings plans (Despard et al., 2022). Market participation was assessed by questioning which investment financial products participants hold or have held in the past within a given list.

F. Risk Profile

To retrieve risk profiles, participants were asked to engage in a self-assessment of their risk profiles across five distinct categories. Moreover, they were presented with two additional questions about their anticipated reaction in the event of an investment incurring losses and to seek insights into their approach to resource diversification.

By incorporating the second and third questions, the study aimed to mitigate the potential distortion arising from participants' overly optimistic evaluations of their investment tendencies. Even if participants are not active in the financial market these questions may be answered as hypothetical aiming to assess risk profiles.

G. Financial literacy "The Big 5 "

Financial literacy is a foundational indicator of individuals' understanding and competence in making informed financial decisions, including saving (Lusardi, 2019). A higher level of financial literacy might prepare individuals with the skills to comprehend the implications of financial nudges better and make informed choices (García & Vila, 2020). Incorporating financial literacy as a control variable improves the participant description within a financial context, as it can shape how individuals perceive and respond to these interventions. One of

the most common ways to assess financial literacy is through the utilization of the "Big Five" financial literacy questions, devised by Lusardi and Mitchell (2011b). These questions are designed to evaluate individuals' knowledge of fundamental financial concepts, such as compound interest, inflation, the interplay between interest rates and bond prices, the correlation between interest rates and mortgage payments, and the principles of stock portfolio diversification. This comprehensive approach to assessment provides valuable insights into individuals' knowledge of key financial principles, making it a widely recognized and utilized measurement tool in financial literacy research.

Table 1 provides a comprehensive overview of the dependent and independent variables in this study, offering precise definitions and classifications of all variables.

#### 3.3 Models

#### 3.3.1 Nudging effectiveness in savings decisions

Model (1) examines whether the nudges influence participants' savings behavior relative to the control condition. Key control variables include nudge transparency, financial literacy, perceived financial literacy, risk profile, market participation, and demographic factors (age, gender, education level, study field, own income level, household income level). The first hypothesis (H1) tests whether participants who received the non-transparent nudge were more likely to select the default option. The model estimates a probit regression, reporting marginal effects specified as follows:

 $\begin{aligned} \text{nudge}\_\text{effectiveness}_i &= \alpha_0 + \alpha_1 \times \text{non\_transparent\_nudge}_i + \alpha_2 \times \text{financial\_literacy}_i + \alpha_3 \times \text{perceived\_fl}_i \\ &+ \alpha_4 \times \text{risk\_profile}_i + \alpha_5 \times \text{market\_participation}_i + \alpha_6 \times \text{age}_i + \alpha_7 \times \text{gender}_i + \alpha_8 \times \text{education\_level}_i + \alpha_9 \times \\ &\text{study\_field}_i + \alpha_{10} \times \text{own\_income\_level}_i + \alpha_{11} \times \text{household\_income\_level}_i + \alpha_{12} \times \text{trait\_reactance}_i + \epsilon_i \end{aligned}$  (1)

#### 3.3.2 Transparent nudging effectiveness in savings decisions

The second hypothesis (H2) tests whether the effectiveness of a transparent nudge in savings decisions is comparable to that of a non-transparent nudge. Model (2) estimates a probit regression, where the dependent variable is binary (1 for effective nudge, 0 for ineffective), and the independent variable indicates whether participants received the transparent nudge. The model also includes financial literacy, risk profile, market participation, socio-demographics (age, gender, education level, study field, own income level, household income level), and trait reactance as covariates:

nudge\_effectiveness<sub>i</sub> =  $\alpha_0 + \alpha_1 \times \text{transparent\_nudge}_i + \alpha_2 \times \text{financial\_literacy}_i + \alpha_3 \times \text{perceived\_fl}_i + \alpha_4 \times \text{risk\_profile}_i + \alpha_5 \times \text{market\_participation}_i + \alpha_6 \times \text{age}_i + \alpha_7 \times \text{gender}_i + \alpha_8 \times \text{education\_level}_i + \alpha_9 \times \text{study\_field}_i + \alpha_{10} \times \text{own\_income\_level}_i + \alpha_{11} \times \text{household\_income\_level}_i + \alpha_{12} \times \text{trait\_reactance}_i + \epsilon_i$ (2)

#### 3.3.3 Experienced autonomy in transparent nudging

Model (3) focuses on whether participants perceive higher autonomy when exposed to a transparent nudge compared to a non-transparent one, testing hypothesis (H3a). The model estimates an ordered probit regression for experienced autonomy and uses a binary independent variable indicating whether participants received the transparent nudge. The model also controls for financial literacy, risk profile, market participation, socio-demographics, and trait psychological reactance as explanatory variables:

Experienced\_autonomy<sub>i</sub> =  $\alpha_0 + \alpha_1 \times \text{transparent_nudge}_i + \alpha_2 \times \text{financial_literacy}_i + \alpha_3 \times \text{perceived_fl}_i + \alpha_4 \times \text{risk_profile}_i + \alpha_5 \times \text{market_participation}_i + \alpha_6 \times \text{age}_i + \alpha_7 \times \text{gender}_i + \alpha_8 \times \text{education_level}_i + \alpha_9 \times \text{study_field}_i + \alpha_{10} \times \text{own_income_level}_i + \alpha_{11} \times \text{household_income_level}_i + \alpha_{12} \times \text{trait_reactance}_i + \epsilon_i$ (3)

#### 3.3.4 Choice satisfaction in transparent nudging

Model (4) estimates an ordered probit regression to analyze whether participants who received a transparent nudge report higher levels of choice satisfaction than those who received a non-transparent nudge, testing hypothesis (H3b). The same model structure as in the previous sections applies, including the effects of financial literacy, risk profile, market participation, socio-demographics, and trait reactance on choice satisfaction:

choice\_satisfaction<sub>i</sub> =  $\alpha_0 + \alpha_1 \times \text{transparent_nudge}_i + \alpha_2 \times \text{financial_literacy}_i + \alpha_3 \times \text{perceived_fl}_i + \alpha_4 \times \text{risk_profile}_i + \alpha_5 \times \text{market_participation}_i + \alpha_6 \times \text{age}_i + \alpha_7 \times \text{gender}_i + \alpha_8 \times \text{education_level}_i + \alpha_9 \times \text{study_field}_i + \alpha_{10} \times \text{own_income_level}_i + \alpha_{11} \times \text{household_income_level}_i + \alpha_{12} \times \text{trait_reactance}_i + \epsilon_i$ (4)

Models (3) and (4) moderate for the psychological reactance trait that corresponds to Hypothesis 4. All models report marginal effects.

#### 3.4. Data

The primary objective of this research is to evaluate the efficiency of transparent nudges within the context of savings decision-making among a Portuguese population aged 18 and older. In Portugal, nudging has found its way in various societal aspects, showcasing its potential for positive behavioral change (Rosas, 2022; Gonçalves et al., 2021; Nudge Project, 2021). The systematic integration of nudge theory in Portuguese governance is limited. However, this opens a door of hope for the future.

Savings represent foundational pillars within the spectrum of financial decisions individuals make, steering them toward achieving financial goals and securing a stable financial future. Portugal faces a notable deficit in widespread savings habits, highlighting the need for increased financial awareness and proactive measures (Intrum, 2022). Guiding individuals toward making desirable savings choices can be achieved through behavioral interventions, such as nudges, which subtly influence decision-making without restricting freedom of choice.

The data collection process was conducted online over 22 days, from September 28, 2023, to October 20, 2023. This process yielded a total of 288 replies, with 17 being ineligible due to the respondents not being of Portuguese nationality. Therefore, 271 responses were considered for the study. The randomization process resulted in 83 responses for the control condition, 92 for the non-transparent nudge condition, and 96 for the transparent nudge condition.

The sample primarily comprises young individuals with an average age of approximately 26 years. Females represent about 60% (N=164) of the sample, while males represent around 40% (N=107). Approximately 32% (N=60) are attending a post-graduation or master's degree program. A significant portion, nearly 38% (N=102), have an educational background in economics, management, finance, or related fields. Financial literacy was assessed using the "Big Five" developed by Lusardi and Mitchell (2011b), with results indicating a high level of correct responses, reflecting a strong grasp of financial knowledge among the sample (Appendix 2).

Studying a younger, educated population provides a unique perspective on savings behavior and responsiveness to digital nudges. These nudges can be seamlessly integrated into apps and platforms that this demographic already uses, increasing the likelihood of engagement and action. Interventions applied to a younger population have the potential for long-term impact, enhancing their financial well-being and shaping their savings behaviors for years to come. This comprehensive sociodemographic profile forms the foundation for our subsequent analyses and findings.

The internal consistency of the dataset was evaluated to ensure the reliability of the findings. The computation of Cronbach's alpha was performed using the statistical software Stata, resulting in an alpha value of 0.775. This value underscores the reliability and validity of the data derived from the questionnaire sustaining the credibility of the research, allowing to draw meaningful and well-founded conclusions from this study. Additionally, testing for multicollinearity is an important step in regression analysis, as it helps ensure the reliability and interpretability of the results. Table 2 displays a correlation matrix using the Pearson correlation coefficient, and the results indicate no concerning correlations were observed between these variables. Therefore, given the absence of evident correlation problems among the variables, this study can proceed confidently by utilizing all the variables.

#### 4. Results

4.1 The influence of nudging in guiding savings decisions

As described previously, the objective is to conduct an analysis focused on examining whether the default value introduced within the nudge conditions influences the participants' savings of the hypothetical monthly income of 1,000€ compared to the participants in the control condition with no nudge. Therefore, investigating if the pre-defined default value assigned to the nudge conditions had an influence on participants' savings decisions.

Table 3 displays the absolute and relative frequency of the participants selecting the default value of allocating 10% of monthly income to savings by condition. The table reveals that a substantial majority of participants in both nudge conditions opted for the 10% default option presented within the experimental setup. Specifically, 73.91% (N=68) of participants in the non-transparent nudge condition and 69.79% (N=66) in the transparent nudge condition. In contrast, participants in the control group exhibited a lower preference for that value, with only 21.69% (N=18) selecting the 10% savings option.

The findings further indicate a notable tendency where a greater proportion of participants opt for the default value of allocating 10% of monthly income to savings, as opposed to selecting alternative amounts, especially when compared to the control group.

Participants may exhibit a propensity to opt for default choices driven by a reluctance to expend additional mental or decision-making effort. Defaults, in this context, provide a convenient and effortless choice, sparing individuals from the cognitive burden associated with actively considering alternative options. Defaults emerge as a practical solution, presenting a pre-selected choice that simplifies decision-making. This behavioral trend aligns

with the concept of inertia, wherein individuals adhere to default options due to their inherent convenience and a reluctance to invest additional effort in effecting changes.

Moreover, participants may perceive default options as safer or less risky choices. Accepting defaults is motivated by the perception that these choices are endorsed or recommended by the system, thereby reducing the perceived risk associated with deviating from the default (Thaler & Sunstein, 2008).

A t-test was conducted to determine if there was a difference in means of the percentages selected by participants to allocate to their monthly savings between the control condition with no nudge and nudge conditions (non-transparent and transparent) aggregated in one group to conduct this analysis. Table 4 summarizes the outcomes of the t-test displaying that the difference between mean percentages selected by participants to allocate to their monthly savings between no nudge condition and nudge conditions was statistically significant, t(269) = 3.9222, p < 0.0001 [95% CI: 3.0047, 9.0617]. These findings suggest that the default value introduced within the nudge conditions has impact on participants' savings decisions. This aspect carries notable implications for financial institutions, particularly banks equipped with insights into clients' savings patterns. With this understanding, banks can strategically establish default options that align with clients' best interests. Such strategic alignment has the potential to positively influence client savings behavior, marking a promising avenue for financial institutions to enhance their impact on the financial well-being of their clientele.

Table 5 presents the marginal effects of a probit regression (Model 1) examining the impact of financial literacy, perceived financial literacy, risk profile, market participation, sociodemographic characteristics, and trait reactance on nudge effectiveness. In this analysis, nudge effectiveness is operationalized as the selection of the default value of 10% for monthly savings given a monthly income of 1000€. The specific focus is on comparing the nontransparent condition to the control condition. In the coding of values for this analysis, a choice of 10% is represented as 1, while any other selection is coded as 0. This coding allows for a clear examination of the impact of the non-transparent condition on the likelihood of participants choosing the default 10% savings option compared to the control condition. The estimated marginal effect for the non-transparent condition is statistically significant. This indicates that, based on the available data, there is evidence suggesting a notable shift in the likelihood of choosing the default value of allocating 10% of monthly income to savings when comparing the non-transparent nudge condition to the control condition.

As a result, we do not reject the null hypothesis  $(H_1)$  that participants who received the non-transparent nudge selected the default value. This study aligns with previous research,

affirming the efficacy of default nudges in influencing savings behaviour (Thaler & Sunstein ,2008). Furthermore, the findings highlight that among the variables examined only own income, household income, risk profile and finance literacy demonstrate statistical significance in shaping the effectiveness of non-transparent nudges in this specific context of savings decision. Specifically, an increase of one unit in own income is linked to a 6.8% decrease in the probability of participants selecting the default value when exposed to the non-transparent nudge. On the other hand, a rise of one unit in household income is associated with a substantial 8.7% increase in the likelihood of participants choosing the default value. Similarly, a rise of one unit in risk profile is connected to a noteworthy marginal increase of approximately 10% in the probability of participants opting for the default value when exposed to the non-transparent nudge. Lastly, an increase of one unit in financial literacy is linked to a 6.4% decrease in the probability of participants selecting the default value when exposed to the non-transparent nudge. Lastly, an increase of one unit in financial literacy is linked to a 6.4% decrease in the probability of participants selecting the default value when exposed to the non-transparent nudge.

However, the central ethical concern remains regarding the perception that certain nudges, particularly defaults, operate outside of people's awareness (Bovens, 2009). In the following sections, the research explores whether transparency might serve as a crucial factor in enhancing the ethicality of nudges without compromising their effectiveness in guiding savings decisions.

#### 4.2 Transparent nudging and its effectiveness in influencing savings decisions

The primary aim of this research is to evaluate the effectiveness of transparent nudges within a savings decision-making context. For this purpose, in the next stages of the results the control condition is dropped, and the data is analyzed only between nudge conditions with a dummy variable designed to distinguish participants exposed to the transparent nudge from those exposed to the non-transparent nudge.

A t-test was conducted to determine if there was a difference in the percentages selected by participants to allocate to their monthly savings between the transparent condition, with the disclosure of the purpose of the nudge, and the non-transparent condition, with no further information about the nudging practice taking place. The test was performed to investigate whether the mean percentages selected by participants to allocate to their monthly savings differ significantly across these nudge conditions.

Table 6 presents the results of the t-test. The difference between mean percentages selected by participants to allocate to their monthly savings between nudge conditions (non-transparent and transparent) is not statistically significant, with a t(186) = 1.0515, p = 0.2944 [95% CI: -

1.4270, 4.6847]. In practical terms, this implies that there is no evidence to suggest a significant difference in participants' savings behavior between nudge conditions. These findings indicate that the transparency of the nudge might not have a significant impact on participants' savings decisions when compared to the non-transparent nudge.

To achieve the main goal of this research and test transparent nudge effectiveness, a probit regression was estimated with the dependent variable structured as a binary dummy variable, indicating the efficacy of the nudge and the independent variable as a dummy variable to distinguish participants between nudge conditions. This approach facilitated a comparative analysis of the influence of transparent versus non-transparent nudges.

Table 7 displays the marginal effects of the probit regression (Model 2) for nudge effectiveness incorporating the effects of financial literacy, perceived financial literacy, risk profile, market participation, sociodemographic characteristics, and trait reactance into the analysis. The estimated margin effect is not statistically significant, suggesting that, based on the available data, there is no strong evidence to indicate a significant change in the probability of nudge effectiveness when comparing the non-transparent to the transparent condition. Therefore, the null hypothesis  $(H_2)$  that making the nudge transparent does not decrease the nudge's effectiveness when compared to the non-transparent nudge, is not rejected, and this study corroborates with prior studies that find transparent nudges to not decrease the effectiveness of the nudge interventions (Bruns et al., 2018; Paunov et al., 2019; Wachner et al., 2020; Michaelsen et al., 2020). The guiding guestion of this research can be answered: It is effective to use transparent nudges to influence individuals' savings decisions. Despite concerns that transparent nudges might not effectively influence decision-making (Bovens, 2009), the results from this research reinforce the notion that transparent nudges do not diminish the effectiveness of nudge interventions. These results challenge the assumption that transparent nudges might inherently be less impactful than non-transparent ones and extend prior findings to the savings field.

The findings from this study hold significant importance, contributing to a growing body of evidence that transparent nudges can be implemented in guiding decision-making without compromising their overall effectiveness. Additionally, as a major contribution to the literature, it underscores the potential viability of employing transparent nudges in influencing savings decisions without affecting effectiveness. According to Thaler and Sunstein (2021), nudges are designed to operate transparently. In this research transparency was implemented by communicating the intended purpose behind the nudge intervention to individuals, demonstrating that this form of transparency does not affect the effectiveness while upholding

ethical values. This outcome strikes a balance between the efficacy of nudge interventions and the elimination of ethical concerns (Michaelsen et al. 2020), presenting an optimal solution for employing nudges in the savings decision-making set that can be implemented by public and private institutions.

Additionally, the results reveal that only education and the risk profile exhibit statistical significance in influencing nudge effectiveness in this context. A one-unit increase in education level is associated with a nearly 4.98% decrease in the probability of participants selecting the default value within the transparent nudge condition.

This highlights a trend where higher education levels correlate with a reduced inclination toward choosing the default option in the transparent nudge. This observation suggests that individuals with higher education levels display a heightened resistance to the influence of the transparent nudge, expressing a preference for alternative choices. On the other hand, a one-unit increase in the risk profile corresponds to a marginal increase of approximately 7.49% in the probability of participants opting for the default value when exposed to the transparent nudge. This insight suggests that individuals with a higher risk profile tend to favour the default option in the transparent nudge, contributing modestly to its impact on decision-making.

The remaining predictors do not appear to have a statistically significant effect on the probability of nudge effectiveness based on this regression model not even trait reactance shows any influence on the nudge effectiveness in this model given the data available.

Transparent interventions have been connected to a decreased sense of threat to autonomy. When participants perceive a nudge as aiming to engage reflective thinking, they expect their choices to be more authentic (Michaelsen et al.,2021). The upcoming section of the study further explores how individuals perceive transparent nudging in a savings decision-making setting.

The final section of the study focuses on a comparative analysis of individuals' perceptions and experiences when exposed to transparent versus non-transparent nudge, focusing specifically on their sense of autonomy and satisfaction regarding the savings decision.

4.3 Transparent nudging and autonomy experienced in savings decisions

Previous studies denote that enhancing the transparency of a nudge does not result in significant negative impacts on individuals' experiences and perceptions of the nudge. Investigations based on participants' experiences have revealed that when a default nudge is

made transparent, there is either no increase or only a slight increase in experienced autonomy (Michaelsen et al., 2020; Wachner et al., 2020).

A t-test was conducted to determine if there was a difference in the levels of experienced autonomy between the transparent and non-transparent nudge conditions. The test was performed to investigate whether the mean levels of experienced autonomy differ significantly across these nudge conditions.

Table 8 summarizes the outcomes of the t-test displaying that the difference in experienced autonomy between nudge conditions (non-transparent and transparent) is statistically significant, t(186) = 2.4591, p = 0.0148 [95% CI: 0.0482, 0.4393]. In the transparent condition (N=96), participants reported an average level of experienced autonomy at 4.33 (SD = 0.575) out of 5, while those in the non-transparent condition (N=92) indicated an average level of 4.08 (SD = 0.773). In practical terms, this suggests a significant difference in the perceived autonomy of participants between the non-transparent nudge and transparent nudge conditions, indicating that the transparency of the nudge may have a notable impact on participants' perceived autonomy compared to the non-transparent nudge. Thus, the null hypothesis ( $H_{3a}$ ) that participants who received the transparent nudge score higher on experienced autonomy than the non-transparent nudge, is not rejected.

The analysis of experienced autonomy proceeded with an Ordered Probit regression (Model 3) with the categorical variable of experienced autonomy as the dependent variable and the dummy variable for nudge conditions alongside the additional variables (financial literacy, perceived financial literacy, risk profile, market participation, sociodemographic characteristics, and trait reactance) as the independent variables.

Table 9 exhibits the result of the Ordered Probit regression (Model 3), describing the marginal effect on the likelihood of the condition participants are in affecting the experienced autonomy. The levels of autonomy experienced by the participants range from 1 to 4, with no participant achieving level 5 of experienced autonomy. For the level 3 (neutral level) of experienced autonomy the transparent condition reveals statistical significance connected to an approximately 6.37% decrease in the likelihood of participants being in this neutral level of experienced autonomy when compared to the non-transparent condition. Moreover, additional explanatory variables (financial literacy, perceived financial literacy, risk profile, market participation, sociodemographic characteristics, and trait reactance) revealed no statistical significance. The results about experienced autonomy show that employing transparent nudges in a savings context may in fact increase the autonomy experienced when compared to a non-transparent nudge. The studies that have explored the impact of enhancing the

transparency of nudges on their perceived effectiveness suggest that the degree of transparency in a default nudge may not significantly influence experienced autonomy (Wachner et al., 2020; Michaelsen et al., 2021). However, the results derived from this study into experienced autonomy within the context of savings decision-making challenge this prevailing perspective. The outcomes of this study indicate that contrary to the general trend observed in previous research, employing transparent nudges in a savings context might contribute to an increase in perceived autonomy compared to non-transparent nudges. These findings offer a nuanced perspective on the relationship between transparency and autonomy, underscoring the context-specific nature of nudging effects and providing insights for the ongoing discourse on the ethical implications of nudging in the field of savings decisions.

#### 4.4 Transparent nudging and choice satisfaction in savings decisions

In addition to analyzing experienced autonomy, the study examines the concept of choice satisfaction. Aiming to empirically test if transparent nudges influence actual satisfaction experiences regarding choices. A t-test was conducted to investigate whether there was a difference in the mean levels of choice satisfaction between the transparent and non-transparent nudge conditions. The analysis aimed to determine if the mean levels of choice satisfaction significantly varied across these nudge conditions.

Table 10 summarizes the outcome of the t-test, displaying that the mean difference in choice satisfaction between nudge conditions (non-transparent and transparent) is statistically significant, t(186) = 4.2909, p = 0.0000 [95% CI: 0.1875, 0.5067]. In the transparent condition (N=96), participants reported an average choice satisfaction level of 4.16 (SD = 0.407) out of 5, while those in the non-transparent condition (N=92) indicated an average level of 3.81 (SD = 0.674). These findings suggest that employing a transparent nudge in this context is associated with higher choice satisfaction levels than a non-transparent nudge. Thus, the null hypothesis (H<sub>3b</sub>) that participants who received the transparent nudge score higher on choice satisfaction than the non-transparent nudge, is not rejected. The analysis of choice satisfaction proceeded with an Ordered Probit regression (Model 4) with the categorical variable of choice satisfaction as the dependent variable and the dummy variable for nudge conditions alongside the additional variables (financial literacy, perceived financial literacy, risk profile, market participation, sociodemographic characteristics, and trait reactance) as the independent variables.

Table 11shows the result of the Ordered Probit regression (Model 4), describing the marginaleffect on the likelihood of the transparent nudge affecting participants' choice satisfaction.Results presented in Table 11 suggest a substantial and statistically positive significance in

the change in choice satisfaction for individuals in the transparent condition compared to the non-transparent condition. This coefficient implies an increase in the highest level of choice satisfaction experienced by the sample of approximately 15.12% when moving from the non-transparent to the transparent condition.

The results of choice satisfaction demonstrate that disclosing the purpose of the nudge makes participants more satisfied with the savings choice made compared to participants in the non-transparent nudge condition. Institutions must remain aware of the autonomy and satisfaction associated with decision-making, as these experiences significantly shape future choices. Negative experiences when making desired choices should be actively minimized (Wachner et al., 2020). In this sense, these findings are important and favorable for the implementation of a transparent nudge within a saving decision set.

Additionally, the effect of additional explanatory variables on choice satisfaction in the different nudge conditions shows that the principal variables relevant to explaining choice satisfaction are household income and trait reactance. Household income and trait reactance reveal statistical significance and are positively related to higher levels of choice satisfaction. This means that an additional point in trait reactance makes individuals 9,89% more likely to be satisfied with their choice. Along the same line, a one-unit increase in household income makes individuals 3,78% more likely to be satisfied with the savings choice made.

This suggests that the specific type of transparency, particularly centered around disclosing the nudge's purpose, appears to enhance satisfaction levels among individuals with higher trait reactance. This indicates that transparent messaging might boost the satisfaction of individuals characterized by higher trait reactance when confronted with a savings decision.

#### 5. Conclusion

This study aimed to assess the effectiveness of transparent nudges in influencing individuals' savings decisions. A comprehensive approach was employed, involving a questionnaire distributed to a sample of 271 Portuguese individuals, coupled with an experimental design that allocated participants into three distinct conditions: a control condition, a non-transparent nudge condition, and a transparent nudge condition. The pursuit of transparency in nudging involves multifaceted approaches (Michaelsen et al. 2020), in the present study transparency is the disclosure of the purpose of the default nudge.

Firstly, the study examined the influence of the default value introduced in nudge conditions on participants' savings decisions compared to a control condition with no nudge. Additionally, it explored the impact of various factors such as risk profile, market participation, financial literacy, and sociodemographic characteristics on savings behaviour across conditions.

Moreover, the study achieved its main objective by analyzing the nudge effectiveness between nudge conditions. In the last step of the study, the influence of transparency on the experienced autonomy of decision-makers and their satisfaction with their choices were investigated. In the investigation of nudge efficacy between nudge conditions and participants' perceptions, the role of trait reactance was also considered, recognizing that it can trigger adverse reactions in individuals when they perceive external influence on their decisionmaking processes. This multifaceted approach allowed to gain a comprehensive understanding of the complex dynamics surrounding savings decision-making and the potential impact of transparent nudges in influencing savings choices.

The findings from this study replicate and contribute to existing evidence on nudge transparency, extending prior conclusions to the savings decision-making set (Bruns et al., 2018; Paunov et al., 2019; Wachner et al., 2020; Michaelsen et al., 2020). These findings suggest that despite the initial concern over the influence of transparency (Bovens, 2009), nudges in the form of defaults can be transparent and, at the same time, effective. Furthermore, while prior research suggests that increasing transparency in nudges may not significantly affect experienced autonomy (Wachner et al., 2020; Michaelsen et al., 2021), this research challenges that notion within the field of savings decision-making. Findings indicate that transparent nudges in the form of disclosing the purpose of the nudge in the savings context may enhance experienced autonomy compared to non-transparent nudges, offering a nuanced perspective on the context-specific nature of nudging effects and contributing insights to the ethical discourse on savings decisions. On the same note, the results on choice satisfaction revealed that participants subjected to the transparent nudge exhibit significantly higher levels of choice satisfaction in contrast to those exposed to the non-transparent nudge condition.

The study contributes to the literature by introducing a new framework that combines prior research on nudging and the application of transparent nudges in a savings decision-making set. This conceptual framework represents a step forward in understanding how transparency intersects with nudges in savings settings. Furthermore, empirical findings hold significant promise for practical implications. By uncovering the impact of transparent nudges on savings

choices, the study offers valuable insights for intervention designers. This has the potential to transform the design of nudge interventions aimed at guiding ethical savings behaviors.

While this study offers valuable insights, some limitations need consideration. Moreover, the use of hypothetical scenarios in the questionnaire is limited, as it might not accurately mirror individuals' genuine choices, potentially reflecting more intentions than real behaviors.

Future research should prioritize overcoming these limitations to produce more precise and widely applicable insights into the influence of transparent nudges on savings decision-making. Incorporating experimental designs that authentically mirror real-life savings scenarios could yield more profound insights into the implications of transparent nudges on savings behavior. Furthermore, while the current study concentrated on a singular type of nudge (default nudge) and one transparency approach (disclosure of nudge purpose) within a specific savings context, there is a need for further investigation to determine the impact of transparency on the effectiveness of nudges in the savings decision-making setting.

# Table 1: Dependent and Independent Variables Panel A: Dependent Variables Description Binary variable: takes the value 1 if the participant

nudge_effectiveness	Binary variable: takes the value 1 if the participant chose the default nudge; 0 otherwise.						
choice_satisfaction	Average of points assigned to each statement on a Likert scale from 1 to 5.						
experience_autonomy	Average of points assigned to each statement on a Likert scale from 1 to 5.						
Panel B: Independent Variables							
age	Ordinal variable: values range from 1 to 5 according to age group (1: 18-25; 2: 26-35; 3: 36-45; 4: 46-55; 5: >55).						
gender	Binary variable: takes the value 1 for male participants; 0 for female participants.						
education	Ordinal variable: values range from 1 to 8 according to education level (1: primary; 2: basic; 3: high school; up to 8: Ph.D.).						
study_field	Binary variable: takes the value 1 for economics and management; 0 for other areas of study.						
own_income	Ordinal variable: values range from 1 to 6 (1: no income; 2: up to €500; up to 6: above €2000).						
household_income	Ordinal variable: values range from 1 to 5 (1: up to €500; 2: €501-1000; up to 5: above €5000).						
trait_reactance	Ordinal variable: average of points assigned to 14 statements on a Likert scale from 1 to 5.						
mrkt_participation	Binary variable: takes the value 1 if the participant holds any investment; 0 otherwise.						
risk_profile	Ordinal variable: average of three questions on risk tolerance, on a scale from 1 to 5 (1: low risk; 5: high risk).						
financial_literacy	Ordinal variable: number of correct answers to five financial literacy questions, ranging from 0 to 5.						
perceived_fl	Ordinal variable: self-assessed number of correct financial literacy answers, ranging from 0 to 5.						
transparent_nudge	Binary variable: takes the value 1 for the transparent nudge condition; 0 for the non-transparent condition.						
non_transparent_nudge	Binary variable: takes the value 1 for the non-transparent nudge condition; 0 for the control condition.						

Variable	М	SD	1.	2.	3.	4.	5.	6.	7.	8.
1. age	1.5	0.9								
2. gender	0.3	0.5	.23*							
3. education	5.4	1.3	05	.19*						
4. study_field	4.1	3.4	.22*	15*	.29*					
5. own_income	2.8	1.6	.48*	.48*	.29*	08				
6. household_income	3.2	0.8	.16*	.24*	.16*	07	.36*			
7. risk_profle	2.3	0.8	.06	.28*	.14*	12	.18*	.13*		
8. market_participation	0.6	0.4	.19*	.19*	.13*	09	.25*	.09	.16*	
9. financial_literacy	3.1	1.4	.01	.25*	.25*	28*	.17*	.11	.33*	.22*

Table 2: Correlation Matrix: means, standard deviations, and correlations

Note. This table presents the means and standard deviations of each variable, as well as the correlations between them. M and SD are used to represent mean and standard deviation, \* indicates p < .05.

# Table 3: Summary of participants selecting the default value of their monthly income to savings by condition

	Control		Non-trans	sparent	Transparent	
	Freq	%	Freq	%	Freq	%
Selected option = 10%	18	21.69%	68	73.91%	66	69.79%

Note. This table presents the absolute and relative frequency of the participants selecting 10% of their monthly income to savings by condition: control, non-transparent and transparent condition.

# Table 4: Analysis of monthly savings allocation in control vs. nudge conditions (transparent and non-transparent)

	Freq	М	SD	t	df	р	[95% CI]
Control Condition	83	18.89	13.774	3.9222***	269	0.0001	[3.0047; 9.0617]
Nudge Conditions	188	12.86	10.620				

Note: This table presents a difference in means t-test of the participants selecting 10% of their monthly income to savings by conditions: control and nudge conditions (non-transparent and transparent condition)

	nudge_effectiveness (=choice of the target savings level)
non_transparent_nudge	.5084621 ***
(vs. control group)	(061647)
age	.0007707
	(.0037899)
gender (male=1)	0562693
	(.0774929)
education	0008103
	(.0240237)
study_field	0090046
	(.0106992)
own_income	0689018***
	(.0244514)
household_income	.0870434**
	(.0384317)
risk_profile	.1034656 ***
	( .1534855)
financial_literacy	0644556 ***
	(.0244968)
market_participation	.0220359
(investiments=1)	( .0314481)
perceived_fl	005738
	(.0181041)
Observations	175
Pseudo R2	0.2972

#### Table 5: Marginal effects of Probit regression for Nudge Effectiveness

Note. This table presents the marginal effects of the Probit regression for Model (1). Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### Table 6: Monthly savings allocation in transparent vs. non-transparent condition

	Freq	М	SD	t	df	р	[95% CI]
Transparent condition	96	13.66	12.177	1.0515 *	186	0.2944	[ -1.4270; 4.6847]
Non-transparent condition	92	12.03	8.694				

Note: This table presents a difference in means t-test of the participants selecting 10% of their monthly income to savings by nudge conditions: non-transparent and transparent condition.

VARIABLES	nudge_effectiveness
transparent_nudge	0468604
(vs. non-transparent)	(.0621847)
age	.0092252
	(.0353641)
gender (male=1)	1160402
	(.0727813)
education	0497762 **
	(.0242873)
study_field	0010274
	(.0096032)
own_income	0292801
	(.0246908)
household_income	.0257175
	(.0408154)
risk_profile	.0748639 *
	(.041981)
financial_literacy	0277812
	(.0296917)
market_participation (investiments=1)	0831882
	(.0682556)
perceived_fl	027286
	(.0363696)
trait_reactance	.0461743
	(.0488166)
Observations	188
Pseudo R2	0.1105

Table 7: Marginal effects of Probit regression for Transparent Nudge Effectiveness

Note. This table presents the marginal effects of the Probit regression for model 2. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### Table 8: Experienced autonomy in transparent vs. non-transparent condition

	Freq	М	SD	t	df	р	[95% CI]
Transparent condition	96	4.33	0.575	2.4591**	186	0.0148	[ 0.0482; 0.4393]
Non-transparent condition	92	4.08	0.773				

Note: This table presents a difference in means t-test of the participants experienced autonomy by nudge conditions: non-transparent and transparent condition.

		Level of experienced_autonomy						
VARIABLES	1	2	3	4				
transparent_nudge	0088001	0511755	0637978***	.1237734				
(vs. non-transparent)	( .0075366)	( .0284673)	(.0319959)	(.0632271)				
age	0030605	0174816	0217115	.0422536				
	(.0036172)	( .0166857)	(.0207694)	(.0400726)				
gender (male=1)	.0084595	.0483201	.0600118	1167913				
	(.0080665)	.0330979)	(.0431775)	( .08067)				
education	0009739	0055628	0069088	.0134455				
	( .0017608)	(.0094109)	(.011955)	(.0229385)				
study_field	0000506	000289	0003589	.0006986				
	(.0007347)	(.0042304)	(.0052487)	(.0102127)				
own_income	0011585	0066171	0082182	.0159937				
	(.0020337)	(.0107796)	( .01367)	(.0262513)				
household_income	001821	0104015	0129182	.0251407				
	(.0031384)	(.0166818)	(.0208192)	(.0402647)				
risk_profile	.0003708	.0021181	.0026306	0051195				
	( .0037613)	.0215409)	(.0267764)	(.0520664)				
financial_literacy	.0024268	.0138615	.0172155	0335038				
market participation	(.0027032)	(.0123335)	(.0160831)	(.0302834)				
(investiments=1)	.0077876	.0444826	.0552457	1075158				
	(.0063513)	(.0294341)	(.0338817)	( .065727)				
perceived_fl	0045525	0260034	0322952	.0628511				
	(.0035832)	(.0154911)	(.0199109)	(.0365479)				
trait_reactance	0114115	065182	0809536	.1575471				
	(.0113015)	(.0485751)	( .0597753)	(.1149219)				
Observations			188					

# Table 9: Marginal effects of Ordered Probit regression for Experienced Autonomy

\_\_\_\_

 Pseudo R2
 0.0362

 Note. This table presents the marginal effects of the Ordered Probit regression for model Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1</td>

|--|

	Freq	М	SD	t	df	р	[95% CI]
Transparent condition	96	4.16	0.407	4.2909***	186	0.0000	[0.1875; 0.5067]
Non-transparent condition	92	3.81	0.674				

Note: This table presents a difference in means t-test of the participants choice satisfaction by nudge conditions: non-transparent and transparent condition.

# Table 11: Marginal effects of Ordered Probit regression for Choice Satisfaction

VARIABLES	1	2	3	4
transparent_nudge	0435723 **	1328669***	.0251645	.1512747***
	(.0194819)	(.0320999)	(.0323937)	(.0338095)
age	0092231	0244187	.0040318	.0296101
	(.0074554)	( .0175834)	(.0060502)	( .0216882)
gender (male=1)	.0169016	.0447479	0073884	0542611
	(.0133217)	(.0340159)	(.0120321)	(.0391628)
education	.0024153	.0063947	0010558	0077542
	( .0040582 )	( .010268)	(.0022961)	(.0124396)
study_field	0005182	0013719	.0002265	.0016636
	(.0013525)	( .0037389)	(.0006982)	( .0044531)
own_income	0023012	0060926	.001006	.0073879
	( .0042063)	(.0104948)	(.0023431)	(.0127126)
household_income	0117809*	0311906*	.0051499	.0378216*
	(.0066296)	(.0183603)	(.0072747)	(.0215508)
risk_profile	0006663	0017641	.0002913	.0021392
	( .007478)	(.0196954)	(.0033465)	(.0238459)
financial_literacy	.0069652	.0186173	0030397	0225428
	(.0062551)	(.014903)	(.005027)	(.017753)
market_participation (investiments=1)	.0055124	.014734	0024056	0178408
	(.0111761)	(.0294001)	(.0056854)	( .0357517)
perceived fl	0039269	0104963	.0017137	.0127095
p	(.0064419)	(.0178056)	(.0178056)	(.0209415)
trait reactance	0305645*	081695***	.0133385	.0989217***
	(.0146459)	(.0289291)	(.0194369)	(.0310898)
Observations	(.01.10.100)	188	(	
Pseudo R2		0.1286		

Note. This table presents the marginal effects of the Ordered Probit regression for model 4. Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

#### References

Alemanno, A., & Bonadio, E. (2011) Do You Mind My Smoking? Plain Packaging of Cigarettes Under the TRIPS Agreement. *John Marshall Review of Intellectual Property Law*, 10. https://ssrn.com/abstract=1751583

Altman, M. (2012). Implications of behavioural economics for financial literacy and public policy. *The Journal of Socio-Economics* 41, 677–690.

Benartzi, S., Beshears, J., Milkman, K. L., Sunstein, C. R., Thaler, R. H., Shankar, M., Tucker-Ray, W., Congdon, W., & Galing, S. (2017). Should Governments Invest More in Nudging? *SSRN Electronic Journal*, 28(8). https://doi.org/10.2139/ssrn.2982109

Beshears, J., Choi, J. J., Laibson, D., & Madrian, B. C. (2013). Simplification and saving. *Journal of Economic Behavior and Organization*, 95, 130–145. <u>https://doi.org/10.1016/j.jebo.2012.03.007</u>

Blake, D. (2022). Nudges and Networks: How to Use Behavioural Economics to Improve the Life Cycle Savings-Consumption Balance. *Journal of Risk and Financial Management*, 15(5), 217. https://doi.org/10.3390/jrfm15050217

Bovens, L. (2009). The Ethics of Nudge. *Preference Change*, 42, 207–219. <u>https://doi.org/10.1007/978-90-481-2593-7\_10</u>

Brace, I. (2018). Questionnaire Design: How to Plan, Structure and Write Survey Material for Effective Market Research (4th ed). Kogan Page.

Brehm, J. W. (1966). Theory of psychological reactance. In Organisational Change: A Comprehensive Reader.

Brehm, S. S., & Brehm, J. W. (1981). Psychological Reactance A Theory of Freedom and Control. In The Encyclopedia of Cross-Cultural Psychology.

Bruns, H., Kantorowicz-Reznichenko, E., Klement, K., Luistro Jonsson, M., & Rahali, B. (2018). Can nudges be transparent and yet effective? *Journal of Economic Psychology*, 65, 41–59. <u>https://doi.org/10.1016/j.joep.2018.02.002</u>

Bryman, A., & Bell, E. (2011). Business research methods (3rd ed). Oxford University Press.

Budiu. NN Group. (2018) Between-Subjects vs Within-Subjects Study Design. Accessible online at: https://www.nngroup.com/articles/between-within-subjects/

Cai, C. W. (2020). Nudging the financial market? A review of the nudge theory. *Accounting & Finance*, 60(4), 3341–3365 <u>https://doi.org/10.1111/acfi.12471</u>

Calboli, S., & Fano, V. (2022). Mechanistic explanations and the ethics of nudging. *Rivista Internazionale Di Filosofia E Psicologia*, 13(3), 175–186. https://doi.org/10.4453/rifp.2022.0017

Carlsson, F., Gravert, C., Johansson-Stenman, O., & Kurz, V. (2021). The use of green nudges as an environmental policy instrument. *Review of Environmental Economics and Policy*, 15(2), 216-237. <u>https://doi.org/10.1086/715524</u>

Chu, Z., Wang, Z., Xiao, J. J., & Zhang, W. (2017). Financial literacy, portfolio choice and financial well-being. Social Indicators Research, 132(2), 799–820. https://doi.org/10.1007/s11205-016-1309-2

CMVM, ASF, & Banco de Portugal (2021). Relatório do 3º Inquérito à Literacia Financeira da população Portuguesa 2020. Retrieved September 20, 2023, from <u>https://www.todoscontam.pt/sites/default/files/2021-06/relatorio3inglf.pdf</u>

Congdon, W. J., & Shankar, M. (2018). The Role of Behavioral Economics in Evidence-Based Policymaking. The ANNALS of the American Academy of Political and Social Science, 678(1), 81-92. https://doi.org/10.1177/0002716218766268

Creswell, J. W. (1994). Research design: Qualitative & quantitative approaches. Sage Publications, Inc.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16(3), 297-334.

Despard, M., Roll, S., Grinstein-Weiss, M., Hardy, B., & Oliphant, J. (2022). Can behavioral nudges and incentives help lower-income households build emergency savings with tax refunds? Evidence from field and survey experiments. *Journal of Consumer Affairs*, 57(1), 245–263. <u>https://doi.org/10.1111/joca.12498</u>

Di Porto, F., & Rangone, N. (2015). Behavioural Sciences in Practices: Lessons for EU Policymakers In Nudge and the Law: A European Perspective. Edited by Alberto Alemanno and Anne-Lise Sibony. Oxford

Dur, R., Fleming, D., Marten van Garderen, & Max van Lent. (2021). A social norm nudge to save more: A field experiment at a retail bank. *Journal of Public Economics*, 200, 104443–104443. https://doi.org/10.1016/j.jpubeco.2021.104443

Felsen, G., Castelo, N., & Reiner, P. B. (2013). Decisional enhancement and autonomy: Public attitudes towards overt and covert nudges. *Judgment and Decision Making*, 8(3), 202–213.

Fernandes, D., Lynch, J. G., & Netemeyer, R. G. (2014). Financial Literacy, Financial Education, and Downstream Financial Behaviors. *Management Science*, *60*(8), 1861–1883. https://doi.org/10.1287/mnsc.2013.1849

Gajewski, J. F., Heimann, M., & Meunier, L. (2021). Nudges in SRI: The Power of the Default Option. *Journal of Business Ethics*, 177(3), 547-566. https://doi.org/10.1007/s10551-020- 04731-x

García, J. M., & Vila, J. (2020). Financial literacy is not enough: The role of nudging toward adequate longterm saving behavior. *Journal of Business Research*, 112, 472–477. <u>https://doi.org/10.1016/j.jbusres.2020.01.061</u>

Gonçalves, D., Coelho, P., Martinez, L. F., & Monteiro, P. (2021). Nudging Consumers toward Healthier Food Choices: A Field Study on the Effect of Social Norms. *Sustainability*, *13*(4), 1660. <u>https://doi.org/10.3390/su13041660</u>

Hansen, P. G., & Jespersen, A. M. (2013). Nudge and the manipulation of choice: A framework for the responsible use of the nudge approach to behaviour change in public policy. *European Journal of Risk Regulation*, 4(1), 3–28. https://doi.org/10.1017/S1867299X0002762

Hastings, J., & Mitchell, O. S. (2010). How Financial Literacy and Impatience Shape Retirement Wealth and Investment Behaviors. *SSRN Electronic Journal*. <u>https://doi.org/10.2139/ssrn.1710146</u>

Hertwig, R., & Grüne-Yanoff, T. (2017). Nudging and Boosting: Steering or Empowering Good Decisions. *Perspectives on Psychological Science*, 12(6), 973–986. https://doi.org/10.1177/1745691617702496

Hong, S. M., & Faedda, S. (1996). Refinement of the hong psychological reactance scale. *Educational and Psychological Measurement*, 56, 173–182.

Institute For Government (2020). Nudge Unit . Accessed January 8, 2024, from <u>https://www.instituteforgovernment.org.uk/article/explainer/nudge-unit</u>

Intrum. (2022). European Consumer Payment Report. Retrieved September 21, 2023, from <a href="https://www.intrum.pt/empresas/relatorios-e-analises/relatorios/european-consumer-payment-report-2022/">https://www.intrum.pt/empresas/relatorios-e-analises/relatorios/european-consumer-payment-report-2022/</a>

Johnson, J., & Goldstein, G. (2003). Do Defaults Save Lives? Science, 302(5649), 1338–1339. https://doi.org/10.1126/science.1091721

Kahneman, D. (2011). Thinking, fast and slow. Farrar, Straus and Giroux.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*,47(2),263–292.https://doi.org/10.2307/1914185

Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1991). The endowment effect, Loss Aversion, and Status Quo Bias. *Journal of Economic Perspectives*, 5(1), 193–206.

Kantorowicz-Reznichenko, E., & Jarosław Kantorowicz. (2021). To follow or not to follow the herd? Transparency and social norm nudges. Kyklos, 74(3), 362–377. <u>https://doi.org/10.1111/kykl.12274</u>

Karlan, D., McConnell, M., Mullainathan, S., & Zinman, J. (2016). Getting to the Top of Mind: How Reminders Increase Saving. *Management Science*, 62(12), 3393–3411. <u>https://doi.org/10.1287/mnsc.2015.2296</u>

Leal, C. C., & Oliveira, B. (2020). Choice architecture: Nudging for sustainable behavior. In C. F. Machado & J. P. Davim (Eds.), Sustainable management for managers and engineers (Chap. 1). London: ISTE and Wiley. <u>https://doi.org/10.1002/9781119804345.ch1</u>

Leal, C. C., Branco-Illodo, I., Oliveira, B. M. N., & Esteban-Salvador, L. (2022). Nudging and choice architecture: Perspectives and challenges. *Revista de Administração Contemporânea*, 26(5), e220098. https://doi.org/10.1590/1982-7849rac2022220098.en

Loewenstein, G., Bryce, C., Hagmann, D., & Rajpal, S. (2015). Warning: You are about to be nudged. *Behavioral Science & Policy*, 1(1), 35–42. <u>https://doi.org/10.1353/bsp.2015.0000</u>

Lusardi, A. (2019). Financial literacy and the need for financial education: evidence and implications. *Swiss Journal of Economics and Statistics*, 155(1). <u>https://doi.org/10.1186/s41937-019-0027-5</u>

Lusardi, A., & Mitchell, O. S. (2011a). Financial literacy and planning: Implications for retirement wellbeing. (No. w17078) *National Bureau of Economic Research*. https://doi.org/10.3386/w17078

Lusardi, A., & Mitchell, O. S. (2011b). Financial literacy around the world: an overview. *Journal of pension economics & finance*, 10(4), 497-508. <u>https://doi.org/10.1017/S1474747211000448</u> Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of economic literature*, 52(1), 5-44. <u>https://doi.org/10.1257/jel.52.1.5</u>

Madrian, B. C., & Dennis F. S. (2001). The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior. *Quarterly Journal of Economics*, 116(4), 1149-87.

May, T. (2001). Social research: issues, methods and process (3rd ed.). Open University Press. Michaelsen, P., Nyström, L., Tj, L., Johansson, L., & Hedesström, M. (2020). Are Default Nudges Deemed Fairer When They Are More Transparent? People's Judgments Depend on the Circumstances of the Evaluation. <u>https://doi.org/10.31234/osf.io/5knx4</u>

Mill, J. S. (1968). Essays on Some Unsettled Questions of Political Economy. New York: Augustus M. Kelley. (Original work published 1844)

Noviarin, J., Coleman, A., Roberts, H., & Whiting, R. H. (2023). Financial literacy and retirees' resource allocation decisions in New Zealand. Pacific-Basin Finance Journal, 79, 101985–101985. https://doi.org/10.1016/j.pacfin.2023.101985

Nudge Project (2021). Nudging consumers towards energy efficiency through behavioural science. Accessed September 20, 2023, from <u>https://www.nudgeproject.eu/</u>

OECD (2020), OECD/INFE 2020 International Survey of Adult Financial Literacy. Organization for Economic Co-operation and Development. Retrieved September 20, 2023, from www.oecd.org/financial/education/launchoftheoecdinfeglobalfinancialliteracysurveyreport.htm

Paunov, Y., Wänke, M., & Vogel, T. (2019). Transparency effects on policy compliance: Disclosing how defaults work can enhance their effectiveness. *Behavioural Public Policy*, 3(2), 187-208. https://doi.org/10.1017/bpp.2018.40

Paunov, Y., Wänke, M., & Vogel, T. (2020). Combining defaults and transparency information to increase policy compliance. *Social Psychology*, 1–6. <u>https://doi.org/10.1027/1864-9335/a000419</u> Pompian, M. M. (2011). Behavioral finance and wealth management: How to build investment strategies that account for investor biases. John Wiley & Sons.

Reisch, L. A., Sunstein, C. R., & Gwozdz, W. (2017). Beyond carrots and sticks: Europeans support health nudges. *Food Policy*, 69, 1–10. <u>https://doi.org/10.1016/j.foodpol.2017.01.007</u>

Ridder, D., Kroese, F., & van Gestel, L. (2022). Nudgeability: Mapping conditions of susceptibility to nudge influence. *Perspectives on Psychological Science*, 17(2), 346-359. <u>https://doi.org/10.1177/1745691621995183</u> Rosa, P. M. (2022). Nudging is the architecture of choice in the world of banking. Revista de Administração Contemporânea, 26(5), e220073. <u>https://doi.org/10.1590/1982-7849rac2022220073.en</u>

Sainfort, F., & Booske, B. C. (2000). Measuring post-decision satisfaction. Medical Decision Making, 20 (1), 51–61. <u>https://doi.org/10.1177/0272989X0002000107</u>

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2009). Research methods for business students (5th ed). Prentice Hall.

Sauro, J., & Lewis, J. R. (2016). Quantifying the user experience: Practical statistics for user research. Morgan Kaufmann.

Sewell, M. (2007). Behavioural finance. University of Cambridge, 13, 389-393.

Shiller, R. J. (1981). Do Stock Prices Move Too Much to Be Justified by Subsequent Changes in Dividends? American Economic Review. 71(3), 421–36.

Silva, S. M. (2022). Nudging and Other Behaviourally Based Policies as Enablers for Environmental Sustainability. *Laws*, *11*(1), 9–9. <u>https://doi.org/10.3390/laws11010009</u>

Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics*, 69(1), 99. <u>http://doi.org/10.2307/1884852</u>

Sunstein, C. (2003). Deciding by default. *University of Pennsylvania Law Review*, 162(1), 57. http://scholarship.law.upenn.edu/cgi/viewcontent.cgi?article=1000&context=penn\_law\_review.

Sunstein, C. R. (2016). People Prefer System 2 Nudges (Kind of). *Duke Law Journal,* 66(1), 121–168. http://dx.doi.org/10.2139/ssrn.2731868

Thaler, R. H. (2018). From Cashews to Nudges: The Evolution of Behavioral Economics. *American Economic Review*, 108(6), 1265–1287. <u>https://doi.org/10.1257/aer.108.6.1265</u>

Thaler, R. H. & Sunstein, C. R (2003). Libertarian Paternalism Is Not an Oxymoron. *The University of Chicago Law Review*, 70(4), 1159–1202

Thaler, R. H., & Benartzi, S. (2004). Save More TomorrowTM: Using behavioral economics to increase employee saving. *Journal of Political Economy*, 112, 164–187. <u>https://doi.org/10.1086/380085</u>

Thaler, R. H., & Sunstein, C. R. (2008). Nudge: Improving decisions about health, wealth, and happiness. New Haven: Yale University Press.

Thaler, R. H., & Sunstein, C. R. (2021). Nudge : the final edition. Penguin Books, An Imprint Of Penguin Random House Llc.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, 185(4157), 1124–1131. https://doi.org/10.1126/science.185.4157.1124

van Rooij, M., Lusardi, A., & Alessie, R. (2012). Financial literacy and stock market participation. *Journal of Financial economics*, 101(2), 449-472. <u>https://doi.org/10.1016/j.jfineco.2011.03.006</u>

Vlachopoulos, S. P., & Michailidou, S. (2006). Development and initial validation of a measure of autonomy, competence, and relatedness in exercise: The basic psychological needs in exercise scale. *Measurement in Physical Education and Exercise Science*, 10(3), 179–201. <u>https://doi.org/10.1207/s15327841mpee1003\_4</u>

Wachner, J., Adriaanse, M., & De Ridder, D. (2020). The influence of nudge transparency on the experience of autonomy. *Comprehensive Results in Social Psychology*, 5(1-3), 49–63. https://doi.org/10.1080/23743603.2020.1808782

World Bank. (2015). The World Bank Annual Report. Retrieved September 21, 2023, from <u>https://www.worldbank.org/en/about/annual-report-2015</u>