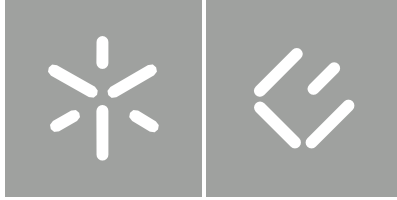


**Universidade do Minho**  
Escola de Economia e Gestão

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**Are transparent nudges effective in influencing savings decisions?**





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I am ending this journey with a heart full of love!

Thank you,

Márcia Machado

## **STATEMENT OF INTEGRITY**

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## Are transparent nudges effective in influencing savings decisions?

### Resumo

O conceito de *nudging* provou ser eficaz em várias áreas, incluindo em moldar decisões de poupança. Apesar do sucesso, preocupações éticas persistem, particularmente em relação ao seu potencial impacto na autonomia individual.

Este estudo aborda uma lacuna significativa na literatura, concentrando-se na transparência dos *nudges* no contexto da tomada de decisões de poupanças. Para este fim, foi conduzido um estudo experimental com uma amostra de 271 participantes da população geral portuguesa. Os participantes foram aleatoriamente distribuídos em três grupos: *nudge* não transparente, *nudge* transparente e um grupo de controle sem *nudge*. O *nudge* no grupo não transparente apresentou um valor predefinido para a poupança sem divulgar o seu propósito. No grupo transparente, a transparência foi garantida ao revelar o propósito por trás do *nudge* padrão exibido. Esta abordagem permitiu examinar como a transparência, por meio da divulgação do propósito do *nudge*, influencia a eficiência do valor pré-definido.

Os resultados revelam que o fornecimento da informação transparente sobre o propósito do *nudge* padrão não altera significativamente a eficácia do *nudge*. Este resultado fornece suporte robusto para a ideia de que os *nudges* podem ser transparentes e eficazes em moldar decisões de poupança.

Além disso, o estudo da autonomia experienciada e satisfação com a escolha foi introduzido para investigar como os indivíduos experienciam os *nudges* transparentes quando comparados a *nudges* não transparentes. Os resultados revelam que há evidências que sugerem que os participantes da condição *nudge* transparente apresentem níveis mais elevados de autonomia experienciada e de satisfação com a escolha.

Este estudo destaca a eficácia potencial de *nudges* transparentes em influenciar decisões de poupança, aumentando a autonomia experienciada e a satisfação com a escolha, oferecendo implicações promissoras para intervenções de tomada de decisão eticamente sólidas.

**Palavras-chave:** *nudges*, transparência, autonomia, decisões de poupança.

## **Are transparent nudges effective in influencing savings decisions?**

### **Abstract**

Nudging has proven to be effective across various domains, including shaping savings decisions. Despite its success, ethical concerns persist, particularly regarding potential impacts on individual autonomy.

This research addresses a notable gap in the literature, focusing on nudge transparency within the context of savings decisions. For this purpose, an experimental study was conducted with a sample of 271 respondents drawn from the general Portuguese population. Participants were randomly assigned to three groups: non-transparent nudge, transparent nudge, and a control group with no nudge. The nudge in the non-transparent group presented a default value for savings without further explanations. In the transparent group, transparency was ensured by revealing the purpose behind the displayed default nudge. This approach allowed to examine how transparency, through the disclosure of nudge's purpose, influences the efficacy of the pre-defined value.

Findings reveal that providing transparent information about the default nudge purpose does not significantly alter nudge effectiveness. This result provides robust support for the idea that nudges can be both transparent and effective in shaping savings decision.

Moreover, the study of experienced autonomy and choice satisfaction was introduced to investigate how individuals experience transparent nudges when compared to non-transparent nudges. Findings reveal that there is evidence to suggest that participants in the transparent nudge condition exhibit higher levels of experience autonomy and choice satisfaction.

This study highlights the potential effectiveness of transparent nudges in influencing savings decisions by increasing experienced autonomy and choice satisfaction, offering promising implications for ethically sound decision-making interventions.

**Keywords:** nudges, transparency, autonomy, savings decisions.



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## 1.Introduction

Each day we are confronted with making decisions that have varying degrees of relevance and impact in our daily lives. Although a portion of these daily decisions are deliberate and thoughtful, our decision-making process is predominantly made through a very short conscious period of liberation, automatically. The minimal conscious control that people use in their unthinking routines may explain the difficulty sometimes experienced in changing behaviour. This difficulty may emerge even when individuals acknowledge that they tend to make decisions that are not aligned with their best interests (Leal et al., 2022).

Humans make irrational and biased decisions relying on heuristics and automatic mechanisms essentially by default (Kahneman, 2011), which might result in suboptimal decisions. Suboptimal decisions can be costly given the impact of some decisions in our lives and financial decisions are among the most important life-shaping ones (Lusardi, 2019).

The complexity of human behaviour itself implies that implementing behavioural changes require a solid understanding of how people behave in different situations and contexts. Behavioural finance provides a rationale for financial decision-making, searching the influence of psychology on the financial behaviour of individuals (Sewell, 2007). This bridge between finance and psychology may be the key to guide individuals on the path of desirable financial behaviour.

Savings represent foundational pillars within the spectrum of financial decisions individuals make, steering individuals towards 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). The possibility to guide individuals on the path of pursuing the most desirable savings choices can be through nudging. Nudges can be defined as “any aspect of choice architecture that alters people’s behaviour predictably without forbidding any options or significantly changing their economic incentives” (Thaler & Sunstein, 2008, p. 6).

Nudges are premeditated changes in the choice environment that influence the chosen alternative (Leal & Oliveira, 2020). However, the criticism levelled against nudging centres on its perceived manipulative nature. This ethical concern about the lack of transparency in nudging led to a substantial debate in the literature about nudge transparency and its effectiveness (Bruns et al., 2018). The effectiveness of transparent

nudges is still understudied and there is little empirical evidence regarding nudge transparency in savings choices.

This relatively recent topic requires deep investigation and one of the main purposes of this dissertation is to provide a better understanding of the effectiveness of transparent nudges in a savings context. Therefore, the guiding question is: Is it effective to use transparent nudges to influence individuals' savings decisions?

To answer the research question an experimental study was conducted, and the data was collected via an online questionnaire (Saunders et al., 2009). Different participants were randomly assigned to three different conditions: non-transparent nudge, transparent nudge, and control condition (no nudge). The focus was placed on incorporating a default nudge in both non-transparent and transparent conditions, with a specific emphasis on transparency in the latter, achieved by revealing the purpose behind the default nudge.

Moreover, this research investigates whether the default value presented in the nudge conditions influence participants savings decision when compared to the control condition with no nudge and study the effect of financial literacy, risk profile, market participation, and sociodemographic characteristics on the savings behaviour of participants. Furthermore, to complement the research it was investigated how the transparency affects the autonomy experienced by the decision maker and the satisfaction with the option chosen when compared to the non-transparent nudge (Wachner et al., 2020). In addition, this study delves into the consideration of an additional factor: psychological reactance. This factor arises from the perception that nudges might intrude upon autonomous decision-making, posing a potential threat to the desired impact of the nudge (Brehm, 1966; Bruns et al., 2018). As part of this exploration, the study assesses participants' trait reactance to examine its influence on nudge effectiveness across different nudge conditions and within the context of perceptions surrounding the transparent nudge.

The target population of this research is the general Portuguese population and was distributed through email and social media platforms. The questionnaire was divided into eight segments: sociodemographics, the experiment (through hypothetical scenario questions applied to control and nudge conditions), experienced autonomy, choice satisfaction, psychologic reactance, market participation, risk profile and financial literacy. After collecting the data, the analysis methodology was to use econometric models, most notably Ordered Probit and Probit regressions.

This dissertation is organized as follows. Section 2 provides an overview of the relevant literature. Section 3 presents the methodology used to conduct the study along with the research hypothesis, Section 4 presents the data description. In Section 5 empirical results are presented. Finally, Section 6 presents the main conclusions of the research as well as limitations and recommendations for future research on this topic.

## **2. Literature Review**

### **2.1 Nudge Theory**

The concept of nudges has been steadily gaining increased recognition over the past decade. The principles of nudging can be found in behavioural finance literature on human irrationality, which includes heuristics and behavioural biases (Tversky & Kahneman, 1974; Kahneman et al., 1991) combined with libertarian paternalism (Thaler & Sunstein, 2003). Essentially, the nudge concept developed by Thaler and Sunstein (2008) is based on two main concepts: choice architecture, consisting on the factors that influence the environment in which individuals make decisions (Thaler & Sunstein, 2008), and libertarian paternalism, as proposed by Thaler and Sunstein (2003), that hinges on preserving individual freedom of choice while offering planned guidance for decision-making, striving to guide choices that make individuals perceiving themselves as better off.

The process of arranging the setting in which a decision is made is known as "choice architecture"; focusing on altering the presentation or organization of choices. Thaler and Sunstein (2008) describe the concept of choice architecture through a school cafeteria buffet by reordering the arrangement of food items, with a deliberate emphasis on healthier alternatives. This design intervention refrains from imposing restrictions on undesirable options, exemplifying a subtle yet impactful method of promoting healthier choices. The decision-making process is influenced by the setting - choice architecture - in which the options are presented (Thaler & Sunstein, 2008).

Libertarian paternalism, according to Thaler and Sunstein (2003), is a philosophy that advocates for the preservation of individual freedom of choice while also allowing private and public institutions to guide people in directions that will promote their well-being; the ideal is to prevent sub-optimal decisions without the use of coercion. Libertarian paternalism

strives to create an environment that facilitates optimal choices without undermining personal autonomy. Thaler and Sunstein (2003) emphasize the central principle of avoiding coercion, aiming to influence choices in a way that will make choosers better off, as judged by themselves while maintaining the freedom to opt-out of undesirable arrangements if they want to do so. The concept of a nudge is characterized as libertarian in nature, as advocated by its proponents, owing to its classification as a form of paternalism that is comparatively subtle and non-intrusive. Within this framework, the individual retains the autonomy to determine the favoured path of action (Thaler & Sunstein, 2008).

Thaler and Sunstein (2008) developed the theory of nudging centred on their understanding of libertarian paternalism (Thaler & Sunstein, 2003). A nudge is defined as: “any aspect of the choice architecture that predictably alters people’s behaviour without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not.” (Thaler & Sunstein, 2008, p. 6). The small changes made to enhance the specific options should not eliminate the other set of options, simply promote the best one while maintaining freedom of choice (Leal & Oliveira, 2020). According to this theory, nudges are neutral, options should continue to be easily available to individuals at no additional cost.

Nudging relates to the dual-process theory (Thaler & Sunstein, 2008) classifying nudges into two types: System 1 nudges and System 2 nudges, each of which addresses different cognitive systems processes. Kahneman (2011) has contributed to a better understanding of the decision-making process, distinguishing the two types of thinking: System 1 and System 2. System 1 corresponds to a fast, unconscious, effortless, and automatic system used in everyday decision-making; System 2 is a slow, conscious, effortful, deliberate system used for complex decision-making.

Correspondingly, the two typologies of nudging can be distinguished into heuristics-based nudging and information-based nudging. The two differ in the cognitive system type they target. Heuristics-based nudging acts predominantly in the automatic System 1 for the kind of decisions that are mainly based on rules of thumb. The nudges aim to achieve behavioral change by addressing specific human heuristics. On the other hand, information-based nudging relies on System 2 to enhance awareness and promote reflective thinking to improve decisions (Leal & Oliveira, 2020).

Humans frequently switch between the two thinking processes known as Systems 1 and 2, with System 1 being the predominant mode (Kahneman, 2011). The implementation of nudges could yield substantial impact, particularly when applied alongside System 1. This approach doesn't compete with the innate System 1 information processing; instead, it acknowledges and works with these cognitive patterns to influence individuals' decisions (Leal & Oliveira, 2020). Furthermore, Reisch et al., (2017) admit that nudges can target both systems although, since System 2 nudges promote deliberation and reflection, they are less common, and less research and literature exist on them.

In the academic literature, nudges are classified into multiple categories of distinct typologies. Following one specific classification, nudges fall into three categories: default rules, smart information nudging, and exploiting/neutralising emotional responses (Di Porto & Rangone, 2015; Silva, 2022).

A default rule establishes the outcome when individuals make no choice, prevailing with the default not engaging in any active choice. Indeed, this scenario refers to a state where the decision-maker abstains from initiating any active choice, a correlated effect is the status quo bias, characterised by maintaining the existing status quo over embracing modifications (Kahneman et al., 1991). Default nudges are extensively employed and have demonstrated remarkable efficacy across various domains. These applications range from the field of healthcare systems, where defaults have been utilized to advance organ donation initiatives (Johnson & Goldstein, 2003), to the financial sector, where they have been employed to increase savings contribution rates amongst employees (Thaler & Benartzi, 2004). Opting for the default choice is frequently preferred since it requires no additional time or effort, making it a convenient and popular option (Sunstein, 2013; Di Porto & Rangone, 2015).

On a different format, smart information nudges leverage insights from framing, salience, and social influence to present information to individuals in a relational manner. These strategies empower rule-makers to design effective smart information nudges by employing comparisons and assessments that tap into the cognitive aspects of decision-makers. The 'tell people what others are doing' approach helps guide behaviours. For example, in several North American cities, personalized statements about energy use, along with comparisons of energy consumption of neighbours, have led to substantial increases in energy-saving practices (Di Porto & Rangone, 2015).



In addition to the previously discussed nudges, there is another subset that operates by targeting individuals' emotional responses. Certain nudge tactics seek to influence choices by leveraging emotional responses, even neutralizing them if necessary. An example of this can be observed in the use of macabre images on cigarette boxes, which aims to reduce consumption by standardizing appearances and increasing the prominence of health warnings (Alemanno & Bonadio, 2011; Di Porto & Rangone, 2015).

Nudges have consistently demonstrated their efficacy across diverse domains. Nudging is a powerful strategy in behavioural change, which accounts for its burgeoning significance across various fields including health, environmental concerns, financial contexts, and even public policy (Johnson & Goldstein, 2003; Thaler & Benartzi, 2004; Thaler & Sunstein, 2008; Sunstein, 2013; Karlan et al., 2016; Benartzi et al., 2017; Carlsson et al., 2021).

In the realm of financial decisions, 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 behaviours, 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.

Biases and cognitive limitations open the possibility for the employment of nudges. Nudges can leverage heuristic tendencies and biases, however, frequently in a manner not explicitly disclosed. This subject warrant further investigation within its ethical boundaries. Extensive research remains imperative to explore the ethical dimensions associated with nudging (Leal & Oliveira, 2020; Ridder et al., 2022).

## **2.2. Nudging in Portugal**

Nudging initiatives have proliferated significantly, finding diverse applications and varying levels of implementation across the globe. Both international governmental and non-governmental entities are at the forefront of disseminating the concept and implementing

public policies based on the understanding of human behavioural biases and the limitations of rationality.

The establishment of the Nudge Unit within the Cabinet Office in 2010 marked a significant stride by David Cameron's government, aiming to harness behavioural science for informing public policy (Institute for Government, 2020). Moreover, President Obama's issuance of Executive Order 13707 on September 2015, titled 'Using Behavioral Science Insights to Better Serve the American People,' underscored the acknowledgment of behavioural science's potential in advancing national goals, such as enhancing employment opportunities, promoting healthier lifestyles, bolstering education accessibility and success, and facilitating the shift toward a low-carbon economy (Congdon & Shankar, 2018).

A growing number of governments and international organizations, institutions like the World Bank (2015) and the European Commission are acknowledging the substantial potential held within behavioural science to enhance the development of more effective and efficient public policies. An illustrative instance is the incorporation of behavioural science as a policy tool, either in current use or under serious consideration, within many of the 35 member countries constituting the Organisation for Economic Co-operation and Development (OECD). The OECD mission centres on advancing policies aimed at improving the economic and social well-being of individuals worldwide. Notably, the OECD is presently engaged in drafting a compilation of over 100 case studies spotlighting practical applications of behavioural insights (Hertwig & Grüne-Yanoff, 2017).

Various organizations have taken tangible steps to integrate behavioural insights into their frameworks. For instance, the World Bank introduced GINI (Global Insights Initiative) in 2015, while the World Health Organization established a dedicated Behavioural Insights Unit in 2020 (Thaler & Sunstein, 2021).

Nudges have been implemented in Portugal in numerous fields in recent years. In a study conducted by Gonçalves et al. (2021), an initiative led by Nudge Portugal aimed to enhance the consumption of fruits and vegetables. The approach undertaken involved a supermarket customer encountering a social norm-based nudge upon taking a shopping cart, with the intent of influencing their shopping behaviours towards healthier choices. The findings indicate that the nudge intervention yielded positive outcomes for individuals whose buying patterns were deemed less health conscious.

The "NUDGE" project is also present in Portugal. Its objective is to study, apply, and assess the potential of behavioural strategies in improving energy efficiency, paving the way for new energy policies, and sustained behavioural changes. The interventions under study will be compared with traditional approaches through the implementation of pilot studies in Greece, Belgium, Germany, Croatia, and Portugal (Nudge Project, 2021).

On a similar note, banks in Portugal are using nudges to encourage positive financial behaviours. Rosas (2022) presents the perspective of "Banco Carregosa", a private banking institution, on the value of employing nudging strategies. Nudges are used to guide clients towards better decision-making in various ways, including sending informative messages and utilizing technology like banking apps. The bank acknowledges the potential of nudges to help investors achieve their expectations and overcome behavioural biases, such as loss aversion. Nudging is also highlighted to encourage socially responsible investment choices. Overall, emphasizes that subtle changes in choice architecture can lead to improved planning, saving, and investing outcomes, aligning investors' decisions with their intentions, and yielding better results.

The practice of nudging has found its way into various aspects of Portuguese society in recent years, demonstrating its potential to positively influence individuals' behaviours and social objectives. The systematic implementation of nudge theory within the Portuguese government's strategies is not widespread. However, this opens a door of hope for the future. It's an opportunity for Portugal to consider embracing nudge theory as a potential tool for enhancing policy effectiveness and societal welfare. As Portugal continues to explore and implement nudging strategies, it may represent a powerful tool for achieving positive social outcomes and aligning individual choices with broader goals, ultimately leading to general improved well-being.

### **2.3 Nudging financial decisions**

The contemporary financial landscape is characterized by a significant evolution in the role of individuals in shaping their financial trajectories. The acceleration of financial digitization has provided individuals with more opportunities to access financial products and services. With this increased accessibility to financial instruments, technological advancements, and investment options, individuals face an expansive array of financial

decisions spanning their lifetimes. This amplified engagement with financial matters reinforces the crucial role of financial literacy (Lusardi, 2019).

Numerous studies have contributed to a comprehensive understanding of the far-reaching impact of financial literacy on individuals' financial behaviours. Extensive research has been conducted on financial literacy and its impact on retirement planning, investment behaviour, savings patterns, and other financial decisions (Perry & Morris, 2005; Lusardi & Mitchell, 2011a; Hastings & Mitchell, 2011; van Rooij et al., 2012; Noviarini et al., 2023). While financial literacy can be a key to enabling individuals to navigate prudent financial choices (Lusardi, 2019), research reveals that this literacy remains limited. The Organization for Economic Co-operation Development (OCDE) International Survey of Adult Financial Literacy (OECD, 2020) reports that individuals scored just under 61% of the maximum financial literacy score, which represents a basic set of knowledge concepts and financially prudent behaviours and attitudes. In Portugal, according to the report of the Third Survey on the Financial Literacy of the Portuguese Population (CMVM et al., 2021) the overall financial literacy indicator has decreased (61.7 in 2020 and 68.3 in 2015), reflecting the declines observed in the financial knowledge indicators (57.1 in 2020 and 71.4 in 2015) and financial behaviour indicators (66.7 in 2020 and 77.8 in 2015). Men, ages between 25 and 54 years with higher education, living in households with incomes above 1000 € are the respondents who exhibit more favourable results in the overall financial literacy indicator.

Financial literacy is associated with higher income and education (Lusardi & Mitchell, 2014) and although there is evidence of a strong relationship between financial knowledge and the likelihood of engaging in desirable financial practices (Chu et al., 2017) even top financial managers, who are typically highly educated, tend to suffer from behavioural biases affecting their financial choices (Pompian, 2011). Anchoring bias, overconfidence, and loss aversion, among others, can lead to outcomes that deviate from rational expectations (Kahneman et al., 1991).

Behavioural biases have been a subject of interest within the financial field. Cognitive patterns that influence how individuals process information and arrive at judgments are persistent when making financial decisions leading to sub-optimal decisions (Kahneman et al., 1991). The collective effect of these biases, when aggregated across market participants, introduces distortions that hinder the realization of optimal outcomes. Resulting in

mispricing, volatility, and irrational investment bubbles, compromising the efficient functioning of the financial market (Shiller, 1981).

Financial literacy alone is insufficient to drive positive financial behaviours. Furthermore, Altman (2012) denotes that the typical choice environment in which people make financial decisions is characterized by asymmetric, incomplete, or even false information. In the pursuit of behavioural change, the integration of behavioural 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 behavioural psychology principles, nudges gently encourage individuals to adopt behaviours that lead to improved financial outcomes.

Given the importance of financial decisions and the demanding need to improve them, nudging has played a dominant role in this field, obtaining effective results (Thaler & Benartzi, 2004). The intention of nudging people is to help them make better choices as judged by themselves (Thaler & Sunstein, 2008), however, financial intermediaries may have strong incentives to nudge people in directions that are not in their best interests. In this sense, it is important to fit nudges ethically in the financial environment so they can help individuals make better financial decisions while maintaining the freedom of choice.

The "Save More Tomorrow" program, introduced by behavioural economists Thaler and Benartzi (2004), is a 401(k) pension plan designed to positively influence individuals' savings behaviours, specifically retirement savings. This program encourages participants to gradually increase their savings alongside with salary increments, challenging the inclination toward loss aversion. Participants, in this context, don't see a reduction in their net income amount and don't perceive the rise in retirement contributions as a loss. 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. Importantly, the "Save More Tomorrow" program respects individual autonomy by allowing participants the freedom to opt-out of automatic enrolment if they so choose. This program operates on the principles of behavioural economics, utilizing nudges to guide individuals toward making positive savings decisions.

Various research has been conducted on nudging saving behaviour. Dur et al. (2021) highlights that interventions offering financial education or information have frequently encountered challenges in producing enduring behaviour changes. Notifying individuals that

their behaviour deviates from the predominant actions of their peers has been demonstrated to be a powerful way to drive behavioural shifts aligned with the descriptive social norm. The study's findings not only emphasize that individuals respond to the social norm-based nudge but also demonstrate its clear effect in influencing savings decisions. Furthermore, Blake's (2022) research findings lead to the conclusion that well-crafted default options play a crucial role in motivating individuals to save for retirement and exercise prudence when utilizing these funds in their post-retirement years.

In the realm of investment selection, research conducted by Gajewski et al. (2021) highlights the substantial impact of a default nudge on the decisions of investors. Regardless of whether the default option pertains to a socially responsible investment (SRI) fund or a conventional investment, the default nudge significantly sways investors' choices in favour of the default option. Nudging can be used in multiple ways in financial markets. Cai (2020) advances that nudges are being used across financial markets essentially in two ways: restructuring how investment options are presented to investors and providing information in a particular way. Financial advisors can nudge the client by displaying their suggested advice in a way that encourages the client to follow it. Ideally, investors make financial decisions by maintaining a balance between autonomy and protection (Thaler & Sunstein, 2003), and regulators have already begun to examine how to nudge investors to help them make better investment decisions (Cai, 2020). Moreover, Cai (2020) introduces that in addition to nudging investors, regulators could nudge financial intermediaries to make more ethical decisions.

Further empirical research on the effectiveness and ethical limits of financial nudging is required to discover its full potential. Overall, nudging financial decisions can be a powerful tool in promoting positive financial behaviours and helping people achieve their financial goals (Thaler & Benartzi, 2004). However, financial nudges must be designed and implemented ethically, with transparency and respect for individual autonomy.

## **2.4 Nudge transparency**

Nudges were initially designed “to influence choices in a way that will make choosers better off, as judged by themselves” (Thaler & Sunstein, 2008, p. 5). However, nudges have raised ethical debates centred around its potential 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 levelled against nudging revolves around its perceived manipulative nature. Critics assert that nudges, by subtly influencing decisions, have the potential to compromise individuals' rational decision-making abilities. However, it's essential to note that awareness alone may not be sufficient to deem nudges non-manipulative. The concern lies in the possibility that, despite being aware of nudges, individuals might find them challenging or even impossible to resist, 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).

The libertarian paternalism in the heart of nudging (Thaler & Sunstein, 2003) implies that “nudgers” — be governments, institutions, or organizations — assume the role of guiding individuals towards choices deemed better for their well-being. This criterion for intervention is marked by considerable debate, as it aligns the optimal choices for individuals with the decisions they would make under conditions of "complete information, unlimited cognitive capabilities, and absence of self-control constraints" (Thaler & Sunstein, 2003, p. 175). The ethical concern lies in the inherent assumption that the nudger's judgment supersedes that of the individual, diminishes the authenticity of choices and pays insufficient respect to individuals' autonomy (Michaelsen et al., 2020).

Making nudges transparent is one way to address this ethical issue (Calboli & Fano, 2022). But this raises the question of whether transparent nudges are effective. One of the main concerns with nudge transparency is: what if people realize they are being nudged and purposefully choose to dissociate from the recommended option? The dilemma of whether to disclose the use of nudges lies at the heart of the debate.

Bovens (2009) states that individuals can detect nudges simply by becoming watchful and unmasking the manipulation. However, Calboli and Fano (2022) assert that it is plausible to argue that a person cannot identify a nudge unless they have previously educated themselves on the underlying cognitive mechanisms, regardless of whether they are watchful or not and advocate for explicit transparency in this context. Moreover, Calboli and Fano (2022) highlighted the overlooked ethical dimensions arising from individuals' lack of awareness regarding the mechanistic explanations of how nudges work. This examination of

mechanistic explanations suggests that nudges could be deemed ethically justifiable in modern liberal democracies if accompanied by the explicit transparency of the employed nudges.

Advocates of transparency contend that explicit communication of the nudge is necessary to uphold ethical values (Michaelsen et al. 2020). However, critics, as articulated by Bovens (2009), caution that nudges may "work best in the dark," implying that awareness of nudge deployment could undermine their effectiveness. Although the efficacy of nudges has been linked to their covert nature empirical evidence suggests that transparency does not affect nudge effectiveness (Loewenstein et al., 2015; Bruns et al., 2018; Paunov et al., 2019; Wachner et al., 2020; Michaelsen et al., 2020).

Transparency may assume the form of written information that exposes the existence, purpose behind, or intended outcome of the nudges. This offers individuals a chance to notice and comprehend the nudge, bringing the effect into cognitive awareness (Michaelsen et al., 2020) and thus deviating from relying on heuristics.

The Loewenstein et al. (2015) study aimed to make people aware of the nudge, and the findings revealed that warning participants that they were being nudged had no impact on the nudge's objective. More such, Bruns et al. (2018) research suggests that despite initial concerns about the effect of transparency, even nudges in the form of defaults can be both transparent and effective. Paunov et al. (2019) went even further suggesting that transparency may even increase nudge effectiveness. Likewise, the recent Michaelsen et al. (2020) research corroborates that disclosing the default nudge to the decision-makers does not diminish the effectiveness of the nudge. However, Kantorowicz-Reznichenko et al. (2021) discovered a reduction in the effectiveness of a disclosed social norm nudge. The nudge aimed to encourage the selection of the high-risk/high-payoff lottery, this finding emerged from a stylized lottery choice experiment.

However, increasing the transparency of a nudge addresses concerns about individuals' experiences and perceptions of the nudge (Bovens, 2009). Enhancing the transparency of nudges has the potential to foster trust between decision-makers and the "nudger" while upholding individuals' autonomy. Nevertheless, this solution introduces a crucial concern: individuals who became aware of their manipulation may react adversely to nudges, a phenomenon termed "reactance" in the psychological literature (Brehm, 1966). One of the main concerns regarding transparency in nudging is psychological reactance:



nudges may be perceived as a threat to freedom of choice and might lead people to react adversely, triggering reactance and thus deviating from the desirable outcome (Brehm, 1966; Bruns et al., 2018). This concern is starting to be empirically investigated and Bruns et al. (2018) experienced-base study states that transparency does not interrelate with psychological reactance. For instance, research indicates that making a default nudge transparent had little to no impact on the extent to which people perceived the potential threat to their freedom of choice (Bruns et al., 2018; Michaelsen et al., 2020).

The Wachner et al. (2020) research indicated that individuals tend to perceive default nudges as expected to violate autonomy. Increasing transparency levels may aim to counteract this perception. The experimental investigation by Wachner et al. (2020) found no evidence that transparency affects autonomy. Indeed, all conditions demonstrated identical high levels of autonomy and choice satisfaction.

Nudges are supposed to work in a transparent way (Thaler & Sunstein 2021). The extent to which individuals are informed about 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 behavioural interventions. Notably, there's a general lack of emphasis on these aspects within the savings domain that need to be explored.

### **3. Methodology**

The principal aim of the research is to investigate whether transparent nudges are effective in influencing savings decisions. The study begins by analyzing whether the default value presented in the nudge conditions influences savings when compared to the control condition with no nudge. Following that, it investigates the effectiveness of the transparent nudge compared to the non-transparent nudge in a hypothetical savings scenario, along with identifying variables that may impact this effectiveness. In this setting, effectiveness pertains to the capacity to prompt individuals to select the pre-defined default value.

The debate surrounding transparent nudging is closely linked to concerns about autonomous decision-making (Bovens, 2009). Consequently, the study proceeds to examine whether experienced autonomy and choice satisfaction differ across nudge conditions.

This study performed a quantitative analysis specifically using primary data (Bryman & Bell, 2011). An experimental study was conducted, and the information was collected via an online survey through Qualtrics (Saunders et al., 2009). Different participants were randomly assigned, through the block randomization function, to the three different conditions: non-transparent nudge, transparent nudge, and control condition (no nudge). The study followed a between-subjects design minimizing knowledge transfer across conditions and maintaining the accuracy of the results (Budiu, 2018).

### **3.1. Objectives and Hypotheses**

The research objectives selected offer a clear and comprehensive roadmap for the research, covering the aspects of the impact of transparent nudges and related factors in savings decision-making:

- Examine whether the default value presented in the nudge conditions influence participants savings decisions when compared to the control condition with no nudge;
- Analyse the effect of financial literacy, risk profile, market participation, and sociodemographic characteristics (age, gender, education level, study field, own income level, household income level) on the saving behaviour of participants;
- Analyse the effectiveness of transparent nudges versus non-transparent nudges in guiding savings decisions and examining the influence of financial literacy, risk profile, market participation, and sociodemographic characteristics (age, gender, education level, study field, own income level, household income level) and trait reactance on individuals' responses to transparent nudges ;
- Investigate how individuals experience transparent nudges when compared with non-transparent nudges, particularly in terms of experienced autonomy and choice satisfaction within a savings context

- Examine how financial literacy, risk profile, market participation, sociodemographic characteristics (age, gender, education level, study field, own income level, household income level) and trait reactance influences experienced autonomy and choice satisfaction within nudge groups.

Default nudges have been implemented within the savings framework and have demonstrated their effectiveness (Thaler & Benartzi, 2004). Moreover, research has indicated that the default option stands out as a particularly influential nudge (Gajewski et al., 2021).

It is hypothesized that:

**H<sub>1</sub>:** Participants who received the non-transparent nudge selected the default value.

The main research question is explored by testing the hypothesis that the study will replicate earlier studies that found transparency not to decrease the nudge's effectiveness (Bruns et al., 2018; Paunov et al., 2019; Wachner et al., 2020; Michaelsen et al., 2020).

Hence, the hypothesis to be tested is:

**H<sub>2</sub>:** Making the nudge transparent does not decrease the nudge's effectiveness when compared to the non-transparent nudge.

Default nudges have proven to be effective, but when applied uniformly to a diverse population, can lead to welfare losses for those with different preferences (Grüne-Yanoff & Hertwig, 2017). In pursuit of ethical nudging, transparent nudges might offer a balance between guidance and individual autonomy. Wachner et al., (2020) argued that the way the nudge is made transparent has the potential to influence the autonomy of the decision maker.

Thus, it is hypothesized that:

**H<sub>3a</sub>:** Participants who received the transparent nudge score higher on experienced autonomy compared to the non-transparent nudge.

Additionally, earlier research argues that people believe they will be less satisfied with their choice if they anticipate that a nudge may undermine their autonomy (Paunov et al., 2020).

It is further hypothesized that:

**H<sub>3b</sub>:** Participants who received the transparent nudge score higher on choice satisfaction compared to the non-transparent nudge.

The type of transparency associated with the nudge implemented in this study is the purpose of the default. The conceptual relationship of this type of transparency with psychological reactance is not evident as denoted by Bruns et al. (2018.) Consequently, this study abstains from constructing specific hypotheses in this regard and focuses instead on observing its effects, similar to the approach with the other independent variables.

The upcoming sections will outline the strategies for achieving these objectives and examine the distinct nudge conditions. These sections will detail the approach taken to address the objectives and the methodology employed to test the hypotheses.

### **3.2. Research method**

This study performed a quantitative analysis specifically using primary data. This approach is particularly useful for measuring and quantify variables and understand their associations on statistical evidence. Primary data refers to original data collected directly from the source for a specific research purpose, and it is valuable because it is tailored to the research objectives and provides control over the data collection process (Bryman & Bell, 2011).

This research followed an experimental design collecting the primary data through a survey to access individuals' behaviour, perceptions, and intentions (Saunders et al., 2009). The experiment followed a between-subjects design which is a type of experimental design where different groups of participants are exposed to different experimental conditions (Budiu, 2018). Participants were divided into three separate groups, each experiencing a

different condition: non-transparent nudge condition, transparent nudge condition, and control condition.

The survey was distributed with Qualtrics which allowed the participants to be assigned to different conditions randomly. The use of random assignment helps ensure that the groups are comparable at the start of the study, reducing the likelihood of pre-existing differences affecting the results. Randomization also helps maintain the accuracy of the results by minimizing bias and increasing the generalizability of findings to the broader population (Creswell, 1994). The universe of study of this research is the general Portuguese population aged 18 years old or older. For this reason, the survey was only distributed in Portuguese. However, as noted by May (2001), because the survey targets the entire population rather than a specific subset, the responses could potentially display a systematic bias toward a particular segment of the population.

The collected data was organized and managed using Microsoft Excel to gain initial insights into the effects of the nudges by comparing statistics between different conditions. In the second stage of analysis, Stata software was used to conduct multiple regression analyses.

The choice of the specific statistical technique depends on the nature of the dependent variable. For binary dependent variables Probit models were used and for the categorical dependent variables Ordered Probit models were preferred. By employing Probit and Ordered Probit econometric models, the marginal effect of each independent variable on each value of the dependent variable can be identified. As a result, this study will rely on the estimation of marginal effects using Probit and Ordered Probit models to gain deeper insights into the relationships and outcomes under investigation.

### **3.3. Questionnaire Design**

The approach selected was to develop a survey questionnaire to gather information to investigate the prior hypothesis. This section provides detail on the format of the questionnaire and experiment, which can be seen in Appendix 1.

The questionnaire was divided into eight segments: sociodemographics, the experiment (through hypothetical scenario question applied to nudge conditions and control conditions),

experienced autonomy, choice satisfaction, psychologic reactance, market participation, risk profile and financial literacy. These segments had specific questions that would allow to empirically answer the objectives of this research and retrieve the necessary data for the variables in the study.

#### A. Demographics

Sociodemographic questions provide an understand of the composition of the sample and ensures that findings can be generalized appropriately to specific populations. This information enhances the external validity of the research, allowing it to assess how representative the sample is of the larger population (Creswell, 1994).

Additionally, this data was necessary to assess whether certain sociodemographic variables have a significant effect on the percentage selected to save, nudge and perceptions of the nudge intervention. Information about, age, gender, education level, field of study, own income and household income were retrieved.

#### B. The experiment

##### i. Control Group

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

In the 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 set 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.”

Neither a preselected default value for the percentage or any additional information were presented (Bruns et al., 2018).

The amount for the monthly net income was set at 1000€ by its proximity to the average monthly net total income in Portugal and to simplify the mental calculation of savings percentages for participants.

ii. 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.

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 enrollees 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 for without actively selecting. Furthermore, participants were provided with the option to specify an alternative percentage ranging from 0% to 100% in an open text box. Within this context, a fixed percentage of their income would be directed to savings by default unless they actively chose to opt-out.

Participants have the flexibility to choose a different percentage respecting the nudge theory pillars, 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 have the opportunity to opt-out or make a different choice (Thaler & Sunstein, 2021).

iii. 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. It is meant to encourage people to prioritize saving."

The following sections: C, D and E were only presented to the nudge conditions.

C. Experienced autonomy

For ethical nudging practices, transparent nudges assume the role of harmonizing 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) altered to autonomy in a decision-making context as in prior nudge research (Wachner et al., 2020) consisting of four statements where participants were asked to rate their level of agreement, in a five points Likert scale (from totally disagree to totally agree). The four scores were averaged to one autonomy score on a scale from one to five.

D. Choice satisfaction



Prior research has denoted that when individuals perceive that a nudge may compromise their autonomy, there is a corresponding anticipation of diminished choice satisfaction (Paunov et al., 2020). The present study aims to empirically investigate whether this anticipation translates into actual feelings of reduced 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), consisting of five statements where participants were asked to rate their level of agreement, in a five points Likert scale (from totally disagree to totally agree). The five scores were averaged to one satisfaction score on a scale from one to five.

#### E. Psychologic reactance

Psychological reactance may be triggered by the belief that nudges might affect autonomous decision-making. This phenomenon might undermine the desired impact of the nudge (Brehm, 1966; Bruns et al., 2018). This was considered by assessing the trait reactance of participants similar to what has been done in 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.

#### F. Market participation

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

### G. Risk Profile

To retrieve risk profiles participants were asked to engage in a self-assessment of their risk profile across five distinct categories. Moreover, they were presented with two more 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.

### H. Financial literacy “The Big 5 “

Financial literacy stands as 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 better comprehend the implications of financial nudges and make informed choices (García & Vila, 2020). Incorporating financial literacy as a variable underscores the rigor of research in nudging within a financial context as it can shape how individuals perceive and respond to these interventions.

One of most the common way 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.

## **3.4. Variables under analysis**

All the variables that were utilized in the statistical analysis are introduced in this section, along with information on how they were calculated. Dependent variables and independent variables are separated into the following two subsections.

#### **3.4.1. Dependent variables**

The hypothesis derived focuses on finding which variables can explain nudge effectiveness, experienced autonomy and choice satisfaction. The dependent variables can be described in further detail as follows:

1. *nudge\_effectiveness* resembles the hypothetical question with the nudge and, is a dummy variable assuming the value of one whenever the respondent chose the default option and, zero otherwise.
2. *choice\_satisfaction* is constructed through the average of the points given to each statement on a scale from one to five.
3. *exp\_autonomy* is constructed through the average of the points given to each statement on a scale from one to five.

#### **3.4.2. Independent variables**

The independent variables used in the research are summarized below:

1. *age* is a categorical variable assuming values between one and five according to the following rule: one for ages between 18 and 25; two for ages between 26 and 35; three for ages between 36 and 45; four for ages between 46 and 55 and five for ages above 55.
2. *gender* is a dummy variable assuming the value of one for male participants and, zero for female participants.
3. *education* is a categorical variable assumes values between one and eight according to the following rule: one for primary education; two for basic education; three for high school; four for attending a bachelor's degree; five for completed bachelor's degree; six for attending pos-graduation or master's degree; seven for completed pos-graduation, master's degree or MBA and eight for Ph.D

4. *study\_field* is a categorical variable assuming values between one and nine as follows: one for economics, management, finance and others; two for health; three for engineering and informatics; five for languages and humanities; six for biology; seven for psychology; and nine for law.
5. *own\_income* is a categorical variable assuming values between one and six, as follows: one for no own income; two for income until 500€; three for income between 501€ and 1000€; four for income between 1001€ and 1500€; five for income between 1501€ and 2000€; six for income above 2000€.
6. *household\_income* is a categorical variable assuming values between one and five, as follows: one for household income until 500€; two for income between 501€ and 1000€; three for income between 1001€ and 2500€; four for income between 2501€ and 5000€ and five for income between above 5000€.
7. *trait\_reactance* is constructed through the average of the points given to each of the 14 statements on a scale from one to five.
8. *mrkt\_participation* is a dummy variable assuming the value of one when the participant holds some form of investment and 0 otherwise.
9. *risk\_profile* was assessed by computing the average of the three questions regarding self-assessment of risk tolerance and individuals' attitude in terms of risk-taking in a scale from one to five.
10. *financial\_literacy* is measured by the number of correct answers to the "Big Five" financial literacy questions assuming values from zero to five according to each respondent's answers.
11. *perceived\_fl* is measured by the self-assessment of the number of correct answers on the financial literacy assuming values from one to five according to each respondent's answers.
12. *transparent\_nudge* serves to distinguish between nudge conditions and, therefore, is a dummy variable assuming the value of one for the transparent condition and 0 for the non-transparent condition.
13. *non\_transparent\_nudge* serves to distinguish between the non-transparent nudge condition and the control condition, therefore, is a dummy variable assuming the value of one for the non-transparent condition and 0 for the control condition.

## 3.5 Models

### 3.5.1. The influence of nudging in savings decisions

Firstly, it was relevant to test whether the default value presented in the non-transparent nudge condition influence participants saving when compared to the control condition. Furthermore, if this result could be influenced by financial literacy, perceived financial literacy, risk profile, market participation, and demographic characteristics (age, gender, education level, study field, own income level, household income level). To test the first hypothesis (**H<sub>1</sub>**) that participants who received the non-transparent nudge selected the default value, this relation was analysed through the following model:

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

### 3.5.2 Transparent nudge effectiveness in savings decisions

The main objective of this research is to analyse if the implementation of transparent nudges in a savings context is effective in influencing savings decisions. To test the second hypothesis, (**H<sub>2</sub>**) that making the nudge transparent does not decrease the nudge's effectiveness when compared to the non-transparent nudge, a probit regression was used where the dependent variable is a binary variable indicating the nudge effectiveness (1 for effective, 0 for not effective), and the independent variable is a dummy variable indicating whether participants received the transparent nudge (1 for transparent nudge, 0 otherwise). Additionally, is relevant to test the effects of financial literacy, risk profile, market participation, socio-demographic characteristics (age, gender, education level, study field, own income level, household income level) and trait reactance on the nudge effectiveness between nudge conditions:

$$\begin{aligned} \text{nudge\_effectiveness} = & \alpha_0 + \alpha_1 (\text{transparent\_nudge}) + \alpha_2 (\text{financial\_literacy}) + \alpha_3 \\ & (\text{perceived\_fl}) + \alpha_4 (\text{risk\_profile}) + \alpha_5 (\text{market\_participation}) + \alpha_6 (\text{age}) + \alpha_7 (\text{gender}) + \alpha_8 \end{aligned}$$

$$\begin{aligned}
& (\text{education\_level}) + \alpha_9 \quad (\text{study\_field}) + \alpha_{10} \quad (\text{own\_income\_level}) + \alpha_{11} \\
& (\text{household\_income\_level}) + \alpha_{12} (\text{trait\_reactance}) + \varepsilon
\end{aligned}
\tag{2}$$

### 3.5.2. Experienced autonomy in transparent nudging

After this analysis, the objective is to study the perception of the transparent nudge versus non-transparent nudge in terms of the autonomy experienced, therefore testing (**H<sub>3a</sub>**) that participants who received the transparent nudge score higher on experienced autonomy compared to the non-transparent nudge. For this purpose, a regression equation was constructed with the categorical variable for the experienced autonomy and the independent variable as a dummy variable indicating whether participants received the transparent nudge (1 for transparent nudge, 0 otherwise).

In addition, the analysis of the influence of financial literacy, risk profile, market participation, sociodemographic characteristics (age, gender, education level, study field, own income level, household income level) and trait reactance on experienced autonomy will be performed. This analysis will help understand which variables are significant predictors of experienced autonomy in this research.

$$\begin{aligned}
\text{experienced\_autonomy} = & \alpha_0 + \alpha_1 (\text{transparent\_nudge}) + \alpha_2 (\text{financial\_literacy}) + \alpha_3 \\
& (\text{perceived\_fl}) + \alpha_4 (\text{risk\_profile}) + \alpha_5 (\text{market\_participation}) + \alpha_6 (\text{age}) + \alpha_7 (\text{gender}) + \alpha_8 \\
& (\text{education\_level}) + \alpha_9 \quad (\text{study\_field}) + \alpha_{10} \quad (\text{own\_income\_level}) + \alpha_{11} \\
& (\text{household\_income\_level}) + \alpha_{12} (\text{trait\_reactance}) + \varepsilon
\end{aligned}
\tag{3}$$

### 3.5.3. Choice satisfaction in transparent nudging

The same analyses performed for experienced autonomy will be applied to choice satisfaction factor to test (**H<sub>3b</sub>**) that participants who received the transparent nudge score higher on choice satisfaction compared to the non-transparent nudge. The effects of the remaining independent variables will be analysed for choice satisfaction as well.

$$\begin{aligned}
\text{choice\_satisfaction} = & \alpha_0 + \alpha_1 (\text{transparent\_nudge}) + \alpha_2 (\text{financial\_literacy}) + \alpha_3 (\text{perceived\_fl}) \\
& + \alpha_4 (\text{risk\_profile}) + \alpha_5 (\text{market\_participation}) + \alpha_6 (\text{age}) + \alpha_7 (\text{gender}) + \alpha_8 (\text{education\_level}) \\
& + \alpha_9 (\text{study\_field}) + \alpha_{10} (\text{own\_income\_level}) + \alpha_{11} (\text{household\_income\_level}) + \alpha_{12} \\
& (\text{trait\_reactance}) + \varepsilon
\end{aligned}
\tag{4}$$

## 4. Data

The primary goal of this research is to assess the effectiveness of transparent nudges in influencing individuals' savings decisions. The eligibility is extended to all Portuguese individuals aged 18 years old and above. This comprehensive approach enables to explore the broader impact of transparent nudges on decision-making within the domain of personal savings.

### 4.1 Pilot test

The first step of the data collection process was the pilot test of the questionnaire research. Before launching the main survey, the pilot test was used to identify potential issues, failures in the design of the nudge conditions, and difficulties that respondents might encounter.

This pilot test involved obtaining responses from 15 individuals, with the primary objective of refining the questionnaire and assessing the accuracy of the nudge design.

The decision to conduct a pilot test was rooted in the fundamental principle of questionnaire research. As Brace (2018) suggests, whether the questionnaire is entirely new and developed to meet specific research objectives or a set of questions adapted from previous studies, piloting is an indispensable step before embarking on a large-scale survey. It serves as a precautionary measure to iron out any flaws, ambiguities, or issues that may undermine the validity of the data collected during the main study.

In this case, the pilot test ensured the questionnaire as well as the nudge were well structured as no changes were deemed necessary after analysing the responses from the 15 participants.

## 4.2. Sample

The primary objective of this research is to evaluate the efficiency of transparent nudges within the context of savings decision-making by the Portuguese population. The questionnaire was developed using Qualtrics and was exclusively distributed in Portuguese through institutional email and various social media platforms focusing on individuals aged 18 and older. Following data collection, the information was organized using Microsoft Excel. Subsequently, the dataset was exported to Stata, where the necessary statistical analyses were conducted.

The data collection process was online over 22 days, starting from 28 of September 2023 to 20 of October 2023. This process yielded a total of 288 replies, with 17 of them being ineligible for the research since they were provided by individuals who were not of Portuguese nationality. Therefore, 271 responses were considered for the study. Respectively, the randomization process for the 271 final responses resulted in 83 responses for the control condition, 92 for the non-transparent condition and 96 for the transparent nudge group.

A descriptive analysis was conducted on the sociodemographic data obtained through the questionnaire. Table 1 shows the frequency, mean and range of the variable age before being categorized by conditions and for the total sample. The average age of the sample is 26.57 years with the youngest respondent being 18 years old and the oldest being 84 years old, indicating a predominantly young population as shown in Table 1.

Table 1. Description of age

	Control		Non-transparent		Transparent		Total Sample		Range	
age	Freq.	M	Freq.	M	Freq.	M	Freq.	M	Min	Max
	83	25.43	92	28.45	96	25.7	271	26.57	18	84

Note. This table presents the frequency, mean and range of the variable age by conditions: for the control condition, non-transparent condition, transparent condition and total sample. M is used to represent the mean.



Table 2 shows a summary of the sociodemographic data of the sample by condition and for the total sample. The sample is primarily comprised of females, representing approximately 60% (N=164) and males representing around 40% (N=107). A substantial portion, roughly 32% (N=60), is attending a post-graduation or a master's degree. The percentage of respondents that have an educational background in economics, management, finance, or related fields is considerable, representing almost 38% (N=102) of the sample. A vast percentage of the respondents, around 40.59% (N=110) report no own income and 50.18% (N=136) a household income level ranging between 1001€ and 2500€ as demonstrated in Table 2.

Table 2. Summary statistics of the sociodemographic data of the sample

	Control		Non-transparent		Transparent		Total Sample	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
<i>Gender</i>								
Male	40	48.19%	30	32.61%	37	38.54%	107	39.48%
Female	43	51.8%	62	67.39%	59	61.46%	164	60.52%
<i>Education Level</i>								
Primary education	1	1.20%	2	2.17%	0	0%	3	1.11%
Basic education	1	1.20%	1	1.09%	2	2.08%	4	1.48%
High school	4	4.82%	3	3.26%	5	5.21%	12	4.43%
Attending bachelor's degree	15	18.07%	22	23.91%	23	23.96%	60	22.14%
Bachelor's degree	6	7.23%	10	10.87%	20	20.83%	36	13.28%
Attending master's degree	27	32.53%	30	32.61%	30	31.25%	87	32.10%
Pos-graduation, master's degree, or MBA	28	33.73%	22	23.91%	15	15.62%	65	23.99%
Ph.D	1	1.20%	2	2.17%	1	1.04%	4	1.48%

<i>Study field</i>								
Economics, management, finance and others	33	39.76%	38	41.30%	31	32.29%	102	37.64%
Health	5	6.02%	4	4.35%	6	6.25%	15	5.54%
Engineering and informatics	21	25.30%	15	16.30%	16	16.67%	52	19.19%
Languages and humanities	2	2.41%	4	4.35%	8	8.33%	14	5.17%
Biology	2	2.41%	5	5.43%	4	4.17%	11	4.06%
Psychology	6	7.23%	4	4.35%	4	4.17%	14	5.17%
Law	8	9.64%	5	5.43%	10	10.42%	23	8.49%
Other	6	7.23%	17	18.48%	17	17.71%	40	14.76%
<i>Own income</i>								
No own income	34	40.96%	37	40.22%	39	40.62%	110	40.59%
Until 500€	2	2.41%	1	1.09%	2	2.08%	5	2.44%
Between 501€ and 1000€	15	18.07%	14	15.22%	18	18.75%	47	17.34%
Between 1001€ and 1500€	20	24.10%	25	27.17%	24	25.00%	69	25.46%
Between 1501€ and 2000€	7	8.43%	5	5.43%	6	6.25%	18	6.64%
Above 2000€	5	6.02%	10	10.87%	7	7.29%	22	8.12%
<i>Household income</i>								
Until 500€	2	2.41%	1	1.09%	1	1.04%	4	1.48%
Between 501€ and 1000€	8	9.64%	10	10.87%	14	14.58%	32	11.81%
Between 1001€ and 2500€	46	55.42%	49	53.26%	41	42.71%	136	50.18%
Between 2501€ and 5000	20	24.10%	24	26.09%	34	42.71%	78	28.78%
Above 5000€	7	8.43%	8	8.70%	6	6.25%	21	7.75%

Note. This table presents the summary statistics of sociodemographic data by conditions: for the control group, nontransparent group, transparent group and total sample.

Studying a younger population provides a unique perspective on savings behaviour and responsiveness to interventions as nudges for savings in the digital format. These nudges

can be seamlessly integrated into apps and platforms that they already use, making them more likely to engage with and act upon them. Given a young age, interventions applied to a younger population have the potential for long-term impact. This approach has the potential to not only enhance their financial well-being but also shape their savings behaviours for years to come. This comprehensive sociodemographic profile forms the foundation for our subsequent analyses and findings.

### 4.3 Internal consistency and multicollinearity analysis

The internal consistency of the dataset was evaluated to ensure the reliability of the findings. Internal consistency analysis enables to identify if there are discrepancies or contradictions within questions, which could affect the accuracy and reliability of research findings.

To test this, Cronbach's alpha (Cronbach, 1951) was employed, a widely recognized and accepted method in the research literature for assessing internal consistency. Cronbach's alpha ( $\alpha$ ), named after its developer Lee Cronbach in 1951, is a statistical method used to measure the internal consistency of a questionnaire, it quantifies how closely related the questions are to one another, aiming to assess the quality and trustworthiness of the data collected.

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 3 displays a correlation matrix using the Pearson correlation coefficient, the results indicate that there are no concerning or problematic correlations observed between these variables.

Table 3. Correlation Matrix: means, standard deviations, and correlations

Variable	M	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*

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  $p < .05$ .

Therefore, given the absence of evident correlation problems among the variables, this study can proceed confidently by utilizing all the variables. The subsequent sections will detail the data.

#### 4.4. Data description

In this section, a comprehensive overview of the data is provided, beginning with a description of key financial variables, including market participation, risk profile, and financial literacy. Subsequently, a data description of psychological reactance experienced autonomy and choice satisfaction.

##### 4.4.1 Data description of financial variables

In this section, the data description of the financial variables in the survey will be analyzed, proceeding in the order of market participation, risk profile, and financial literacy. This structured approach provides a comprehensive understanding of each variable's characteristics and the dataset.

Table 4 shows the absolute and relative frequency for the variable market participation by conditions and for the total sample. Market participation among young individuals within the survey sample appears to be notably low as exhibited in table 4. Specifically, the primary financial products held by the individuals in this study are

demand/term deposits, constituting 91.88% (N=249) of the sample. Following behind are savings certificates, held by only 26.20% (N=71) of the participants. In contrast, more complex financial products and crowdfunding investments are less predominant, with ownership rates of 5.54% (N=15) and 3.69% (N=10) in the sample, respectively. This reduced market participation can be attributed to the socioeconomic characteristics of the sample. Significantly, 40.59% (N=110) of the individuals in the sample do not receive any monthly income, which understandably reduces their capacity for active participation in financial markets.

Table 4. Summary statistics of market participation

market_participation	Control		Non-transparent		Transparent		Total Sample	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Demand deposits/term deposits	75	90.30%	84	91.30%	90	93.75%	249	91.88%
Savings certificates	24	28.92%	24	26.09%	23	23.96%	71	26.20%
Structured deposits	9	10.84%	12	13.04%	4	4.17%	25	9.23%
RSP	16	19.28%	20	21.74%	19	19.79%	55	20.30%
Investment funds	20	24.10%	15	16.30%	16	16.67%	51	18.82%
Stocks	24	28.92%	14	15.22%	19	19.79%	57	21.03%
Corporate bonds/Comercial paper	6	7.23%	5	5.43%	5	5.21%	16	5.90%
Complex financial products	5	6.02%	8	8.70%	2	2.08%	15	5.54%
Crowdfunding investments	4	4.82%	4	4.35%	2	2.08%	10	3.69%
Bitcoin or other digital currency	12	14.46%	13	14.13%	18	18.75%	43	15.87%

Note. This table presents the summary statistics of market participation by conditions: control, non-transparent, transparent group condition and total sample.

Table 5 shows the average and standard deviation for the variable risk profile by condition and for the total sample. The data reveals a consistent average level of

approximately 2 across all the study groups. This consistency suggests that, on average, the risk profile of participants in each group is “moderately conservative”.

Table 5. Description of variable risk profile

Risk profile	Control			Nontransparent			Transparent			Total Sample		
	Freq.	M	SD	Freq.	M	SD	Freq.	M	SD	Freq.	M	SD
	83	2.43	0.854	92	2.36	0.866	96	2.42	0.742	271	2.41	0.818

Note. This table presents the frequency, mean and standard deviation of the variable risk profile by conditions: for the control group, nontransparent group, transparent group and total sample.

Financial literacy was evaluated using the "Big Five" developed by Lusardi and Mitchell (2011b). Table 6 displays the absolute and relative values for correct answers to each of the five questions, by condition and for the entire sample. The results indicate that all groups exhibit a high level of correct responses. Question 5, which relates to the principles of stock portfolio diversification, stands out with the highest percentage of correct answers, with 78.23% (N=212) of respondents selecting the correct option. In contrast, question 3, addressing the relationship between interest rates and bond prices, records the lowest percentage of correct responses, with only 28.78% (N=78) of respondents providing the correct answer. These questions are designed to assess individuals' understanding of fundamental financial concepts, and the study's sample demonstrates a strong grasp of financial knowledge, as reflected in the average performance across the questions.

Table 6. Summary of “Big 5” financial literacy questions

financial_literacy	Control		Nontransparent		Transparent		Total Sample	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Question 1	56	67,47%	67	72,82%	64	66,66%	187	69,00%
Question 2	58	69,88%	65	70,65%	72	75,00%	195	71,95%
Question 3	26	31,32%	24	26,08%	28	29,16%	78	28,78%

Question 4	53	63,85%	53	57,60%	60	62,50%	166	61,25%
Question 5	65	78,31%	74	80,43%	73	76,04%	212	78,22%

Note. This table presents the relative and absolute frequency for each question of the "Big 5" by conditions: for the control group, nontransparent group, transparent group and total sample. Question 1 - compound interest; Question 2 - inflation; Question 3 - the interplay between interest rates and bond prices; Question 4 - correlation between interest rates and mortgage payments; Question 5 - principles of stock portfolio diversification.

Table 7 shows the frequency, mean, standard deviation and range of variables of financial literacy and perceived financial literacy for the total sample. The analysis of the data reveals that the average number of correct answers for the entire sample stands at 3.092. This indicates that, on average, participants correctly answered approximately three questions within the financial literacy assessment. The distribution of correct answers spans from a minimum of 0 to a maximum of 5, as depicted in Table 7, showcasing the range of participants' financial knowledge. There is a similarity between the actual correct mean of correct answers value (3.092) and participants' perceived financial literacy (3.236), where participants self-assessed the number of questions they believed they had answered correctly.

Table 7. Description of variables financial literacy and perceived financial literacy

VARIABLES	Freq.	M	SD	Min	Max
financial_literacy	271	3.092	1.4046	0	5
perceived_fl	271	3.236	1.2062	1	5

Note. This table presents the frequency, mean, standard deviation and range of the variables financial literacy and perceived financial literacy for the total sample

Table 8 shows the relative and absolute frequency for the number of correct answers by conditions: for the control, non-transparent, transparent group condition, and total sample. In the control condition, a significant portion of participants achieved a higher level of financial literacy, with 33.73% correctly answering four out of five questions. Likewise, the non-transparent condition displayed a similar trend with 29.35% of participants achieving the same level of financial knowledge. The transparent condition demonstrated similar results, with 28.13% of participants answering four questions correctly.

Table 8. Summary of financial literacy

financial_literacy	Control		Non-transparent		Transparent		Total Sample	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
0 correct answers	6	7,23%	7	7,61%	3	3,13%	16	5,904%
1 correct answer	6	7,23%	7	7,61%	8	8,33%	21	7,749%
2 correct answers	13	15,66%	17	18,48%	23	23,96%	53	19,55%
3 correct answers	18	21,69%	18	19,57%	20	20,83%	56	20,66%
4 correct answers	28	33,73%	27	29,35%	27	28,13%	82	30,25%
5 correct answers	12	14,46%	16	17,39%	15	15,63%	43	15,86%

Note. This table presents the relative and absolute frequency for the number of correct answers by conditions: for the control, non-transparent, transparent group condition, and total sample.

The data elucidates substantive degree of financial literacy among the participants despite the low market participation.

#### 4.4.2 Data description of psychological reactance

The proneness to experience psychological reactance was measured in terms of trait reactance. Table 9 illustrates the mean and standard deviation for the variable trait reactance in the non-transparent and transparent treatment conditions. The data indicates that the average level of trait reactance in both conditions is similar, with an average score of approximately 3. This consistency suggests that, on average, individuals in the sample reveal a neutral level of trait reactance.

Table 9. Description of variable trait reactance

trait_reactance	Non-transparent			Transparent		
	Freq.	M	SD	Freq.	M	SD
	92	2.923	0.561	96	2.94	0.601

Note. This table presents the frequency, mean and standard deviation of the variable trait reactance by nudge condition: non-transparent and transparent.

Furthermore, there is a remarkable similarity between the groups in terms of their level of agreement with each of the 14 statements concerning trait reactance (see Appendix 2). The statements that garnered the highest level of agreement, indicating a tendency for



trait reactance in both conditions, included: "The thought of being dependent on others aggravates me." with 40.22% of the respondents' strong agreement in the nontransparent group and 53.12% in the transparent condition and "I become angry when my freedom of choice is restricted," with 19.57% in the non-transparent condition and 32.29% in the transparent condition. On the other hand, there was a statement that raised a strong level of disagreement in both groups: "When something is prohibited, I usually think, 'that's exactly what I am going to do'," with exactly 25% of respondents in both groups strongly disagreeing with this statement. Additionally, it's worth noting the level of disagreement with the statement: "Regulations trigger a sense of resistance in me," with 54.35% of respondents in the non-transparent condition and 51.04% in the transparent condition expressing disagreement. The data reveals a significant degree of consistency in the respondents' reactions to various statements related to trait reactance within both the non-transparent and transparent conditions.

#### **4.4.3 Data description of experienced autonomy and choice satisfaction**

When analyzing the responses of participants from different conditions regarding the four statements of experienced autonomy, some differences emerge. The transparent condition exhibits a slightly higher level of agreement with some statements. Specifically, the statement, "I feel that I had the opportunity to have influence my decision.", garners a strong agreement rate of 53.12% among respondents in the transparent condition, whereas the non-transparent condition displays a comparatively lower rate of 38.04%. Furthermore, the level of disagreement with these statements is remarkably low within the transparent condition, with only 1.04% of respondents expressing disagreement across all statements. In contrast, the non-transparent condition shows a relatively higher level of disagreement, with the statement "I feel that my decision is definitely an expression of myself" revealing the highest disagreement rate at 11.96% (consult Appendix 2).

The responses concerning choice satisfaction exhibit a consistent pattern with a slightly higher level of agreement observed in the transparent condition as denoted to experienced autonomy. Especially, the statement "My decision is sound" stands out as having the highest level of strong agreement within the transparent condition, with 59.38% of respondents expressing strong agreement, while in the non-transparent condition, this

statement reveals a slightly lower rate of strong agreement at 46.74%. The statement “I am comfortable with my decision” emerges as the statement with the highest level of agreement in the non-transparent condition, with 51.09% of respondents expressing agreement. Interestingly, the statement “It was difficult to make a choice” uncovers disparities between the two groups. In the non-transparent condition, there is a higher percentage of strong disagreement at 33.7%, whereas in the transparent condition, the percentage of strong disagreement is lower at 25%. Conversely, the level of strong agreement with this statement is particularly higher in the transparent condition, with 14.58% agreement, compared to the 7.61% agreement rate in the non-transparent condition.

## **5. Results**

In this section, the empirical evidence is presented and discussed, by analysing the data obtained from the questionnaire through the regression models that were previously constructed are presented. The results will be discussed in the following way: firstly, an examination of the efficacy of the default percentage to monthly savings presented to participants across nudge conditions as compared to the control condition, along with an exploration of the impact of independent variables on these choices. Secondly, it analysed the effectiveness of the transparent nudge versus non-transparent nudge and the effect of the independent variables adding trait reactance to the analyses. Lastly, the findings related to experienced autonomy and choice satisfaction between nudge conditions are explored, as well as the respective effects of the independent variables.

### **5.1 The influence of nudging in guiding savings decisions**

In the initial stage of the research, the objective is to conduct an analysis focused on examine whether the default value introduced within the nudge conditions influences the participants’ savings of the hypothetical monthly income of 1,000€, when comparing with the participants in the control condition with no nudge. Therefore, investigating if the pre-defined default value assigned to the nudge conditions had influence on participants' savings decisions.

Table 10 provides an overview of the average percentages, standard deviations, and the range of values selected by participants in the control condition and both nudge

conditions for their monthly savings. In the control condition (N=83), participants exhibited a mean percentage of monthly income savings of 18.89% (SD = 13.77), slightly higher than the mean percentages of 12.03% (SD = 8.69) in the non-transparent condition (N=92) and 13.66% (SD=12.77) in the transparent condition (N=96). The range of selected values across conditions spans from a minimum of 0% to a maximum of 50%.

Table 10. Description of percentages of monthly income allocated to savings

Percentages	Control			Non-transparent			Transparent			Range	
	Freq.	M	SD	Freq.	M	SD	Freq.	M	SD	Min	Max
	83	18.89	13.774	92	12.03	8.694	96	13.66	12.177	0	50

Note. This table presents the frequency, mean, standard deviation and range of the percentages allocated to savings by conditions: control, non-transparent nudge and transparent condition.

However, the higher percentage of monthly income allocated to savings in the control condition with no nudge contradicts the expectations. The European Consumer Payment Report (Intrum, 2022) demonstrates that more than half of the Portuguese population (53%) can save every month, but only up to 10% of their salary. The mean percentage of monthly savings on the control condition of 18.89% can be related to the sociodemographic characteristics of the sample with 40.96% (N=34) of the participants in the control condition presenting no own income. The sample might unveil limitations in correctly assessing realistic saving results that can be boarder to the general population. This decision can also be found in the context of prospect theory: individuals tend to evaluate outcomes relative to a reference point, which could be their previous income condition, if the income increases, the new income level may be viewed as a gain, leading to a desire to save a higher proportion of it (Kahneman & Tversky, 1979). Thus, for individuals with no own income, the hypothetical net income of 1,000€ might be viewed as a great increase leading to a higher willingness to save it.

Table 11 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

Table 11. Summary of participants selecting 10% of their monthly income to savings by condition.

	Control		Non-transparent		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.

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 behavioural 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. The acceptance of 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 12 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].

Table 12: Analysis of monthly savings allocation in control vs. nudge conditions

	Freq	M	SD	t	df	p	[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)

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 13 presents the marginal effects derived from 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 non-transparent 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 calculated marginal effect for the non-transparent condition is found to be 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, the null hypothesis ( $H_0$ ) that participants who received the non-transparent nudge selected the default value, is not rejected. This study aligns with previous research, affirming the efficacy of default nudges in influencing savings behaviour (Thaler & Sunstein, 2008).

Table 13. Marginal effects of Probit regression for Nudge Effectiveness

VARIABLES	nudge_effectiveness
non_transparent_nudge	.5084621 *** (.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 (investments=1)	.0220359 (.0314481)
perceived_fl	-.005738 (.0181041)
Observations	175
Pseudo R2	0.2972

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

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.

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.

## **5.2 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 14 summarizes the outcomes 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].

Table 14: Analysis of monthly savings allocation in transparent vs. non-transparent condition

	Freq	M	SD	t	df	p	[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.

In practical terms, this implies that there is no strong evidence to suggest a significant difference in participants' savings behaviour 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 principal goal of this research and test transparent nudge effectiveness, a Probit regression was utilized 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 15 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 question 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.

Table 15. Marginal effects of Probit regression for Transparent Nudge Effectiveness

VARIABLES	nudge_effectiveness
transparent_nudge	-.0468604 (.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 (investments=1)	-.0831882
	(.0682556)
perceived_fl	-.027286
	(.0363696)
trait_reactance	.0461743
	(.0488166)
<hr/>	
Observations	188
<hr/>	
Pseudo R2	0.1105
<hr/>	
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	
<hr/>	

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 set.

### **5.3 Perceptions of transparent nudging within the context of the savings decision**

The final segment of the study delves into 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.

#### **5.3.1 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 nudge condition and the non-transparent nudge condition. The test was performed to investigate whether the mean levels of experienced autonomy differ significantly across these nudge conditions.

Table 16 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).

Table 16: Analysis of experienced autonomy in transparent vs. non-transparent condition

	Freq	M	SD	t	df	p	[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.

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 compared to 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 with the additional variables (financial literacy, perceived financial literacy, risk profile, market participation, sociodemographic characteristics, and trait reactance) as the independent variables.

Appendix 3 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 the 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 demonstrate 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 actually contribute to an increase in the 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.

### **5.3.2 Transparent nudging and choice satisfaction in savings decisions**

In addition to the analysis on experienced autonomy, the study examines the concept of choice satisfaction. Aiming to empirically test if actual experiences of satisfaction regarding choices are influenced by transparent nudges.

A t-test was conducted to investigate whether there was a difference in the mean levels of choice satisfaction between the transparent nudge condition and the non-transparent nudge condition. The analysis aimed to determine if the mean levels of choice satisfaction significantly varied across these nudge conditions.

Table 17 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).

Table 17: Analysis of choice satisfaction in transparent vs. non-transparent condition

	Freq	M	SD	t	df	p	[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.

These findings suggest that employing a transparent nudge in this context is associated with higher levels of choice satisfaction compared to a non-transparent nudge. Thus, the null hypothesis ( $H_{0b}$ ) that participants who received the transparent nudge score higher on choice satisfaction compared to 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 with the additional variables (financial literacy, perceived financial literacy, risk profile, market participation, sociodemographic characteristics, and trait reactance) as the independent variables.

Appendix 3 shows the result of the Ordered Probit regression (Model 4), describing the marginal effect on the likelihood of the transparent nudge affecting participants' choice satisfaction. Results presented in appendix 3 suggests 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 the disclosure of 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 the decision-making process, 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 favourable for the implementation of transparent nudge within a saving decision set.

Additionally, the results of the effect of additional explanatory variables on choice satisfaction in the different nudge conditions show 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. In 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 centred 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.

## **6. 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 the satisfaction with the choices they made were investigated. In the investigation of nudge efficacy between nudge conditions and its perceptions by participants, it was also considered the role of trait reactance, recognizing that it can trigger adverse reactions in individuals when they perceive external influence on their decision-making 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 behaviours.



While this study offers valuable insights, some limitations need consideration. Primarily, the sample size does not adequately represent of the diverse Portuguese population, limiting the generalizability of findings. Furthermore, the savings behaviour observed in the control condition responses suggests potential influence from the sociodemographic characteristics of the sample resulting in possibly biased outcomes. Moreover, the use of hypothetical scenarios in the questionnaire poses a limitation, as it might not accurately mirror individuals' genuine choices, potentially reflecting more intentions than real behaviours.

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 deeper insights into the implications of transparent nudges on savings behaviour. 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 set.



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## Appendices

### Appendix 1. Questionnaire

#### Bloco 1 - Dados sociodemográficos

1) Por-favor, indique a sua nacionalidade.

Portuguesa  Outra. Qual? \_\_\_\_\_

2) Por favor, indique a sua idade.

\_\_\_\_\_

3) Por favor, indique o seu género.

Feminino  Masculino  Outro

4) Indique o seu nível de escolaridade.

- Instrução primária (4º ano/4ª classe)
- Ensino básico (9º ano)
- Ensino secundário (12º ano)
- Frequenta ensino superior (politécnico/universitário)
- Ensino superior completo (politécnico/universitário)
- Frequenta pós-graduação ou mestrado
- Pós-graduação, mestrado ou MBA
- Doutoramento

5) Indique a sua área principal de estudos.

- Economia, gestão, negócios, finanças e afins
- Saúde
- Engenharia
- Arquitetura
- Línguas, humanidades e direito
- Biologia
- Psicologia
- Matemática e estatística
- Desporto
- Outro

**6) Indique o seu escalão de rendimento líquido mensal.**

- Sem rendimento próprio
- Até 500€
- Entre 501€ e 1000€
- Entre 1001€ e 1500€
- Entre 1501€ e 2000€
- Mais de 2000€

**7) Indique o escalão de rendimento líquido mensal do seu agregado familiar.**

- Até 500€
- Entre 501€ e 1000€
- Entre 1001€ e 2500€
- Entre 2501€ e 5000€
- Mais de 5000€

## **Bloco 2 – Experimento**

- 8) Leia atentamente a seguinte questão e indique a sua decisão num cenário hipotético. Por-favor, alinhe a sua decisão com a decisão que tomaria numa situação da vida real.**

### **Grupo de Controlo**

Considere que tem um salário líquido mensal de 1000€.

É apresentada a seguinte oportunidade pelo seu banco:

Todos os meses quando receber o seu salário pode se comprometer a reservar uma percentagem do mesmo para as suas poupanças. A característica única é que essa determinada percentagem será automaticamente transferida para as suas poupanças no dia em que receber o seu salário. No entanto, tem completo controlo sobre o processo e pode ajustar a percentagem de modo a ir de encontro às suas necessidades ou cancelar o plano a qualquer momento.

Por-favor, indique a percentagem que desejaria atribuir:

\_\_\_\_\_ %

### **Grupo de teste – Default nudge**

Considere que tem um salário líquido mensal de 1000€.

É apresentada a seguinte oportunidade pelo seu banco:

Todos os meses quando receber o seu salário pode se comprometer a reservar uma percentagem do mesmo para as suas poupanças. A característica única é que essa determinada percentagem será automaticamente transferida para as suas poupanças no dia em que receber o seu salário. No entanto, tem completo controlo sobre o processo e pode ajustar a percentagem de modo a ir de encontro às suas necessidades ou cancelar o plano a qualquer momento.

O seu banco propõe por default a transferência de 10% do seu salário para poupanças, se concordar basta clicar em seguinte, caso contrário, indique a baixo a percentagem desejada.

Outro: \_\_\_\_\_ %

### Grupo de teste – Nudge transparente

Considere que tem um salário líquido mensal de 1000€.

É apresentada a seguinte oportunidade pelo seu banco:

Todos os meses quando receber o seu salário pode se comprometer a reservar uma percentagem do mesmo para as suas poupanças. A característica única é que essa determinada percentagem será automaticamente transferida para as suas poupanças no dia em que receber o seu salário. No entanto, tem completo controlo sobre o processo e pode ajustar a percentagem de modo a ir de encontro às suas necessidades ou cancelar o plano a qualquer momento.

**Por-favor tenha em atenção a opção default pré-seleccionada. Destina-se a encorajar as pessoas a priorizar poupar.**

O seu banco propõe por default a transferência de 10% do seu salário para poupanças, se concordar basta clicar em seguinte, caso contrário, indique a baixo a percentagem desejada.

Outro: \_\_\_\_\_ %

**As próximas questões estão relacionadas à escolha feita no bloco anterior. Por favor, responda com atenção.**

### Bloco 3 – Autonomia experienciada

- 9) Numa escala de 1 a 5, em que 1 significa discordo totalmente; 2 – discordo, 3 – neutro, 4- concordo, 5 – concordo totalmente, classifique as seguintes afirmações relacionadas com a decisão tomada anteriormente:

Afirmações	discordo totalmente	discordo	neutro	concordo	concordo totalmente
A minha decisão é altamente compatível com os meus objetivos e interesses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sinto que a minha decisão se encaixa perfeitamente no meu gosto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sinto que tive a oportunidade de influenciar a minha decisão	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sinto que a minha decisão é definitivamente uma expressão de mim mesmo	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### **Bloco 4 – Satisfação com a escolha**

**10) Numa escala de 1 a 5, em que 1 significa discordo totalmente; 2 – discordo, 3 – neutro, 4- concordo, 5 – concordo totalmente, classifique as seguintes afirmações relacionadas com a decisão tomada anteriormente:**

<b>Afirmações</b>	<b>discordo totalmente</b>	<b>discordo</b>	<b>neutro</b>	<b>concordo</b>	<b>concordo totalmente</b>
A minha decisão é acertada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Estou confortável com a minha decisão	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A minha decisão é a certa para a minha situação	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Estou satisfeito com a minha decisão	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Foi difícil fazer uma escolha	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### **Bloco 5 – Reatância psicológica**



A seguinte questão serve a avaliar o seu nível de reatância psicológica, por favor responda atentamente.

11) Numa escala de 1 a 5, em que 1 significa discordo totalmente; 2 – discordo, 3 – neutro, 4- concordo, 5 – concordo totalmente, classifique as seguintes afirmações :

Afirmações	discordo totalmente	discordo	neutro	concordo	concordo totalmente
A ideia de depender dos outros irrita-me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Considero os conselhos dos outros uma intromissão	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fico frustrado quando não consigo tomar decisões livres e independentes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fico com raiva quando a minha liberdade de escolha é restrita	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Resisto às tentativas dos outros de me influenciar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conselhos e recomendações geralmente induzem-me a fazer exatamente o oposto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Acho estimulante contradizer os outros	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Apenas fico contente quando ajo por vontade própria	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulamentos despertam em mim uma sensação de resistência	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dececiona-me ver os outros a submeterem-se a normas e regras	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quando alguém me força a fazer algo, sinto vontade de fazer o oposto	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Deixa-me com raiva quando outra pessoa é apresentada	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

como um modelo para eu seguir					
Quando algo é proibido, eu geralmente penso, "isso é exatamente o que eu vou fazer"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Irrita-me quando alguém aponta algo que é óbvio para mim	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

### **Bloco 6– Participação de mercado**

**A seguinte questão serve para determinar a sua participação de mercado, por favor responda atentamente.**

#### **12) Detém ou já deteve algum dos seguintes produtos financeiros?**

- Depósitos à Ordem/ Depósitos a Prazo
- Certificados de Aforro/ Certificados de Tesouro /Obrigações do Tesouro
- Depósitos Estruturados
- Planos de Poupança Reforma (PPR)
- Fundos de Investimento (excluindo fundos de poupança reforma)
- Fundos de pensões
- Ações
- Obrigações de empresas / papel comercial
- Produtos financeiros complexos
- Investimentos em crowdfunding
- Investimentos em Bitcoins ou outras moedas digitais
- Outros

### **Bloco 7 – Perfil de risco**

**As seguintes questões servem para avaliar o seu perfil de risco, por favor responda atentamente.**

**13) Indique o perfil de investidor que melhor o classifica:**

- Conservador (procura de segurança de capital, risco mínimo e rendimentos mínimos ou baixos)
- Moderadamente conservador (disposto a assumir um pequeno nível de risco para potenciais retornos a médio e longo prazo)
- Moderado (procura de retornos relativamente mais elevados a médio e longo prazo com risco modesto)
- Moderadamente agressivo (procura maximizar retornos a médio e longo prazo com alto risco)
- Agressivo (disposto a correr riscos significativos para maximizar os retornos a longo prazo)

**14) Quanto aos riscos envolvidos nos investimentos, como reagiria ao verificar que determinado investimento, após certo período, apresentou retorno negativo?**

- Resgataria imediatamente a totalidade do investimento
- Resgataria parcialmente
- Determinaria um valor máximo de perda e sendo atingido iria resgatar
- Manteria o investimento indeterminadamente aguardando a sua recuperação
- Realizaria aportes adicionais, aproveitando o decréscimo de preço

**15) Como diversifica ou diversificaria a alocação dos seus recursos?**

- Investe a maior parte do seu património em investimentos de baixíssimo risco
- Investe a maior parte do seu património em investimentos de baixíssimo risco, mas direciona uma pequena parte para investimentos de maior risco

- Investe 50% do seu património em investimentos de baixo risco e o restante em investimentos de maior risco e maior expectativa de retorno
- Investe a maior parte de seu património em investimentos de maior risco, e direciona uma pequena parte para investimentos de baixo risco
- Investe a totalidade do seu património em investimentos de maior risco

### **Bloco 8 – Literacia financeira “The Big 5”**

**As seguintes questões servem para avaliar a sua literacia financeira, por favor responda atentamente.**

**16) Suponha que tem 100€ numa conta poupança e a taxa de juro é de 2% ao ano. Ao fim de 5 anos, quanto acha que teria na conta se deixasse o dinheiro crescer?**

- **Mais de 102€**
- Exatamente 102€
- Menos de 102€
- Não sei

**17) Imagine que a taxa de juro da sua conta poupança é de 1% ao ano e a inflação é de 2% ao ano. Ao fim de um ano, quanto conseguiria comprar com o dinheiro nesta conta?**

- Mais do que hoje
- Exatamente o mesmo
- **Menos do que hoje**
- Não sei

**18) Se as taxas de juro subirem, o que normalmente acontecerá com os preços das obrigações?**

- Vão subir
- **Vão cair**
- Vão permanecer constantes
- Não há nenhuma relação entre os preços das obrigações e a taxa de juro

- Não sei

**19) Uma hipoteca de 15 anos normalmente requer pagamentos mensais mais elevados do que uma hipoteca de 30 anos, mas os juros totais pagos ao longo da vida do empréstimo serão menores.**

- Verdadeiro**
- Falso
- Não sei

**20) Comprar ações de uma única empresa geralmente proporciona um retorno mais seguro do que um fundo mútuo de ações.**

- Verdadeiro
- Falso**
- Não sei

**21) Indique quantas das questões anteriores pensa que acertou**

1   2   3   4   5

FIM DO QUESTIONÁRIO

**Appendix 2. Descriptive statistics of statements related to Trait Reactance, Experienced Autonomy and Choice Satisfaction**

Table 18. Descriptive statistics of statements related to trait reactance.

trait_reactance	Non-transparent					Transparent				
	1	2	3	4	5	1	2	3	4	5
The thought of being dependent on others aggravates me.	1.09%	7.61%	5.43%	45.65%	40.22%	0%	8.33%	7.29%	31.25%	53.12%
I consider advice from others to be an intrusion.	10.87%	52.17%	23.91%	11.96%	1.09%	12.50%	58.33%	18.75%	8.33%	2.08%
I become frustrated when I am unable to make free and independent decisions.	1.09%	10.87%	20.65%	52.17%	15.22%	3.12%	10.42%	17.71%	51.04%	17.71%
I become angry when my freedom of choice is restricted.	2.17%	14.13%	22.83%	41.30%	19.57%	4.17%	9.38%	14.58%	39.58%	32.29%
I resist the attempts of others to influence me.	4.35%	14.13%	28.26%	46.74%	6.52%	7.29%	15.62%	22.92%	42.71%	11.46%
Advice and recommendations usually induce me to do just the opposite.	7.61%	54.35%	28.26%	9.78%	0%	19.79%	36.46%	32.29%	9.38%	2.08%
I find contradicting others stimulating.	17.39%	39.13%	25.00%	14.13%	4.35%	25.00%	33.33%	20.83%	16.67%	4.17%
I am content only when I am acting on my own free will.	6.52%	30.43%	34.78%	21.74%	6.52%	13.54%	34.38%	30.21%	15.62%	6.25%
Regulations trigger a sense of resistance in me.	8.70%	54.35%	17.39%	17.39%	2.17%	10.42%	51.04%	18.75%	16.67%	3.12%
It disappoints me to see others submitting to standards and rules.	20.65%	46.74%	17.39%	10.87%	4.35%	29.17%	36.46%	21.88%	9.38%	3.12%
When someone forces me to do something, I feel like doing the opposite.	10.87%	31.52%	25.00%	26.09%	6.52%	10.42%	29.17%	22.92%	25.00%	12.50%
It makes me angry when another person is held up as a role model for me to follow.	5.43%	30.43%	39.13%	20.65%	4.35%	7.29%	29.17%	34.38%	20.83%	8.33%
When something is prohibited, I usually think, "that's exactly what I am going to do."	25.00%	46.74%	16.30%	11.96%	0%	25.00%	47.92%	17.71%	6.25%	3.12%
It irritates me when someone points out things, which are obvious to me.	3.26%	27.17%	31.52%	26.09%	11.96%	5.21%	15.62%	23.96%	37.50%	17.71%

Note. This table presents the descriptive statistics of the relative frequency of statements related to trait reactance by nudge condition : non-transparent and transparent.

Table 19. Descriptive statistics of statements related to experienced autonomy

experienced_autonomy	Non-transparent					Transparent				
	1	2	3	4	5	1	2	3	4	5
My decision is highly compatible with my goals and interests.	0%	4.35%	14.13%	39.13%	42.39%	0%	1.04%	3.12%	47.92%	47.92%
I feel very strongly that my decision perfectly fits my taste	0%	5.43%	20.65%	32.61%	41.30%	0%	1.04%	6.25%	44.79%	47.92%
I feel that my decision is definitely an expression of myself	0%	11.96%	19.57%	29.35%	39.13%	0%	1.04%	21.88%	35.42%	41.67%
I feel that I had the opportunity to have influence on my decision.	1.09%	8.70%	10.87%	38.04%	41.30%	1.04%	1.04%	15.62%	29.17%	53.12%

Note. This table presents the descriptive statistics of the relative frequency of statements related to experienced autonomy by nudge condition: non-transparent and transparent.

Table 20. Descriptive statistics of statements related to choice satisfaction.

choice_satisfaction	Non-transparent					Transparent				
	1	2	3	4	5	1	2	3	4	5
My decision is sound.	0%	2.17%	15.22%	35.87%	46.74%	0%	0%	5.21%	35.42%	59.38%
I am comfortable with my decision.	3.26%	8.70%	6.52%	30.43%	51.09%	0%	2.08%	1.04%	38.54%	58.33%
My decision is the right one for my situation.	2.17%	3.26%	16.30%	34.78%	43.48%	0%	3.12%	2.08%	37.50%	57.29%
I am satisfied with my decision	0%	6.52%	15.22%	33.70%	44.57%	0%	1.04%	3.12%	38.54%	57.29%
It was difficult to make a choice	33.70%	28.26%	15.22%	15.22%	7.61%	25.00%	22.92%	18.75%	18.75%	14.58%

Note. This table presents the descriptive statistics of the relative frequency of statements related to choice satisfaction by nudge condition: non-transparent and transparent.



### Appendix 3. Marginal effects for Ordered Probit regressions for Experienced Autonomy and Choice Satisfaction

Table 21. Marginal effects of Ordered Probit regression for Experienced Autonomy

VARIABLES	experienced_autonomy			
	1	2	3	4
transparent_nudge	-0.0088001 (.0075366)	-.0511755 (.0284673)	-.0637978*** (.0319959)	.1237734 (.0632271)
age	-.0030605 (.0036172)	-.0174816 (.0166857)	-.0217115 (.0207694)	.0422536 (.0400726)
gender (male=1)	.0084595 (.0080665)	.0483201 (.0330979)	.0600118 (.0431775)	-.1167913 (.08067)
education	-.0009739 (.0017608)	-.0055628 (.0094109)	-.0069088 (.011955)	.0134455 (.0229385)
study_field	-.0000506 (.0007347)	-.000289 (.0042304)	-.0003589 (.0052487)	.0006986 (.0102127)
own_income	-.0011585 (.0020337)	-.0066171 (.0107796)	-.0082182 (.01367)	.0159937 (.0262513)
household_income	-.001821 (.0031384)	-.0104015 (.0166818)	-.0129182 (.0208192)	.0251407 (.0402647)
risk_profile	.0003708 (.0037613)	.0021181 (.0215409)	.0026306 (.0267764)	-.0051195 (.0520664)
financial_literacy	.0024268 (.0027032)	.0138615 (.0123335)	.0172155 (.0160831)	-.0335038 (.0302834)
market_participation (investments=1)	.0077876 (.0063513)	.0444826 (.0294341)	.0552457 (.0338817)	-.1075158 (.065727)
perceived_fl	-.0045525 (.0035832)	-.0260034 (.0154911)	-.0322952 (.0199109)	.0628511 (.0365479)
trait_reactance	-.0114115 (.0113015)	-.065182 (.0485751)	-.0809536 (.0597753)	.1575471 (.1149219)
Observations	188			

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Pseudo R2

0.0362

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Note. This table presents the marginal effects of the Ordered Probit regression for model 3. Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Table 22. Marginal effects of Ordered Probit regression for Choice Satisfaction

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