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Henrik Dindas / Manuel Pietzonka (Hrsg.)

*Nudge: Effective Medicine Against Acute Inertia
in Wealth Creation*

*An Analysis of Thaler & Benartzi's Approach
with German Private Investors*

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Marcel Kallenbach

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Institut für Wirtschaftspsychologie
der FOM Hochschule
für Ökonomie & Management

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Nudge: Effective Medicine Against Acute Inertia in Wealth Creation

An Analysis of Thaler & Benartzi's Approach with German Private Investors

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Foreword

This master's thesis, "Nudge – Effective Medicine Against Acute Inertia in Wealth Creation: An Analysis of Thaler & Benartzi's Approach with German Private Investors" by Marcel Kallenbach, addresses a highly topical and relevant issue at the intersection of behavioral economics and financial psychology. The study examines the SMarT™ program ("Save More Tomorrow™") developed by Thaler and Benartzi (2004), which aims to enhance individuals' willingness to save and improve their financial decision-making through the application of behavioral "nudges." While the program's effectiveness has been extensively validated in the United States, empirical evidence regarding its impact on German private investors has remained scarce. This research addresses this gap, thereby making a significant contribution to the international discourse. Through an experimental design, Marcel Kallenbach empirically assesses the transferability and efficacy of the SMarT™ program in the German context.

What makes this study particularly relevant and distinctive is the use of a controlled experiment, in which various types of nudges were applied to a representative sample of German private investors. The participants were divided into experimental and control groups to measure the effects of these nudges on saving behavior and investment decisions. This methodological approach enables the identification of causal relationships between the behavioral interventions and the observed changes in investment behavior. The significance of this research is underscored by the challenges facing the German pension system and the current economic landscape. The German population is increasingly exposed to the risk of old-age poverty, largely due to the pay-as-you-go pension system, which is under strain from demographic shifts (Geyer, 2014; Haan et al., 2017). Moreover, recent crises, including the COVID-19 pandemic and the war in Ukraine, have significantly affected inflation and capital markets (European Central Bank, 2023). In this context, the importance of private retirement planning, and the selection of appropriate investment strategies has become ever more critical.

In his thesis, Marcel Kallenbach demonstrates that psychological distortions and cognitive biases, such as the "money illusion" (Harrod & Fisher, 1929) and the "disposition effect" (Shefrin & Statman, 1985), play a significant role in leading German investors to make suboptimal investment decisions. This is where the SMarT™ program becomes relevant. Based on the principles of "libertarian paternalism" (Thaler & Sunstein, 2008), the program seeks to improve financial decision-making through targeted behavioral interventions, commonly known as "nudging." Kallenbach's research explores various types of nudges and illustrates how they can be employed to encourage German investors to increase their retirement savings. Particularly noteworthy is his innovative approach to adapting the effectiveness of the SMarT™ program to the specific context of German investors, which is convincingly demonstrated through his empirical analysis in this master's thesis.

The research results indicate that all applied nudges led to increased savings, with one specific nudge, based on default settings and preferences, proving particularly effective. These findings hold significant value not only for academic research but also for practical application. They reinforce the hypothesis that psychological incentives that have proven successful in other cultural contexts can also be effective in Germany. This represents a substantial contribution to our understanding of both cultural differences and similarities in investment behavior (Lusardi et al., 2017).

In conclusion, this thesis not only addresses academic inquiries but also offers practical benefits with direct implications. The findings have the potential to enhance the advisory practices of financial institutions, enabling German investors to make more informed financial decisions and improve their long-term financial security. Furthermore, Marcel Kallenbach's research makes a valuable contribution to the ongoing academic discourse by demonstrating that the application of behavioral economic

principles can be effectively transferred to traditionally risk-averse German investors, significantly increasing their willingness to save for retirement. This work thus contributes meaningfully to the promotion of financial literacy and wealth creation. It highlights that a well-designed nudging concept, such as the SMarT™ program, can have a substantial impact, not only in theory but also in practical application.

Essen, April 2024

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Abstract

Investors appear to regularly fail to make adequate investment decisions in the context of financial provision because of both economic and psychological irrationality. However, despite an economic urgency to make appropriate investment decisions for a secure financial future, people tend to neglect those decisions due to bounded rationality. Thaler and Benartzi's (2004) Save More Tomorrow™ program is an effective means to overcome psychological irrationality by nudging investors within a framework based on libertarian paternalism. SMarT™ appears to be quite effective in the context of company pension plans, but there is no evidence on German investors and investment decisions *beyond* company pension plans. Therefore, this analysis aims to explore how psychological strategies, such as SMarT™, can be implemented among German investors to improve investment decisions.

This analysis employs a quantitative-deductive research approach designed as a cross-sectional analysis by exposing participants to a fictitious investment situation and manipulating a total of six decision situations through various nudges based on a comprehensive conceptual background, whose effectiveness in terms of differences in average savings rate increase amounts is then compared with two corresponding control groups. The data were collected through an online questionnaire (n = 226)..

While all nudges led to higher increase amounts than their respective control groups, one specific nudge proved to be particularly effective with a large distance: Subjects chose the highest increase amounts when exposed to a nudge based on defaults and preset assumptions in percent without additional anchor-based or social validation-based nudges.

Since this study is a cross-sectional analysis, it remains open whether the observed decisions are consistent over time. As this method is based on hypothetical financial decisions, there are no real financial inter-

ests at stake, which could have influenced the decisions. Finally, some results could not be explained by the present conceptual background and therefore need to be supplemented by further research.

About the Editors

Henrik Dindas

Henrik Dindas is full professor for higher education didactics and an inhouse consultant of the rectorate at FOM University of Applied Sciences in Essen, Germany, where he also heads the Competence Centre for Didactics (KCD). He also works as a freelance consultant and systemic coach for university didactics (www.hd-coaching.de) with over 10 years of experience in the fields of higher education didactics, university development, quality management and evaluation, e.g. as vice-chair for international accreditation audits. He has teaching and coaching experience at various universities in Germany and the USA and his research focuses on the interaction and communication between professional and practical teaching and learning experiences of students and teachers.

Manuel Pietzonka

Manuel Pietzonka studied psychology and anthropology at the Universities of Hildesheim and Göttingen. From 2006 to 2015, he worked at the Central Evaluation and Accreditation Agency (ZEVA) as project officer and head of the department of institutional accreditation. In 2013, he earned his doctorate at the International Centre for Higher Education Research (INCHER) at the University of Kassel, focusing on higher education change processes from an organizational psychology perspective. Since 2015, he has been a professor of work and organizational psychology and research methods at FOM University of Applied Sciences. In 2022, he became Director of the iwp Institute for Business Psychology and Head of the Department of Organizational Psychology at FOM University.

About the Author

Marcel Kallenbach

Marcel Kallenbach (born Piotrowski) completed his apprenticeship as a bank clerk at Sparkasse Mülheim an der Ruhr in 2018. He then began his part-time studies at the FOM University of Applied Sciences in Essen in International Management (B.A.), which he completed in July 2021. At the beginning of his studies, he worked as a financial advisor in the “Private Clients” sales department and started an internal trainee program in the “High Net Worth Individuals” sales department in March 2020. During his trainee program, Marcel Kallenbach began his second part-time degree in Business Psychology (M.Sc.) at FOM University of Applied Sciences in Essen, which he completed in January 2024.

Due to his strong interest in the consulting fields of investment and securities consulting and behavioral economics, Marcel Kallenbach has been working at DekaBank Deutsche Girozentrale (the securities house of the Sparkassenfinanzgruppe) since April 2023. As a sales advisor in “Sparkassenvertrieb North-Rhine Westphalia”, he supports the Sparkassen assigned to him in their operational securities business: As part of sales, product and specialist training courses as well as supporting sales managers and employees, he helps to ensure that the customers of the Sparkasse in the “Private Customers” and “High Net Worth Individuals” sales areas receive needs-based advice on securities products and are supported in their investment decisions in an economically sensible manner.

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List of Abbreviations

ANOVA	Analysis of Variance
DF	Degrees of Freedom
ECB	European Central Bank
EURIBOR	Euro Interbank Offered Rate
MiFID (II)	Market in Financial Instruments Directives II
MRO rate	Main refinancing operations rate
SMarT™	Save More Tomorrow Program™
WpHG	Wertpapierhandelsgesetz

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1 Introduction

According to German neuroscientist Ernst Pöppel, humans make approximately 20,000 decisions every day (Pöppel, 2008). While some of them are quite trivial, others can have a major impact on our lives. One can reasonably assume that *financial decisions* belong to the latter category: Decisions about whether to take care of adequate financial provision can have a significant impact on our financial situation in the future – a future that is certain to be characterized by uncertainty. Haan et al. (2017) show that by the first half of the 2030s, one out of five German pensioners will face significant old-age poverty risks. One of the main reasons for this is the “pay as you go” structure of the German retirement system: Soon, demographic changes will lead to structural problems, as there will not be enough employees to bear the pension payments of our future pensioners (Horn & Schuchardt, 2014). It can be intuitively assumed that generous financial provision can ensure a carefree everyday life, while a lack of such provision can lead to financial problems that can seriously ruin one’s life. Hence, private households undoubtedly must take care of additional financial provision to ensure their financial security in the long term (Deutsche Rentenversicherung, 2023c).

Another important issue is that our world has been characterized by various crises for some years now, and by a high degree of complexity and volatility. These crises have, in addition to many other consequences, directly affected the global economy and capital markets. Last but not least, they have led to inflation rates worldwide, which have not been reached for the past 30 years (International Monetary Fund, 2023). It seems that the COVID-19 pandemic is no longer even mentioned and the conflict between Russia and Ukraine is dominating everyday life in a frightening way (Mearsheimer, 2022) and companies and households must cope with historically high price increases and supply shortages (Abel-Koch, 2021). In order to fight inflation, central banks such as the European Central Bank (2023c) (“ECB”) and the Federal Reserve (2023) (“FED”) are tightening monetary policy - which in turn leads to a tense sentiment

in the global economy and recession concerns. Guenette et al. (2022), for example, point out that leading economists are indeed expecting a challenging economic period: The growth outlook for major economies such as the U.S., the eurozone and China has been significantly lowered. Although inflation rates seem to be falling, economists still believe that the fight against inflation will continue to accompany investors in the coming years (International Monetary Fund, 2023). How does this relate to decisions regarding additional financial provision?

1.1 Problem Description and Objectives

While German private investors rejoice in the return of interest rates, they seem to forget or neglect one important fact: Although the market for conservative and supposedly safe investment products is prospering splendidly, inflation is still substantially reducing purchasing power. It should be noticed that this negligence is far from being a novel phenomenon - psychological biases, such as the money illusion described above (Harrod & Fisher, 1929), are a widely researched area of behavioral finance (Cartwright, 2018). However, in view of the historically high inflation and old-age poverty risks, the need for profitable investments has never been greater. But many people do not take sufficient care of their old-age provision (Thaler & Shefrin, 1981; Thaler & Benartzi, 2004; Thaler & Sunstein, 2008; Lusardi et al., 2017). This is of course not an effect caused by the aspects described above - rather, this is a general problem that is simply exacerbated by the current high complexity and volatility of our world. Nevertheless, the combination of high inflation rates and the lack of adequate pension provision can prove to be a problem that significantly threatens the existence of private investors in the long run - and these aspects do not yet take into account the deep-rooted problems of the German pension insurance system.

The reasons why private investors avoid engaging in sophisticated investment decisions and neglect adequate retirement planning have been

widely studied: Thaler (1994), for example, studied investors' bounded rationality in making investment decisions. He found that retail investors overweight short-term needs over long-term financial objectives, making long-term investment decisions more difficult. Topa and Herrador-Alcaide (2016) discovered that one of the main reasons for avoiding financial decisions is the tendency of human beings to procrastinate various matters. In this context, self-discipline was found to be one of the most critical aspects of financial planning success. With respect to self-discipline, it is commonly known that humans regularly fail to behave in a disciplined way. In addition to these phenomena described above, there are several other insights about psychological biases and heuristics suggesting that private investors seldom make their investment decisions in a rational manner, as they are regularly influenced by heuristics and cognitive biases (Kahneman & Riepe, 1998). For example, Piotrowski and Bünnings (2022) investigated how the affect heuristic, the anchor heuristic and the availability heuristic significantly influence investment decisions regarding one-time investments and savings plans among German private investors.

While research has provided ample evidence on phenomena that *explain* how and why investors do not behave proactively and appropriately, the ultimate solution against investors' bounded rationality and their resulting negligence in setting aside financial provisions does not yet seem to have been found. Considering the high degree of inter-personal differences and highly individual preferences, the lack of an universally applicable solution is not wondering. However, such a solution would be of considerable societal interest: High welfare gains could be achieved with effective strategies that lead investors to adequate financial provision. If all citizens had a financial background that enabled them to live a carefree everyday life, the entire society could benefit from collective financial prosperity - without government transfers that could cause declines in collective prosperity.

In short, private investors neglect that the current economic situation is insidiously depreciating the real value of their assets, and investment decisions are regularly made under the influence of psychological phenomena - if not postponed because of those phenomena. This can lead to welfare losses by causing far-reaching financial difficulties. While researchers have discovered various strategies to address these problems and consequences, there is one particularly promising tool that fits into the choice architecture strategies: With their invention of the Save More TomorrowTM program (hereafter “SMarTTM program”), Thaler and Benartzi (2004) have shown how various strategies of the concept of *libertarian paternalism* can lead savers to save more over the long run and thus improve their wealth situation. Based on this concept, numerous researchers have studied nudges in a variety of settings. Nevertheless, there is no empirical evidence about the effectiveness of the SMarTTM program among *German* investors. Without claiming to find the solution against the above-described issues, this master thesis aims to provide practical and helpful insights that answer the research question: *How can strategies of the SMarTTM program and phenomena of behavioral finance be employed to improve the investment behavior of German private investors and what welfare gains can be generated compared to non-nudged investors?*

Of course, the SMarTTM program is only one of many ways to encourage investors to make better investment decisions (or to make any at all). This, of course, raises the question of why exactly the SMarTTM program was chosen as the subject of this study: There are numerous other strategies and incentives aimed at encouraging households to engage in additional retirement planning. For example, governments reward employees with attractive tax reliefs if they contribute to company pension plans, also known as “401(k) plans” (Beshears et al., 2009). Moreover, some companies or employers subsidize their employees’ pension contributions

¹ The Save More TomorrowTM (SMarT) program is a registered trademark of Richard Thaler and Shlomo Benartzi.

with so-called "matched savings plans", which means they top up the savings rate by a certain amount (Falk & Karamcheva, 2023). Also the German government subsidizes pension contributions with tax reliefs or with direct subsidies such as the „Riester-Rente“ (Deutsche Rentenversicherung, 2023a). However, all these strategies have one thing in common: They require people to address financial issues actively and self-reliantly. Thus, compared to the SMarT™ program, these strategies rely only on financial incentives or rational benefits, but do not aim to trigger the decision-making process itself or to improve it. Precisely this is the reason for selecting the SMarT™ program: To the best of my knowledge, SMarT™ is the only scientifically proven concept that successfully aims to promote and improve financial decision-making processes themselves. Furthermore, if one evaluates the probability of most people actively and self-responsibly engaging in financial decisions, we basically all know that this probability is vanishingly small.

While this scientific analysis aims to develop effective strategies to intervene in retail investment decision-making processes, one could of course argue that such interventions could be classified as morally questionable. These strategies should be composed of an effective combination of general psychological influencing strategies with the ideas of Thaler and Benartzi's (2004) SMarT™ program. Although the intentions of this research are to benevolently improve financial decisions, leading to a higher level of individual and societal prosperity, the pending results should be handled with caution, as it cannot be ruled out that untrustworthy actors may misuse and opportunistically employ these strategies. This scientific work therefore additionally considers decidedly moral aspects of this type of choice architecture by ascertaining the moral attitude of private customers. In a nutshell, the aim of this master thesis is to gain valuable insights into the effects of nudges and the general and moral attitude of private investors toward subtle nudges that influence their financial decisions.

1.2 Scientific and Practical Contribution

Since there are no empirical findings on the SMarT™ program among German investors yet, it can be assumed that this scientific research is of high interest for both science and practice. Academia may benefit from novel perspectives and a critical review of previous findings in other countries. The decisive added value is that proven concepts that have been investigated in other countries are examined for their applicability in the German private investor setting. Thereby, methodical approaches and research results are analyzed, constructively questioned, and refined. This can reveal, among other things, new insights into the widely researched area of investment decision processes. Of course, one could question why it is necessary to shed light on this topic from a scientific perspective. The first and obvious reason is that the SMarT™ program is a concept that has been developed based on scientific analysis. Therefore, it should not be surprising that this concept is also analyzed in Germany on an equally scientific basis. Second, this in turn is important since, although the effectiveness of the SMarT™ program has been sufficiently confirmed in the context of U.S. employees (Thaler & Benartzi, 2004), cultural differences (e. g. investors' risk appetite considering the German conservative investor mentality) can lead to significant discrepancies. Third, Germany is characterized by a different regulatory and tax framework as well as a different pension system, which requires sufficient consideration. Since this study is of course intended to provide an impactful practical contribution, a scientific design is required to present reliable, evidence-based results that can potentially be used by relevant parties.

With respect to the practical contribution, financial advisors and financial institutions can benefit from satisfied customers, who, in turn, might be grateful for being guided to make wise and lucrative financial decisions that can tangibly improve their wealth situation. As a result, many parties can benefit from this scientific analysis: First, and most important, private investors can avoid financial problems in the future and can thus achieve financial security, financial institutions can enhance their

economic result, and the government can save money that it would otherwise had to spend to support private households that have too little financial resources, which in turn can enhance societal financial prosperity. Overall, the results of this analysis might provide solutions for appropriate financial provisioning that can lead to far-reaching welfare gains.

These added values also hold for another and particularly critical aspect of the German investor mentality: German investors not only neglect their own financial provisioning, as described above – even when they do take care, they tend to invest predominantly in assets that cannot preserve the real value of their capital because inflation exceeds the returns on their capital earned with those assets (Grabka & Wittenberg, 2015). Economists assume that inflation will continue to exceed returns and interest earned with highly conservative investments. Thus, and most importantly, science and practice can benefit from entirely new insights in a country known for its conservative investor mentality, which should have a strong interest in breaking down existing conventions given the strained economic situation.

Given the lack of adequate financial provisioning, coupled with high inflation rates and the challenges of the German pension system, which is known to be under considerable pressure, private investors could undoubtedly benefit from nudges that can help to improve and secure their own financial futures. This procedure, i. e. the combined analysis of these aspects, clearly distinguishes the present study from other studies, which have largely addressed the above issues in isolation (Geyer et al., 2014; Haan et al., 2017; Laibson, 1997; Xiao & Porto, 2019; Sunstein & Thaler, 2003; Mitchell, 2004). Unfortunately, by addressing these issues in isolation, important interrelationships could, understandably, be neglected or left undiscovered. Therefore, it is assumed that this scientific analysis will reveal findings that go beyond those concerning only economic, only psychological, or only moral aspects.

1.3 Course of Research and Methodical Approach

To attain the research objectives described above, this master thesis is structured as follows: After the introductory Section 1, Section 2 provides an overview of the related literature and conceptional background. It starts by presenting the economic perspective about why financial provisioning is an urgent issue in Germany and sheds light on the prevailing investor mentality of German retail investors, especially considering the problems arising from the combination of these two aspects. Subsequently, the psychological perspective is examined. Here, general theories from the broad field of behavioral finance are described, followed by the principles of libertarian paternalism and nudges as instruments of choice architecture. While these two subsections provide the technical basis of this thesis' research topic, the most important part of Section 2 is the explanation and discussion of the SMarT™ program (Thaler & Benartzi, 2004) in terms of its applicability in Germany. In short, Section 2 presents research results and findings, controversially questions them, discusses them in an interdisciplinary framework, and extends them in this process, with the intention of providing a meaningful and practical basis for the methodology of this research. Section 2 ends with formulating several constructive research hypotheses that are generated during this section considering previous insights and results.

Section 3 (Methodology) and Section 4 (Results) form the scientific core of this thesis, which employs a quantitative-deductive research approach. Although a qualitative research approach may provide more individualized and insightful results that reflect private investors' attitudes toward nudging more individually, a quantitative approach is assumed to be more appropriate considering extensive evidence from other countries and settings. The core idea of this research is to examine whether strategies that already work quite effectively in other countries are also feasible in Germany. The available literature should therefore allow for the formulation of constructive hypotheses that will be tested using statistical methods. The data required for these tests will be collected with an online survey

that measures individual differences between different treatment groups. That is, a between-subject design is employed to assess which strategies of the SMarT™ program and libertarian paternalism are most effective compared to a control group not exposed to those strategies. In preparing this thesis, it is considered to design a mixed-methods approach that complements the quantitative-deductive approach with a qualitative data analysis and collects additional data by interviewing retail customers regarding the findings from the quantitative part. That is, if the quantitative data analysis does not provide sufficiently clear findings, qualitative interviews could complement these findings and help to explore retail investors' attitude toward nudges in a more individualized way. However, the decision of whether additional qualitative research methods are supplemented is made in dependence of a) the extent of this analysis and, most important, b) the clarity and informational content of the results.

Section 4 highlights the results that emerge from the methodology approach in Subsection 4.1, while Subsection 4.2 controversially discusses cross-connections to previous research findings described in Section 2. The present master thesis concludes with Chapter 5, which summarizes the test results regarding the research approach, the key findings, retrospectively questions the methodological research approach about the limitations of this thesis and summarizes constructive implications for further research.

2 Literature Review and Conceptual Background

In the following, the conceptual background is presented by analyzing relevant literature. This section first describes the economic perspective of wealth creation, including the investor mentality of German investors and the resulting consequences. These consequences are then linked to the German pension system, clearly highlighting the importance of additional private pension provision. Then, the psychological perspective is considered: While this subsection starts with a general overview of psychological biases and illusions in the context of behavioral finance, it focuses on different nudging strategies that can be used as a tool of choice architecture. Section 2 ends with the presentation and evaluation of the SMarT™ program and the discussion of follow-up studies, continuously creating cross-referencing possible strategies for the implementation in the German private investor environment.

2.1 Economic Perspective

The years after 2020, which have been marked by several crises, such as the COVID-19 pandemic, the war between Russia and Ukraine, the resulting shortage of energy sources and historically high inflation rates, can be summarized as an economically challenging period, to say the least. However, this period is far from being the first difficult period in economic history and it will probably not have been the last one: In the late 1990s, a severe financial crisis in several Asian countries led to currency devaluations, high levels of debt and capital outflows (International Monetary Fund, 2000). At the beginning of the 2000s, the bursting of the dot-com bubble, which had inflated as a result of investor speculation, led to sharp falls in value on the stock markets (Ofek & Richardson, 2003). The financial crisis around 2007-2008, one of the most severe economic crises ever, triggered by the bursting of areal estate bubble, started with a banking crisis, continued with a collapse of the money and capital markets, and ended with a strong global economic recession (McKibbin & Stoeckel,

2010). Nevertheless, our economy appears to be extremely resilient in the *long* term. Although the economy has been affected by several crises, it has recovered every time – economic fluctuations can therefore be classified as “normal events” and do not pose a threat to either private or institutional investors: In the long term, economic development has always been intact.

Given the consequences of such events, it is not surprising that economic fluctuations can have a significant impact on monetary values and assets: Economic crises regularly lead to rising unemployment rates, declining housing prices, decreasing outputs, devaluation of asset prices and increases in government debt (Reinhart & Rogoff, 2009). One of the most important factors affecting asset prices and monetary value is the inflation rate, which affects the purchasing power of monetary assets (European Central Bank, 2023e). In simplified terms, the inflation rate describes the relative change in prices between two different baskets of goods – one basket contains prices from a “base year” that serves as a basis for comparison, and the other basket presents current prices. Figure 1 illustrates that the overall inflation rate in Germany has been well below the European Central Bank’s (2023e) inflation target of about 2.00 percent per annum for around nine years but is now significantly exceeding this level. The consequences of the war between Russia and the Ukraine have led to an average inflation rate of approximately 7.80 percent in 2022 (Statistisches Bundesamt, 2022) and currently 6.30 percent in 2023 (Statistisches Bundesamt, 2023), respectively. However, when considering the long-term inflation rate over the last 50 years, it averages around 2.56 percent per year (Statistisches Bundesamt, 2023), which is roughly in line with the targeted level of “around 2.00 percent”. The inflation rate over the last 20 years, however, averages around 1.74 percent per year, which is even below the targeted inflation level (Statistisches Bundesamt, 2023).

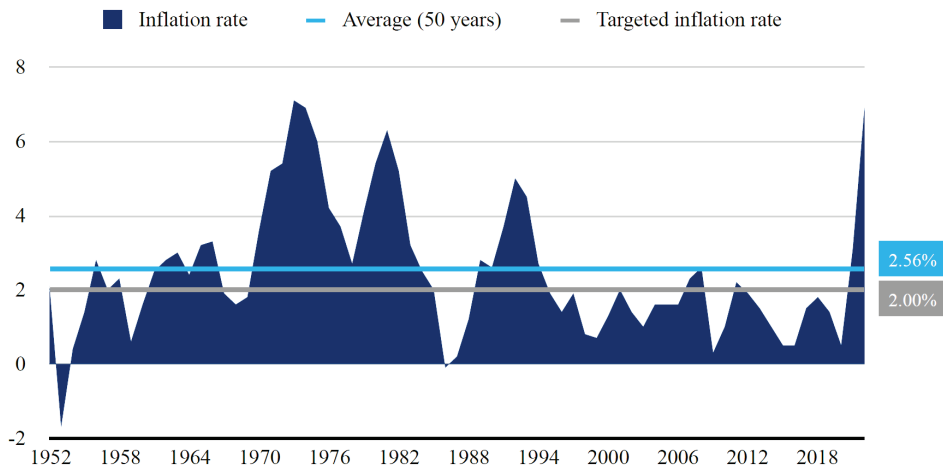


Figure 1. Inflation Rate in Germany from 1952 to 2022 (in accordance with Statistisches Bundesamt, 2023).

As described above, the inflation rate is one of the most important factors influencing the purchasing power of money and thus the economic development. For price stability in the Eurozone, the responsibility lies with the ECB, while this is also its primary task (European Central Bank, 2023a). To keep prices stable, the ECB has various steering instruments (European Central Bank, 2023d). Apart from these various instruments, which will not be considered further, the probably most effective instrument is the key interest rate level: By raising or lowering the key interest rate level, the ECB can steer financing conditions for people, businesses, and governments (European Central Bank, 2023c). In total, there are three key interest rates: The *main refinancing operations rate* (MRO rate) represents the rate at which banks can borrow money on a weekly basis, which represents the bulk of liquidity in the banking system. The *marginal lending facility* is the rate at which banks can borrow money overnight and the *deposit facility* is the rate at which banks can make overnight deposits with the ECB (European Central Bank, 2023c). Adjustments of these interest rate levels affect how expensive it is for companies, governments, or households to borrow money – or how lucrative it is, to deposit money, respectively. This, in turn, affects all economic agents, such as companies

that need a loan for business expansion or plan new investments, or households that want to buy a mortgage-financed house — all these effects affect prices and inflation because of the interplay between supply and demand of economic goods (European Central Bank, 2023d).

Since this scientific analysis examines the investment behavior of German private investors, the *deposit facility* is of high interest, as this rate significantly determines the interest rates which banks pay their customers for savings deposits. While the inflation rate in Germany remained well below the inflation target of around 2.00 percent for nine years until recently, the ECB's deposit facility was set accordingly between 0.00 percent in July 2012 and -0.50 percent until June 2022 (European Central Bank, 2023c). It follows that the ECB lowers the key interest rate level to promote inflation, as households are motivated to spend or invest their money due to insufficient deposit interest rates, and companies are more motivated to invest, as they can borrow money at very low costs. The effect of these two mechanisms is to strengthen the economy and, as a result, to increase prices more sharply, so that the inflation target can be achieved (Taylor & Mankiw, 2017). Accordingly, the ECB raises the key interest rate level to make financing conditions more difficult so that economic agents are less able to bear financing costs and to motivate them to deposit their funds with banks as they receive higher interest rates on their assets. This leads to lower economic activity and thus to declining prices (European Central Bank, 2023d).

As described above, the inflation rate averages 7.80 percent in 2022 and 6.30 percent in 2023, which is well above the long-term inflation target (Statistisches Bundesamt, 2023). According to a macroeconomic research by DekaBank Deutsche Girozentrale (2023c), hereafter DekaBank“, the reasons for this excessive inflation rate are a) catch-up effects from the economic recovery after the COVID-19 pandemic and b) the economic consequences of the war between Russia and Ukraine. The combination of these two reasons leads on the one hand to unusually high economic demand caused by catch-up effects and on the other hand to unusually low

economic supply caused by the war, which causes prices for companies and end consumers to shoot up significantly (Presse- und Informationsamt der Bundesregierung, 2023).

To control inflation, the ECB has raised the MRO rate at a historically fast pace from 0.00 percent (June 2022) to 4.50 percent (September 2023) (Deutsche Bundesbank, 2023a). Although leading economists are of the opinion that the key interest rate level will not return to its level prior to the hawkish monetary policy, the current inverse yield curves clearly indicate that the interest level will decline moderately in the medium term (European Central Bank, 2023b).

2.1.1 Financial Investments and Consequences of the German Investor Mentality

So far, this chapter has illuminated the economic fundamentals and thus the basic framework for financial investments in Germany. Looking at the various options of investments, one could argue that there is a glut of financial products. It is not surprising that customers lose the overview of countless investment options such as shares, corporate bonds, government bonds, mutual funds, real estate, crypto currencies, commodities, fixed-term deposits, savings accounts, or insurances – without claiming the completeness of this short and only exemplary overview. For the right investment, appropriate guidance is needed: Various banks, financial institutions and financial consultancies offer free or fee-based investment advice. One might discuss that some of these agents have benevolent and customer-oriented intentions, while others might have self-interested and solely profit-maximizing intentions. This study evaluates the application of investment behavior control tools to *considerably improve* the financial situation of private customers and focuses thereby on the investment advisory style of the DekaBank, the securities house of the Sparkassen-Finanzgruppe (DekaBank Deutsche Girozentrale, 2023b). The Sparkassen-Finanzgruppe is the largest financial group in Europe, the market leader in

Germany, and clearly defines its strategy of enabling people to adequately participate economically and socially in society as its public mission (S-Communication Services GmbH, 2023). The Sparkassen-Finanzgruppe is, of course, far from being a charitable organization and, quite justifiably, pursues economic interests - and yet it is precisely its public mission that sets it apart from other profit-oriented financial institutions: This includes the financial participation for all citizens through a holistic, all-encompassing financial advice to provide the opportunity for appropriate financial investments and thus the citizens' participation in economic development and welfare (Deutscher Sparkassen- und Giroverband e. V., 2023).

DekaBank's investment advisory style is therefore based on the scientifically founded portfolio theory by Markowitz (1952). With this, Markowitz (1952) considerably revolutionized the knowledge of suitable financial investment strategies at that time. In highly simplified terms and without considering the mathematical and statistical background, Markowitz's (1952) portfolio theory shows that broadly diversified portfolios can enable optimal risk-return profiles because of opposing correlations and interactions. He describes that the higher the achievable returns, the higher the risks and vice versa. Successful portfolio diversification is therefore based on investments in *different* asset classes instead of single assets - appropriate diversification significantly reduces risks and ensures higher returns and thus better investment results in the long term (Markowitz, 1952). In line with the findings of Markowitz (1952), DekaBank Deutsche Girozentrale (2023a) recommends diversifying financial investments into four asset classes. Figure 2 illustrates that these four asset classes are divided into *monetary values* on the right side, which include the liquidity and fixed-income assets, and *real assets* on the left side, which include equities and real estate (DekaBank Deutsche Girozentrale, 2023a).

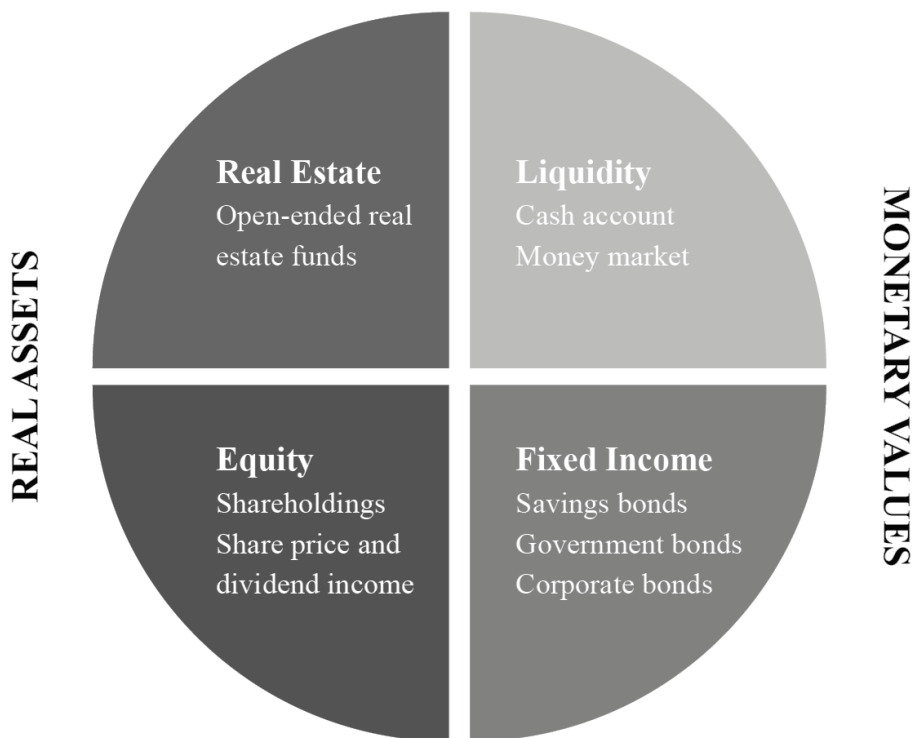


Figure 2. Financial Investments According to the DekaBank's Advisory Approach (in accordance with DekaBank Deutsche Girozentrale, 2023a).

These asset classes differ significantly in their nature and functioning, especially regarding their risk-return profiles. The liquidity asset class is the most conservative asset among these classes: Apart from the possible uncertain solvency of the issuing bank, this type of investment is *nominally* risk free. A comparison of this overnight asset class with the 1-month European Interbank Offered Rate (hereafter "Euribor") shows an average return of around 0.95 percent p.a. over the last 20 years (Triami Media B.V., 2023). As Figure 3 illustrates, this rate of return results in an investment return of €121 per €100 invested. Putting this return in relation to the corresponding 20-year average inflation rate of 2.01 percent p.a. (Statistisches Bundesamt, 2023), one can see that this asset class is indeed risk-free only when viewed in nominal terms: Inflation gradually but steadily depreciates the real value of the money invested in this asset class.

According to the index figures on the right-hand side of Figure 3, an adequate investment would have had to generate a result of at least €149 per €100 invested over the 20-year period to compensate for inflation and thus avoid monetary devaluation.

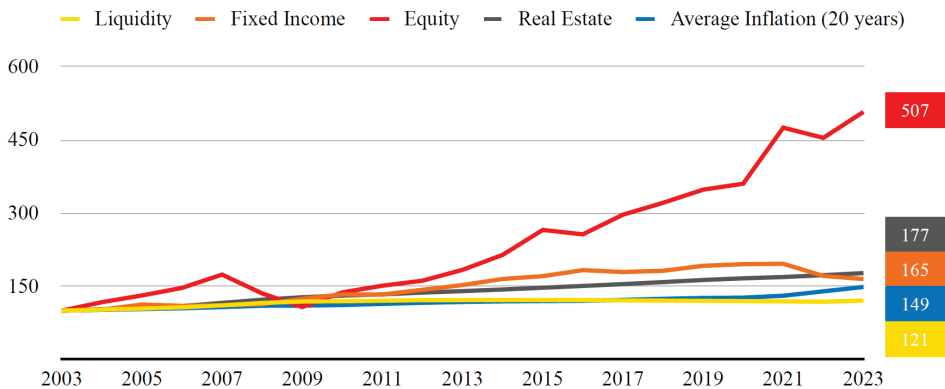


Figure 3. Long-term Performance of the Different Asset Classes in Comparison. (In accordance with DekaBank Deutsche Girozentrale, 2023a.) Performance in Euro, Index: 30th June 2003 = 100, 30th June 2023 = target. Performance: Liquidity Index based on 1-month Euribor (Triami Media B.V., 2023), Fixed Income Index based on iBoxx € Total Return (S&P Dow Jones Indices, 2023), Equity Index based on MSCI World All Country (MSCI, 2023), Real Estate Index based on several real estate funds (DekaBank Deutsche Girozentrale, 2023a), Inflation based on statistical data (Statistisches Bundesamt, 2023). Without consideration of costs and fees.

The return on the second asset class, fixed income, averages 2.68 percent per year (S&P Dow Jones Indices, 2023), which is slightly above the average inflation rate - in other words, the value of the money invested can be maintained but not substantially increased. If the aim is to seriously fight inflation and increase the value of the money invested in real terms, only the equity asset class seems to be suitable: An equity investment of €100 produced an investment result of €507 over a 20-year period, which corresponds to an annual return of around 9.37 percent (MSCI, 2023). The last asset class, open-ended real estate funds, delivers an annual return of

around 2.90 percent, which is also slightly above the corresponding inflation rate and therefore serves as a value-preserving investment (DekaBank Deutsche Girozentrale, 2023a). While an investment of €100 developed into a result of €177, this type of investment also does not appear to be suitable for real money appreciation, but at least outperforms the return on of fixed-income securities.

So far, the explanations above provided detailed information on the DekaBank's advisory style, which is based on the foundation of Markowitz's (1952) portfolio theory and stipulates that adequate financial investments ideally consist of a mix of four asset classes. The main reason why investors should consider all four of these asset classes is that inflation would otherwise lead to a creeping but steady devaluation of monetary values. While one might conclude that this investment philosophy seems sensible and purposeful and should therefore be followed by German private investors, one should not neglect the distinctly conservative investor mentality of German investors (bank und markt, 2017). Figure 4 illustrates that 41.2 percent of German financial assets are held in cash and demand deposits. Further 34.8 percent are invested in insurance or retirement saving systems. This means that already 76 percent of German financial assets are invested highly conservatively, yielding no more than 0.95 percent (liquidity) or 2.56 percent (fixed income) per year – only 11.1 percent are invested in investment funds (it should be noted that there are also very conservative investment funds such as money market funds), only 11.0 percent are held in shares and only 1.5 percent in fixed-income securities (Deutsche Bundesbank, 2023b).

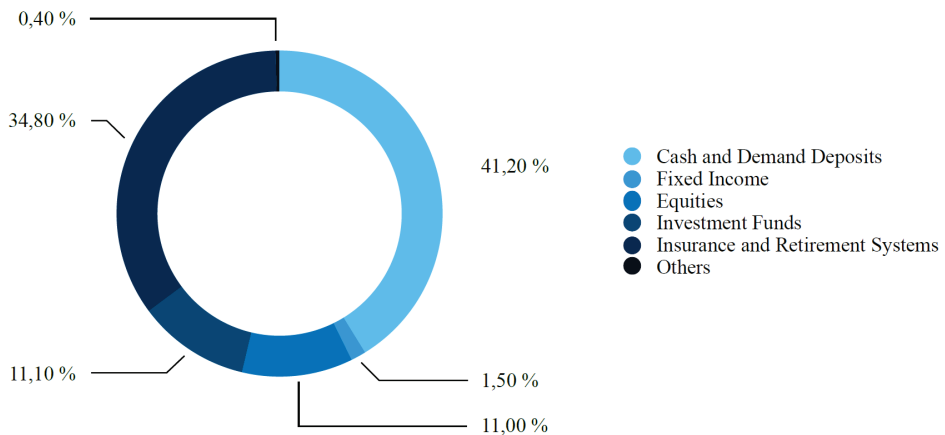


Figure 4. Distribution of Financial Assets in Germany (third quarter of 2022). (In accordance with Deutsche Bundesbank, 2023b).

Considering the German investors' mentality, especially regarding the return of their preferred asset classes and the inflation to which this return is exposed, it can be concluded that the Germans' investment behavior contributes to real wealth losses and thus to a deterioration of welfare in the long run (Grabka & Wittenberg, 2015).

As described above, the ECB has continuously increased the key interest rate level (MRO) from 0.00 percent to 4.25 percent (Deutsche Bundesbank, 2023a) to fight inflation. The deposit facility relevant for retail deposit pricing has therefore been set at 3.75 percent (Deutsche Bundesbank, 2023a). As a result, short-term investments such as money market accounts or time deposit accounts have gained additional popularity: The online bank *ING Diba*, for example, offers a call money interest rate of 3.50 percent per year for an investment period of 6 months, and 1.00 percent per year thereafter – which is just a single example of the high quantity of such offers (Biallo & Team GmbH, 2023). While German investors rejoice about the comeback of such interest rate offers, they seem to completely neglect the fact that the current inflation rate nevertheless exceeds these interest rates. Moreover, they seem to ignore the additional investment conditions, such as the fact that these offers are usually only

granted for a limited investment period: Calculating the effective interest rate of the above example results in an annual effective interest rate of 2.25 percent (Biallo & Team GmbH, 2023). Combining the interest rate of the ING Diba overnight deposit with the inflation rate of 7.80 percent in 2022 (Statistisches Bundesamt, 2023) results in an annual real return of -5.55 percent – even the comparison with the 20-year inflation rate of 2.01 percent p. a. yields no more than a real return of 0.24 percent, which cannot be interpreted as a serious increase in monetary value. In the former case, of course, investors would not experience an actual loss of money in their investment account, but they would simply have to spend more money in the future to receive the same countervalue.

Up to this point, it can be concluded that the asset class liquidity has never been suitable for preserving the value of money in real terms, and that the asset class fixed income deposits is only suitable for preserving the value of money, but not for increasing the value of money in real terms. However, these asset classes enjoy great popularity among German investors because of their very conservative attitude. This finding represents the first serious problem which this scientific paper is intended to help solve.

2.1.2 The Importance of Additional Private (Pension) Provision

Although the importance of adequate investments in terms of inflation and the real interest rate trap has been sufficiently illustrated above, there is another reason why German investors should ensure additional private provision. This reason is a result of the basis and functioning of the German pension insurance system: Haan et al. (2017) have analyzed that Germany faces a serious risk of old-age poverty. Already in the first half of the 2030s, the risk for old-age poverty will increase from around 16 percent to about 20 percent, which corresponds to an increase of 25 percent. Of course, the risk for old-age poverty depends on many other factors, such as educational level, parental leave periods or unemployment –

regardless of the reasons, the risk can undoubtedly be classified as serious (Geyer, 2014). The background to this is that the German pension system is based on a *pay-as-you-go* pension model. This means that the pensions of today's retirees are financed by the contributions of today's employees who pay into the German pension insurance system (Horn & Schuchardt, 2014). Rürup (2002) thereby identifies demographic changes as the main reason for the old-age poverty risk: The combination of the increasing aging of the population with the decreasing number of upcoming workers who finance the pension of retirees represents a major burden for the German pension system.

The above aspects indicate that German employees will face a considerable pension gap when they retire at the current retirement age of 67: Contributions to the German pension insurance system are not expected to be sufficient to retain employees' income in retirement (Börsch-Supan & Wilke, 2004). As a result, even the German pension insurance carrier, Deutsche Rentenversicherung, clearly recommends using the second and third layers of retirement provision (i. e., company pension and private provision) in addition to the first layer, which is covered by the statutory pension insurance (Deutsche Rentenversicherung, 2023b). Deutsche Rentenversicherung (2023c) provides additional information about this via the pension information that every German citizen over the age of 27 receives – it can be assumed that German private investors should theoretically be aware of the risk of old-age poverty.

Thus, employees are clearly recommended to additionally invest in company and private pension plans (Deutsche Rentenversicherung, 2023b). Overall, these problems named are greatly exacerbated by the effects of inflation and the resulting depreciation of monetary assets, once again emphasizing the urgent need for adequate financial provision by private investors, which is the second aspect that this scientific work is intended to help solve.

2.2 Psychological Perspective

So far, this chapter has examined the economic perspective of financial decisions and highlighted the economic consequences of the conservative German investor mentality. However, economic aspects are not the only decision criteria in financial decisions. There are other, even more significant aspects that influence such decisions: The factors of the psychological perspective. As investor psychology and behavioral finance are extremely complex and diverse areas of research, Section 2.2 is divided into a general overview of these topics, followed by nudging strategies, and completed by the evaluation of the SMarT™ program.

2.2.1 Common Biases and Illusions in the Context of Financial Decisions

In general, investment decisions are seldom made in a rational manner, but regularly influenced by heuristics and cognitive biases (Kahneman & Riepe, 1998). Heuristics in judgement and decision making can be understood as "rules of thumb" or shortcuts to reduce the complexity of decision situations or estimations (Del Campo et al., 2016). That is, heuristics and cognitive biases are a kind of "filter" placed over decision situations to facilitate decisions – heuristics work particularly effective when similar decisions have already been made in the past and the parameters of that situation can be applied to the current decision situation. It follows that heuristics are intended to simplify complex decision situations – but precisely because of this, they can also lead to systematic errors and poor decisions (Tversky & Kahneman, 1974). The initial research on heuristics and judgment stems from Tversky and Kahneman (1974), who discovered the *availability heuristic* (decisions or estimations based on the ease with which memories can be recalled), the *anchor heuristic* (the tendency to make decisions or estimations in relation to specific reference

points) and the *representativeness heuristic* (estimations based on the degree to which A resembles B, or on assumed affiliation with a superior category).

Based on these findings, various researchers have studied heuristics and cognitive biases related to financial decisions, forming the basis for the field of behavioral finance. Shefrin and Statman (1985), for example, studied the *disposition effect*, which states that both private and institutional investors make irrational investment decisions in terms of gains and losses: They tend to hold investments that steadily lose in value while they quickly sell investments that yield attractive returns, which is, obviously, no rational or economically logical investment behavior. As described above in the section on the economic perspective, the supposedly safe fixed-income investments produce a loss of wealth when viewed in real terms. However, fixed-income investments are currently being really hyped and represent one of the most popular asset classes among German investors (Deutsche Bundesbank, 2023b). This currently irrational investment behavior is thus almost congruent with the findings of the disposition effect. Mussweiler and Strack (2000) showed that both private and institutional investors are indeed guided, unconsciously, by certain reference points and anchor values, according to the anchor heuristic (Tversky & Kahneman, 1974). Jordan and Kaas (2002) found that heuristics influence perceptions of investment fund advertising strategies, fortifying the strong effect of the anchor heuristic regarding the perception of gains and losses. Chen et al. (2017) studied the *January effect*, which describes a Taiwanese stock market trading anomaly caused by bonus payments of Chinese employees before the Luna New Year in January: Employees seem to typically invest their bonuses in stocks, implying a house money effect based on the availability heuristic (Tversky & Kahneman, 1974). Piotrowski and Bünnings (2022) conducted a real-world experiment among German private investors in the Sparkassen-Finanzgruppe, indicating strong effects of the *affect heuristic* (Slovic et al., 2007), the anchor heuristic and the availability heuristic: When financial advisors actively focus and induce one of

these heuristics, the probability of product purchase can be increased by about 50 percent compared to a control group.

It can be concluded from the above examples that investors do not always behave rationally when making investment decisions. The current state of research suggests that investors make their investment decisions under the intense influence of psychological factors, heuristics in judgement and other behavioral phenomena. This assumption is consistent with an extensive research by Shefrin and Statman (2000): In their study "Behavioral Portfolio Theory", they critically investigated how investors *actually* construct their investment portfolios instead of assuming that they perfectly process technical, well-founded information and thus make optimal and rational investment decisions. To this end, they investigated cognitive biases or investors' tendencies such as *loss aversion* (Shefrin & Statman, 1985), *overconfidence* (Statman et al., 2006) and the tendency to adhere to previous decisions, also known as *sunk cost fallacy* (Arkes & Blumer, 1985). Most importantly, they found in their study that precisely these behavioral phenomena that lead investors to make poor investment decisions, such as insufficiently diversified portfolios, trading too frequently, and holding on to investments that constantly losing value (Shefrin & Statman, 2000).

When analyzing the investment behavior of private investors, it should be noted that they do not only *behave* irrationally in their investment decisions: Findings from the research on the money illusion suggest that they additionally *evaluate* them irrationally (Harrod & Fisher, 1929). The money illusion describes how humans regularly think in nominal terms, neglecting the relative perspective (Harrod & Fisher, 1929). This means that investors think in terms of nominal returns and interest rates and do not examine real, inflation-adjusted returns. In other words, investors evaluate nominal price adjustments, neglecting developments in the real purchasing power of money. Taking an example from the area of wage increases: If inflation is 10percent, workers would be happy with a 5percent wage increase, while they would be unhappy with a 2percent wage

increase if inflation is 0 percent. The combination of this illusion and the disposition effect (Shefrin & Statman, 1985) could be reasons why investors do not pay sufficient attention to their investment behavior and portfolio diversification according to Markowitz (1952) and are already satisfied with moderate interest rates on conservative assets that do not allow for inflation compensation. Hence, the consequences of the money illusion present the third aspect that this scientific work is intended to help solve.

Beside the behavioral or financial psychology anomalies, Thaler and Sunstein (2021) identified *procrastination* as a further reason why people fail to take sufficiently care of adequate financial investments and provision. Ferrari et al. (1995) define procrastination as the tendency to put off subjectively important things or tasks that are perceived as unpleasant, even though one knows exactly how important they are and even how to complete them but keeps looking for reasons not to do them after all (Yakuub, 2000). This behavior is perfectly supplemented by the findings of *hyperbolic discounting* (Laibson, 1997): This theoretical approach illustrates time-inconsistent behavior with respect to rewards. In highly simplified terms, hyperbolic discounting (Laibson, 1997) describes the tendency to prefer immediate rewards over long-term rewards, even when the long-term rewards are substantially larger than the immediate rewards. This phenomenon can be illustrated by a simple example: Imagine you are given the choice of receiving €1,000 today or €2,000 in one year. Although the exception might prove the rule, according to the theory of hyperbolic discounting, most people would prefer to receive €1,000 today instead of being patient for the larger reward. In terms of investments and financial provision, these insights can be translated as follows:

- a) Investors prefer short-term, supposedly save investments that yield, for example, an average interest rate of 2.68 percent per year (S&P Dow Jones Indices, 2023), instead of being patient and brave to invest in a portfolio (Markowitz, 1952) that yields an average return of 5.80 percent. (DekaBank Deutsche Girozentrale, 2023a)

b) Investors prefer to spend their income today instead of taking care of retirement planning for their still distant retirement age to avoid old-age poverty (Haan et al., 2017) and to ensure a comfortable living standard in retirement. The tendencies toward procrastination and the hyperbolic discounting of the utility of financial and retirement planning represent the fourth concern that this scientific work aims to help address.

As an interim conclusion on psychological behavior patterns in financial investment decisions: investment decisions are regularly distorted by various psychological phenomena such as heuristics and cognitive biases and are rarely made rationally – even though investors probably believe that they are behaving rationally. As Figure 5 illustrates, the most influential biases that this academic analysis aims to help solve are the disposition effect (holding investments that depreciate in relative value and are thus not suitable to compensate for inflation), the money illusion (thinking in terms of nominal values rather than relative and real values), procrastination (putting off important concerns), and hyperbolic discounting (overweighting short-term benefits over long-term higher benefits). Since considering the above aspects might lead to the assumption that investors could never make adequate investment decisions, possible coping strategies to overcome these behavioral patterns are examined below.

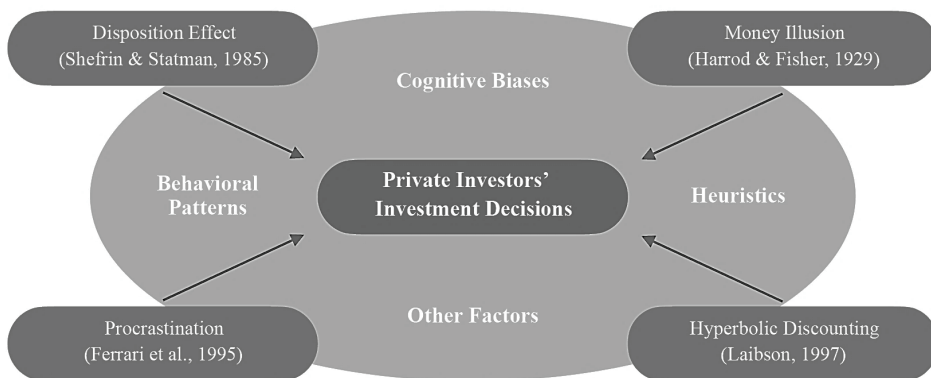


Figure 5. Psychological Behavior Patterns that Influence Investment Decisions.

2.2.2 Nudges as a Tool for Choice Architecture

So far, Section 2 has clarified that human beings not always behave rationally – even though human behavior has been examined here in the context of financial investments, their partially irrational behavior holds similarly for other contexts and situations. Under a fully rational view, it is not understandable why people smoke cigarettes, drink alcohol in harmful amounts, ignore obesity, put off their tax returns, or hit "Snooze" on their alarm clock so often that they are late for work. Although these behaviors are, under a fully rational view, not understandable, people still sometimes behave irrationally – fortunately, behavioral psychology provides some strategies for overcoming irrational tendencies and optimizing decisions.

Some of those strategies are based on a term composed of two completely contradictory words: *Libertarian paternalism* (Thaler & Sunstein, 2003). While *paternalism* can be understood as a regime in which people are forced to behave in a certain way through coercion, *libertarian* is associated with complete freedom of choice (Thaler & Sunstein, 2003). The combination therefore means that people are motivated to behave in a certain way but are still completely free in their final choice. That is, choice architects (people responsible for a particular decision situation) can design situations in such a way that people are motivated to unconsciously behave in a certain way, but they are in no way forced to do so: With this idea, Thaler and Sunstein (2008) launched their concept of "nudges". From the above definition, it follows that nudging obviously represents a form of influencing or controlling human decisions and behavior, and nudging instruments can therefore be considered quite controversial. While it can be argued that nudges are tools of manipulation, it should be differentiated with which objective decision-makers "are nudged". On the one hand, it is of course understandable to judge nudges as morally reprehensible if they are used with self-centered or self-serving interests. On the other hand, nudges that aim to improve the current situation of even the lives of decision makers should be judged differently.

With their systematic literature review, Kuyser and Gordijn (2023) defined four general ethical factors: *autonomy*, *welfare*, *long-term adverse effects*, and *democracy and deliberation*. Regarding autonomy, Saghai (2013), for example, doubts that nudges fulfill the idea of freedom of choice: If nudges are too effective and if they are not easy resistible, some people might be influenced against their own will. Considering welfare, Thaler and Sunstein (2008) provide examples how people fail to make optimal decisions, which costs welfare: Nudges are therefore assumed to improve overall welfare. However, Kuyser and Gordijn's (2023) research revealed that it is disputed whether nudges *always* improve welfare. Regarding long-term adverse effects, Kuyser and Gordijn (2023) noted that a) it is not guaranteed that nudges have only positive effects, especially considered in the long term (Binder & Lades, 2015), and b) nudges could lead to mistrust by decision makers towards choice architects if they find out that they have been nudged (Avitzour et al., 2019). In the context of governmental nudges, the factor democracy and deliberation raises the question of whether nudges are consistent with its original definition – however, as this paper is not a governmental context, this factor will not be considered further. Care should be taken to ensure that the impetus developed at the end of this chapter is consistent with the factors described above.

Referring to this, Hansen and Jespersen (2013) propose a framework for an ethically acceptable use of nudges by dividing them in four different types. First, they differentiate between *type 1* and *type 2 nudges*, drawing on Stanovich's (2011) concept of *automatic and reflective thinking*. While “both types of nudges aim at influencing automatic modes of thinking (...), type 2 nudges are [additionally] aimed at influencing the attention and premises of (...) reflective thinking (...)” (Hansen & Jespersen, 2013: 14). That is, type 1 nudges aim to only influence automatic thinking (e. g. lane markings on a road to make drivers more slowly), and type 2 nudges aim to influence both automatic and reflective thinking (e. g., reframing perceived information of situations, such as in Kahneman

and Tversky's (1984) „Asian Disease Problem“). Furthermore, they differentiate between *transparent* and *non-transparent nudges*. Figure 6 provides an overview of the resulting four different types with brief descriptions.

	Transparent Nudges	Non-transparent Nudges
Type 1 Nudges (Automatic Thinking)	Open manipulation of behavior	Hidden manipulation of behavior
Type 2 Nudges: (Reflective Thinking)	Open manipulation of choice	Hidden manipulation of choice

Figure 6. Different Types of Nudges (in accordance with Hansen and Jespersen, 2013, and Stanovich, 2011).

Since processes of the automatic thinking lead directly to specific behaviors without actively thinking about them (Stanovich, 2011), type 1 nudges are classified as manipulation of *behavior*. The crucial difference to type 2 nudges is that decision makers there still must make the decision themselves, although their choice is manipulated with respect to the decision alternatives: These nudges are therefore classified as manipulation of *choice*. Considering the transparency of nudges, it can be assumed that non-transparent nudges, i. e. hidden manipulations, could be rather judged as morally questionable. While transparent nudges are also a form of manipulation, they are at least not hidden and therefore obvious to decision makers. Hansen and Jespersen argue that „such nudges are not aimed at (...) [influencing agents] by means of psychological manipulation. Rather, nudges of this type aim at promoting decision-making in ways that are transparent to the agents influenced“ (Hansen & Jespersen, 2013: 23-24). Hence, these nudges are used to prompt reflective decision-making while at the same time promoting certain decision alternatives.

Evaluating these characteristics with respect to the three relevant of Kuyper and Gordijn's (2023) four ethical aspects, type 2 nudges can be

generally classified as largely unobjectionable for nudging investors in financial decisions. Regarding autonomy (first factor), a critical requirement for possible nudges is that they should not be too effective and could thus be resisted. From the economic perspective, and especially in view of inflation, the negative real return on monetary assets and the possible old-age poverty caused by the German retirement system, suitable nudges would undoubtedly contribute to improving welfare (second factor) in the long term. Since type 2 nudges are not intended to covertly control behavior, but rather to encourage reflective decision-making, they are unlikely to lead to mistrust, and therefore no long-term adverse effects (third factor) are expected. Nevertheless, it remains open whether transparent type 2 nudges are less controversial than non-transparent type 2 nudges - on a completely rational view and if they certainly improve investors' financial situation, non-transparent type 2 nudges should be considered positive. An advantage of covert nudges is that they are probably more effective – however, this represents a conflict with the ethical factor autonomy. It might prove useful to simply ask private investors whether they would evaluate non-transparent type 2 nudges as morally objectionable if they certainly helped to improve their financial situation, at least in the long term. According to Hansen and Jespersen (2013), non-transparent type 2 nudges belong to the category of paternalism and would have nothing in common with libertarian paternalism. In the context of financial decisions, however, this statement should be interpreted with caution: Even if investors are covertly nudged, they still make the final decision whether to invest or not themselves. As a result, it can be assumed that those nudges would nevertheless preserve the idea of libertarian paternalism. According to Hansen and Jespersen (2013), the principles of the SMarT™ program (Thaler & Benartzi, 2004) outlined below belong to transparent type 2 nudges. That is, the issues discussed above regarding non-transparent or highly manipulative nudges do not apply to nudges in the context of the SMarT™ program.

Finally, regarding the moral and ethical perspective, it should be noted that Sunstein and Thaler (2003) have clarified one false assumption and two misconceptions regularly associated with libertarian paternalism, which can be considered very revealing: “„The false assumption is that almost all people, almost all of the time, make choices that are in their best interest or at the very least are better, by their own lights, than choices that would be made by third parties.“ (Sunstein & Thaler, 2003: 4, 5). The tendencies of people’s irrational behavior in financial decisions described above are almost perfectly consistent with the meaning of this false assumption. “„The first misconception is that there are viable alternatives to paternalism. In many situations, some organization or agent *must* make a choice that will affect the behavior of some other people.“ (Sunstein & Thaler, 2003: 5). It follows that it is simply not avoidable to influence other people. This holds especially true for investment advice: Regarding the anchor heuristic, it is even a form of influence or manipulation if advisors provide information about the minimum investment amount – this can lead to investors unconsciously orienting themselves towards this value. Hence, it should not be judged objectionable if advisors use nudges that improve their customers’ financial situations. ”The second misconception is that paternalism always involves coercion.“ (Sunstein & Thaler, 2003: 7). This means that even if people, or in this context investors, are nudged, no one is forcing them to behave in the promoted way.

Summarizing the factors described above with regard to moral and ethical aspects, nudges are considered appropriate in the context of financial investments provided they meet some specific requirements based on the framework proposed by Hansen and Jespersen (2013). A very important finding is that appropriate nudges should be transparent type 2 nudges, i. e., nudges that a) are obvious to the investor and b) aim to influence reflective thinking. It should be reiterated that the SMarT™ program-style tools meet these requirements. As a result, the three relevant ethical

aspects of Kuyser and Gordijn's (2023) can be largely fulfilled. Nevertheless, it is important to consider the direct view of retail customers, which will be done in this analysis.

So far, nudges have been examined with regard to their objectives and with a wide range of ethical and moral aspects in mind. In the following, selected strategies are presented with which decision-makers can potentially be nudged. These measures are not analyzed in depth here with regard to moral or ethical aspects – their applicability in the context of this research and with regard to the research objectives is assessed in section 2.3.2, where moral and ethical aspects are also addressed.

Overall, there are a large number of influencing strategies. Attempting to consider all available strategies would provide enough material for a comprehensive analysis of its own. Therefore, to provide a *structured and concise* overview, Cialdini's (2021) persuasion strategies are selected as the framework for the following content and are therefore briefly described below. Figure 7 provides a short overview of these strategies.

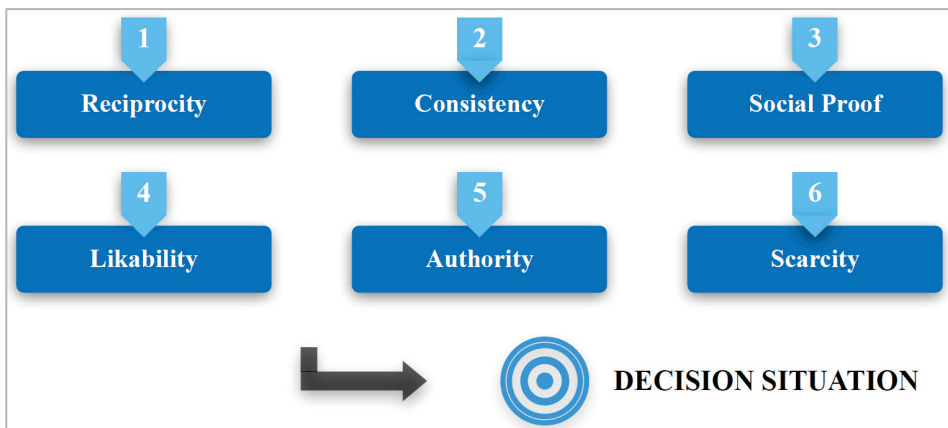


Figure 7. Persuasion Strategies (in accordance with Cialdini, 2021).

The first of the strategies is the principle of *reciprocity*, which describes people's tendency to feel obliged to give something back when they received something in advance. So giving something in advance significantly increases the likelihood of approval. The same principle applies

to situations where people have already rejected several proposals or offers and are then asked to agree to a rather trivial request: People get the feeling that they *have to* fulfill this small request because they have already rejected several other requests. The second principle, *consistency*, states that people regularly rely on actions or decisions that are consistent with those they have already done before. This tendency is based on the virtue that people should ensure that they do what they have committed to do. The third and, according to Cialdini (2021), most effective strategy, *social proof*, describes the tendency of people to orient themselves towards the behavior of others. Accordingly, the likelihood of compliance can be considerably increased if people are told that others, preferably people in a similar situation, have already made the promoted decision. *Likability*, the fourth strategy, means that people are more willing to agree with people they like. It is divided into physical attractiveness, similarity or familiarity, compliments, and association. It is simply much easier to say “no“ to a stranger than to people we like. The fifth principle, *authority*, states that humans like to rely on the opinion and suggestions of experts – that is, expert status greatly increases the likelihood of agreement. Scarcity, the final strategy, simply means that people regularly yearn for what there is little of. Of these six persuasion strategies, also Thaler and Sunstein (2008) describe *social nudges* (i. e. nudging principles based on social proof or validation) as a highly effective influencing strategy. In their work, they cite several examples of how people are guided by others around them: For example, Akerlof et al. (1996) found that teenage girls surrounded by other teenagers who have children are more likely to become pregnant themselves. In addition, Gardner et al. (2000) found that employees are more likely to sue their employer if their colleagues have done the same.

While the above strategies and principles belong to the category of persuasive psychology (Cialdini, 2021), equally some cognitive biases and heuristics can be used as tools to influence decision makers. Since heuristics in decision making can be understood as rules of thumb aimed to reduce complexity, they are generally considered as phenomena that lead to

systematic errors (Del Campo et al., 2016). However, their functioning could also be considered positively: By actively triggering concrete heuristics, people, or in this context investors, could be benevolently guided through complex decision situations. For example, Tversky and Kahneman (1974) described the anchor heuristic as a bias that leads to poor or irrational decisions and estimations. On the other hand, Piotrowski and Bünnings (2022) showed that the functioning of this heuristic can be intentionally triggered by investment advisors, which increased the average savings rate level by about €14.00 (corresponding to about 61.40percent), or the overall purchase probability by almost 39.66percent. For this, advisors provided their customers with specific anchor values, such as: "Mrs. Y, on average, my customers save €129.50 per month in equity funds. Does that match up for you as well?" (Piotrowski & Bünnings, 2022: 8). Here, customers orient their decision whether and how much to invest at the provided anchor value of €129.50 per month – it can be assumed that considerably smaller anchor values would result in smaller savings amounts.

In addition to the above ways of nudging decision makers, there are other strategies for designing decision-making situations. One of the best-known strategies by Thaler and Sunstein (2008) is that of specific *defaults*, in the sense of presets. Here, agents are nudged in decision making by preset defaults. For example, choice architects could preset "duplex printing" to save paper when operating a printer. In the context of defaults, they differentiate between opt-in and opt-out default. Using organ donations as an example, opt-in defaults mean that people are standardly classified as "not agreeing" to donate their organs and would have to "opt in" to change this default. The opposite opt-out default means that people are assumed to agree to donate their organs by default and would have to "opt out" in order not to do so. Another of their strategies is that of simplification: Preferred decision outcomes can be made much more accessible by having choice architects, for example, making healthy foods more salient than unhealthy ones, making it easier to choose the healthy foods (Thaler

& Sunstein, 2008). Since this academic analysis is about nudges in the context of financial investment decisions, the next section evaluates the SMarT™ program (Thaler & Benartzi, 2004), which offers several contextual nudging strategies for improving consumer decisions about financial investments.

2.3 SMarT™ – Using Behavioral Economics to Increase (Employee) Saving

The functioning and strategies of the SMarT™ program are one of many possible solutions to the four problems identified in the previous course of this scientific work:

- 1) German investors seem to highly prefer conservative assets over return-oriented assets, even though these investments are not capable of increasing the value of money in real terms.
- 2) The German retirement system is not assumed to be able to maintain citizens' income and wealth, as the system is under significant pressure due to demographic and economic changes.
- 3) The money illusion causes investors to not think in terms of real values, resulting in their failure to recognize that those assets are not suitable for increasing the real value of money.
- 4) The consequences of procrastination and the psychological bias hyperbolic discounting lead investors to postpone the extremely important matter of financial planning and provision.

Some of these issues are based on perceptual biases, others are based on a lack of self-control. Thaler and Shefrin (1981) examined human behavior from this perspective of self-control and found that self-control is an extremely important factor in economic decision-making. This also means that self-control is an important factor in solving the problems regarding the economic perspective. However, as described in Section 2.2,

people regularly have difficulties controlling themselves when making important decisions. Thaler and Shefrin (1981) therefore recommend proactively engaging in long-term decision making: Making long-term decisions and then immediately forgetting about them is a helpful way to strengthen self-control. This is precisely where nudging strategies play a highly important role, and the SMarT™ program of Thaler and Benartzi (2004) aim exactly at this recommendation.

The main idea of SMarT™ (Thaler & Benartzi, 2004) is that savers, or in the original setting employees, commit themselves in the present to increase their savings rates in the future – simply put, to “save more tomorrow“. The program is thereby perfectly consistent with the idea of libertarian paternalism: Employees are of course not forced at any point to increase their savings rates in the future, but the framework of their decision-making is designed in a way that encourages them to do so. Thaler and Benartzi themselves describe their program as follows: “(...), we take seriously the possibility that some of [the] low-saving workers are making a mistake. By calling their low-saving behavior a mistake, we mean that they might characterize the action the same way, just as someone who is 100 pounds overweight might agree that he or she weighs too much. We then use principles from psychology and behavioral economics to devise a program to help people save more.“ (Thaler & Benartzi, 2004: 166).

In the present analysis, it was documented that a) German retirement provision will not be sufficient to maintain living standards, combined with the high risk of old-age poverty – which in other words means that German investors save too little, and b) that German investors invest their money too conservatively, leading to real wealth losses. When evaluating corresponding psychological biases and phenomena, it was found that people regularly fail to make appropriate financial investment decisions. Thaler and Benartzi (2004) identified three key reasons for poor savings behavior of retail investors: First, it is quite difficult to find a suitable investment product. Second, long-term financial provisioning requires self-control and third, procrastination prevents people from taking care of

adequate provisioning. Regarding Thaler and Benartzi's (2004) description of their SMarT™ program, it can therefore be classified as exceedingly suitable to help solve the problems summarized above. Thaler and Benartzi (2004) acknowledge that *standard* economic theory predicts that savers will have no interest in joining such plans. On the other hand, they point out that *behavioral* economic theory suggests that savers should precisely find such plans quite attractive. Against this background, the present analysis additionally surveys this interest among retail investors.

Overall, the SMarT™ program consists of two basic principles. Thaler and Benartzi's (2004) first strategy to overcome investors' inertia or procrastination is *automatic enrollment*. This strategy is based on the nudging idea of *defaults* described in Section 2.2.2. Since people could forget enrolling in savings plans due to inertia and procrastination, the assumption here is simply that people would like to join a retirement plan and are therefore enrolled by default. The researchers analyzed this strategy in the context of company pension plans: "In such plans, when employees first become eligible for the savings plan, they are automatically enrolled unless they explicitly opt out." (Thaler & Benartzi, 2004: 168). The results of Madrian and Shea's (1999) study, for example, show an increase in participation rates from 49percent to 86percent – an increase of about 75percent. The second strategy aims to *automatically increase investors' savings rates*. The rationale for this is hyperbolic discounting: From this bias, it can be deduced that investors are reluctant to save high amounts today for their supposedly distant future – they would probably prefer to spend their money today to receive an immediate and thus time-consistent reward. This suggests that investors would rather start with smaller savings rates than with high ones – though, higher savings rates are necessary to solve the risk of old-age poverty. Therefore, the second idea is to encourage investors to start with smaller savings rates that "do not hurt" and then automatically increase them to a target level. Of course, one could argue that people will simply abandon their savings plans or their increases in the medium term – but the same behavioral pattern that

prevents people from taking care of financial provision is now applied to prevent them from dropping these plans: The powerful effects of procrastination. Thaler and Benartzi (2004) have shown that the power of procrastination does indeed prevent savers from stopping their SMarT™ plans.

In its original version, the SMarT™ program of Thaler and Benartzi (2004) consists of four steps: First, employees are informed about the automatic savings rate increase a certain time before the increase – with respect to hyperbolic discounting, this period should be as long as possible. Second, the savings rate increase is implemented with the first salary payment after a salary increase – this ensures that savers are not noticeably influenced by the psychology of loss aversion. Third, future savings rate increases are automatically conducted up to a preset maximum savings rate. Fourth, savers have the option of withdrawing at any time - provided they want to. To evaluate their SMarT™ program, Thaler and Benartzi (2004) performed three sub-studies, which are briefly described below.

The first study was conducted in a midsize manufacturing company in the USA. Two different strategies were used: Participants were first offered the opportunity to receive professional advice from a financial consultant who calculated their individual optimal savings rate. Of 315 eligible employees, 286 agreed to meet with this advisor, but only 79 employees (28percent) accepted his recommendations. For the remaining 207 eligible workers, the advisor offered a version of the SMarT™ program, which was accepted by 162 workers (i. e. 78percent). Of these savers, only 2percent cancelled their plan before the first savings' rate increase. Another 18percent cancelled their plan until their fourth increase, meaning that 80percent of the savers retained their plan for more than four years. The SMarT™ program led to an increase in the average savings rate as a percentage of salary from 3.5percent before the program to 13.6percent after the fourth increase – that is, the average savings rate nearly quadrupled because of the SMarT™ program.

The second study was also conducted in a company in the USA, but with a completely different approach. Here, the strategy was to acquire suitable employees with minimal effort. Both employees who were not yet enrolled and already enrolled employees who were not yet saving the maximum savings rate were approached with just a single solicitation letter, without any further effort. This strategy resulted in 18.1percent of already enrolled employees participating in the SMarT™ program and thus benefiting from future savings rate increases and 8.2percent of employees who were not yet enrolled. Of course, one could argue that 8.2percent is not a large percentage, but it should be noticed that only one single letter was sent. In addition, the letter in this study had the subject “Important information about your 401 (k) account”, meaning that it is reasonable to assume that many workers who were not yet enrolled simply ignored this letter. Against this background, the effects can be classified as quite successful.

The third study by Thaler and Benartzi (2004) examined two different subject groups, each with different nudging strategies. Besides the fact that Study 3 confirmed the findings from Studies 1 and 2, the most important findings from this study are that the increase in savings rate does not necessarily have to be associated with a salary increase: Here, subjects were told that their savings rates would automatically increase each year regardless of whether they received a pay raise - in fact, in this setting, the average savings rate increase was even 2.75percent-points higher than in Study 2. In addition, Study 3 found that contact with a financial advisor further strengthened the effectiveness and compliance of SMarT™ plans.

Considering Thaler and Benartzi's (2004) approach to evaluate their SMarT™ program, one can recognize some of the nudging strategies described above. While this present analysis will generally follow their approach, it will consider additional influencing strategies that were not used in the described studies. Furthermore, this study does not consider only employees eligible for company pension plans: This study generally targets all potential retail investors, regardless of whether they are eligible

for company pensions, as those pension plans represent only one of three important layers of financial provision in Germany. This study is intended to provide insights that will help to capture the investment behavior of consumers. The methodical approach will therefore employ further developed approaches that help to go beyond the influence of nudges on company pension plans - these ideas are described below, before formulating according to research hypotheses in Section 2.5.

2.4 Approaches for Implementing SMarT™ in Germany

So far, Section 2 has described the economic perspective of financial investments, the psychological perspective including different nudging tools, and the SMarT™ program. This section aims to combine the findings from the previous sections by suggesting specific approaches to implement nudges in Germany following the SMarT™ program. Before that, it should be considered that there exist countless options how to design possible nudges that help to solve the problems and questions formulated so far – the following suggestions should therefore be considered as just that: Suggestions that must be tested in the course of this work. Nevertheless, these suggestions are of course based on scientifically researched concepts.

The following approaches all refer to improving the private customers' savings behavior, as this behavior can be the most effective way to solve the four described problems in the long term. However, this should not be interpreted as any type of limitation: The likelihood that nudging approaches that work to improve the savings behavior will also work to improve the investment behavior in general can be assumed to be very high. The following suggestions focus on the basic idea of the SMarT™ program: To encourage customers to “save more tomorrow“. As described above, the idea of the approaches below goes beyond the original SMarT™ strategies. While the original strategies are intended to encourage employees to opt for a savings plan at all, these methods could be described as

quite difficult to implement in the context of financial advisory. Financial advisors are legitimately not empowered to enroll their customers in specific savings contracts “by default“ or “based on pre-set assumptions“. This would likely, and rightly, alarm consumer protection agencies, as it can be assumed that some advisors would abuse those strategies for self-serving interests. Thus, these strategies are not aimed at encouraging customers to choose a savings plan at all, but at encouraging them to automatically *increase* the savings plans they have already chosen. Automatic savings plan *increases* are thus the central object of these strategies.

1) Defaults and pre-set assumptions: Since defaults have been identified as a highly powerful nudging approach (Thaler & Shefrin, 1981; Thaler, 1994; Thaler & Benartzi, 2004; Thaler & Sunstein, 2008), potential approaches should strongly consider this strategy. Moreover, defaults are the key component of the SMarT™ program: Here, savers are enrolled by default and their savings plans automatically increase each year once they are enrolled. While this research focuses on how financial advisors can encourage their customers to make more effective investment decisions, defaults could be used by explaining their customers that new savings plans *automatically increase* each year by a certain amount chosen by the customer. It can be assumed that customers who receive such information undergo substantially higher savings rate increases than customers who do not learn about those defaults. With respect to practical applicability in financial consulting, this procedure can be classified as easy to apply.

2) Defaults and pre-set assumptions: Heuristics in judgement and decision-making: As Piotrowski and Bünnings (2022) have shown, heuristics in judgement and decision-making seem also appear to have a significant impact on investment decisions. While the affect and availability heuristic tend to considerably influence one-time investments, the anchor heuristic has a significant effect on decisions regarding savings plans. The anchor heuristic can therefore be interpreted as a second supportive nudge to enhance the investment and saving behavior of retail customers. Financial advisors could, for example, recommend a certain amount for the annual

increase of their customers' savings plans. Of course, this amount should be based on sensible information such as the average inflation rate. Advisors could, for example, recommend increasing savings plans by a certain percentage or euro amount that corresponds to the average inflation.

3) Social proof: While describing Cialdini's (2021) persuasion strategies, it was highlighted that *social proof* is probably one of the most powerful tools for influencing people. The principle of social proof states that people use others as a guide in deciding whether a certain behavior or decision is correct (Lun et al., 2007). Several research findings indicate that people prefer to orient to people who are like them (Abrams et al., 1990; Akerlof et al., 1996; Burn, 1991; Gardner et al., 2000; Schultz, 1999). The choice of this influencing strategy is based on the fact that also Thaler and Sunstein identified *social nudges* as highly effective: "Humans (...) are often influenced by other humans, even when they shouldn't be" (Thaler & Sunstein, 2008: 64). In the financial advice setting, advisors could tell their customers that other clients like them have also decided to follow the suggestions to increase their savings plans by default. This strategy can be further strengthened by combining it with the anchor heuristic, i. e., recommending a default, automatic savings rate increase by an amount that other clients like the current client have also chosen.

While the above suggestions largely consist of amount-based recommendations for automatic increases, one last aspect should be considered: From the money illusion (Harrod & Fisher, 1929) described earlier, it can be inferred that humans have difficulty in thinking in relative amounts. Consequently, there could arise considerable differences in these three strategies depending on whether both the recommendation and the decision are in absolute amounts, i. e. in euros, or in relative amounts, i. e. in percentages. The strategies described above should therefore be tested in both absolute amounts as well as relative amounts.

2.5 Formation of Research Hypotheses

Regarding the conceptional background described in Section 2, consisting of the economic and psychological perspective, and the resulting strategy proposals, ten research hypotheses are formulated below that aim to test the suggestions for implementing SMarT™ strategies in the financial advice setting in Germany. The according overview of variables is illustrated in Section 3.1.1 after explaining the research procedure.

Research Hypotheses:

Hypothesis H_{1.1} The default-triggered savings rate increase in percent leads to a higher average savings ratio over a 5-year [H_{1.1a}] / 10-year [H_{1.1b}] / 20-year [H_{1.1c}] / 30-year [H_{1.1d}] period than the savings rate increase in euros.

Hypothesis H_{1.2} The anchor-triggered savings rate increases in percent leads to a higher average savings ratio over a 5-year [H_{1.2a}] / 10-year [H_{1.2b}] / 20-year [H_{1.2c}] / 30-year [H_{1.2d}] period than the savings rate increase in euros.

Hypothesis H_{1.3} The social validation-triggered savings rate increases in percent leads to a higher average savings ratio over a 5-year [H_{1.3a}] / 10-year [H_{1.3b}] / 20-year [H_{1.3c}] / 30-year [H_{1.1d}] period than the savings rate increase in euros.

Hypothesis H_{2a} Subjects who are told that their savings plan will automatically increase by a freely selectable euro amount each year opt for a higher average increase in the savings rate in euros than a control group that is only informed about the possibility of this increase.

Hypothesis H_{2b} Subjects who are told that their savings plan will automatically increase by a freely selectable percentage each year opt for a higher average increase in the savings rate in percent than a control group that is only informed about the possibility of this increase.

Hypothesis H_{3a} Subjects who are told that their savings plan will automatically increase by a suggested euro amount each year opt for a higher

average increase in the savings rate in euros than a control group that is only informed about the possibility of this increase.

Hypothesis H_{3b} Subjects who are told that their savings plan will automatically increase by a suggested percentage each year opt for a higher average increase in the savings rate in percent than a control group that is only informed about the possibility of this increase.

Hypothesis H_{4a} Subjects who are told that their savings plan will automatically increase each year by a suggested euro amount, which many other customers have also opted for, opt for a higher average increase in the savings rate in euros than a control group that is only informed about the possibility of this increase.

Hypothesis H₄ Subjects who are told that their savings plan will automatically increase each year by a suggested percentage, which many other customers have also opted for, opt for a higher average increase in the savings rate in percent than a control group that is only informed about the possibility of this increase.

Hypothesis H₅ With increasing age, the effect of the default-based [H_{5.1}] / anchor-based [H_{5.2}] / social validation-based nudge [H_{5.3}] on the savings rate increase in euros [a] / percent [b] decreases.

Hypothesis H₆ Increasing income strengthens the effect of the default-based [H_{6.1}] / anchor-based [H_{6.2}] / social validation-based nudge [H_{6.3}] on the savings rate increase in euros [a] / percent [b].

Hypothesis H₇ Increasing positive assessment of the SMarT™ program strengthens the effect of the default-based [H_{7.1}] / anchor-based [H_{7.2}] / social validation-based nudge [H_{7.3}] on the savings rate increase in euros [a] / percent [b].

3 Data and Methods

As the core of this research, Section 3 presents the methodical and scientific approach. To this end, the research design is first described with reference to the methodological procedure. Here, possible research approaches are weighed, and their respective advantages and disadvantages are discussed, followed by the derivation of the methodological procedure with special consideration of the findings from Section 2 and the resulting research hypotheses. Subsequently, the intended sample is described before elucidating the data collection procedure. Statistical analyses, which are composed of descriptive statistics, the exploratory data analysis, and inferential statistics are presented with their corresponding results in Section 4.

3.1 Research Design and Methodological Procedure

Section 2 presented and explored the conceptional background of this thesis' topic. Overall, the literature review led to the conclusion that increasing savings plans is particularly sensible from both decision-psychological and economic aspects. Building on the above economic and psychological foundations, concrete suggestions were developed on how SMarT™ strategies can be implemented in the German retail investor setting and how they can be adjusted to be practicable to an extent that goes beyond the tools of Thaler and Benartzi's (2004) original SMarT™ program. That is, Section 2 provides concrete suggestions for solving the research question of this scientific analysis: *How can strategies of the SMarT™ program and phenomena of behavioral finance be employed to improve the investment behavior of German private investors and what welfare gains can be generated compared to non-nudged investors?* Based on these suggestions, corresponding hypotheses were formulated. As a result, this research follows a hypothesis-testing design, which is categorized as a quantitative-deductive research approach (Sauer, 2019).

Of course, one could argue that a qualitative research approach would also be appropriate to answer this research question. However, this research is intended to present *first* insights about whether nudging strategies are effective in improving the investment decisions of retail customers in Germany and how this target group evaluates the principles of nudging from a moral and utility perspective. Again, it could be argued that first insights could be achieved through a qualitative approach. Yet, Section 2 provides extensive material on how influencing and nudging strategies have already been proven to be quite successful in other contexts, such as, most notably, in Thaler and Benartzi's (2004) SMarT™ program. That is, the present suggestions are derived from methods from other research that have already been tested and found to be successful – this implies that a qualitative approach that could identify possible strategies or ideas is not necessary because appropriate methods already exist. Therefore, these findings are now translated into possible ways of applying them in Germany. If these suggestions also prove to be effective and valid for German retail investors, a qualitative analysis can be conducted in a much more precise and targeted form, as such an analysis could focus entirely on improving or further developing the present suggestions. Thus, the main reason for the quantitative approach is simply efficiency, as numerous implementation approaches are available through prior research in other contexts.

3.1.1 Questionnaire Construction and Experimental Approach

For assessing the actual success of different nudges, a study under real-life conditions would be highly informative. To obtain those real-life conditions, banks or financial institutions could simply try to apply different nudges in their advisory meetings and then this study could compare the respective results. However, this approach is difficult to implement since German investment advice is regulated by tight requirements such as the Securities Trading Act (Wertpapierhandelsgesetz - WpHG) and the

Markets in Financial Instruments Directive II (MiFID II). To obtain *first impressions* of the potential success of the SMarT™ program in Germany, this study employs a research design that attempts to *imitate* real-life conditions. If these first impressions show positive effects and positive response of the SMarT™ program, potential follow-up studies could then attempt to achieve a study design that matches real-world conditions respecting the tight regulatory requirements.

For the design of a research approach that imitates real-life conditions, an *online questionnaire* is used as a suitable medium. Therefore, relevant requirements for the construction of such a questionnaire and the concrete course of its construction are discussed below. In general, this questionnaire will be divided into two parts: The first part aims to collect explanatory data, and the second part represents the experimental part, where participants are asked to imagine themselves in an arbitrary situation and then make some decisions nudged by the methods described in Section 2. In addition to obvious requirements such as anonymity and privacy, participants should be explicitly made aware of the necessity to make their decisions exactly as if their own real-world finances were at stake. This is achieved by describing to participants an imaginary story of a realistic advisory meeting in which they are asked to make specific decisions that are influenced by different nudges.

Before participants answer the experimental part of the questionnaire, sociodemographic data and information about their investment behavior are collected, which serve as explanatory data. Age is asked with a drop-down menu where participants select their current age, i. e., the variable age is a metric scale. Gender is asked with a single-choice question in which participants can select “male”, “female” or “diverse” – that is, the gender variable is a categorical nominal scale. Subsequently, subjects select their educational attainment on a categorical ordinal scale based on the German education system. Following the sector, they select their occupational status (employee, self-employed, official, ...) and their province,

which are also categorical nominal scales. In addition to these socio-demographic data, financial data are collected since the financial situation can obviously influence the investment behavior of the subjects. To ensure a variety of analysis options, these questions are intentionally asked in an opened format, requiring participants to freely enter their income, expenses, assets, real estate holdings, and current monthly savings amounts into an open text box. While this procedure results in a metric scale level, subjects may be reluctant to enter their exact income, expenses, etc. – it is likely that simply sorting them into ranges will lead to less hesitation by subjects. However, the pretest of the questionnaire shows no such hesitation – in fact, only 1 out of 20 pretest participants reported hesitation in entering this data. Regarding investment behavior, it might be useful to collect data on participants' risk appetite and their knowledge or experience with financial investments, as it can be assumed that experienced investors make different investment decisions than lay investors. Therefore, the risk appetite of the subjects is measured with five items, which are based on the questions from the investment advice process of the Sparkassen-Finanzgruppe.

At this point, participants are divided into different groups according to the different nudging strategies described in Section 2. This division results in a total of eight groups, which are structured as follows: First, a control group serves as a neutral basis for comparison. Since automatic savings plan increases can be formulated in either a monetary amount or a percentage, the control group itself is divided again into two respective subgroups ("*Control group 1*" and "*Control group 2*"). Against the background of the effects of the money illusion (Harrod & Fisher, 1929), this differentiation is highly sensible: Since humans regularly fail to adequately translate absolute values into relative values and vice versa, both approaches are considered in this study and the respective differences are elaborated. In addition to these two control groups, three study groups are formed for the three different nudging strategies, each of them divided into a "euro group" and a "percentage group" analogous to the control group.

Overall, all test subjects first read a fictional story described identically for all groups, which is intended to imitate a real financial advice situation (Attachment 1).

The instruction, which was identical for all groups, contained short facts to facilitate putting oneself in the situation. Moreover, this advisory situation is not purely fictional, but is based on the author's extensive experience from numerous advisory meetings. Hence, this situation can be classified as everyday business in a German bank, since it is relatively unlikely that customers will seek out the investment advice described below on their own initiative (also compare the discussion in Section 2). All subjects were told that an advisory meeting would be presented on the following pages and that they should imagine they were the customer. The trigger for this advisory meeting was described as a service issue: Opening a checking account, activating a debit card, enrolling in online banking, etc. – lastly, they were informed about the necessity to make all subsequent decisions as if it were about their own, real-world financial interests. In short, the advisory meeting was about such a service issue, which was quickly solved, and the advisor then moved to another topic: In this situation, the advisor was trying to cross-sell an investment fund savings plan. At this point, participants read the information that they would agree to receive some according information about it. That is, the outcome of this cross-selling attempt was described as the customer (i. e., the subject) being basically interested in the advisor's suggestion to contribute to an equity fund savings plan. This conversation is presented in Attachment 2 and was initially designed as a continuous text. However, some participants in the pretest reported that absorbing information from this relatively lengthy text was very demanding –therefore, the presentation of this conversation was revised and is now presented as a speech bubble-based illustration. Participants in a second pretest reported significantly improved readability and information processing.

Subsequently, depending on their group affiliation, they are then prompted to make two decisions that are triggered by the respective nudging strategies, which are described in the following. Overall, the first decision is the same for all eight groups: Here, participants are asked to enter the amount how much they would like to save each month. Of course, they were informed about the fact that they also could select €0.00. The technical design for this decision (and for the decision regarding the annual savings rate increase) is an open text box. Initially, it was considered to have a slider perform this decision, but this could introduce two problems: First, the extrema would have to be selected based on logical values. While this requirement can be met in principle, there is a second, even more limiting challenge: Given the power of the anchor heuristic, the slider extrema and its default position could well influence the subjects' decision (Tversky & Kahneman, 1974; Lavin et al., 2019; Piotrowski & Bünnings, 2022). Of course, this type of influence could lead to positive outcomes, but the purpose of this analysis is to evaluate the effects of the three nudging strategies described. Therefore, it should be ensured that, if possible, no further stimuli influence the decision situation except the respective nudges. After selecting the fictitious savings rate, customers (i. e., subjects) in the control group were then simply informed that they *could* additionally select a certain amount (Control group 1 in euros and Control group 2 in percentage) by which their savings plan is increased each year. Since the control groups serve as a basis for comparison, no nudges are implemented in the decision-making process.

While participants in Study group 1 were exposed to the same information and conversation as participants in the control groups, their decision situation regarding the savings plan increase was nudged by the first strategy: Defaults and pre-set assumptions. As described above, the study groups are also divided into two subgroups analogous to the Control group: Study group 1.1 for defaults and pre-set assumptions in euros and Study group 1.2 in percentage. In the default-based nudging approach, subjects were first asked to select their desired savings rate (non-nudged) and were

then informed that all savings plans would be automatically equipped with an automatic increase function and that they would only need to select the desired increase amount. Accordingly, it was simply assumed as a default setting that an automatic increase would be selected in any case, though participants could also select “€0.00”, or “0.00percent”, respectively.

The subjects from study group 2 were exposed to the second nudging strategy: Heuristics in judgement and decision-making. Here, as suggested in Section 2, customers were informed about the fact that all savings plans would be automatically equipped with an automatic increase function (analogous to Study group 1), while the advisor additionally actively suggested a specific increase amount. That is, the advisor both explained the annual increase as a standard practice and provided a specific anchor value to encourage customers to follow this anchor value. The anchor value for the Study group 2.1 (euro amounts) is constructed as follows: According to Statistisches Bundesamt (2022), the average savings rate in Germany is €240.00. Calculating the annual inflation value attributable to this by multiplying €240.00 by the average 50-year inflation rate of 2.56percent yields an inflation amount of €6.14 per year. The advisor therefore recommended to automatically increase the savings plan by €6.14 per year and justified this amount with the equivalence to the average inflation. The participants in Study group 2.2 were recommended to automatically increase their savings plan by 2.50percent per year, which also corresponds to the 50-year inflation, rounded down.

The last strategy, social proof, is employed in Study groups 3.1 and 3.2. Here, subjects received a) the information that the annual automatic savings plan increase was standard practice, b) a suggestion for a specific anchor value that corresponds to the anchor values in Study group 2, and c) the information that other customers like them or in a similar situation have also selected the recommended increase amount.

In short, participants in the Control groups are not nudged, while participants in Study group 1 are nudged with defaults and pre-set assumptions, participants in Study group 2 are nudged with defaults and pre-set assumptions combined with the anchor heuristic, and participants in Study group 3 are nudged with defaults and pre-set assumptions, the anchor heuristic, and the social proof principle. All four groups are divided into two subgroups: One for euro amounts and one for percentage amounts.

The questionnaire concludes with a final section that considers the moral perspective of nudging and influencing strategies in relation to financial decisions. To this end, participants are first informed about how nudges and the SMarT™ program work, highlighting the positive intentions and the financial advantages of this approach. The explanation is consistent with the facts described in Section 2, focusing on the origin of this approach as well as its idea of utilizing the same principles to improve financial decisions that deter us from taking care of this issue: Procrastination and inertia. Subsequently, participants answer six ordinal-scaled items, which are then aggregated into a metric-scaled "Overall Assessment of SMarT™" five-point scale. These items consider a) a general evaluation of nudging strategies, b) their positive impact on customers' wealth, c) the classification as manipulation, which was justifiable if the intentions were beneficial, d) their effectiveness in overcoming inertia and procrastination, e) their general justifiability (inversely coded), and f) whether they would agree with their advisors' recommendation if they explained the intentions and background. The last question is a digital statement (yes or no) about whether participants support nudging in this context, which corresponds to a categoric nominal scale.

Finally, some global aspects of the questionnaire are highlighted below. First, it is important to note that subjects did not receive any compensation or other incentives for participating in the survey. Therefore, it can be assumed that no reciprocity principles influenced the responses. Regarding the form of address, the participants are addressed informally

in the questionnaire. The reason for this is that informal addressing is expected to create a more familiar atmosphere in this context. Since this questionnaire asks for very personal data such as financial data, a familiar atmosphere is considered helpful for a high willingness to share these data. On the other hand, financial topics are usually discussed with financial advisors, who tend to use the formal form of address — this would imply that the formal form of address would be more appropriate. However, in this procedure, participants are asked to imagine that they are participating in an advisory meeting. In this regard, it is believed that the informal salutation helps participants to better empathize with this fictional situation, as the atmosphere is more familiar and resembles a story being told. In the presented advisory interview itself, of course, the formal form of address is used. Furthermore, the intended sample for this analysis is more likely to be of younger age, as financial provision and retirement planning are particularly relevant for younger savers (Geyer, 2014; Haan et al., 2017).

Now that the variables are known to the reader, the interplay between the variables based on the hypotheses formulated in Section 2.5 is illustrated in Figure 8. It should be noted that the dependent variable "Selected Savings Rate" is not included in the hypothesis testing, as this variable is not of interest for the purpose of this research, which is evaluating the effectiveness of nudges in *increasing* the chosen savings rates of retail investors. The group affiliation is an explanatory dummy variable for the different study groups: Control group 1, Control group 2, etc., and Study group 3.2. The strength of its influence on the dependent variables is assumed to be moderated by participants age, their income, and their assessment of the applied nudging strategies. Regarding the increase in the savings rates itself, the percentage nudges are assumed to be more effective than the euro-related nudges (H1, right-hand side of Figure 8).

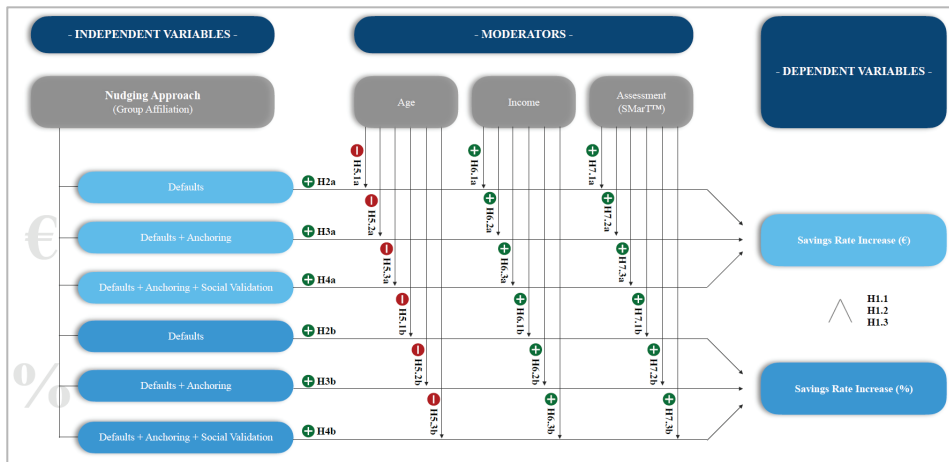


Figure 8. Interplay between Explanatory and Dependent Variables.

3.1.2 Quality Criteria of Research

Before illuminating the sample and data collection procedure, the quality criteria of this research are considered. The first criterion, *objectivity*, means that the research results are independent of the person conducting the research and that, consequently, other researchers at other times obtain identical results (Himme, 2007). Objectivity is thereby divided into three subtypes: *Implementation objectivity* is fulfilled when the investigator does not influence the subjects through verbal instructions, non-verbal or para-verbal signals. In addition, subjects must not learn anything about the research objectives prior to the data collection. Since this study uses an online survey as the data collection instrument and participants do not learn about the objectives until after the experimental part, this requirement is met: All subjects read the same instructions, which cannot be influenced by the investigator. *Evaluation objectivity* is fulfilled if the analysis itself is based on uniform analysis methods: The collected data are analyzed with common analysis methods, using the statistic software R Studio. The analysis procedure can therefore be considered rule-based,

which means that other researchers should obtain similar results when using similar methods. *Interpretation objectivity* requires objective interpretations and conclusions. Although it cannot be ruled out that readers of this paper may interpret the following results differently than presented in this paper, all results are interpreted in comparison to their respective control group so that the interpretation within this analysis is on a consistent basis.

The second criterion, *reliability*, describes the proportion of the variance of the “true“ values to the variance of the observed values – the measurement accuracy (Schmidt-Atzert et al., 2022). Thus, a method or analysis can be classified as reliable if the methodical procedure captures the construct being measured very accurately. According to Schmidt-Atzert et al. (2022), there are four common methods to estimate reliability. To test the reliability of this scientific analysis, the *split-half reliability* is calculated. In simple terms, the split-half reliability is calculated by dividing a test or questionnaire in two equal halves and then evaluating their correlation (Schmidt-Atzert et al., 2022). While the split-half reliability can be calculated for individual scales, such as “risk appetite“, its analysis in this context aims to assess the accuracy of the experimental approaches as a whole. This means that the subgroups (Control 1, Control 2, Study 1.1, Study 1.2, etc.) are each first divided into two equal halves and then their respective results are compared. For this, the variables to be tested of each half are correlated with each other. The two halves are formed using the odd-even-method (Schmidt-Atzert et al., 2022): Subjects are divided into the two halves by assigning subjects with an even reference number to one group and those with an odd reference number to the other group. The reliability of this analysis can be considered high if these correlations, which are presented in Table 1, are high. It should be noted that calculating these correlations requires equal sizes of the two halves. If they are unequal in size, the larger group is reduced by one randomly selected observation. Considering these correlations, there are two striking insights: Unfortunately, none of these correlations between the “odd“ and “even“ groups

are statistically significant at $\alpha < .05$ nor are their coefficients economically high. The first thought would be to conclude that there is no within-subgroup reliability or that a measurement error has occurred – but we should consider some limitations of this reliability analysis.

Table 1. *Reliability Analysis of Dependent Variables*

Group	Selected Savings Rate	Dynamization (€)	Dynamization (percent)
Control group 1	.0182	.1595	—
Control group 2	.1506	—	.0180
Study group 1.1	- .1245	.1151	—
Study group 1.2	.0395	—	- .4061
Study group 2.1	.1854	.0344	—
Study group 2.2	- .2965	—	.3009
Study group 3.1	.2640	.1539	—
Study group 3.2	.0290	—	.0551

Notes. Method: Pearson's correlation. Significant correlations are in bold. Control group 1: $n_{1/2} = 14$; Control group 2: $n_{1/2} = 15$; Study group 1.1: $n_{1/2} = 14$; Study group 1.2: $n_{1/2} = 14$; Study group 2.1: $n_{1/2} = 15$; Study group 2.2: $n_{1/2} = 16$; Study group 3.1: $n_{1/2} = 11$; Study group 3.2: $n_{1/2} = 14$.

Although the sample size of $n = 226$ implies high goodness of this research approach (see Section 3.2), the subgroup sizes are considerably small, especially due to the division into two halves. To detect a hypothesized correlation of, for example, $r = .50$, significant at $\alpha < .05$, with a statistical power of $1 - \beta = .90$, each group would require a subgroup size of $n_{1/2} = 37.03547 \approx 38$, which is not true for the above correlations. It follows that the small coefficients could simply be due to the small size of the subgroups. In addition, it is well known that correlation requires variance – however, some subgroups have strikingly identical increase amount values, such as Study 2.1, 2.2, 3.1, and 3.2. Identical values may result in low variance, which in turn could explain their low linear correlation or

lack of statistical significance. Although this reasoning could be interpreted to mean that this lack of reliability is not taken seriously, these observations are treated with appropriate caution. That is, the following statistical analyses are conducted with appropriate vigilance. Furthermore, the statistical analysis will consider the accurateness of the nudges' effectiveness with caution.

To assess the reliability of individual scales, their internal consistency is considered by calculating Cronbach's alpha (Cronbach, 1951), which provides information about how good the relationship is between individual items in relation to their overall scale (Schmidt-Atzert et al., 2022). For the "Knowledge in Securities" scale, Cronbach's alpha is $\alpha = .93$, for participants' "Risk Appetite", $\alpha = .80$, and for participants' assessment of the applied nudging strategies, $\alpha = .82$. Although there is no "always fit" rule for interpreting Cronbach's alpha, this measure can be interpreted as appropriate when $\alpha > .70$ (Streiner, 2003). Since this holds true for all three important explanatory variables, their scales are classified as "reliable".

The third and final criterion, *validity*, considers two aspects: First, *internal validity*, which addresses the question of whether the measurement measures what it is supposed to measure (Himme, 2007). In the context of the present analysis, internal validity is assumed to be sufficiently met for two reasons: First, the assignment to the control and experimental groups is purely random using a random generator with equal assignment probabilities. Second, the effectiveness of nudging strategies is not interpreted arbitrarily but in relation to the corresponding control groups. Therefore, potential effects can indeed be attributed to the nudges with a very high probability. *External validity* describes that the results of the measurement can be generalized beyond its study (Himme, 2007). Since this criterion considers the validity of *results*, this criterion will be assessed in the corresponding Section 4) Results.

3.2 Sample, Statistical Power Analysis & Data Collection

Up to this point, the methodological approach was highlighted by describing the process of questionnaire development and the experimental approach, followed by the evaluation of common research quality criteria. In the following, the sample, the statistical power analysis, and the data collection are illuminated. Therefore, the desirable sample size is calculated according to Cohen's (1988) guidelines, which serve as a basis for evaluating the quality of this analysis. These calculations are then compared with the sample size obtained, which allows conclusions to be drawn about the quality of this analysis. Finally, some details on the data collection procedure are explained with respect to the survey period and strategy.

Before considering the calculations concerning the desirable sample size, some aspects should be noted in advance. Most important, previous studies cited in this research that would be suitable, especially in terms of their methodological procedure, as a basis for these calculations do not consider evaluations regarding their statistical power or desirable sample size. That is, the assumptions made for the present power analysis are precisely this: Assumptions. This observation was already made by Cohen in 1988: "(...), we find evidence that statistical power is frequently not understood and, in reports of research where it is clearly relevant, the issue is not addressed" (Cohen, 1988: 1). The following calculations regarding the desirable sample size refer to an *analysis of variance* (ANOVA) with one factor, as this method is suitable to investigate the statistical significance of differences of metric scaled variables between more than two groups (Sauer, 2019), which applies to the methodical design of this study.

To calculate the desired sample size according to Cohen (1988), the following parameters are required: The *desired statistical power* ($1 - \beta$), the *significance level alpha* (α), the *number of groups* (k), and the *estimated effect size* (f). Simply put, the statistical power is the probability that a test or study will detect significant differences between groups or conditions when those differences exist (Cohen, 1988). Since a low statistical

power would imply a high type II error (β), i. e., the likelihood of missing effects that exist, a high statistical power is desirable. Consequently, the statistical power is described by $1 - \beta$, whereas β should not be larger than 10percent in this study. In this case, the statistical power is $1 - \beta = 1 - .10 = .90$. Although a lower statistical power would result in a smaller required sample size, this would imply a lower goodness of this study. For this reason, the type II error should not exceed 10percent. The significance level alpha (α) stands for "the risk of mistakenly rejecting the null hypothesis" (Cohen, 1988: 4), which can also be interpreted as a "false alarm". In other words, the significance level alpha is the probability of supposedly identifying an effect that does not exist. In this study, this probability should not exceed 5percent, resulting in a significance level of $\alpha = .05$. Regarding the group size, this study consists of eight groups. Since one half of these eight groups consider effects measured in euros and the other half consider effects measured in percentages, the present analysis does not evaluate the isolated amounts of savings rate increases (this would require two ANOVAs with four groups each, one considering the euro and the other the percentage amounts), but the long-term average monthly savings rate at an investment perspective of 5, 10, 20, and 30 years. These values are then evaluated with four eight-level ANOVAs (one for each investment perspective), which is why the number of groups for each ANOVA is $k = 8$ (two control groups and at total six study groups). It is important to note that this comparison assumes largely equal savings rates chosen by the subjects. Unequal savings rates would result in an unequal basis and potentially bias any effects. For the last parameter, the effect size f , a medium effect is expected. The reason for this is that in the study by Piotrowski and Bünnings (2022), an effect size of $d = .62684$ was found when comparing the differences in the savings rates of two groups (control and experimental group). According to Cohen (1988), effect sizes between two means can be interpreted as medium if they are larger than $d = .50$, which is true in this example. As this example is relatively like the second nudge of this study, it is assumed that this medium effect should also be found in

this study. However, this effect size requires translation into the study design used here: Unlike Cohen's d , which was designed to compare *two* groups, Cohen's f is appropriate for comparing *more than two* groups. Cohen's f can be interpreted as medium if it is larger than 25percent (Cohen, 1988), which is why $f = .30$ is targeted for this study (f is set slightly larger than medium as the effect size in the study by Piotrowski and Bünnings (2022) was also slightly larger than medium). Now the required sample size for an ANOVA is calculated using the software R Studio. With $1 - \beta = .90$, $\alpha = .05$, $k = 8$ and $f = .30$, a sample size of $n = 26.287 \rightarrow n \approx 27$ is required for each group to detect significant effects. This leads to a desired total sample size of $n_d = 8 \times 27 = 216$. The actual sample of this research consists of 272 subjects, of which 46 terminated before completion, resulting in a total sample of $n = 226$ participants.

As mentioned earlier, statistical power suffers with a smaller sample size - so in turn, a larger sample size enhances the statistical power. The sample size of this study ($n = 226$) is even larger than the calculated desired sample size of $n_d = 208$, which strengthens the quality of this study: With $n_s = 226$, $\alpha = .05$, $k = 8$ and $f = .30$, the power is $1 - \beta = .9235651 \approx .92$. It follows that the probability of a type II error is $\beta = .08$, which means that potentially existing effects could be missed with a probability of merely 8percent. This relatively low β is interpreted as a major strength of the quality of this research. It can therefore be expected that the data analysis can reveal highly informative and significant results if those effects exist.

Table 2. *Participants' Professional Background*

Sector	%	Sector	%
1) Advertising & Marketing	1.33	10) Finance & Real Estate	24.78
2) Agriculture & Farming	0.00	11) Pharma & Healthcare	4.87
3) Art, Culture & History	1.33	12) Public Service & Institutions	23.01
4) Chemistry & Raw Materials	1.77	13) Services	7.52
5) Construction & Craft	4.87	14) Trade & E-Commerce	3.10
6) Consumption & Retail	4.42	15) Technology & Telecomm.	2.65
7) Economy & Politics	1.33	16) Tourism & Gastronomy	0.88
8) Education & Pedagogy	7.52	17) Transport & Logistics	2.65
9) Energy, Electronics & Ecology	5.75	NA	2.21

Notes. Own illustration. Differences to 100.00% possible due to rounding.

As described above, the sample is collected through an online survey. This survey was created with Soscisurvey, a free survey tool for non-profit academic research, and was registered on the May 19, 2023. After a pretest with $n_{PT} = 16$ people who did not participate in the final version due to potential bias from their initial participation, the survey was online from the August 01, 2023 to October 12, 2023. The survey itself was shared via social media and with the acquaintances of the author and his work colleagues from the sales team of DekaBank Dt. Girozentrale. Thereby, it was important to ensure that no expertise in (behavioral) finance would bias this study – therefore, acquaintances and work colleagues were instructed not to complete the survey themselves, but to share it with their own acquaintances, who are more likely to have rather lay knowledge in finance. Of course, it was not the intention to consider solely people who have no financial knowledge at all, but this approach helps to rule out the possibility of the sample being biased by a too high level of expert-based financial knowledge. Table 2 provides detailed information about the distribution of the participants' professional background.

Regarding the origin of the subjects, it should be noted that most participants (76.99percent) come from North Rhine-Westphalia, 4.87percent from Niedersachsen, 3.98percent from Bayern, 3.10percent from Hessen, 2.65percent from Schleswig-Holstein, 1.77percent from Thüringen, 1.33percent from Berlin, 1.33percent from Mecklenburg-Vorpommern, and 3.98percent from other German states. This distribution could of course lead to a major bias of potential effects: It cannot be ruled out that investors in North Rhine-Westphalia make different investment decisions than investors from, for example, Northern Germany or Southern Germany. Inferences from the present sample to the corresponding population should therefore be drawn with some caution, which at the same time represents an important implication for further research.

Table 3. *Participants' Education and Occupational Status*

Educational Background		%	Occupational Status		%
1)	Lower Secondary School Dipl.	1.77	1)	Pupil	0.00
2)	Secondary School Diploma	13.27	2)	Trainee (apprenticeship)	2.20
3)	Vocational Baccalaureate Dipl.	12.83	3)	Student	9.70
4)	High School Diploma	32.30	4)	Dual Student (part-time empl.)	6.20
5)	Bachelor's Degree	25.22	5)	Employee	66.80
6)	Master's Degree	13.72	6)	Civil Servant	7.50
7)	Doctorate	0.88	7)	Self-employed	4.40
			8)	Pensioner	3.10

Notes. Own illustration. Differences to 100.00% possible due to rounding.

Last, Table 3 illustrates the subjects' educational background and occupational status. Among the $n = 226$ participants, 65.56percent are employees, plus another 6.11percent who are both part-time employees and students. Thus, more than two-thirds of the subjects are (part-time) employed – this target group is of particularly high interest for nudging strategies regarding their savings behavior, as exactly this group represents citizens who will be especially vulnerable to old-age poverty (Haan et al., 2017). With respect to the educational background, it should be noted that

only 14.45percent have a (lower) secondary school diploma, which indicates a relatively high level of education among the participants.

4 Results and Implications

This chapter highlights the results that emerge from the methodological approach and is divided into two parts: Chapter 4.1 highlights the statistical analysis, which is briefly explained at its beginning. Section 4.2 then discusses the resulting findings, links them to relevant aspects derived in the literature review and conceptual background and concludes with important implications for both the scientific, and particularly the practical perspective.

4.1 Descriptive Statistics, Exploratory Data Analysis, and Inferential Statistics

Below, the main statistical analysis is performed, which is structured as follows: First, statistical analyses are performed to evaluate the effectiveness of the different nudges. Subsequently, the hypotheses formulated in Section 2 are tested. Finally, other interesting connections beyond the hypothesis testing are illuminated. For this, each individual analysis consists of three parts: It starts with a description of the descriptive statistics, is complemented by an exploratory data analysis with appropriate illustrations and is concluded with inferential statistics to check whether observations are statistically significant. Table 4 provides a comprehensive overview of explanatory and dependent variables, which are briefly explained below.

Considering participants' age, the average age in the total sample is $M = 35.47$, while the youngest subject is $\text{Min} = 19.00$ and the oldest subject is $\text{Max} = 75.00$ years old. The age varies in a range from 32.00 (Study 2.1) to 41.50 (Control 2), indicating that all groups are relatively close to the overall average. This is important for equal conditions - too strong differences could distort any effects. Of the $n = 226$ participants, 66.00percent are female and 34.00percent are male. The lowest proportion of women is in Study 3.1 (59percent) and the highest proportion is in Study

3.2 (86percent). It follows that there is a strong woman surplus in the sample, especially in Study 3.2. This ratio must be adequately considered, especially when interpreting possible effects. For an objective statistical analysis, an approximately equal distribution would have been more appropriate. The following five variables in Table 4 consider the participants financial situation (income, expenses, wealth, real estate wealth and savings rates), which are expressed in “TEUR” (thousand euros) for presentation reasons, except for the current savings rates, which are expressed in € like the selected fictitious savings rates. The income averages €2,640, with the lowest mean at €2,330 and the highest mean at €2,870. Although this range is relatively large [€540,00], the income is not expected to have a substantial impact on the savings rate increases, as subjects choose their own individually desired savings rate.

Table 4. *Descriptive Statistics*

	Unconditional		Control 1		Control 2		Study 1.1		Study 1.2		Study 2.1		Study 2.2		Study 3.1		Study 3.2	
	Mean SD	Min Max	Mean SD	Min Max	Mean SD	Min Max	Mean SD	Min Max	Mean SD	Min Max	Mean SD	Min Max	Mean SD	Min Max	Mean SD	Min Max	Mean SD	Min Max
<i>Explanatory Variables</i>																		
Age	35.47 12.86	19.00 75.00	41.50 14.75	20.00 75.00	34.97 13.78	21.00 73.00	35.38 12.48	21.00 62.00	34.92 11.29	23.00 63.00	32.00 11.44	19.00 65.00	33.91 11.89	19.00 63.00	36.45 13.10	20.00 67.00	35.36 13.33	22.00 75.00
Gender: Female	0.66 0.48	1.00 2.00	0.68 0.48	1.00 2.00	0.61 0.50	1.00 2.00	0.55 0.51	1.00 2.00	0.72 0.46	1.00 2.00	0.60 0.50	1.00 2.00	0.64 0.49	1.00 2.00	0.59 0.50	1.00 2.00	0.86 0.36	1.00 2.00
Income [TEUR]	2.64 1.51	0.00 10.00	2.77 2.01	0.00 10.00	2.57 1.34	0.45 7.00	2.87 1.57	1.00 9.00	2.75 1.50	0.35 6.00	2.55 1.51	0.00 6.00	2.80 1.66	0.00 10.00	2.33 1.21	0.50 6.50	2.45 1.12	0.60 5.30
Expenses [TEUR]	1.38 0.92	0.03 7.50	1.62 1.36	0.08 7.50	1.28 0.73	0.10 3.50	1.41 0.84	0.50 4.00	1.72 1.29	0.03 6.00	1.22 0.86	0.10 3.00	1.37 0.75	0.30 3.50	1.10 0.66	0.20 3.00	1.32 0.59	0.03 2.50
Wealth (cash) [TEUR]	60.34 142.40	0.00 1,300	115.60 192.30	0.00 900	79.36 237.8	0.00 1,300	52.62 59.96	0.50 250	83.08 202.50	0.00 1,000	30.64 37.75	0.00 150	35.64 45.31	0.40 200	48.3 128.40	0.00 600	42.13 76.52	0.00 350
Wealth (real estate) [TEUR]	169.70 414.30	0.00 4,000	212.90 437.40	0.00 2,200	148.70 411.50	0.00 2,000	183.40 303.20	0.00 1,400	264.80 806.80	0.00 4,000	198.60 469.90	0.00 2,000	127.00 194.40	0.00 600	104.50 219.30	0.00 800	121.20 194.20	0.00 500
Current Savings Rates [%]	428.66 459.69	0.00 2,500	387.14 454.74	0.00 2,000	512.42 580.44	0.00 2,500	524.66 431.12	0.00 1,800	502.64 553.21	0.00 2,300	319.00 324.68	0.00 1,500	473.49 516.47	0.00 2,000	270.91 289.37	0.00 1,200	400.61 398.49	0.00 1,500
Knowledge in Securities	3.21 1.46	1.00 6.00	2.94 1.42	1.00 6.00	3.29 1.56	1.00 6.00	3.18 1.33	1.00 6.00	3.14 1.47	1.29 6.00	3.36 1.37	1.00 6.00	3.78 1.45	1.00 6.00	3.07 1.39	1.00 5.71	2.74 1.60	1.00 6.00
Risk Appetite	3.64 1.15	1.00 6.00	3.41 1.10	1.60 6.00	3.72 1.27	1.00 6.00	3.63 0.95	2.20 5.40	3.53 1.19	1.20 5.40	4.10 0.99	1.40 6.00	3.92 1.12	1.60 6.00	3.46 1.17	1.00 5.40	3.22 1.17	1.00 6.00
Assessment of SMarT™ (scale)	3.64 0.73	1.00 5.00	3.65 0.73	1.67 4.83	3.53 0.82	1.33 4.83	3.62 0.74	1.50 4.67	3.67 0.63	2.33 4.67	3.77 0.75	1.67 4.83	3.60 0.66	2.00 4.67	3.66 0.95	1.33 4.83	3.66 0.63	2.67 5.00
Assessment of SMarT™ (accept.)	0.77 0.43	1.00 2.00	0.75 0.44	1.00 2.00	0.77 0.43	1.00 2.00	0.83 0.38	1.00 2.00	0.80 0.41	1.00 2.00	0.80 0.41	1.00 2.00	0.76 0.44	1.00 2.00	0.68 0.48	1.00 2.00	0.71 0.46	1.00 2.00
<i>Dependent Variables</i>																		
Selected Savings Rate [%]	110.40 109.90	0.00 750.00	116.10 140.80	0.0000 500.00	106.00 87.58	0.00 300.00	176.7 168.00	0.00 750.00	109.60 78.19	0.00 250.00	118.80 120.40	0.00 500.00	113.80 79.40	0.00 300.00	52.95 43.17	0.00 150.00	73.57 63.83	0.00 250.00
Dynamization [%]	9.24 15.90	0.00 100.00	7.95 15.74	0.00 50.00	— —	— —	12.07 16.66	0.00 50.00	— —	— —	9.61 18.80	0.00 100.00	— —	— —	6.64 10.14	0.00 50.00	— —	— —
Dynamization [%]	2.41 3.75	0.00 25.00	— —	— —	0.88 1.58	0.00 5.20	— —	— —	5.88 6.64	0.00 25.00	— —	— —	1.67 0.43	0.00 5.00	— —	— —	1.88 1.10	0.00 2.50

Notes. Own illustration based on n = 226. Participants in Control group 1 = 28; Control group 2 = 31; Study group 1.1 = 29; Study group 1.2 = 25; Study group 2.1 = 30; Study group 2.2 = 33; Study group 3.1 = 22; Study group 3.2 = 28. In the course of the data analysis, Rows 94, 106, and 137 will be removed from the data set due to far above-average dynamization amounts. Further four observations are removed due to incomplete data (NAs). This might affect the descriptive statistics. A duplicate of this table with adjusted descriptive statistics can be found in Attachment 6.

The variable “Knowledge in Securities“ measures participants’ knowledge about financial instruments on a six-point scale consisting of seven items corresponding to the risk classes of financial instruments according to the German Securities Trading Act (WpHG). To calculate an overall knowledge scale, the seven items are aggregated according to the following formula:

$$\text{Knowledge in Securities} = \frac{1}{n} \sum_{i=1}^n x_i$$

In the total sample, the knowledge averages $M = 3.21$, while the lowest average is $M = 2.74$ in Study 3.2 and the highest average is $M = 3.78$ in Study 2.2. Since the knowledge could have an impact on the chosen savings rate increase, this variable could be of high importance. The subjects “Risk Appetite“ is structured in the same way as their knowledge in securities: A six-point scale with five items aggregated to their “general risk appetite“:

$$\text{Risk Appetite} = \frac{1}{n} \sum_{i=1}^n x_i$$

The overall risk appetite averages $M = 3.64$, while the lowest risk appetite averages $M = 3.22$ in Study group 3.2 and the highest risk appetite averages $M = 4.10$ in Study group 2.1. These figures are already interesting: German investors are known to be quite conservative (Bank und Markt, 2017), but this assessment can already be interpreted as risk-seeking.

The following variable “Assessment of SMarT™ (scale)“ is also structured similarly to the previous two variables: It consists of a five-point scale with six items that were described in Section 3.1. The index of these six items is aggregated by:

$$\text{Overall Assessment of SMarT}^{\text{TM}} = \frac{1}{n} \sum_{i=1}^n x_i$$

The $n = 226$ participants rated the applied ideas of the SMarT™ program with an average $M = 3.64$ points from a maximum of 5.00 points, which can be interpreted as relatively high. Control group 2 had the lowest

rating of $M = 3.53$ and Study group 2.1 had the highest rating of SMarT™ with $M = 3.77$. From this, it can be inferred that the range is relatively close, indicating a commonly high rating. Inferential statistics should analyze whether the groups differ significantly in their assessment at all, or if they are all ranked relatively equally high.

The next variable, which also considers participants' evaluation of the SMarT™ program, represents a digital assessment of whether participants agree or disagree with the implementation of nudges. Here, the rate of agreement is presented: In the overall sample, 77percent would agree to implement the applied nudging strategies if financial advisors would explain the intended purpose (which was described in extensive detail in Section 2.2). The lowest agreement rate is 68percent in Study group 3.1 (which is still well over half) and the highest agreement rate is as high as 83percent in Study group 1.1. Already here, subjects largely agree with these strategies – though, their effectiveness has not yet been analyzed.

Last, the dependent variables are described. The “Selected Savings Rate” is the amount that the subjects chose as their fictitious new savings rate. In the overall sample, this averages $M = €110.40$, while the lowest average is found in Study 3.1 with $M = €52.95$, and the highest average is found in Study 1.1 with $M = €176.70$. It should be noted that these averages differ significantly, which could be due to differences in participants' income. In fact, the correlation between the income and the selected savings rate is with $r = .25$; $p < .01$ highly significant. These differences are likely to affect the aim of analyzing the success of the nudges by comparing average monthly savings rates - this would require largely equal average savings rates. That issue is adequately addressed by calculating participants' savings ratios, which should largely mitigate the differences in the selected savings rates - incidentally, this approach is consistent with the study design of Thaler and Benartzi (2004), who also considered savings ratios. The selected increases are stored in the variables “Dynamization [€]“ and “Dynamization [percent]“, respectively. For the euro amounts, this increase averages $M = €9.24$ in the overall sample, while the lowest average

is found in Study 3.1 with $M = €6.64$ and the highest average is found in Study 1.1 with $M = €12.07$. For the percentage amounts, the unconditional average increase amount is $M = 2.41$ percent, while the lowest average is $M = 0.88$ percent in Control group 2 and the highest average is $M = 5.88$ percent in Study 1.2.

Regarding the effectiveness of the nudging approaches and in particular regarding the above-described lack of statistical reliability of the nudging groups, Figure 9 illustrates the ratios of how much participants chose the provided anchor value. In Control 1, Study 1.1 and Study 1.2, no subject chose the euro or the percent anchor. Only in Control 2, two subjects (i.e., 6.45 percent) chose the anchor value of 2.50 percent, which can be classified as pure coincidence, since they did not learn about this anchor. In Study 2.1 (56.67 percent), 2.2 (51.52 percent), 3.1 (63.63 percent), and 3.2 (75.00 percent), many subjects were guided by the provided anchors or social validation nudges, respectively. This illustration simply aims to show that the nudging approaches point in the desired direction, despite their low statistical reliability.

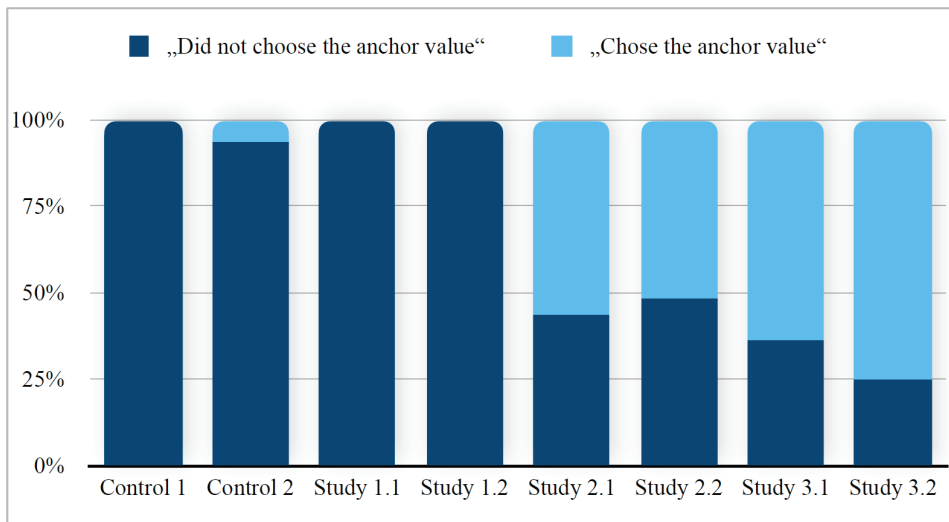


Figure 9. Effectiveness of Anchoring and Social Validation.

Notes. “Chose the anchor value” is assigned if the euro groups chose exactly €6.14 and if the percent groups chose exactly 2.50percent. Otherwise, “Did not chose the anchor value” is assigned.

Up to this point, this section provided descriptive statistics and explained the variables, giving initial insight into the success of two of the three nudging approaches. Now that the variables are familiar to the reader, the statistical analysis regarding the research hypotheses can be conducted, which was already graphically illustrated in Figure 8.

As described in the calculation of the required sample size for this methodical approach, an eight-level ANOVA design is used to assess the general effectiveness of the different nudging approaches on the savings rate increases. Since one half is measured in euro increases and the other half in percent increases, it is not possible to compare their effects directly. Thus, a variable is required that allows for a uniform comparison that combines the effects of both euro and percentage increases: A future average monthly savings *ratio* (i. e., the future savings rates as a percentage of participants’ income). Of course, the two units might differ in their effects’ intensity, especially with respect to the required time of taking their effects: In relative terms, euro increases can be expected to lead to strong effects in the short term, while their effects decrease over time, since their amount of increase (numerator) is fixed, while the savings rate (denominator) increases from year to year. In mathematical terms, this leads to a decreasing increase percentage. In the case of percentage increases, this relationship is reversed: It can be assumed that their absolute increase amounts are relatively small in the short term, while the long-term absolute increase amounts increase every year due to the compound interest effect (Heitmann et al., 2022). To adequately account for both implications, the comparison of the average monthly savings ratio is performed in four perspectives: 5-year perspective, 10-year perspective, 20-year perspective and 30-year perspective, which are calculated below:

$$\text{Average Savings Ratio (€)} = 100 * \frac{SR + ((IP - 1) * DYN)}{Income}$$

$$\text{Average Savings Ratio ()} = 100 * \frac{SR * (1 + \frac{DYN}{100})^{IP - 1}}{Income}$$

SR = Savings Rate | DYN = Dynamization (€/) | IP = Investment Perspective

The corresponding results were then stored in their respective variable (“[Initial] Savings Ratio T0“, ”Savings Ratio T5“, ...). Table 5 shows the savings ratios (upper values) and their respective relation to their initial ratios (lower values) for each control and experimental group. It should be noted that three outliers were removed, which would have led to dramatically exponentially increasing savings ratios due to far above average dynamization values of around 25.00percent per year, especially considering the relatively small sample sizes of the subgroups, which are characterized by a high susceptibility to individual outliers. In addition, further four observations are removed due to incomplete values (NAs).

Table 5. *Long-term Average Monthly Savings Ratios (Numerical)*

Group	Investment Perspective				
	Initial	5 years	10 years	20 years	30 years
Control group 1	3.71% 1.00	4.75% 1.28	6.05% 1.63	8.64% 2.33	11.23% 3.03
Control group 2	4.27% 1.00	4.50% 1.05	4.86% 1.14	5.80% 1.36	7.19% 1.68
Study group 1.1	6.63% 1.00	8.53% 1.29	10.91% 1.65	15.67% 2.36	20.44% 3.08
Study group 1.2	5.51% 1.00	6.85% 1.24	9.11% 1.65	16.74% 3.04	32.49% 5.90
Study group 2.1	6.73% 1.00	8.15% 1.21	9.93% 1.48	13.49% 2.01	17.06% 2.54
Study group 2.2	4.55% 1.00	4.92% 1.08	5.43% 1.19	6.69% 1.47	8.36% 1.84
Study group 3.1	3.15% 1.00	4.82% 1.53	6.91% 2.19	11.08% 3.52	15.26% 4.84
Study group 3.2	2.98% 1.00	3.26% 1.09	3.66% 1.23	4.61% 1.55	5.82% 1.95

Notes. Own illustration. Three participants were removed from the original dataset due to far above average dynamization values. Note that this might affect reliability.

With respect to the extent of this analysis, only the 30-years ratio is interpreted with more detail. The rationale for this is that this paper aims to improve investment decisions specifically with respect to retirement planning – since the participants in this study are on average 35.55 years old, this perspective seems quite appropriate since the retirement age in Germany is 67 years (Deutsche Rentenversicherung, 2023c) – i. e., in about 30 years for this sample.

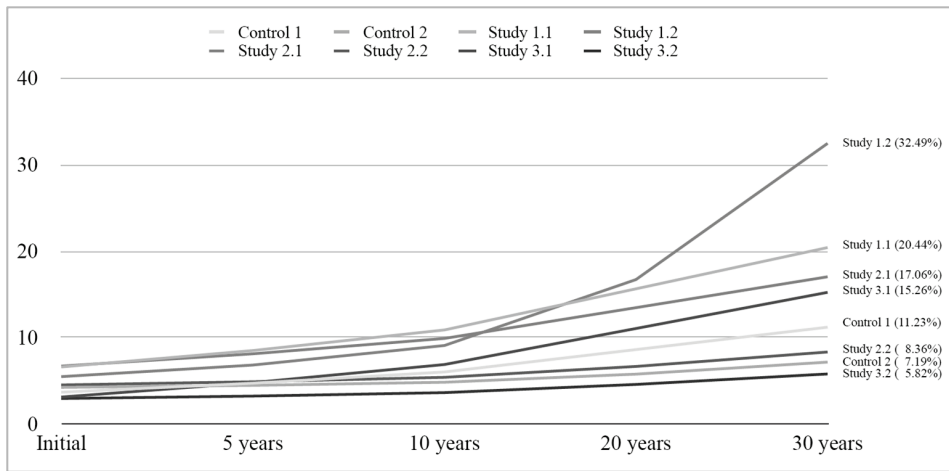


Figure 10. Long-term Average Monthly Savings Ratios (Graphical). Own illustration based on Table 5. Control group 1, study groups 1.1, 2.1, and 3.1 are in green colors, Control group 2, study groups 1.2, 2.2, and 3.2 are in blue colors.

Considering these ratios, which are additionally shown graphically in Figure 10, the highest rate is achieved in Study 1.2 with $M = 32.49$ percent, followed by Study 1.1 with $M = 20.44$ percent and Study 2.1 with $M = 17.06$ percent. The first relevant finding from this is that no control group ranked among the highest ratios, which gives a first indication that nudges in general do indeed lead to higher savings rates. However, it is not yet possible to infer from these values whether the nudge of Study 1.2 is actually more effective than that of Study 1.1 or 2.1 - to do so, the relative change in the ratios has to be considered (lower values in Table 5): It is noticeable that the ratios in Study 1.2 are significantly lower in the shorter periods than in Study group 1.1 - the turning point seems to be reached in the 10-year perspective, as the ratios converge by a factor of 1.65 at this point - from here on, Study 1.2 seems to be more effective with a factor of almost 6 in the 30-year perspective, while the push of Study group 1.1 „only“ leads to a tripling of the savings ratios. This corresponds almost perfectly with the expectations described above regarding the compound interest effect (Heitmann et al., 2022). When looking at the relative

changes, another interesting finding can be made: Although Study 3.1 only ranks fourth among the highest 30-year-old savings rates, its factor of 4.84 is the highest after that of Study 1.2. However, this effect should be interpreted with some caution, since the chosen savings rate of this group averages €52.95, while its average dynamization amount averages €6.64, implying a very strong relative increase relation that could cause this effect.

The last and probably most important critical finding from this distribution is that the nudges in study groups 2.2 and 3.2, which were assumed to lead to the *highest* long-term average savings ratios, lead to the *lowest* long-term savings ratios (regardless of Control group 2). The explanation for this can already be seen in part from Figure 9 (p. 54): From these two study groups, many participants had been guided by the anchor or social validation values. In Study 2.2, 53.12percent chose exactly the anchor value (only 6.25percent chose a higher value), and in Study 3.2, even 75.00percent chose exactly the socially validated value (no participant chose a higher value). This can also be seen in the average dynamization values: In Study 2.2, the average is $M = 1.67$ percent, and in Study 3.2 the average is $M = 1.88$ percent. Interestingly, the average value in Study 1.2 (i.e., the group with “savings rate increases are a standard practice” but without specific anchors) is $M = 5.88$ percent. This suggests two preliminary conclusions: 1) The percentage anchor values, and social validation values work without question. 2) They do not produce the intended effect: Subjects in the group *without* anchors and social validation chose *higher* increase rates. This finding holds similarly true for the euro-based nudges from Study 2.1 and 3.1 (although they nevertheless rank considerably higher than Study 2.2 and 3.2). In Study 1.1, it can be observed that the dynamization values average $M = €12.07$, while in Study 2.1 the average is $M = €9.61$ and in Study 3.1 the average is $M = €6.64$.

The above values suggest that these differences are of economic relevance - to determine whether they are also of statistical relevance, four eight-level ANOVAs are calculated, one for each investment perspective. Since the analysis of variance only shows *whether* there are significant

differences, it does not allow for conclusions about *which* differences are significant – for this purpose, *pairwise Tukey comparisons* are calculated as a post-hoc analysis (Dean et al., 2017, Boßow-Thies & Krol, 2022). Table 6 presents the ANOVA results, while the results of the Tukey comparisons can be found, due to illustration reasons, in Attachment 5.

All four ANOVAs are characterized by $DF_1 = 7$ degrees of freedom in the numerator and $DF_2 = 211$ in the denominator, resulting in a critical F-value of $F_{crit} = 2.053$ ($\alpha = .05$). Therefore, the F-values of the ANOVAs should be larger than the critical value and their p -values should be smaller than the alpha $\alpha = .05$ to have statistical significance. In fact, all four F-values exceed this upper limit, and all four p -values are well below the significance level α . This suggests that the observed differences in the average savings ratios are both economically and statistically significant, implying that there are differences that are not a result of pure chance.

Table 6. *ANOVA – Average Savings Ratios by Perspectives*

I. Five Year Investment Perspective					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	7	702	100.3	2.56	.0150
Residuals	211	8,256	39.1	F _{crit} = 2.05	
II. Ten Year Investment Perspective					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	7	1,345	192.1	2.96	.0056
Residuals	211	13,692	64.9	F _{crit} = 2.05	
III. Twenty Year Investment Perspective					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	7	4,014	586.0	3.42	.0018
Residuals	211	36,190	172.0	F _{crit} = 2.05	
IV. Thirty Year Investment Perspective					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	7	13,878	1,983.0	4.28	.0002
Residuals	211	97,698	463.0	F _{crit} = 2.05	

Notes. Own calculations based on $n = 219$. Significance level $\alpha = .05$.

Pairwise Tukey comparisons (Attachment 5) reveal that, on the 5-year investment perspective, the savings ratio in Study 3.2 is significantly lower than in Study 1.1 ($\Delta_{S3.2-S1.1} = -5.27\text{percent}$; $p < .04$) and almost significantly lower than in Study 2.1 ($\Delta_{S3.2-S2.1} = -4.89\text{percent}$; $p < .08$). On the 10-year investment perspective, the ratio in Study 3.2 is again significantly lower than in Study 1.1 ($\Delta_{S3.2-S1.1} = -7.26\text{percent}$; $p < .02$) and again close to significantly lower than in the Study 2.1 ($\Delta_{S3.2-S2.1} = -6.28\text{percent}$; $p < .08$). In addition, the ratio in Control group 2 is nearly significantly lower than in Study 1.1 ($\Delta_{C2-S1.1} = -6.06\text{percent}$; $p < .08$). On the 20-year perspective,

in addition to the above differences ($\Delta_{S3.2-SI.1} = -11.06\text{percent}$; $p < .04$; $\Delta_{S3.2-SI.1} = -12.13\text{percent}$; $p < .03$; $\Delta_{C2-SI.1} = -9.88\text{percent}$; $p < .08$), now Study group 1.2 is close to significantly exceed its according control group ($\Delta_{C2-SI.2} = -10.94\text{percent}$; $p < .06$). On the 30-year perspective, the differences change in clear favor of Study group 1.2. This nudge, which uses defaults and preset assumptions to encourage participants to choose a freely selectable automatic percentage increase, significantly outperformed the long-term savings ratios of control groups 1 and 2, and the long-term savings ratios of study groups 2. 2 and 3.2 ($\Delta_{C1-SI.2} = -21.25\text{percent}$; $p < .02$; $\Delta_{C2-SI.2} = -25.29\text{percent}$; $p < .01$; $\Delta_{S2.2-SI.2} = -24.13\text{percent}$; $p < .01$; $\Delta_{S3.2-SI.2} = -26.66\text{percent}$; $p < .01$).

In a nutshell, on the 5-year perspective, the nudge of Study 1.1 ranks first with a statistically significant distance to Study 3.2; on the 10-year perspective, again the nudge of Study 1.1 ranks first with (almost) statistical significance to Control group 2 and Study 3.2; on the 20-year perspective, the nudge of Study 1.2 takes the first place with (almost) significant distance to Control group 2 and Study 3.2; on the 30-year perspective, the nudge of Study 1.2 ranks first with now considerable significant distance to both control groups, Study 2.2 and Study 3.2. Other differences that might be of economic importance did not prove to be statistically significant and are therefore not interpreted further.

Following the above, rather global comparison of the applied nudging strategies, exploratory analyses and inferential statistical analyses specifically addressing the research hypotheses are conducted below. The research hypotheses 1 to 4 are tested with simulation-based inference statistics ("SBI"). For better comprehensibility and clarity, this method is accurately described in adequate detail for the testing of H1.1, while for the subsequent hypotheses only the corresponding SBI results are presented, without describing the entire procedure for all hypotheses each time. H5, H6 and H7 are tested with conventional linear regression models designed as multiple regressions with moderator analyses.

The research hypotheses $H_{1,1}$, $H_{1,2}$ and $H_{1,3}$ aim to assess whether the nudges regarding the automatic savings rates increases in percent lead to higher savings rates than nudges regarding increases in euro. $H_{1,1}$ refers to the default-based nudge (presumed assumption), i. e., Study 1, while $H_{1,2}$ considers the anchor-based nudge, i. e., Study 2, and $H_{1,3}$ refers to the socially validated savings rate increases. Each hypothesis is further divided into four sub-hypotheses ($H_{1,Xa}$, $H_{1,Xb}$, ...) related to the four investment perspectives (5 / 10 / 20 / 30 years). The SBI is now demonstrated using the example of $H_{1,1a}$ ("The default-related increase in the savings rate as a percentage leads to a higher ratio over a period of 5 years than the increase in the savings rate in euros").

First, the actual observed difference between the average savings ratio of Study 1.1 and Study 1.2 is calculated: $\Delta_{SI,2-SI,1} = -1.679$. This difference is then permuted 10,000 times (as suggested by (Sauer, 2019)). This permutation aims to compensate for the relatively small sample size in the partial data set ($n_{SI} = 52$). Since the counter hypothesis ("There is no statistically significant difference between Study 1.1 and Study 1.2") suggests that the actual observed difference is just a coincidence, the permutation reassigns the group membership at each permutation, resulting in a distribution under a null hypothesis where any difference is indeed just a coincidence. Finally, the observed difference in the real sample is compared to the calculated differences under the null hypothesis distribution. If the observed difference is outside the 95percent confidence interval of the permuted differences ($\alpha = .05$), the probability that this difference is merely coincidental is too low. Hence, the observed difference between the two groups would be statistically significant: The null hypothesis would be rejected, and the research hypothesis would be accepted. Here, the 95percent confidence interval is $[-4.308$ (lower); 4.474 (upper)] – it can be observed that the observed difference $\Delta_{SI,2-SI,1} = -1.679$ lies left-sided within this interval. Figure 11 shows the null distribution with the actual observed difference of $\Delta_{SI,2-SI,1} = -1.679$ as the second line from left.

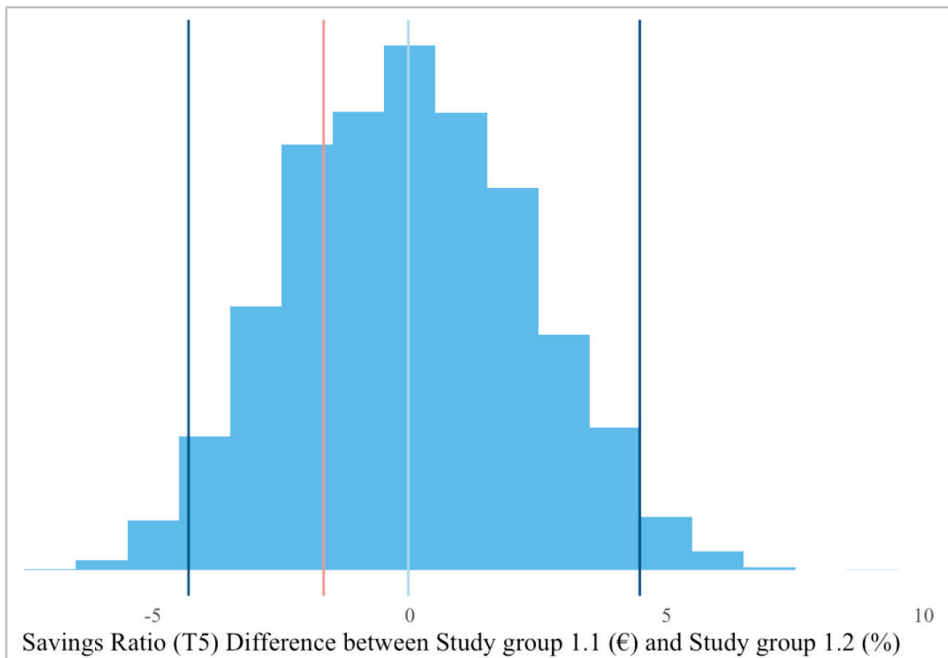


Figure 11. Null Distribution of Hypothesis $H_{1.1a}$. Own illustration based on 10,000 bootstrapping replications.

Finally, the p -value of this distribution is determined, which indicates the probability of observing a difference under the null distribution greater than the absolute value of $\Delta_{SI.2-SI.1}$. If this probability is less than $\alpha = .05$, the null hypothesis would be rejected because the probability would be too small. In this case, the probability of observing a difference that is greater than $|\Delta_{SI.2-SI.1}| = 1.679$ is $p = .49$; $> .05$: Under the null hypothesis, the probability of observing a difference greater than the actual difference is 49percent. Consequently, the null hypothesis "There is no statistically significant difference between Study 1.1 and Study 1.2" is accepted – and, as a consequence, research hypotheses $H_{1.1a}$ is rejected. The effect size between these two groups is $d = .21$, which can be interpreted as a low effect size (Cohen, 1988).

Table 7. *Simulation Based Inference Statistics – H_1*

Hypothesis	Observed Differences (%)	95% Confidence Interval (Null Distribution)		p-value	Cohen's d
		Lwr	Upr		
$H_{1.1a} - T5$	-1.68	-4.31	4.47	.49	.21
$H_{1.1b} - T10$	-1.81	-5.90	6.12	.59	.16
$H_{1.1c} - T20$	1.07	-10.39	10.87	.86	.05
$H_{1.1d} - T30$	12.05	-18.69	19.92	.27	.33
$H_{1.2a} - T5$	-3.23	-3.70	-3.43	.08	.45
$H_{1.2b} - T10$	-4.50	-4.22	3.97	.03*	.56
$H_{1.2c} - T20$	-6.80	-5.58	5.27	.01**	.66
$H_{1.2d} - T30$	-8.69	-7.01	6.70	.01**	.66
$H_{1.3a} - T5$	-1.56	-2.30	2.11	.23	.36
$H_{1.3b} - T10$	-3.25	-3.43	3.09	.05	.53
$H_{1.3c} - T20$	-6.48	-5.85	5.17	.01**	.63
$H_{1.3d} - T30$	-9.43	-8.32	7.29	.01**	.65

Notes. Based on 10,000 bootstrapping replications. Significance codes: ** $p < .001$; * $p < .01$; * $p < .05$. Effect size d (Cohen, 1988): $d < .50$ = small effect; $d < .80$ = medium effect; $d \geq .80$ = large effect.

For a better overview, the SBI results on the following sub-hypotheses of H_1 are summarized in Table 7. Considering the above observations, only research hypotheses $H_{1.2b}$, $H_{1.2c}$, $H_{1.2d}$, $H_{1.3c}$ and $H_{1.3d}$ are of statistical significance ($p < .05$), while the remaining research hypotheses must be rejected due to non-significant differences. Interestingly, Table 5 and Figure 10 revealed that on the 30-year perspective, Study 1.2 considerably outperformed Study 1.1 with a difference of 12.05 percent points - though, this difference is not statistically significant. However, it should not be neglected that this absolute difference is of high economic interest. The above results, in brief, suggest that the *euro*-based nudges lead to statistically significantly higher average savings ratios at 10-, 20- and 30-year

investment perspectives (Study 2: Anchored increase amounts), or at 20- and 30-year investment perspectives (Study 3: Anchored *and* socially validated increase amounts), with exception of Study 1, where the percent-based nudges lead to higher savings ratios at investment perspectives of 20 and 30 years, though these differences are not of statistical significance. It can be followed that the euro-based nudges outperform the percent-based nudges when concrete (socially validated) anchor values are provided, which might be due to the provided anchor values. However, hypotheses $H_{1,2}$ and $H_{1,3}$ assumed that the percent-oriented nudges would outperform the euro-oriented nudges, while obviously the opposite holds true: As a result, these hypotheses are also rejected, though they suggest reversed statistically significant results.

The following analyses aim to evaluate the effectiveness of nudging strategies in comparison to their corresponding control groups. The purpose of this is to identify whether nudges generally lead to higher savings plan increases than in decision situations without nudges, regardless of which nudging approach is most effective (this can be interpreted from the above analyses). This should provide insight into whether nudges improve increase amounts per se, or whether subjects choose higher increase amounts without nudges. The statistical analysis is again performed with SBI, comparing each study with their control group (Study 1.1 vs. Control 1, Study 2.1 vs. Control 1, ...). The according results are summarized in Table 8.

Table 8. *Simulation Based Inference Statistics – H_2 , H_3 , and H_4*

Hypothesis	Observed Differences (%)	95% Confidence Interval (Null Distribution)		p-value	Cohen's d
		Lwr	Up		
$H_{1.1a} - T5$	-1.68	-4.31	4.47	.49	.21
$H_{1.1d} - T30$	12.05	-18.69	19.92	.27	.33
$H_{1.2a} - T5$	-3.23	-3.70	-3.43	.08	.45
$H_{1.2d} - T30$	-8.69	-7.01	6.70	.01**	.66
$H_{1.3a} - T5$	-1.56	-2.30	2.11	.23	.36
$H_{1.3d} - T30$	-9.43	-8.32	7.29	.01**	.65

Notes. Based on 10,000 replications. Significance codes: *** $p < .001$; ** $p < .01$; * $p < .05$. ¹ = Value in euro (€); ² = Value in percent (%). Effect size d (Cohen, 1988): $d < .50$ = small effect; $d < .80$ = medium effect; $d \geq .80$ = large effect. Rows 94, 106, 137 were removed (c.f. page 55) from the original dataset due to far above average dynamization values, which can cause differences to the values from Table 4 (Descriptive Statistics). This might affect reliability.

With respect to the above values, research hypotheses H_{2a} , H_{3a} , and H_{4a} are rejected because of non-significant differences, while hypotheses H_{2b} , H_{3b} , and H_{4b} are accepted because of significant p -values. This result allows for a highly insightful conclusion: Although the euro-based anchors (S2.1) and socially validated anchors (S3.1) seem to outperform their counterpart percent-based nudges in terms of their effect on average savings *ratios* at an investment perspective of 10 or more years, there is no statistically significant difference to non-nudged decision situations (i.e. control group 1) when considering dynamization amounts. This suggests that it makes no difference whether advisors nudge their customers or not when considering only the isolated dynamization values. In turn, all three percent-based nudges lead to significantly higher increase amounts than their respective control group (control group 2).

While the above comparisons refer to the differences from the control groups, the effects of the nudges will also be compared with each

other. Before this, two ANOVAs are performed as a priori analyses to determine if there are any significant differences at all.

Table 9. *ANOVA – Absolute Savings Rate Increase Amounts*

I. Euro-based Nudges (S1.1, 2.1, 3.1)

	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	2	532	266	1.73	.18
Residuals	76	11,695	154	$F_{\text{crit}} = 3.12$	

II. Percent-based Nudges (S1.2, 2.2, 3.2)

	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	7	1,345	192.1	2.96	.0056
Residuals	211	13,692	64.9	$F_{\text{crit}} = 3.11$	

Notes. Own calculations based on $n = 109 / 117$ observations.

Table 9 indicates that there is no significant difference between the euro-based nudging approaches ($F_1 = 1.73$; $< F_{\text{crit}} = 3.12$; $p > .05$). In turn, regarding the percent-based nudges, there seem to be significant differences between the study groups ($F_{11} = 11.00$; $> F_{\text{crit}} = 3.11$; $p < .01$). Consequently, SBI are only performed for study groups 1.2, 2.2, and 3.2.

Table 10. *Simulation Based Inference Statistics – Percent-based Nudges*

Groups	Observed Differences	95% Confidence Interval (Null Distribution)		p-value	Cohen's d
		Lwr	Upr		
S2.2 – S1.2	-2.50	-1.49	1.43	.01***	1.01
S3.2 – S1.2	-2.34	-1.51	1.50	.01***	.96
S3.2 – S2.2	0.16	-0.65	0.63	.66	.12

Notes. Based on 10,000 bootstrapping replications. Significance codes: *** $p < .001$; ** $p < .01$; * $p < .05$. Effect size d (Cohen, 1988): $d < .50$ = small effect; $d < .80$ = medium effect; $d \geq .80$ = large effect. Rows 94, 106, 137 were removed (p. 55) from the original dataset due to far above average dynamization values.

Table 10 confirms two assumptions already formulated in the analysis of the long-term average savings ratio differences (Table 5): The anchor and the social validation nudges in Study 2.2 and 3.2 work without doubt, but in a different direction than intended. Obviously, participants from Study 1.2, i.e. participants nudged without specific anchor values, choose significantly higher savings rate increases of $\Delta_{SI.2-S2.2} = 2.50$ and $\Delta_{SI.2-S3.2} = 2.34$, respectively.

The last statistical analyses relate to hypotheses H_5 to H_7 . These hypotheses aim to reveal potential moderator effects of three variables: Participants' age (H_5), participants' income (H_6), and their "Overall Assessment of the SMarT™ program" (H_7). For the analysis of moderator effects for relations between a metric-scaled variable (here, the respective dynamization amount) and categorical-scaled variables (here, the group membership in the respective nudging approaches), an *analysis of covariance* (ANCOVA) is the appropriate method (Boßow-Thies & Krol, 2022). However, the information content of ANCOVAs is limited to F-statistics and p -values, so multiple regressions with moderator analyses would provide more informative insights. Therefore, ANCOVA models are computed as a-priori analyses using the formula below, which are supplemented by corresponding multiple regression analyses if their results prove to be statistically significant. Tables 11, 12, and 13 present the ANCOVAs' results.

$$Y_{ig} = \beta_0 + \beta_1 X_{ig} + \beta_2 C_{ig} + \varepsilon_{ig}$$

g = Group (index) | β_0 = Intercept | β_1 = Regression coefficient Group X |
 β_2 = Regression coefficient Covariate C | ε_{ig} = Regression error

Table 11. *ANCOVA – Moderator: Age (H_5)*

H _{5.1a} - Default-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	242	242	1.02	.32
Age	1	1,861	1,861	7.84	.01
Group:Age	1	15	15	0.06	.80
Residuals	53	12,588	238	$F_{crit} = 4.02$	

H _{5.2a} - Anchor-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	40	40	0.14	.71
Age	1	1,105	1,105	3.82	.06
Group:Age	1	219	219	0.76	.39
Residuals	54	15,618	289	$F_{crit} = 4.02$	

H _{5.3a} - Social validation-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	21	21	0.13	.72
Age	1	450	450	2.76	.10
Group:Age	1	899	899	5.51	.02
Residuals	46	7,499	163	$F_{crit} = 4.05$	

H _{5.1b} - Default-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	346	346	15.97	.01
Age	1	2	2	0.11	.75
Group:Age	1	1	1	0.05	.83
Residuals	52	1,128	22	$F_{crit} = 4.03$	

H _{5.2b} - Anchor-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	10	9.96	4.33	.04
Age	1	2	2.05	0.89	.35
Group:Age	1	0.5	0.50	0.22	.64
Residuals	60	138	2.30	$F_{crit} = 4.00$	

H _{5.3b} - Social validation-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	14.60	14.64	7.53	.01
Age	1	0.50	0.52	0.27	.61
Group:Age	1	0	0.01	0.01	.94
Residuals	55	107	1.94	$F_{crit} = 4.02$	

Notes. Own calculations based on na = 57, and nb = 56 observations. Significance level $\alpha = .05$.

Table 12. *ANCOVA – Moderator: Income (H_6)*

H _{6.1a} - Default-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	242	242.1	0.91	.34
Income	1	250	250.3	0.94	.34
Group:Inc.	1	96	96.3	0.36	.55
Residuals	53	14,117	266.4	$F_{crit} = 4.02$	

H _{6.2a} - Anchor-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	40	40	0.14	.71
Income	1	870	870	2.94	.09
Group:Inc.	1	61	61	0.20	.65
Residuals	54	16,012	297	$F_{crit} = 4.02$	

H _{6.3a} - Social validation-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	21	21	0.12	.74
Income	1	414	414	2.26	.14
Group:Inc.	1	1	1	0.01	.93
Residuals	46	8,432	183	$F_{crit} = 4.05$	

H _{6.1b} - Default-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	346	346	18.47	.01
Income	1	71	71	3.77	.06
Group:Inc.	1	86	86	4.57	.03
Residuals	52	975	19	$F_{crit} = 4.03$	

H _{6.2b} - Anchor-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	10	9.96	4.32	.04
Income	1	0.5	0.47	0.20	.65
Group:Inc.	1	1.8	1.78	0.77	.38
Residuals	60	138.3	2.3	$F_{crit} = 4.00$	

H _{6.3b} - Social validation-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	14.6	14.64	7.54	.01
Income	1	0.6	0.63	0.33	.57
Group:Inc.	1	0	0	0	.99
Residuals	55	106.9	1.94	$F_{crit} = 4.02$	

Notes. Own calculations based on na = 57, and nb = 56 observations. Significance level $\alpha = .05$.

Table 13. *ANCOVA – Moderator: SMarT™ Assessment (H₇)*

H7.1a - Default-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	242	242	0.94	.34
Assessment	1	723	723	2.79	.10
Group:Ass.	1	30	30	0.12	.73
Residuals	53	13,771	259	$F_{crit} = 4.02$	

H7.1b - Default-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	346	346	16.77	.01
Assessment	1	27	27	1.29	.26
Group:Ass.	1	31	31	1.49	.23
Residuals	52	1,074	21	$F_{crit} = 4.03$	

H7.2a - Anchor-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	40	40	0.13	.72
Assessment	1	561	561	1.86	.18
Group:Ass.	1	79	79	0.26	.61
Residuals	54	16,303	302	$F_{crit} = 4.02$	

H7.2b - Anchor-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	10	9.96	5.05	.03
Assessment	1	14.2	14.21	7.20	.01
Group:Ass.	1	8	7.97	4.04	.05
Residuals	60	118.3	1.97	$F_{crit} = 4.00$	

H7.3a - Social validation-based Nudges (€)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	21	21	0.12	.73
Assessment	1	122	122	0.68	.41
Group:Ass.	1	415	415	2.30	.14
Residuals	46	8,310	181	$F_{crit} = 4.05$	

H7.3b - Social validation-based Nudges (%)					
	Df	Sum Sq	Mean Sq	F value	Pr (>F)
Group	1	14.6	14.64	7.99	.01
Assessment	1	5.2	5.18	2.82	.10
Group:Ass.	1	1.6	1.55	0.85	.36
Residuals	55	100.8	1.83	$F_{crit} = 4.02$	

Notes. Own calculations based on na = 57, and nb = 56 observations. Significance level $\alpha = .05$.

From the above values, it can be concluded that only hypotheses H5.3a, H6.1b, and H7.2b have (almost) significant F-values and p -values and are therefore analyzed in more detail. Since the interactions assumed in the remaining research hypotheses are not statistically significant, they are rejected without further consideration. The multiple regression models with moderator analyses, which are calculated with the below formula, are presented in Table 14.

$$Y_i = \beta_0 + \beta_1 X_i + \beta_2 M_i + \beta_3 M_i + \varepsilon_i$$

β_0 = Intercept | β_1 = Regression coefficient “Group” | β_2 = Regression coefficient “Moderator” | β_3 = Regression coefficient “Interaction” | ε_i = Regression error

Table 14. *Multiple Regressions with Moderators: $H_{5.3a}$, $H_{6.1b}$, $H_{7.2b}$*

	Estimate	Std. Error	t-value	Pr ($> t $)
<i>Hypothesis $H_{5.3a}$</i>				
Intercept	27.01	7.32	3.69	.01 ***
Group: Study3_1	-26.76	11.01	-2.43	.02 *
Age	-0.46	0.17	-2.76	.01 **
Group:Age	0.64	0.27	2.35	.02 *
<i>Residual Standard Error: 12.8 on 46 DF. Multiple R^2: 0.15, Adj. R^2: 0.10. F-statistic: 2.8 on 3 and 46 DF, p-value: 0.05</i>				
<i>Hypothesis $H_{6.1b}$</i>				
Intercept	0.66	1.71	0.38	.70
Group: Study1_2	9.90	2.51	3.95	.00 ***
Income	0.00	0.00	0.15	.89
Group:Income	-0.01	0.00	-2.14	.04 *
<i>Residual Standard Error: 4.33 on 52 DF. Multiple R^2: 0.34, Adj. R^2: 0.30. F-statistic: 8.94 on 3 and 52 DF, p-value: < .05</i>				
<i>Hypothesis $H_{7.2b}$</i>				
Intercept	0.01	1.13	0.01	.99
Group: Study2_2	-2.78	1.79	-1.55	.13
Assessment SMarTTM	0.25	0.31	0.78	.44
Group:Assessment	0.99	0.49	2.01	.05 *
<i>Residual Standard Error: 1.4 on 60 DF. Multiple R^2: 0.21, Adj. R^2: 0.17. F-statistic: 5.43 on 3 and 60 DF, p-value: < .05</i>				

Notes. Based on $n_{5.3a} = 50$, $n_{6.1b} = 56$, and $n_{7.2b} = 64$ observations. Significance codes: *** $p < .001$; ** $p < .01$; * $p < .05$.

As described above, the ANCOVA on the significance test of $H_{5.3a}$ indicates a significant influence of the interplay between the dynamization amount in euro and the social validation nudging approach. This significant moderator effect is confirmed in the corresponding multiple regression analysis - but one critical aspect should not be missed: The interaction effect of group and age *positively* influences the effect of the nudge on the dynamization amount - even though $H_{5.3a}$ assumed that this interaction *negatively* moderates this effect. As a result, the null hypothesis of $H_{5.3a}$ ("there is *no* significant difference") is rejected - but this does not speak in favor of $H_{5.3a}$, since an unexpected finding is revealed, so that this hypothesis is also rejected.

Hypothesis $H_{6.1b}$ assumes that increasing income strengthens the effect of the nudge on the according increase amount (here, the percentage

dynamization). Again, the multiple regression confirms a statistically significant interaction effect, but like $H_{5.3a}$, the expected effect is reversed: The negative sign of the coefficient suggests that the interaction effect *negatively* influence the effect of the nudge on the dynamization. However, this finding should be interpreted with caution: The exact coefficient $\beta_3 M_i * X_i = -0.0017858$ and has been rounded to $\beta_3 \approx 0.01$ for presentation reasons only. According to the methodical rules of this scientific analysis, the research hypothesis $H_{6.1b}$ is rejected due to the *statistically* significantly negative coefficient, leaving the final decision on whether this finding is interpreted also as economically significant to the reader. Correlation analyses regarding the income and the dynamization amounts indicate correlation coefficients of $r = -.07$ ($p = .50$; $> .05$) for the euro increase and $r = -.01$ ($p = .90$; $> .05$) for the percent increase, which further suggests that there is a very slightly negative influence, which is, however, not statistically significant.

The last significant finding, i.e. the moderator effect of $H_{7.2b}$, indicates that the participants assessment of the SMarT™ program (or, the nudging approaches, respectively) in fact positively influences the effect of the nudge on the increase amount. However, as the remaining sub-hypotheses of H_7 had to be rejected, this holds only true for the anchor-based nudge regarding the increase amount in percent. The correlation between participants' assessment of SMarT™ and the dynamization amount in euro is $r = .14$ ($p > .05$), and with the dynamization amount in percent $r = .24$ ($p < .05$), respectively, which further strengthens the above finding.

To complete the analyses regarding the dynamization amounts, one last aspect should be considered: Two-tailed t-tests show that there are no statistically significant differences between female and male participants. The mean difference of the dynamization amount in euros is $\Delta_{F-M} = -0.13$ ($t = -0.05$, $DF = 99$, $p = 1$), and the mean difference of the percentage amount is $\Delta_{F-M} = 0.19$ ($t = 0.43$, $DF = 74$, $p = .70$).

The methodology section ends with a final analysis of interesting relationships that were not addressed during this comprehensive statistical analysis. First, some correlations (see Attachment 4) that are relevant for the research objectives of this study are highlighted. Participants' level of education correlates significantly positively with their selected increase amount in euros ($r = .24$; $p < .05$) and with their risk appetite ($r = .17$; $p < .05$), which *could* be explained by an effect of general education level on financial literacy. Though, education is not a factor that can be influenced by investment advisors and is therefore not considered further. Although income has no direct influence on the increase amounts (see H6.1b), it is significantly positively correlated with the selected fictitious savings rate ($r = .24$; $p < .05$), while the selected savings rate is in turn (almost) significantly positively correlated with both the dynamization amounts in euro ($r = .23$; $p < .05$) and in percent ($r = .18$; $p = .06$): It seems that participants make their decision about the increase amount (partly) depending on their selected savings rate. This rather complex interaction could be explained by a possible moderator effect - indeed, a first ANOVA reveals an F-statistic of $F = 2.87$ ($< F_{\text{crit}} = 3.94$, $DF_{\text{income}} = 1$, $DF_{\text{residuals}} = 101$; $p < .10$). Since this p -value is above $\alpha = .05$, and especially given the extent of this analysis, this aspect is not analyzed in more detail, but should be of high interest for possible follow-up studies. Finally, participants' knowledge in securities correlates significantly positively with their risk appetite ($r = .72$; $p < .05$) and with their overall assessment of the SMarT™ program ($r = .19$; $p < .05$). That is, the higher subjects' knowledge in securities, the higher their risk appetite and the higher their agreement with the nudging strategies.

With regard to the background of the moral aspects of nudges, the "Overall Assessment of SMarT™" scale is examined in more detail below. For the individual items of this scale, their quantiles are considered due to their ordinal scale level. Here, it is noticeable that the third quartile for all six items is at least 4 out of 5 (i. e. 75percent chose 4 or more out of 5 points) – it should be noted that some items were coded reversely, which

is already considered in these values in the form of a conversion. Considering the average SMarT™ assessment of $M = 3.83$, these values imply a left-skewed distribution, which suggests a rather positive attitude toward nudges. Thereby, item 5 ("I do not find this type of nudging morally defensible") should receive additional attention: 75percent of the participants chose the lowest possible score, indicating that 75percent *fully agree* with the nudging strategies in terms of moral aspects, provided their intentions are beneficial and serve the interests of investors. This assumption finds additional support when looking at the approval rates: 76.7 percent directly agree with the question of whether or not they approve of nudges terminally. A two-tailed t-test shows that there is no statistically significant difference between female and male subjects regarding the average Overall SMarT™ Assessment of $M = 3.83$ ($\Delta_{F-M} = -0.10$, $t = -0.98$, $DF = 163$, $p = .30$).

Finally, Table 15 shows two comprehensive multiple regression models, one for each type of dynamization, which provide a holistic overview of the influence of the most important variables on the dynamization amounts. The crucial difference from the individual and isolated analyses above is that the interplay between the variables is considered here in a fully global context - this is important because, for example, the interplay between income and the nudging approach may be significantly different in an interactive analysis with other variables than in an isolated comparison of these two variables.

Table 15. *Holistic Multiple Regression Model (Overall Relationships)*

	Estimate	Std. Error	t-value	Pr (> t)
<i>Dynamization in Euro</i>				
Intercept	-1.00	9.48	-0.11	.92
Group: Study1_1	3.32	3.47	0.96	.34
Group: Study2_1	-1.67	3.54	-0.47	.64
Group: Study3_1	1.19	3.71	0.32	.75
Age	-0.03	0.11	-0.30	.76
Gender: Male	-1.06	2.93	-0.36	.72
Income	-0.00	0.00	-1.21	.23
Knowledge	0.21	1.35	0.15	.88
Risk Appetite	0.90	1.72	0.52	.60
Assessment SMarT™	1.53	1.69	0.90	.37
Selected Savings Rate	0.03	0.01	3.16	.00 **
<i>Residual Standard Error: 12.3 on 94 DF. Multiple R²: 0.17, Adj. R²: 0.08. F-statistic: 1.92 on 10 and 94 DF, p-value: 0.05</i>				
<i>Dynamization in Percent</i>				
Intercept	-1.47	1.21	-1.21	.23
Group: Study1_2	3.33	0.52	6.39	.00 ***
Group: Study2_2	0.85	0.48	1.78	.08
Group: Study3_2	1.09	0.50	2.17	.03 *
Age	0.01	0.02	0.67	.50
Gender: Male	-0.28	0.44	-0.63	.53
Income	-0.00	0.00	-1.77	.08
Knowledge	-0.11	0.19	-0.56	.58
Risk Appetite	0.07	0.25	0.30	.77
Assessment SMarT™	0.54	0.27	1.97	.05
Selected Savings Rate	0.01	0.00	3.51	.00 ***
<i>Residual Standard Error: 1.86 on 103 DF. Multiple R²: 0.392, Adj. R²: 0.332. F-statistic: 6.63 on 10 and 103 DF, p-value: < .01</i>				

Notes. Based on $n = 219$ observations. Significance codes: *** $p < .001$; ** $p < .01$; * $p < .05$.

In short, this final analysis largely confirms the results already discovered during this statistical analysis. The upper half of Table 15 shows that no explanatory variables have a statistically significant impact on the dependent variable (dynamization amount in euros). Only the selected savings rate appears to have a significant impact on the increase amount - the coefficient of $\beta = 0.03$ indicates that with each euro savings rate, the dynamization amount increases by €0.03, corresponding to an incremental dynamization amount of €3.00 per €100.00. Looking at the bottom half of

Table 15, the nudge from Study 1.2 is of high statistical as well as economic significance: Compared to their control group, participants choose $\beta = 3.33$ percentage points *higher* increase amounts. This finding is consistent with the results in Table 8, which also show that the nudges differ significantly from their control group in terms of percentage dynamization amounts, though this does not hold for the euro-based nudges. The other explanatory variables are not interpreted due to their non-significant p -values.

4.2 Summarizing Discussion and Implications

In the following, the research findings described above are controversially discussed. This includes a) a recapitulation of the methodological approach in terms of its appropriateness and gained implications, b) a summary of the most salient findings with consideration of the research hypotheses, c) linking the findings to relevant insights from Chapter 2, especially about morality and implementation aspects, and d) a critical appraisal of the research objectives. The discussion concludes with the assessment of the validity of this study as announced in Section 3.1.2. Figure 12 again presents the interplay between the explanatory and dependent variables and now additionally illustrates the acceptance or rejection of the according research hypotheses.

Methodological Procedure

This analysis employed a quantitative-deductive research approach that was supplemented by additional *qualitative* methods. The implementation of this complementation was described as dependent on a) the scope of this analysis and b) its necessity considering the statistical findings. With respect to these two aspects and one other aspect, conducting additional qualitative interviews is rejected. First, the scope of this master thesis has simply been exhausted; second, the results provide highly insightful findings, especially regarding the morality aspects described as particu-

larly critical in Chapter 2; and third, the literature review has revealed sufficiently viable techniques for implementing nudges in the context of investment decisions in the setting of retail investors in Germany.

Regarding the methodological procedure, a few changes were made during the statistical analysis. Most importantly, four additional dependent variables were created because of the limitations in evaluating the effectiveness of the nudges. In designing the study and creating the questionnaire, it was simply neglected that the chosen savings rate of participants must be largely equal to adequately compare the effectiveness of the different nudges.

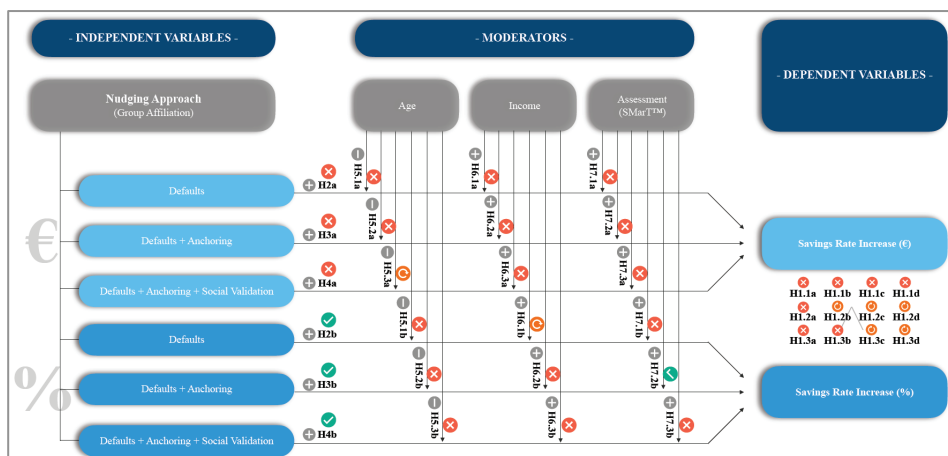


Figure 12. Adjusted Interplay between Explanatory and Dependent Variables.

Since this was not the case, savings ratios based on different investment perspectives were calculated to address this issue. This allowed for a more objective comparison of the nudges' effectiveness. Fortunately, the analyses yielded relatively clear findings that could be confirmed by further comparisons and by considering a holistic multiple regression model that considers general connections considering all relevant explanatory variables.

Finally, it should be noted that despite low internal split-half reliabilities of the three dependent variables, the statistical analyses yielded (highly) statistically significant results. Nevertheless, it should be noted that for some hypotheses, no significant interplays could be identified. Possible reasons for the lack of internal reliability of these variables have been sufficiently considered in the corresponding section. However, with respect to reliability, one critical aspect should be noted: The present (highly) statistically significant results would not have been obtained if the dependent variables were indeed not reliable. This should simply emphasize the most probable reason for the calculated low internal reliability: The distribution of these variables has been shown to be relatively homogeneous, which is particularly supportive for the effectiveness of the anchor-based and social validation-based nudges.

Overall Assessment of the Different Nudging Approaches (H1)

The results from the comparisons regarding the long-term average savings ratios on the investment perspectives of 5, 10, 20, and 30 years allow for creating a ranking that briefly summarizes the effectiveness of the different nudging approaches depending on the investment perspectives, which is illustrated in Figure 13.

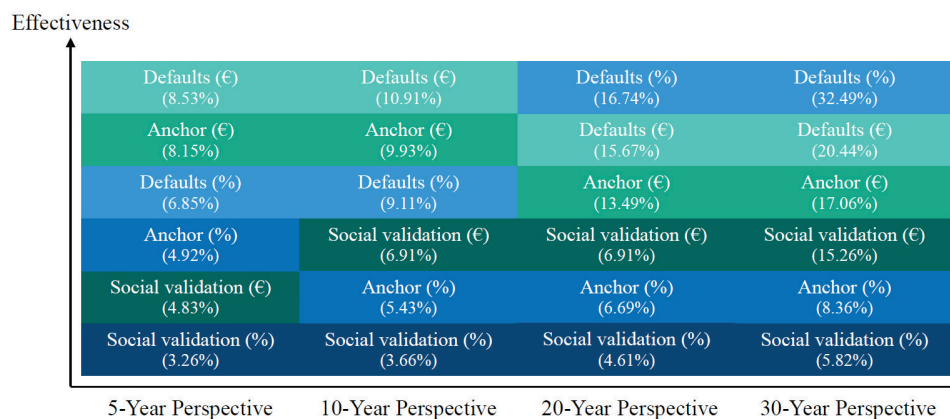


Figure 13. Overall Assessment of the Nudging Approaches. Based on the ranking in Table 5. Control groups were removed, since only nudges are evaluated.

The green squares show nudges aimed at improving decisions on dynamization amounts in euros, and the blue squares those aimed at improving percentage dynamization amounts. Even a quick glance at Figure 13 shows that the upper half is rather dominated by green squares and that the two lower rows are almost completely occupied by blue squares. However, this should not lead to hasty conclusions: It should not be neglected that all three euro-based study groups started with higher initial savings rates (Study 1: 6.63percent vs. 5.51percent; Study 2: 6.73percent vs. 4.55percent; Study 3: 3.15percent vs. 2.98percent - cf. adjusted Table 4). This could be one reason why hypotheses $H_{1.1a}$ - $H_{1.1d}$ were rejected - here, the default-based euro-oriented nudges were compared with the percent-oriented nudges, which revealed that there are no statistically significant differences, although they are of economic importance. However, when looking at the relative changes in the ratios compared to the initial savings ratio, it is noticeable that the euro-based nudges of studies 2 and 3 nevertheless perform better than the percentage-based nudges. The reason why the observed effects are reversed to the effects expected could also be the fact that the euro-based nudges started with (considerably) higher initial savings ratios, which could be due to lower incomes in the euro groups

(resulting in higher ratios). In summary, the following conclusion can be formulated: When looking at the savings plan in relation to customers' income, two of three nudges aimed at improving dynamization amounts in euros outperform their corresponding percentage-based nudges in the 5- and 10-year investment perspectives. Looking at the 20- and 30-year investment perspectives, however, this interplay is reversed: Here, the default-based percentage nudge outperforms its corresponding euro-based nudge by a significant distance, though this distance is not *statistically* significant. This nudging approach is followed by the default-based euro-oriented nudge and the anchor-based euro-oriented nudge.

Despite the above conclusions, the decision as to which nudge is the best one cannot be made universally: Which nudge leads to the highest improvement in customer-related welfare simply depends on the intended investment perspective. Therefore, this decision must be made by the reader (respectively, advisors and clients) themselves. Considering the specific objective of this research, the following conclusion is drawn: To improve financial investment decisions aimed at improving long-term financial provision and, in particular, retirement savings of retail customers, the standards-based percentage nudge proves to be most effective. In addition, it should be noted that Thaler and Benartzi (2004) and Thaler and Sunstein (2008) showed that savers actually "forget" to care further about their savings behavior, which could be interpreted as follows in light of the above finding: Advisors should try to nudge their customers with the default-based percentage nudge that is most effective on a 20- and 30-year perspective, because their customers are likely to forget to take care of their savings behavior anyway. In addition, this procedure is in line with the strategy how participants were nudged in the study of Thaler and Benartzi (2004). Yet, this decision should not be made without consulting the customer, especially considering their individual age and financial situation.

In terms of the effectiveness of nudges, perhaps the most important finding from this study is that participants chose significantly higher increase amounts when they were told that savings rate dynamics were common practice, but without being told (socially validated) anchor or reference points. At least this finding is both economically and statistically significant for the percentage nudges, although there is no statistical significance for the euro-oriented nudges. This suggests another conclusion: The percentage anchor indeed do have an effect, as already suggested by the study of Piotrowski and Bünnings (2022), as well as the socially validated anchor as suggested by Thaler and Sunstein (2008) and Cialdini (2021): The stronger the nudge, the more the chosen increase amount is pulled toward the anchor. Nevertheless, participants without anchors chose higher increase amounts. There are two implications from this: The first implication is of a practical sense and states that advisors should not provide anchor values to their clients but should simply inform them that percent-based dynamizations are standard practice. Based on the available data, it is very likely that clients choose higher increase amounts than 2.50percent. The second conclusion is of a scientific nature: Follow-up studies should test the effect of higher anchor values and can thereby adopt this study design. In Section 2.5, it was hypothesized that the socially validated anchor would lead to the highest savings rates - while this is not the case, this nudge still has the highest power to influence, as almost 64percent (S3.1) and 75percent (S3.2) adhered exactly to the anchor value.

In addition, another "anomaly" can be observed. Table 7 shows the difference in savings rates between percentage- and euro-based approaches within each study. With respect to the hypotheses, it was assumed that the percentage-based dynamizations would lead to significantly higher savings rates in the long run, which was justified by the compound interest effect (Heitmann et al., 2022). It was assumed that initially the euro-based increments would lead to higher ratios, while this interplay would reverse as the investment perspective increases (cf. page 54). However, this inter-

play is not observed in the present data: As the investment perspective increases, the difference between percentage-based and euro-based nudges increasingly diverges. Apparently, the given anchor values lead to such low percentages that the compound interest effect cannot unfold its full potential - in any case, the euro-based nudges seem to lead to significantly higher relative dynamization amounts. This can be explained by the money illusion (Harrod & Fisher, 1929) described in Section 2.2: It was assumed that investors would, because of the money illusion, select higher relative increase amounts when asked to determine them in percent than in euro. Obviously, the opposite holds true: According to Table 4, calculated relative euro increase amounts are consistently higher than the corresponding percent increases (S1: 6.8percent vs. 4.2percent, S2: 5.4percent vs. 1.72percent, S3: 12.5percent vs. 1.88percent).

*Overall Assessment of Nudges Compared to their Control groups
(H2 to H4)*

While all percentage-based nudges performed significantly better than the corresponding control group, this effect was not found for the euro-based nudges, leading to the rejection of H_{2a} , H_{3a} , and H_{4a} . It is striking that this applies to *all three* euro-oriented nudges, though this finding is particularly surprising for the default-based euro-oriented nudge, which on average leads to €5.82 higher increase amounts - but this difference is not statistically significant. This implies that the control group chose considerably higher increase amounts even without being nudged. Considering the available database and the conceptual background, only one explanation can be found for this: The money illusion (Harrod & Fisher, 1929) causes investors to have difficulty choosing a non-nudge *percentage* increase amount - after all, this control group differs significantly from the study groups, but this difficulty does not apply to euro-based increase amounts. From a purely statistical point of view, one could conclude that advisors would only need to inform customers about the possibility to automatically increase their savings plans by a fixed *euro* amount - the results suggest that subjects indeed choose relatively high increase amounts ($M =$

€6.25), even without being nudged. In terms of practical implications, however, it should by no means be neglected that the observed difference is nevertheless of high economic importance ($\Delta_{sl,1-cl} = €5.82$). Most important, especially in the long run, the percentage default-based nudge proved to be the most effective, by a large distance compared to the corresponding euro-based nudge. This emphasizes the added value of a) percentage-oriented savings rate increases encouraged by b) the default-based nudge. After all, this finding is consistent with the results of Thaler and Benartzi (2004) with respect to their SMarT™ program.

Assessment of Moderation Effects (H5 to H7)

Regarding the assumed moderation effects, the age of investors was expected to have a negative impact on the effect of nudges on the increase amounts, as the study by Piotrowski and Bünnings (2022) suggests that the older investors are, the lower their chosen savings rate. In fact, there are no statistically significant interaction effects, except for the euro-based, socially validated anchor nudge. Here, the age *positively* influences the impact of the nudge on the chosen increase amount. A possible explanation for this could be that the older investors are, the more they follow the decisions of other investors (social validation) - however, this interaction could not be confirmed for the corresponding percentage nudge. Thus, the present data do not provide sufficient information to obtain a logical explanation, which is at the same time an important implication for possible follow-up studies.

Participants' income was expected to positively influence the impact of nudges on dynamization due to higher financial capability – however, the statistical analysis revealed a statistically significant effect that is slightly negative. Though, since this finding only applies to the default-based percentage nudge and the coefficient is close to zero, this interaction is not interpreted as economically significant. However, this represents another implication that should be considered in future research. The last effect, the overall SMarT™ assessment, was only identified for the anchor-based percent-oriented nudge. At least, although they have no statistical

significance, the coefficients regarding the other interactions are positive and therefore suggest that investors' attitude generally positively increases the dynamization amounts.

Finally, two last aspects are worth highlighting. First, the selected savings rate was found to possibly moderate the effect of income on the dynamization amounts, as it is significantly positively correlated with both income and dynamization amounts. Potential follow-up studies could test this interaction by providing subjects with individualized information about dynamization amounts in dependence of their income: For example, a study design could provide customized dynamization anchors depending on specific income levels, testing whether this interacts with the savings rate. Second, participants' knowledge in securities correlates significantly positively with their risk tolerance and with their overall evaluation of nudges. This suggests that financial literacy does indeed have a positive impact on the investment behavior and attitudes toward nudges aimed at improving their investment behavior. From this, an important finding can be drawn: The public mission of the Sparkassen-Finanzgruppe (to contribute to financial literacy through individualized financial advice) is indeed purposeful.

Moral Aspects and Implications for the Implementation of Nudges

In Section 2.2.2, various moral aspects related to nudges have been illuminated. Thereby, a framework was formulated that should be adhered to nudge investors in a morally acceptable way, which is based on the ethical factors defined by Kuyser and Gordijn (2023). Briefly, this framework consists of three important aspects: 1) Autonomy: Nudges should not be too effective, and they should be generally resistible; 2) Welfare: They should undoubtedly lead to welfare improvements; 3) Long-term adverse effects: Those effects should be avoided, which could lead to mistrust by decision makers if they had been nudged covertly. To this end, Figure 6 provides an overview of four different nudging types, whereby the nudges applied in this study can be classified as non-transparent nudges of type 2

(Hansen & Jespersen, 2013): The nudges at hand represent *hidden manipulation of choice* - that is, they do not represent hidden manipulation of *behavior*, which would clearly be morally reprehensible. In the following, the statistical results are related to the above framework.

Regarding the first factor, autonomy, these requirements would eliminate anchor-based nudges, at least the socially validated ones. The reason for this is that almost 64percent (euro-oriented) and 75percent (percent-oriented) chose exactly the anchor value. With respect to the autonomy factor, one can conclude that this type of influence would simply be too powerful to be implemented in real advisory meetings, as correctly raised by Saghai (2013). However, statistical analyses revealed that this strategy would in fact lead to *lower* increase amounts, which would imply that the full potential would not be realized anyway compared to the other nudges. Interestingly, it is precisely those nudges that lead to the highest savings rate increase amounts that at the same time perfectly satisfy the autonomy requirement: The nudges that simply inform subjects that savings rate dynamizations were standard practice lead to the highest increase amounts - Factor 1 is therefore completely fulfilled by the use of the default-based nudges (regardless of euro-oriented or percent-oriented).

Since default-based nudges lead to the highest savings rate increase amounts, they simultaneously satisfy the second factor, welfare: Automatic savings rate increases undoubtedly lead to welfare increases, as private investors save ("tomorrow more") money for their own future. Even if opponents of libertarian paternalism would classify this approach as harmful to autonomy, they simply cannot argue that customers would not benefit from these strategies – especially because, left to their own devices, they would opt for rather conservative and thus money-losing investments (cf. Section 2.1). Hence, according doubts regarding welfare, as summarized by Kuyler and Gordijn (2023) can be ruled out, at least in this context.

The third factor, long-term adverse effects, is related to the scale "Overall Assessment of SMarT™" (i. e., participants' assessment of

nudges). In Section 2.2.2, it was concluded that it would be quite helpful to simply ask subjects whether they found it morally reprehensible to be nudged by covert type 2 nudges. To evaluate the moral assessment, item AS01_03 is of particular interest: "While the SMarT™ program is a form of influence, this type of influence is acceptable since savers can recognizably benefit from it." It should be emphasized that 60percent selected 4 or 5 out of a maximum of 5 points of agreement, which clearly speaks for moral acceptability. Additionally, looking at the third agreement point of this scale, which can be interpreted as "neutral attitude" of the participants, it can be concluded that as many as 90percent of the participants agree with this item or at least have a neutral attitude towards it. Against this background, concerns formulated by Binder and Lades (2015) or Avitzour et al. (2019) are *not* assumed to hold true for the implementation of nudges in this context.

Briefly, participants in this study clearly have a positive or at least neutral attitude toward the nudging strategies applied in the experimental part and toward the associated explanations regarding SMarT™ given prior to their evaluation of these ratings. Figure 14 illustrates the aggregated scale "Overall Evaluation of SMarT™", whose distribution can be interpreted as left-skewed, indicating that most participants chose higher or medium levels of agreement.

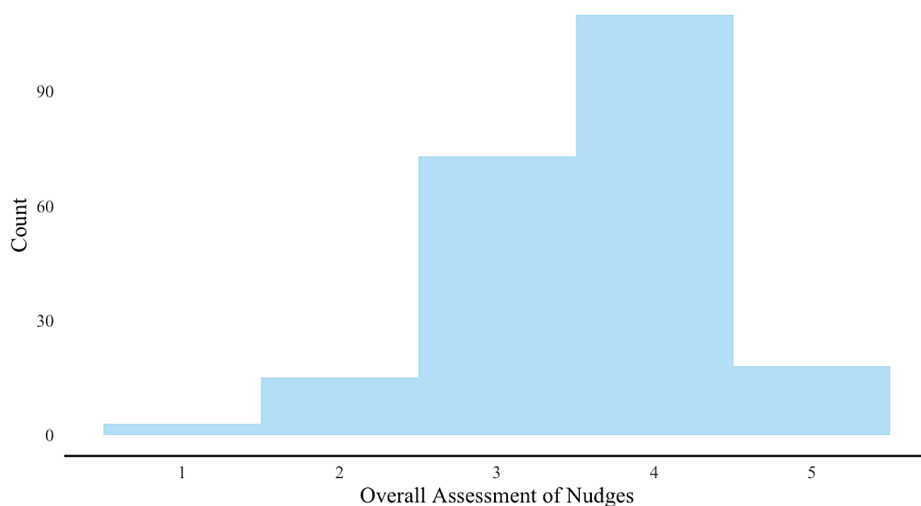


Figure 14. Overall Assessment of SMarT™. Own illustration based on the statistical distribution of Overall Assessment of SMarT™.

Assessment of Moderation Effects (H5 to H7)

Finally, as announced in Section 3.1.2, the validity of the present results is assessed below. The *internal validity* was considered to be fulfilled due to the sophisticated methodological design of this study. Therefore, it remains open whether this study also fulfills the *external validity*, which is to answer the question whether the present results can be generalized to the corresponding population (Himme, 2007). This requires a closer glance at the study design. Since data were collected at a single survey time point in this study, the design can be classified as a *cross-sectional analysis*. Therefore, the results presented here are to be classified as being related to a single point of time and do not allow any conclusions to be drawn about possible changes over time. For this purpose, a *longitudinal analysis* would be suitable, as data are here collected at several points of time over a longer time period, as was the case in the study by Thaler and Benartzi (2004), which evaluated participants' savings rates over a longer period of time. However, this was simply not feasible for the requirements of this master thesis. The intention of this study was to gain first insights regarding the transferability of Thaler and Benartzi's (2004)

SMarT™ program to its applicability in Germany. Although the intention was to study this topic for "all German investors" (i. e., the population), it should be noted that as many as 77percent of the participants come from North Rhine-Westphalia, indicating a strong bias in the sample. From *this* point of view, external validity is *not* fulfilled, as individuals from North Rhine-Westphalia cannot be classified as representative for the whole of Germany due to possible cultural or financial differences. On the other hand, the present results have partly confirmed already existing research findings, which in turn speaks for external validity (Harrod & Fisher, 1929; Thaler & Benartzi, 2004; Thaler & Sunstein, 2008; Piotrowski & Bünnings, 2022).

In summary, validity is considered to be "partially met". In short, considering the sophisticated study design consisting of two control and six experimental groups, internal validity is assessed as fulfilled, while this research requires further studies to confirm the present results to fully meet external validity. Specifically, the factors that should be addressed are a) higher internal reliability of the dependent variables, b) a study design that includes a longitudinal analysis to examine whether subjects maintain their decisions over time (particularly considering the high savings rates extrapolated in the default-based percentage nudging approach), and c) a federal state-neutral sample.

5 Conclusion and Final Remarks

In the following, this scientific analysis is concluded by first reviewing the course of work and the results to answer the research question formulated at the beginning, then summarizing the most striking results, and finally critically reviewing some limitations of this master thesis.

This scientific work aimed to find both practical and scientific answers for the research question formulated at the beginning. A retrospective glance at the course of this work allows for a clear assessment of whether this research question could be answered: Against the background of the constructive literature research, the sophisticated methodological approach, and the extensive statistical analyses, it can be concluded that the research question can be adequately clarified. Before formulating the answer on this research question, the four problems that this study was designed to help solve are considered.

1) German investors seem to highly prefer conservative assets over return-oriented assets, even though these investments are not capable of increasing the value of money in real terms.

Of course, this study was never intended to change the conservative investor mentality of German investors. Rather, it was intended to provide suggestions on how investment advisors can adequately address this issue. To this end, Section 2.1 described in detail how to build a conservative yet return-oriented portfolio. In the experimental part of this study, potential customers were simply presented with the fact that a savings plan in equity funds was an adequate investment for their situation - in the overall sample, more than 83.00percent chose to invest as a result. This indicates that retail customers are generally willing to invest in such more return-oriented investment products, so that this problem is classified as solved in the context of this setting.

2) The German retirement system is not assumed to be able to maintain citizens' income and wealth, as the system is under significant pressure due to demographic and economic changes.

Again, this study was not intended to facilitate structural changes regarding a fixed system. Rather, it was intended to provide a solution to dealing with this issue. The SMarT™ program (Thaler & Benartzi, 2004) has proven to be helpful in improving investors' investment decisions. Although there is no guarantee that they will have no financial problems at all at retirement, the strategies developed contribute remarkably to encouraging investors to make smarter investment decisions that can undoubtedly improve their financial situation.

3) The money illusion causes investors to not think in terms of real values, resulting in their failure to recognize that those assets are not suitable for increasing the real value of money.

The solution to this problem is also found in the answer to the first problem. First, the subjects were simply not offered an alternative to the savings plan in an equity fund, resulting in a compliance rate of over 83percent. Moreover, the money illusion was even found to contribute to participants opting for, relatively, higher dynamization amounts in euros than other participants did in percentage terms. Hence, this problem was appropriately addressed.

4) The consequences of procrastination and the psychological bias hyperbolic discounting lead investors to postpone the extremely important matter of financial planning and provision.

Honestly, the literature review does not give any reason to assume that this problem could be solved at all. Therefore, this paper has attempted to develop strategies that precisely exploit these consequences to improve the financial situation of retail investors in the long run. Thaler and Benartzi (2004) and Thaler and Sunstein (2008) suggest that it is exactly this what makes those nudging strategies successful: Procrastination and hyperbolic discounting.

Consequently, this problem does not longer have to pose a problem for private investors if investment advisors adequately adopt the strategies described in this work.

Based on the key findings, which are presented in Section 5.1, the below answer is formulated for the research question: *How can strategies of the SMarT™ program and phenomena of behavioral finance be employed to improve the investment behavior of German private investors and what welfare gains can be generated compared to non-nudged investors?*

Given the present results, a nudge based on defaults and presets assumptions aimed at improving investors' decisions regarding automatic savings rate increases in percent turned out to be the best way to implement strategies of the SMarT™ program to positively exploit phenomena of behavioral finance in the investors' favor. This leads to significant potential welfare gains in the long-term compared to investors who were not nudged, resulting from 1.52 times (5-year perspective), 1.87 times (10-year perspective), 2.89 times (20-year perspective), and even 4.52 times (30-year perspective) higher savings ratios compared to their respective control group. Investment advisors can integrate this nudge into their advisory sessions by simply informing their customers that it is standard practice for their monthly savings rates to automatically increase by a fixed percentage each year, although it is very important that advisors do not provide their customers with a specific reference point for doing so.

5.1 Key Findings

While the statistical analysis provided various insights, this conclusion aims to present a highly compromised summary of the most important research findings. First, it should be noted that all six nudging approaches, regardless of whether they are euro-based or percentage-based, lead to higher increase amounts than their respective control group. This implies that the nudges are basically effective. Yet, it should be noted that only the

observed differences between the percentage-based nudges and their control group are of both economic and statistical significance: While the euro-based nudges led to higher increase amounts, at least from an economic perspective, the differences to their control group are not statistically significant.

However, interestingly, the euro-based nudges turned out to lead to significantly higher savings *ratios* (i. e., the selected savings rate, extrapolated by the respective increase factor, divided by participants' income) in the long run, except for the default-based percentage-oriented nudge (Study group 1.2). Though, this effect could be due to partially large differences in the selected savings rates, so that this result should be interpreted with some caution. The finding that the default-based percentage-oriented nudge leads to the highest savings ratios is explained by the compound interest effect.

In the context of the above findings, there is another, even more important finding. The present results suggest that the anchor nudges and the social validation nudges, albeit working without question, seem to have too strong effects - at least they lead to the opposite of the intended effect: Participants select both economically and statistically significantly higher savings rate increase amounts when they were *not* provided with (socially validated) anchor values. Again, it should be noted that statistical significance only applies to the percentage-based nudges. This leads to two implications: From a practical perspective, advisors should simply apply the nudging approach described above (cf. the answer to the research question), i. e., nudge customers without providing anchor values. For research, in turn, this result implies that further studies should simply replicate this approach with higher anchor values.

Regarding moderation effects, the expected effects related to participants' age and income could not be confirmed, as the opposite is true: For the euro-oriented social validation nudge, participants' age was found

to positively moderate the effect on the increase amount, while for the percentage-oriented default-based nudge, participants' income was found to moderate the effect slightly negatively on the increase amount. Regarding participants' assessment of SMarT™, a positive moderation effect was found for the percentage-oriented anchor-based nudge. However, all three moderation effects were found to be significant for no more than one group, and therefore cannot be generalized. Finally, the selected savings rate was found to potentially moderate the effect of income on the increase amounts due to consistently positive correlations, providing another implication for follow-up studies.

With respect to the moral requirements framework presented by Kuyper and Gordijn (2023), default-based nudges (i. e., exactly the type of nudge declared as the answer to the research question) are undoubtedly rated as morally acceptable, based on both literature-related aspects and participant assessments. However, (socially validated) anchor-based nudges should not be used, as they have been found to be too effective, which conflicts with the moral requirements framework. Overall, nudges are viewed very positively by participants, with 90percent agreeing with nudges or at least having a neutral attitude.

5.2 Limitations, Scientific Implications and Practical Implications

Although the present sophisticated methodological approach led to insightful findings, some limitations should be considered. First and most important, it should be noted that this study is of hypothetical nature and did not consider participants' real finances, i.e., there were no real financial interests at stake. It simply cannot be ruled out that participants might behave differently in real life than observed in this theoretical framework. Since this hypothetical design was intended to provide initial insights, which suggest that nudges actually work, these findings now need to be confirmed by further studies that should analyze the behavior of "real" customers.

Furthermore, this study is a cross-sectional analysis. That is, the present results are based on one specific point in time of the survey. A longitudinal analysis, as conducted by Thaler and Benartzi (2004), would have provided more insights into the consistency of subjects' behavior over a longer period. Although Thaler and Benartzi's (2004) results suggest that participants are likely to adhere to their decisions, this aspect remains open in this study, which is an implication for further research.

In addition, it remains open why some euro-based nudges, except for the nudge in Study 1.2, led to higher savings rates than the corresponding percentage-based approaches. Although some assumptions were formulated for this, such as partially large differences in the selected savings rates or incomes, no scientific explanation was found. Moreover, no income increases were considered in the extrapolation of long-term savings ratios. Future studies should try to obtain more homogenous savings rates, as this allows an objective comparison of different nudges. Here, it might be helpful to provide participants with guidelines or instructions for their decision on how much to save each month – or to try to guide participants with obvious working anchors to achieve largely homogeneous savings rates. Finally, this analysis revealed some unexpected moderation effects related to participants' age and income and found evidence of a possible moderation effect of the selected savings rate itself. However, it remains open why these unexpected moderation effects occurred and whether the possible moderation effect concerning the selected savings rate exists.

With a final glance at the practical implications, the most important finding is that nudging strategies should be consistently implemented in financial advice discussions and that financial literacy of private investors is significantly important. Section 2 provided ample evidence of investors' lack of financial literacy, or at least their psychologically driven behavioral patterns that prevent them from making rational decisions from an economic perspective. In addition, critical aspects of the German pension system were highlighted – in a nutshell, the current structures are not functioning adequately. As a result, there are currently important discussions

about restructuring this system, including the terms "equity pension" and "generational capital", among other keywords. According to Hildebrand et al. (2023), Germany wants to invest more than 200 billion euros in a special fund (generation capital) to cover the financial deficits of the German pension system. It follows from this that the improvement of financial and retirement provision is already a concern in political debates, which means that an extremely high level of importance can be inferred from this. Nudging strategies, as described in this paper, can be perfectly integrated into the ideas described above and the implementation of a new structure of the German pension system and should therefore be considered in further debates. For example, the German pension system could apply the defaults and preset assumptions" nudging strategy by linking pension contributions to income development. Concretely, the standard procedure for retirement contributions could be designed through an initial contribution rate (e. g. employees' very first contribution rate) that increases over time according to the development of their income. Of course, employees should have the opportunity to disagree with this procedure – however, the behavioral economics framework of this opt-out system (Thaler & Sunstein, 2008) would certainly discourage many employees from objecting to the contribution increases. Another idea could be to link the retirement contribution rate to the inflation index – this would at least counteract the greatly underestimated consequences of monetary devaluation. Of course, citizens must retain the option of objecting to this procedure. In addition, the government could try to improve citizens' retirement savings behavior through social nudges, which can be perfectly combined with general education or information measures: The government could proactively promote the need for additional retirement savings through active advertising in an easily communication style, focusing on social nudges such as those used in this study design. It should be noted that this third idea can also be combined with the first two ideas. All these and many other ideas could be taken into account in the development of the "equity pension" and "generation capital", which would lead to a higher accumulation of wealth by citizens and thus

to a considerable improvement in prosperity, supported by a higher financial security for both citizens and the government. Unfortunately, those restructuring measures can be expected to take a long time, which underlines the importance of additional measures such as nudges. Until then, they could be seen as a kind of interim solution that should be applied by banks and financial institutions when advising their customers in financial or retirement provision subjects.

The Sparkassen-Finanzgruppe was described as a company that defines its strategy as enabling people to participate in society in economic and social terms. Against the background of the present results, advisors of the Sparkassen-Finanzgruppe should implement the present findings in their advisory work to foster the achievement of their public objectives. In the foreword of their international survey of financial literacy, the Organisation for Economic and Co-operation and Development (2020: 3) describes that "Financial education, financial consumer protection and financial inclusion are recognized at the highest policy level as three essential ingredients for the financial empowerment of individuals and the overall stability of the financial system (...)"'. They thereby strongly emphasize the importance of financial literacy and the educational work of financial institutions such as the Sparkassen-Finanzgruppe. This means that nudging strategies should be implemented in investment advice and at the same time customers should be educated about the intentions of these strategies to improve financial literacy. As a result, all parties can benefit from significant welfare gains: The Sparkassen-Finanzgruppe can further strengthen its customer relationships by providing helpful advice, the DekaBank can expand its market share and, most importantly, private customers are helped to build up considerable wealth, which contributes to financial security.

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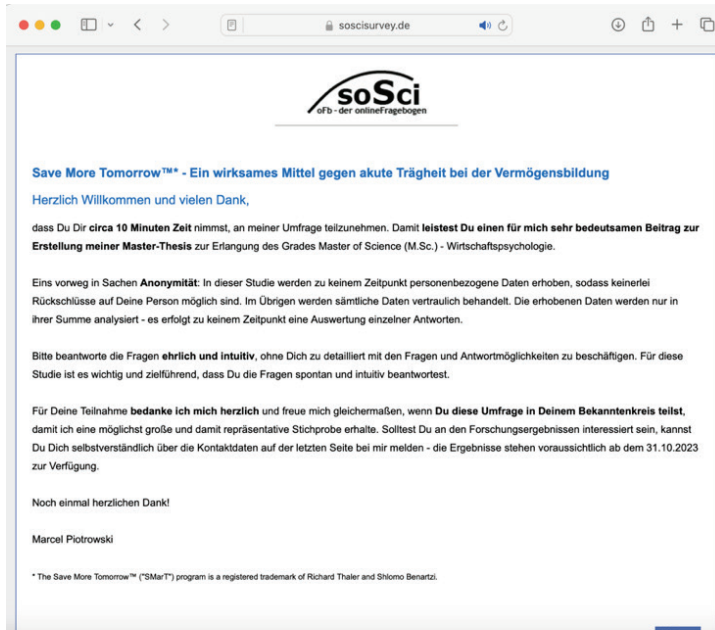
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Attachment

Attachment 1. Online Questionnaire (1-2)



soSci
oFb - der onlineFragebogen

Save More Tomorrow™ - Ein wirksames Mittel gegen akute Trägheit bei der Vermögensbildung

Herzlich Willkommen und vielen Dank,

dass Du Dir **circa 10 Minuten Zeit** nimmst, an meiner Umfrage teilzunehmen. Damit **leistest Du einen für mich sehr bedeutsamen Beitrag zur Erstellung meiner Master-Thesis** zur Erlangung des Grades Master of Science (M.Sc.) - Wirtschaftspsychologie.

Eins vorweg in Sachen **Anonymität**: In dieser Studie werden zu keinem Zeitpunkt personenbezogene Daten erhoben, sodass keinerlei Rückschlüsse auf Deine Person möglich sind. Im Übrigen werden sämtliche Daten vertraulich behandelt. Die erhobenen Daten werden nur in ihrer Summe analysiert - es erfolgt zu keinem Zeitpunkt eine Auswertung einzelner Antworten.

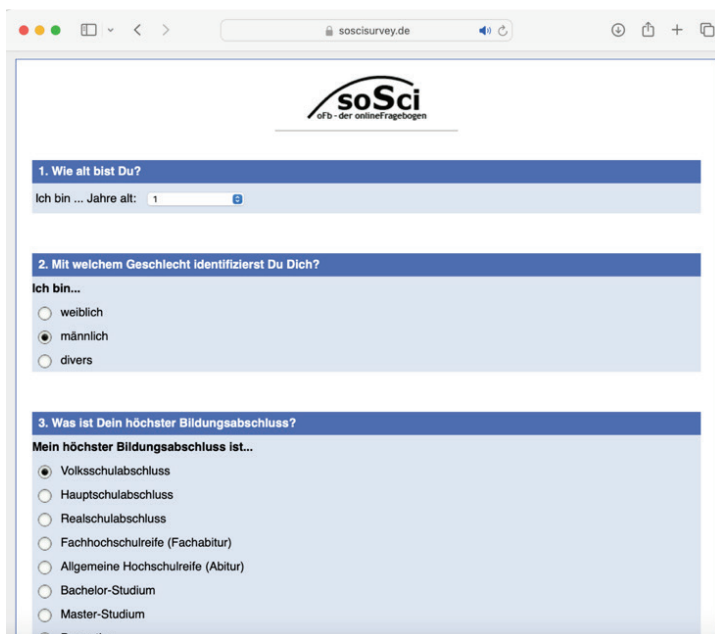
Bitte beantworte die Fragen **ehrlich und intuitiv**, ohne Dich zu detailliert mit den Fragen und Antwortmöglichkeiten zu beschäftigen. Für diese Studie ist es wichtig und zielführend, dass Du die Fragen spontan und intuitiv beantwortest.

Für Deine Teilnahme **bedanke ich mich herzlich** und freue mich gleichermaßen, wenn **Du diese Umfrage in Deinem Bekanntenkreis teilst**, damit ich eine möglichst große und damit repräsentative Stichprobe erhalte. Solltest Du an den Forschungsergebnissen interessiert sein, kannst Du Dich selbstverständlich über die Kontaktdaten auf der letzten Seite bei mir melden - die Ergebnisse stehen voraussichtlich ab dem 31.10.2023 zur Verfügung.

Noch einmal herzlichen Dank!

Marcel Piotrowski

* The Save More Tomorrow™ ("SMarT") program is a registered trademark of Richard Thaler and Shlomo Benartzi.



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1. Wie alt bist Du?

Ich bin ... Jahre alt:

2. Mit welchem Geschlecht identifizierst Du Dich?

Ich bin...

☐ weiblich

☒ männlich

☐ divers

3. Was ist Dein höchster Bildungsabschluss?

Mein höchster Bildungsabschluss ist...

☒ Volksschulabschluss

☐ Hauptschulabschluss

☐ Realschulabschluss

☐ Fachhochschulreife (Fachabitur)

☐ Allgemeine Hochschulreife (Abitur)

☐ Bachelor-Studium

☐ Master-Studium

☐ Promotion

Attachment 1. Online Questionnaire (3-4).

☐ Bachelor-Studium
☐ Master-Studium
☐ Promotion

4. Wie ist Deine berufliche Stellung?
Ich bin...

☒ Schüler/in
☐ Auszubildende/r
☐ Student/in
☐ Berufsbegleitende/r Student/in
☐ Angestellte/r
☐ Beamte/in
☐ selbstständig
☐ Rentner/in
☐ arbeitsuchend

5. In welcher Branche arbeitest oder studierst Du?
Ich arbeite oder studiere in der Branche...

☒ Agrar- & Landwirtschaft
☐ Baugewerbe & Handwerk
☐ Bildungswesen & Pädagogik
☐ Chemie & Rohstoffe
☐ Dienstleistungen

6. Wie hoch ist Dein monatliches Nettoeinkommen?
Mein monatliches Nettoeinkommen beträgt in etwa Euro.

7. Wie hoch sind in etwa Deine monatlichen Fixkosten?
Damit sind beispielsweise folgende Ausgaben gemeint: Miete, Nebenkosten, Strom, Lebensmittel, Gegenstände des alltäglichen Bedarfs, Handyvertrag, Kredit- und Leasingraten, Mitgliedschaften, ...
Meine monatlichen Fixkosten betragen in etwa Euro.

8. Wie hoch ist in etwa Dein Geld- und Wertpapiervermögen?
Das Geld- und Wertpapiervermögen beinhaltet Girokontoguthaben, Sparbuchguthaben, Guthaben in Lebensversicherungen, Wertpapierbestände etc. Natürlich kannst Du den Betrag auf- oder abrunden. Als Ehepartner gib bitte das Eheleute-Vermögen an.
Mein Geld- und Wertpapiervermögen beträgt in etwa Euro.
Mein Immobilienvermögen beträgt in etwa Euro (falls Du kein Immobilienvermögen besitzt, trage bitte „0“ ein).

9. Wie viel Geld sparst Du momentan monatlich in Sparpläne?

Attachment 1. Online Questionnaire (5-6)

Mein Immobilienvermögen Euro (falls Du kein Immobilienvermögen besitzt, trage bitte „0“ ein).
beträgt in etwa

9. Wie viel Geld sparst Du momentan monatlich in Sparpläne?
Gemeint sind beispielsweise Daueraufträge auf ein Sparbuch oder Tagesgeldkonto, Investmentfonds- und ETF-Sparpläne, Bausparverträge, kapitalbildende Lebensversicherungen.


Falls Du aktuell nicht sparst, trage bitte „0“ ein.

Momentan spare ich jeden Monat in 1 Euro.
etwa

10. In welchem Bundesland lebst Du?

Ich wohne in...

- ☒ Baden-Württemberg
- ☐ Bayern
- ☐ Berlin
- ☐ Brandenburg
- ☐ Bremen
- ☐ Hamburg
- ☐ Hessen
- ☐ Mecklenburg-Vorpommern
- ☐ Niedersachsen
- ☐ Nordrhein-Westfalen


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11. Im Folgenden werden Dir Fragen bezüglich Deiner Risikobereitschaft gestellt.
Bitte gib an, in wie weit Du den nachfolgenden Aussagen zustimmst.
Wichtig: Diese Aussagen beziehen sich auf freies Anlagevermögen und nicht auf Geld, das für eine bestimmte Ausgabe reserviert ist oder als finanzielles Polster dient.

	Stimme überhaupt nicht zu	Stimme voll und ganz zu
Bei der Geldanlage gehe ich Risiken nur ungern ein.	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	
Bei der Geldanlage achte ich vorrangig auf die Rendite.	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	
Die Sicherheit meines Kapitals ist mir am allerwichtigsten.	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	
Kleine und kurzfristige Verluste kann ich gut verkraften.	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	
Die Gefahr, einen Teil meines Kapitals verlieren zu können, belastet mich stark.	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>	

[Weiter](#)

B.A. Marcel Piotrowski, FOM Hochschule – 2023 25% ausgefüllt

Attachment 1. Online Questionnaire (7-8)

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12. Welche Kenntnisse (nicht Erfahrungen!) hast Du in den nachfolgenden Anlageklassen?
Bitte beantworte diese Frage mit Blick auf Deine Kenntnisse („Ich weiß was ... ist“) - es folgt noch eine weitere Frage, die Deine Erfahrungen („Ich habe schon ...“) misst.

	Überhaupt keine Kenntnisse	Sehr gute Kenntnisse
Klasse 1: Geldmarkt-, Tagesgeld- und Sparkonten	<input type="radio"/>	<input checked="" type="radio"/>
Klasse 2: Jeweils in Euro – Anleihen, Rentenfonds, Immobilienfonds	<input type="radio"/>	<input checked="" type="radio"/>
Klasse 3: Jeweils in Fremdwährung – Anleihen, Rentenfonds, Immobilienfonds	<input type="radio"/>	<input checked="" type="radio"/>
Klasse 4: Dachfonds, Mischfonds, Vermögensverwaltungen	<input type="radio"/>	<input checked="" type="radio"/>
Klasse 5: Jeweils in Euro – Aktien, Aktienfonds, Aktienanleihen, Zertifikate	<input type="radio"/>	<input checked="" type="radio"/>
Klasse 6: Jeweils in Fremdwährung – Aktien, Aktienfonds, Aktienanleihen, Zertifikate	<input type="radio"/>	<input checked="" type="radio"/>
Klasse 7: Optionen, Optionsscheine, Futures, Zertifikate mit Knock-Out-Charakter	<input type="radio"/>	<input checked="" type="radio"/>

Welche Erfahrungen hast Du in den Anlageklassen?
Bitte gib für die Anlageklassen an, ob Du bereits Erfahrungen damit hast. Erfahrungen bedeutet, dass Du Anlageprodukte aus diesen Klassen aktiv selber nutzt oder in der Vergangenheit genutzt hast.

diesen Klassen aktiv selber nutzt oder in der Vergangenheit genutzt hast.

13. Klasse 1: Geldmarkt-, Tagesgeld- und Sparkonten
Ja, nutze ich aktiv ☒

14. Klasse 2: Jeweils in Euro – Anleihen, Rentenfonds, Immobilienfonds
Ja, habe ich schon mal gehabt, aber jetzt nicht mehr ☒

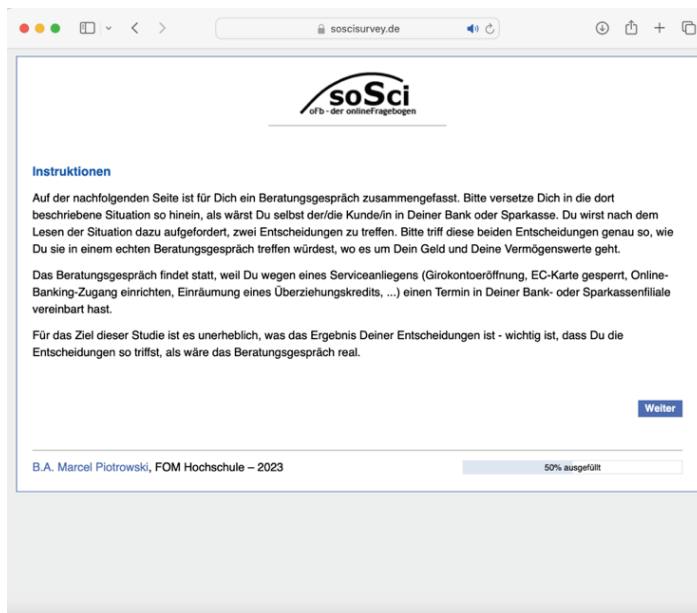
15. Klasse 3: Jeweils in Fremdwährung – Anleihen, Rentenfonds, Immobilienfonds
Nein, noch nie genutzt ☒

16. Klasse 4: Dachfonds, Mischfonds, Vermögensverwaltungen
Ja, nutze ich aktiv ☒

17. Klasse 5: Jeweils in Euro – Aktien, Aktienfonds, Aktienanleihen, Zertifikate
Ja, habe ich schon mal genutzt, aber jetzt nicht mehr ☒

18. Klasse 6: Jeweils in Fremdwährung – Aktien, Aktienfonds, Aktienanleihen, Zertifikate
Nein, noch nie genutzt ☒

Attachment 1. Online Questionnaire (9-10)



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Instruktionen

Auf der nachfolgenden Seite ist für Dich ein Beratungsgespräch zusammengefasst. Bitte versetze Dich in die dort beschriebene Situation so hinein, als wärst Du selbst der/die Kunde/in in Deiner Bank oder Sparkasse. Du wirst nach dem Lesen der Situation dazu aufgefordert, zwei Entscheidungen zu treffen. Bitte tritt diese beiden Entscheidungen genau so, wie Du sie in einem echten Beratungsgespräch treffen würdest, wo es um Dein Geld und Deine Vermögenswerte geht.

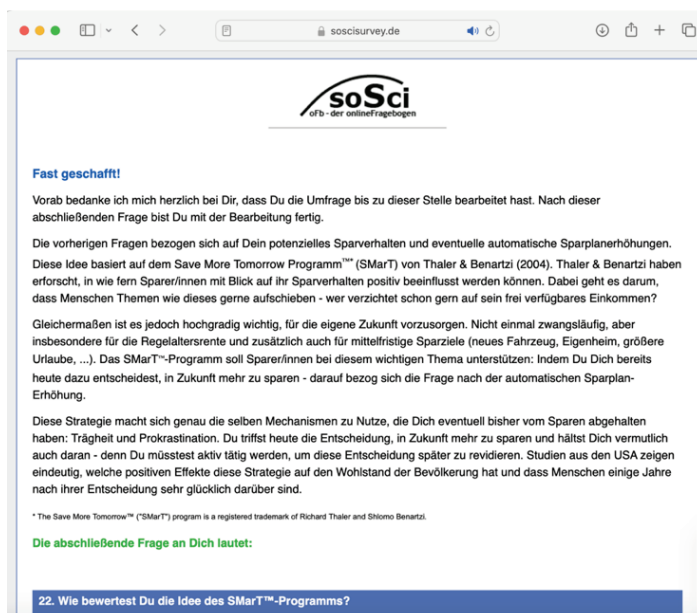
Das Beratungsgespräch findet statt, weil Du wegen eines Serviceanliegens (Girokontoeröffnung, EC-Karte gesperrt, Online-Banking-Zugang einrichten, Einräumung eines Überziehungskredits, ...) einen Termin in Deiner Bank- oder Sparkassenfiliale vereinbart hast.

Für das Ziel dieser Studie ist es unerheblich, was das Ergebnis Deiner Entscheidungen ist - wichtig ist, dass Du die Entscheidungen so triffst, als wäre das Beratungsgespräch real.

Weiter

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50% ausgefüllt



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Fast geschafft!

Vorab bedanke ich mich herzlich bei Dir, dass Du die Umfrage bis zu dieser Stelle bearbeitet hast. Nach dieser abschließenden Frage bist Du mit der Bearbeitung fertig.

Die vorherigen Fragen bezogen sich auf Dein potenzielles Sparverhalten und eventuelle automatische Sparplanerhöhungen. Diese Idee basiert auf dem Save More Tomorrow Programm™ (SMarT) von Thaler & Benartzi (2004). Thaler & Benartzi haben erforscht, in wie fern Sparer/innen mit Blick auf ihr Sparverhalten positiv beeinflusst werden können. Dabei geht es darum, dass Menschen Themen wie dieses gerne aufschieben - wer verzichtet schon gern auf sein frei verfügbares Einkommen?

Gleichmaßen ist es jedoch hochgradig wichtig, für die eigene Zukunft vorzusorgen. Nicht einmal zwangsläufig, aber insbesondere für die Regelaltersrente und zusätzlich auch für mittelfristige Sparziele (neues Fahrzeug, Eigenheim, größere Urlaube, ...). Das SMarT™-Programm soll Sparer/innen bei diesem wichtigen Thema unterstützen: Indem Du Dich bereits heute dazu entscheidest, in Zukunft mehr zu sparen - darauf bezog sich die Frage nach der automatischen Sparplan-Erhöhung.

Diese Strategie macht sich genau die selben Mechanismen zu Nutze, die Dich eventuell bisher vom Sparen abgehalten haben: Trägheit und Prokrastination. Du triffst heute die Entscheidung, in Zukunft mehr zu sparen und hältst Dich vermutlich auch daran - denn Du müsstest aktiv tätig werden, um diese Entscheidung später zu revidieren. Studien aus den USA zeigen eindeutig, welche positiven Effekte diese Strategie auf den Wohlstand der Bevölkerung hat und dass Menschen einige Jahre nach ihrer Entscheidung sehr glücklich darüber sind.

* The Save More Tomorrow™ ("SMarT") program is a registered trademark of Richard Thaler and Shlomo Benartzi.

Die abschließende Frage an Dich lautet:

22. Wie bewertest Du die Idee des SMarT™-Programms?

Bitte gib an, wie weit Du den Aussagen zustimmst.

Attachment 1. Online Questionnaire (11-12)

Die ausstehende Frage ist nicht beantwortet.


22. Wie bewertest Du die Idee des SMarT™-Programms?
Bitte gib an, in wie weit Du den Aussagen zustimmst.

	Stimme überhaupt nicht zu	Stimme voll und ganz zu
Ich erkenne für mich einen bedeutsamen Mehrwert in dieser Strategie.	<input type="radio"/>	<input checked="" type="radio"/>
Ich denke, dass sich solch eine Entscheidung NICHT positiv auf mein Vermögen auswirken kann.	<input type="radio"/>	<input checked="" type="radio"/>
Das SMarT™-Programm ist zwar eine Form von Beeinflussung, allerdings ist diese Art der Beeinflussung vertretbar, weil Sparer/innen erkennbar davon profitieren können.	<input type="radio"/>	<input checked="" type="radio"/>
Das SMarT™-Programm ist ein wirkungsvolles Mittel, um Trägheit und Prokrastination bei wichtigen Finanzentscheidungen zu lösen.	<input type="radio"/>	<input checked="" type="radio"/>
Ich finde diese Art der Beeinflussung moralisch nicht vertretbar.	<input type="radio"/>	<input checked="" type="radio"/>
Würde mein/e Bank- oder Sparkassenberater/in mir so etwas vorschlagen und mir den Sinn dahinter erklären, kann ich mir vorstellen, sowas für mich zu nutzen.	<input type="radio"/>	<input checked="" type="radio"/>

23. Alles in allem finde ich die Idee, die hinter dem SMarT™-Programm steckt, gut und fände es hilfreich, wenn Investoren wie ich bei unseren Anlageentscheidungen davon beeinflusst würden.

☒ Ja
☐ Nein

Weiter


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Geschafft!

Herzlichen Dank für Deine Teilnahme.

Ich bin Dir sehr dankbar, wenn Du diese Umfrage in Deinem Freundes- und Bekanntenkreis teilst, weil für diese Studie eine sehr hohe Teilnehmeranzahl erforderlich ist.

Falls Du an den Ergebnissen dieser Studie interessiert bist, kannst Du mich unter folgender E-Mail-Adresse erreichen: marcel.piotrowski@fom-net.de. Die Ergebnisse sind voraussichtlich ab dem 31.10.2023 verfügbar.

Du kannst das Browser-Fenster jetzt schließen.

Viele Grüße
Marcel Piotrowski

Attachment 1. Online Questionnaire (Exp. Approach C1 & S1.1)

Fragebogen | Seite 1

1. Wie hoch soll Dein monatlicher Sparplan sein?
Wenn Du keinen Sparplan möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Meine monatliche Sparrate soll bei Euro pro Monat liegen.

2. Um welchen festen Geldbetrag soll sich Dein Sparplan jedes Jahr erhöhen?
Wenn Du keine Sparplanerhöhung möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Ich möchte, dass sich mein Sparplan jährlich um Euro erhöht.

Weiter

B.A. Marcel Piotrowski, FOM Hochschule – 2023 57% ausgefüllt

Attachment 1. Online Questionnaire (Exp. Approach C2 & S1.2)

Fragebogen | Seite 1

1. Wie hoch soll Dein monatlicher Sparplan sein?
Wenn Du keinen Sparplan möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Meine monatliche Sparrate soll bei Euro pro Monat liegen.

2. Um welchen festen Prozentsatz soll sich Dein Sparplan jedes Jahr erhöhen?
Wenn Du keine Sparplanerhöhung möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Ich möchte, dass sich mein Sparplan jährlich um % erhöht.

Weiter

B.A. Marcel Piotrowski, FOM Hochschule – 2023 57% ausgefüllt

Attachment 1. Online Questionnaire (Exp. Approach S2.1 & S3.1)

1. Wie hoch soll Dein monatlicher Sparplan sein?
Wenn Du keinen Sparplan möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Meine monatliche Sparrate soll bei Euro pro Monat liegen.

2. Um welchen festen Geldbetrag soll sich Dein Sparplan jedes Jahr erhöhen?
Wenn Du keine Sparplanerhöhung möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Ich möchte, dass sich mein Sparplan jährlich um Euro erhöht.

[Weiter](#)

B.A. Marcel Piotrowski, FOM Hochschule – 2023 57% ausgefüllt

Attachment 1. Online Questionnaire (Exp. Approach S2.2 & S3.2)

1. Wie hoch soll Dein monatlicher Sparplan sein?
Wenn Du keinen Sparplan möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Meine monatliche Sparrate soll bei Euro pro Monat liegen.

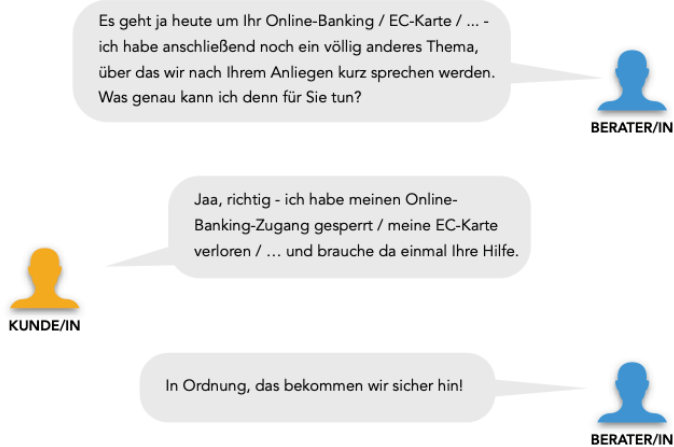
2. Um welchen festen Prozentsatz soll sich Dein Sparplan jedes Jahr erhöhen?
Wenn Du keine Sparplanerhöhung möchtest, kannst Du auch „0“ eintragen.

Bitte triff die Entscheidung so, wie Du sie in einem echten Beratungsgespräch treffen würdest!

Ich möchte, dass sich mein Sparplan jährlich um % erhöht.

[Weiter](#)

B.A. Marcel Piotrowski, FOM Hochschule – 2023 57% ausgefüllt

Attachment 2. Fictitious Conversation between Customer and Advisor

Situationshinweis: Dein/e Berater/in löst Dein Anliegen voll und ganz Deinen Erwartungen entsprechend und Du bist sehr zufrieden mit dem Gespräch.



Attachment 3. Adjusted Descriptive Statistics

Explanatory Variables	Unconditional			Control 1			Control 2			Study 1.1			Study 1.2			Study 2.1			Study 2.2			Study 3.1			Study 3.2		
	Mean	SD	Min	Mean	SD	Min	Mean	SD	Min	Mean	SD	Min	Mean	SD	Min	Mean	SD	Min	Mean	SD	Min	Mean	SD	Min	Mean	SD	Min
Age	35.27	12.94	19.00	42.42	23.00	23.00	34.97	13.78	21.00	35.38	12.48	21.00	35.43	23.00	23.00	32.57	11.64	19.00	34.06	12.05	19.00	36.45	20.00	35.36	20.00	35.36	22.00
Gender: Female	0.65	1.00	0.65	1.00	0.65	1.00	0.61	1.00	1.00	0.55	1.00	1.00	0.70	1.00	1.00	0.61	1.00	1.00	0.63	1.00	1.00	0.59	1.00	0.86	1.00	0.86	1.00
Income [TEUR]	0.48	2.00	0.49	2.00	0.50	2.00	0.51	2.00	0.51	2.00	0.51	2.00	0.47	2.00	0.47	2.00	0.50	2.00	0.49	2.00	0.49	2.00	0.50	2.00	0.56	2.00	2.00
Income [TEUR]	2.72	0.35	2.98	0.60	2.57	0.45	2.57	0.45	7.00	2.87	1.00	2.87	1.00	2.92	0.35	2.70	0.90	2.88	1.00	2.88	1.00	2.33	0.90	2.45	0.60	2.45	0.60
Expenses [TEUR]	1.47	10.00	1.93	10.00	1.34	7.00	1.34	7.00	1.57	9.00	1.41	9.00	1.61	0.03	1.43	6.00	1.44	6.00	1.60	10.00	1.21	6.50	1.12	5.30	1.12	5.30	0.03
Wealth (cash) [TEUR]	0.87	7.50	1.39	7.50	0.73	3.50	0.73	3.50	4.00	0.84	4.00	0.92	4.50	0.92	4.50	0.85	3.00	0.74	3.50	0.66	3.00	0.66	3.00	0.59	2.50	0.59	2.50
Wealth (cash) [TEUR]	57.39	0.00	123.80	0.00	79.36	0.00	237.8	1.30	52.62	0.50	46.00	0.00	69.92	2.00	38.19	1.50	46.02	0.40	35.81	0.40	48.30	0.00	40.21	0.00	42.13	0.00	42.13
Wealth (real estate) [TEUR]	154.90	0.00	224.00	0.00	148.70	0.00	411.50	2.00	183.40	0.00	100.90	0.00	212.80	0.00	212.80	0.00	131.00	0.00	131.00	0.00	196.20	0.00	196.20	0.00	121.20	0.00	121.20
Current Savings Rates [%]	423.90	0.00	332.30	0.00	512.40	0.00	580.40	2.50	431.10	1.80	532.50	2.30	472.40	0.00	340.00	1.30	482.50	0.00	270.90	0.00	270.90	0.00	400.61	0.00	400.61	0.00	400.61
Knowledge in Securities	3.24	1.00	3.00	1.00	3.29	1.00	3.29	1.00	3.18	1.00	3.21	1.29	3.21	1.00	3.49	1.00	3.79	1.00	3.07	1.00	3.07	1.00	2.74	1.00	2.74	1.00	2.74
Risk Appetite	1.17	6.00	1.14	6.00	1.27	6.00	1.27	6.00	1.33	6.00	1.32	6.00	1.52	6.00	1.33	6.00	1.47	6.00	1.47	6.00	1.39	5.71	1.60	6.00	1.60	6.00	
Assessment of SMar™ (scale)	3.64	1.00	3.41	1.60	3.72	1.00	3.63	2.20	3.50	1.20	4.15	1.40	3.93	1.60	4.15	1.40	3.93	1.60	3.46	1.00	3.46	1.00	3.22	1.00	3.22	1.00	3.22
Assessment of SMar™ (scale)	3.65	1.00	3.64	1.67	3.53	1.33	3.53	1.33	3.62	1.50	3.64	2.33	3.85	2.50	3.85	2.50	3.63	2.00	3.66	1.33	3.66	1.33	3.66	2.67	3.66	2.67	3.66
Assessment of SMar™ (scale)	0.73	5.00	0.76	4.83	0.82	4.83	0.82	4.83	0.74	4.67	0.65	4.67	0.65	4.67	0.66	4.83	0.65	4.67	0.96	4.83	0.96	4.83	0.63	0.63	0.63	0.63	0.63
Assessment of SMar™ (accept.)	0.77	1.00	0.73	1.00	0.77	1.00	0.77	1.00	0.83	1.00	0.78	1.00	0.78	1.00	0.82	1.00	0.82	1.00	0.78	1.00	0.68	1.00	0.71	1.00	0.71	1.00	0.71
Assessment of SMar™ (accept.)	0.42	2.00	0.45	2.00	0.43	2.00	0.43	2.00	0.38	2.00	0.42	2.00	0.42	2.00	0.39	2.00	0.42	2.00	0.42	2.00	0.48	2.00	0.46	2.00	0.46	2.00	0.46
Dependent Variables																											
Selected Savings Rate [%]	110.60	0.00	111.50	0.00	106.00	0.00	87.38	300.00	176.70	0.00	109.60	0.00	77.03	250.00	125.50	0.00	114.20	0.00	52.95	0.00	43.17	130.00	73.57	0.00	73.57	0.00	73.57
Dynamization [%]	110.50	750.00	145.70	500.00	87.38	300.00	168.00	750.00	168.00	750.00	168.00	750.00	77.03	250.00	121.70	500.00	80.63	300.00	43.17	130.00	6.64	0.00	—	—	—	—	—
Dynamization [%]	8.07	0.00	6.25	0.00	—	—	—	—	12.07	0.00	—	—	—	—	8.07	44.00	—	—	—	—	—	—	—	—	—	—	—
Dynamization [%]	12.85	50.00	13.91	50.00	—	—	—	—	16.66	50.00	—	—	—	—	8.07	44.00	—	—	10.14	50.00	—	—	—	—	—	—	—
Dynamization [%]	2.03	0.00	—	—	0.88	0.00	0.88	0.00	4.22	0.00	—	—	4.22	0.00	—	—	—	1.72	0.00	—	—	—	—	1.88	0.00	1.88	0.00
Dynamization [%]	2.28	10.00	—	—	1.38	5.20	1.38	5.20	3.45	10.00	—	—	3.45	10.00	—	—	—	1.43	5.50	—	—	—	—	1.10	2.50	1.10	2.50

Notes. Adjusted Descriptive Statistics due to the removal of Rows 94, 106, and 137 due to far-above dynamization values and NAs. Based on n = 219. Participants in Control group 1 = 26; Control group 2 = 31; Study group 1.1 = 29; Study group 1.2 = 23; Study group 2.1 = 28; Study group 2.2 = 32; Study group 3.1 = 22; Study group 3.2 = 28.

Attachment 4. Correlation Analysis

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.
I. Age ¹	-	-.22	.37	.42	.24	.29	-.01	-.08	-.28	-.12	-.04	-.16	-.00
II. Education ²		-	.11	.03	.15	-.04	.17	.16	.17	.12	.09	.24	.01
III. Income ¹			-	.74	.44	.35	.41	.36	.17	.09	.27	-.07	-.01
IV. Expenses ¹				-	.35	.32	.09	.28	.11	.06	.17	-.09	.05
V. Wealth (cash) ¹					-	.27	.40	.28	.14	.08	.14	-.13	-.12
VI. Wealth (real estate) ¹						-	.07	.20	.05	.06	.06	.02	-.06
VII. Current Savings Rate ¹							-	.34	.29	.08	.13	-.00	-.13
VIII. Knowledge in Securities ¹								-	.72	.19	.14	.03	-.04
IX. Risk Appetite ¹									-	.26	.15	.09	-.00
X. Assessment of SMarTTM ₀										-	.18	.14	.24
XI. Selected Savings Rate ¹											-	.23	.18
XII. Dynamization (EUR) ¹												-	0.00
XIII. Dynamization (%) ¹													-

Notes. 1 Pearson's Correlation Coefficient. 2 Spearman's Correlation Coefficient. Correlations significant at the $\alpha = .05$ level are in bold.

Attachment 5. Pairwise Tukey Calculations

I. Five Year Investment Perspective					
Group	Difference	Lwr	Upr	p (adj.)	
control2 - control1	-0.24768	-5.3405	4.8451	1.000	
study1_1 - control1	3.77897	-1.3933	8.9513	0.342	
study1_2 - control1	2.10043	-3.3815	7.5824	0.937	
study2_1 - control1	3.39952	-1.8163	8.6153	0.4874	
study2_2 - control1	0.16388	-4.8905	5.2223	1.000	
study3_1 - control1	0.07002	-5.4776	5.6177	1.000	
study3_2 - control1	-1.49095	-6.7067	3.7248	0.980	
study1_1 - control2	4.02665	-0.9208	8.9741	0.2047	
study1_2 - control2	2.34811	-2.9222	7.6185	0.8724	
study2_1 - control2	3.64720	-1.3457	8.6401	0.3344	
study2_2 - control2	0.41356	-4.4126	5.2397	1.000	
study3_1 - control2	0.31771	-5.0210	5.6564	1.000	
study3_2 - control2	-1.24327	-6.2362	3.7496	0.9948	
study1_2 - study1_1	-1.67854	-7.0257	3.6687	0.9793	
study2_1 - study1_1	-0.37945	-5.4534	4.6945	1.000	
study2_2 - study1_1	-3.61309	-8.5231	1.2969	0.3249	
study3_1 - study1_1	-3.70895	-9.1235	1.7056	0.4201	
study3_2 - study1_1	-5.26992	-10.3439	-0.1960	0.0355	
study2_1 - study1_2	1.29909	-4.0002	6.6894	0.9957	
study2_2 - study1_2	-1.93455	-7.1697	3.3006	0.9492	
study3_1 - study1_2	-2.03041	-7.7415	3.6807	0.9387	
study3_2 - study1_2	-3.59138	-8.9806	1.7979	0.4574	
study2_1 - study2_1	-3.23364	-8.1894	1.7221	0.4859	
study3_1 - study2_1	-3.32930	-8.7856	2.1266	0.5742	
study3_2 - study2_1	-4.89048	-10.0087	0.2278	0.0727	
study3_1 - study2_2	-0.09386	-5.3998	5.2081	1.000	
study3_2 - study2_2	-1.65883	-6.6126	3.2869	0.9704	
study3_2 - study3_1	-1.56098	-7.0171	3.8951	0.9879	

II. Ten Year Investment Perspective					
Group	Difference	Lwr	Upr	p (adj.)	
control2 - control1	-1.1918	-7.7503	5.3667	0.9993	
study1_1 - control1	4.8634	-1.7975	11.5242	0.330	
study1_2 - control1	3.0581	-4.0015	10.1178	0.8880	
study2_1 - control1	3.8842	-2.8327	10.6010	0.6407	
study2_2 - control1	-0.6179	-7.1295	5.8937	1.000	
study3_1 - control1	0.8603	-6.2840	8.0045	1.000	
study3_2 - control1	-2.3930	-9.1068	4.3238	0.9582	
study1_1 - control2	6.0552	-0.3161	12.4265	0.0758	
study1_2 - control2	4.2499	-2.5372	11.0371	0.5407	
study2_1 - control2	5.0760	-1.3539	11.5088	0.2386	
study2_2 - control2	0.5739	-5.6412	6.7890	1.000	
study3_1 - control2	2.0521	-4.8230	8.9272	0.9845	
study3_2 - control2	-1.2012	-7.6310	5.2286	0.9992	
study1_2 - study1_1	-1.8052	-8.6913	5.0809	0.9928	
study2_1 - study1_1	-0.9792	-7.5134	5.5590	0.9998	
study2_2 - study1_1	-5.4813	-11.8043	0.8418	0.1430	
study3_1 - study1_1	-4.0031	-10.9759	2.9697	0.6493	
study3_2 - study1_1	-7.2564	-13.7906	-0.7222	0.0180	
study2_1 - study1_2	0.8260	-6.1143	7.7663	1.000	
study2_2 - study1_2	-3.6760	-10.4178	3.0658	0.7070	
study3_1 - study1_2	-2.1979	-9.5526	5.1568	0.9844	
study3_2 - study1_2	-5.4512	-12.3914	1.4891	0.2445	
study2_1 - study2_1	-4.3020	-10.8940	1.8799	0.3816	
study3_1 - study2_1	-3.0239	-10.0302	4.0025	0.8914	
study3_2 - study2_1	-6.2772	-12.8694	0.3141	0.0746	
study3_1 - study2_2	1.4782	-5.3522	8.3086	0.9978	
study3_2 - study2_2	-1.7751	-8.1571	4.6069	0.9808	
study3_2 - study3_1	-3.2533	-10.2796	3.7730	0.8483	

Notes. Pairwise Tukey Comparisons based on ANOVA calculations of Table 6.

Attachment 5. Pairwise Tukey Calculations (Continuation)

III. Twenty Year Investment Perspective					
Group	Difference	Lwr	Upr	p (adj.)	
control2 - control	-2.8432	-13.5004	7.8197	0.9921	
study1_1 - control	7.0322	-3.79708	17.8615	0.4924	
study1_2 - control	8.0979	-3.37972	19.5755	0.3804	
study2_1 - control	4.8534	-6.06689	15.7737	0.8738	
study2_2 - control	-1.9497	-12.53632	8.6369	0.9992	
study3_1 - control	2.4408	-9.17438	14.0560	0.9982	
study3_2 - control	-4.0348	-14.95512	6.8855	0.9493	
study1_1 - control2	9.8754	-0.48319	20.2339	0.0740	
study1_2 - control2	10.9411	-0.09353	21.9756	0.0538	
study2_1 - control2	7.6966	-2.75711	18.1503	0.3242	
study2_2 - control2	0.8934	-9.21114	10.9980	1.0000	
study3_1 - control2	5.2840	-5.89364	16.4616	0.8339	
study3_2 - control2	-1.1916	-11.64534	9.2621	1.0000	
study1_2 - study1_1	1.0657	-10.12980	12.2612	1.0000	
study2_2 - study1_1	-2.1788	-12.80217	8.4446	0.9985	
study3_2 - study1_1	-8.9819	-19.26197	1.2981	0.1361	
study3_1 - study1_1	-4.5914	-15.92787	6.7451	0.9190	
study2_2 - study1_2	-11.0670	-21.69041	-0.4436	0.0345	
study3_2 - study1_2	-3.2445	-14.52802	8.0391	0.9875	
study2_1 - study1_2	-10.0476	-21.00851	0.9133	0.0689	
study3_1 - study1_2	-5.6571	-17.61441	6.3003	0.8334	
study3_2 - study1_2	-12.1327	-23.41625	-0.8491	0.0253	
study2_2 - study2_1	-6.8031	-17.17905	3.5727	0.4794	
study3_1 - study2_1	-2.4126	-13.83609	9.0109	0.9981	
study3_2 - study2_1	-8.8882	-19.60441	1.8279	0.1849	
study3_1 - study2_2	4.3905	-6.71435	15.4954	0.9281	
study3_2 - study2_2	-2.0851	-12.46008	8.2008	0.9986	
study3_2 - study3_1	-6.4756	-17.89912	4.9479	0.6640	

IV. Thirty Year Investment Perspective					
Group	Difference	Lwr	Upr	p (adj.)	
control2 - control	-4.042	-21.561	13.478	0.9967	
study1_1 - control	9.201	-8.992	26.994	0.7399	
study1_2 - control	21.252	2.394	40.111	0.0153	
study2_1 - control	5.823	-12.120	23.765	0.9730	
study2_2 - control	-2.875	-20.269	14.519	0.9996	
study3_1 - control	4.021	-15.063	23.105	0.9982	
study3_2 - control	-5.410	-23.353	12.532	0.9835	
study1_1 - control2	13.243	-3.777	30.262	0.2356	
study1_2 - control2	25.294	7.164	43.424	0.0008	
study2_1 - control2	9.864	-7.312	27.040	0.6489	
study2_2 - control2	1.166	-15.436	17.768	1.0000	
study3_1 - control2	8.063	-10.302	26.428	0.8838	
study3_2 - control2	-1.369	-18.544	15.807	1.0000	
study1_2 - study1_1	12.051	-6.343	30.446	0.4804	
study2_2 - study1_1	-3.378	-20.833	14.076	0.9989	
study3_2 - study1_1	-12.076	-28.967	4.814	0.3026	
study3_1 - study1_1	-5.180	-23.806	13.447	0.9808	
study2_2 - study1_2	-14.611	-32.066	2.843	0.1757	
study3_2 - study1_2	-15.430	-33.969	3.109	0.1814	
study2_1 - study1_2	-24.128	-42.137	-6.119	0.0015	
study3_1 - study1_2	-17.231	-36.877	2.415	0.1329	
study3_2 - study1_2	-26.663	-45.202	-8.123	0.0004	
study2_2 - study2_1	-8.698	-25.746	8.350	0.7723	
study3_1 - study2_1	-1.801	-20.570	16.968	1.0000	
study3_2 - study2_1	-11.233	-28.840	6.374	0.5160	
study3_1 - study2_2	6.897	-11.349	25.142	0.9429	
study3_2 - study2_2	-2.535	-19.383	14.513	0.9998	
study3_2 - study3_1	-9.432	-28.201	9.338	0.7857	

Notes. Pairwise Tukey Comparisons based on ANOVA calculations of Table 6.

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- Arbeitszufriedenheit, Stress und Erholung, Digitalisierung und die Erfordernisse und Auswirkungen der Entgrenzung des Arbeitens im Bereich Arbeitspsychologie,
- Organisationsdiagnose und -entwicklung sowie Führung im Bereich Organisationspsychologie,
- die Entwicklung von psychologischen Testverfahren für Personalpraktiker im Bereich Personal,
- Entscheidungsprozesse bei Käufen und Finanzentscheidungen sowie der Entwicklung neuer Messverfahren im Bereich Konsumentenpsychologie.

Weitere Informationen finden Sie unter **fom-iwp.de**



Der Wissenschaftsblog der FOM Hochschule bietet Einblicke in die vielfältigen Themen, zu denen an der FOM geforscht wird: **fom-blog.de**