
This is the **published version** of the bachelor thesis:

Arrufat Villar, Miguel; Olivella, Pau, dir. Behavioral Economics to increase ecological food sales : How choice architecture helps to modify consumer decision making. 2022. 67 pag. (1417 Grau en Administració i Direcció d'Empreses)

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**Universitat Autònoma
de Barcelona**

**BEHAVIORAL ECONOMICS
TO INCREASE ECOLOGICAL FOOD SALES**
How choice architecture helps to modify consumer decision making

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30/05/2022
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Abstract

Behavioral Economics has supposed a paradigm shift in the field of modern Economics. Applying psychological concepts to traditional models has made it possible to change the way of looking at people's behavior and making predictions about it. By better understanding the patterns that define behavior and the factors that bias individuals' decision making, it is possible to develop mechanisms, known as nudging, to affect the perception of the different options available and guide them to choose a particular one. The intention of this paper is to apply this knowledge to the business field. It will investigate how choice architecture and different nudging strategies affect consumers' decision making, and how they can be used by vendors to increase sales of high quality products. Specifically, we will seek to guide consumers to buy more ecological food, products of higher quality and beneficial for the environment, healthier for consumers, and more profitable for producers, generating a shared benefit for companies and the community.

Keywords

Behavioral Economics

Choice architecture

Nudging

Survey

Decision making

Acknowledgements

To Carlos, Rosa, Mar and the rest of my family. Thank you for accompanying me on this journey, supporting me in the good and bad times and encouraging me when it seemed that I could not find my way.

To my friends and people who have supported me at all times. Thank you for the endless talks, the laughs, for helping me to disconnect and for so many unforgettable experiences.

To my class colleagues. Thank you for sharing these 4 years with me. For the trips to the Cívica, the meals, the beers, for the disinterested help and for sharing different visions.

Finally, to Pau, my tutor in this Final Thesis. Thank you for your good vision, for guiding me and helping me with your good advice at all times. I have learned a lot during the completion of this work.

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List of abbreviations

Econs	Homo Economicus
SIF	Supposedly Irrelevant Factors
EBET	Evidence-Based Economic Theory
H&JNCM	Hansen and Jaspersen Nudge Classification Matrix
ANOVA	Analysis of Variance

CHAPTER 1. INTRODUCTION

1.1. Justification

Behavioral Economics is a paradigm-shifting concept, which combines elements of economics and psychology to try to understand the reasons why people act the way we do in real life. The evidence shows that people act in a different way to that described in Neoclassical Economics, which, erroneously, has assumed for decades that people have well-defined preferences, and make well-informed, self-interested and therefore rational decisions based on these preferences. The disruptive vision proposed by the field of Behavioral Economics is an extension of Neoclassical Economic Theories, and seeks to build models and make predictions based on evidence rather than theory, using concepts from psychology to do so.

Psychological studies show that in certain situations, people make mistakes in their decision making, which are not random. Errors are reproduced systematically and in specific situations. This means that, with the help of this knowledge, it is possible to bias people's preferences, which guides them to act in the way we want them to act. This is the basis of the concept of *Nudging*, and how choice architecture helps to condition people's decision-making.

The field of Behavioral Economics managed to awaken my interest and desire to continue researching about the ways in which it tries to explain people's behavior in a practical way, rather than in a theoretical and completely rational one. Also the concepts of nudging and choice architecture, and how it is possible to take advantage of the cognitive biases of individuals in order to modify their decision making. These were some of the reasons why I chose this topic for my Final Thesis.

I was also curious about the possibility of trying to change the decision of consumers, encouraging them to consume a greater amount of ecological food, considered high-end products, which are those of a higher quality and price than their more conventional variants. The intuition is that people have a positive view and general acceptance of ecological food. They know that they are of superior quality and that the environment has been respected in their production process, and they would be willing to choose them over their more conventional variants on equal terms. On the other hand, the price of these products and the lack of initiative to change act as a barrier for many consumers to purchase them.

This study seeks to prove that by manipulating the choice architecture, it is possible to increase the consumption of ecological food, which would represent an increase in respect for the environment, a boost to the profit of producers, and an improvement in the quality of the aliments ingested and therefore in the health of consumers.

To achieve this purpose, 4 different types of surveys have been designed, to which different homogeneous groups of consumers will have to respond. The structure will be the same for all surveys, but three of them will introduce changes in their choice architecture to try to bias participant's preferences. The last of the surveys will have a neutral architecture, so that its

participants will act as a control group. In this way it will be possible to observe and analyze the effects of nudging on consumers.

1.2. General and specific objectives

This report will focus on some particular nudging strategies, all described by Ana Caraban (2019). They all belong to the same mechanism, Facilitate, which is characterized by bringing the desired option closer to the consumer, making it more accessible and facilitating their decision making. The interest of this study is not focused on the design of tools or formats for vendors, but to see how consumers respond to different ways of trying to modify their behavior. The intuition is that individuals to whom a nudging strategy is applied will respond differently than those in the control group.

The general objective of this report is, therefore, to analyze how different nudging strategies affect the formation of consumer choice in relation to the quality and benefits of a product. Also to analyze if there are differences between the different strategies, and if there is one that is shown to be more effective than the rest under the context in which the study will be conducted.

Specifically, this study seeks to analyze with evidence whether variables such as consumers' gender have an effect on their valuation of ecological food or on the effect that different nudging strategies have on them. Also, whether differences in the price of products are a barrier to the effects of choice architecture.

Knowledge of the nudging strategies studied and the results of this study can help vendors to design better strategies to increase the sale of their ecological products. In the following sections, we will review the theoretical foundations that encompass the field of Behavioral Economics, focusing specifically on the concept of nudging, and the different strategies that will later be implemented and discussed. The results will then be analyzed using the statistical tool JMP and the final conclusions of the study will be presented.

CHAPTER 2. THEORETICAL FRAMEWORK

2.0 Introduction

This chapter presents a review of the literature that was taken into account for the realization of this Final Thesis. It provides an overview of the field of Behavioral Economics, the concept, theories and most relevant details. Later on, it deepens in the nudging section, and focuses specifically on the strategies that will later be put into practice to fulfill the objectives of this work.

2.1 Behavioral Economics

2.1.1 What is Behavioral Economics?

When building economic models, economists often assume that individuals are rational and efficient when making decisions. Evidence, on the other hand, shows the opposite: in many cases, people are impulsive, inefficient and make totally irrational decisions, which are not consistent with classical economic models. Behavioral Economics represents a branch of economics, which focuses on how people actually behave, applying psychological, social and emotional concepts that have been shown to influence the human decision-making process.

Contrary to popular belief, this is an ancient concept, already introduced by Adam Smith in his *Theory of Moral Sentiments* in 1759, which already took into account the irrational elements of human behavior. Taking these concepts into consideration generates an added difficulty when building economic models and making accurate predictions, so generations of economists decided to ignore them and build their theories assuming the total rationality of people.

After decades in the shadows, the field of Behavioral Economics was brought back into the spotlight thanks to the work of a number of economists, who realized the importance of establishing a bridge between economic and psychological analysis in individual decision making. Among them is Richard Thaler, considered the father of Modern Behavioral Economics, who was awarded the Nobel Prize in 2017 for his work in this field. Despite this, Thaler continues to highlight Adam Smith as the first Behavioral Economist, and for this he presents some concepts that Smith introduced long before his work:

1. **Overconfidence.** “the overweening conceit which the greater part of men have of their own abilities”(1776)
2. **Loss aversion**¹. “Pain...is, in almost all cases, a more pungent sensation than the opposite and corresponding pleasure” (1759).
3. **Self control.** “The pleasure which we are to enjoy ten years hence, interests us so little in comparison with that which we may enjoy today” (1759)

¹ Strong tendency of people to prefer to avoid monetary losses rather than to obtain equivalent monetary gains: Losses outweigh gains.

These concepts introduced by Smith represent the core ideas of Behavioral Economics, as said by Thaler (*The 2018 Ryerson Lecture*, University of Chicago, 2018). When developing economic theories, it is possible to leave psychology aside, but it is totally impossible to leave human nature aside. Even if an economist does not use psychological evidence to develop his theories, he will still not be able to leave psychology out of his work, since one is inherently linked to the other. Instead, he will have to make use of his own conclusions to develop his models and theories. Assuming that we are not talking about an expert in psychology, evidently many of his conclusions will be wrong by making use of "bad psychology", which will result in useless models. Referring to this idea Thaler stated that "Behavioral Economics is a matter of borrowing good psychology, rather than inventing bad psychology".

2.1.2 Neoclassical Economics Assumptions

To label one type of economics as "Behavioral", it seems obvious that there should be another type of economics that is "Non-Behavioral", which can be contrasted. Therefore, what is Non-Behavioral Economics?

As Herb Simon (1936) said, the answer to this question is to be found in the specific assumptions about human behavior made in Neoclassical Economic Theory². These assumptions are the following:

1. **Optimization.** It is assumed that people will always choose the best option they can afford.
2. **Consumer sovereignty.** People know what's best for themselves. They know better than anyone else could know and especially better than the government would know. Neoclassical economics implicitly assumes that there is no self control problem, and that consumers always choose what's best for them, meaning that they never choose the wrong option.
3. **Unbiased beliefs.** There is an assumption of consumer's rational expectations. It formalizes the belief that people's expectations about the future are unbiased, something that was always assumed in Economics.
4. **Self interest.** Neoclassical economists assume that people only care for their self interest, also probably of their family.

If these assumptions about human behavior were true, it would be impossible to explain, for example, that people going to a restaurant order more food than they can eat, or drink more than will be good for them. According to classical assumptions, people follow an optimized behavior that does not give errors to their choice.

² Economic approach based on the marginalist analysis that includes the assumption of total rationality and efficiency in the decision making of individuals.

There are many examples that show that many of these assumptions do not hold true in real life. To take another example, it is not possible to rationally explain that some people pay gym membership every month, but never go. They just do it. Neoclassical assumptions overlook these phenomena, while Behavioral economics takes them into account and applies them to existing theories, adding a greater degree of complexity.

Behavioral Economics, therefore, doesn't blow up classical Economic Theories, it just seeks to understand when and why people behave differently than economic models suggest. Another example that best exemplifies this deviation from the rational behavior assumed by classical theories is the Ultimatum Game.

2.1.3 The Ultimatum Game

One of the most popular experiments in the field of Behavioral Economics is the Ultimatum Game. The first experiments using this type of game were carried out by three German economists: Güth, Schmittberger and Schwarze (1982). Let us imagine a game in which there are two participants, which we will refer to as Player 1 and Player 2. Player 1 receives \$100 and is told that he must offer an amount of that money to Player 2. In the event that Player 2 rejects the offer, neither player will receive anything. Let's imagine for a moment that we are in the position of Player 1. What is, therefore, the offer we should make to Player 2 to maximize our profit?

Rubinstein (1982) theorized, based on the assumptions of classical economic models, that the most obvious decision for Player 1 is to offer the minimum amount to Player 2, i.e. one dollar. Assuming the efficiency principle³, we should think that he will make the more rational decision and prefer to keep a dollar rather than go home with nothing. Despite this, Rubinstein warned about the risk of following this strategy: if Player 2 perceives the offer as an insult, it is likely that he will decide to reject it, accepting to lose a dollar rather than accept an offer that he considers unfair.

This is in contradiction with classical economic theory, and the assumption that all individuals make rational and efficient decisions. Following this theory, Player 2 should accept any offer, even the minimum offer. Reality, on the other hand, shows that human behavior is not only driven by gain, but also by other more complex factors such as fairness, justice and even revenge (*Anomalies: The Ultimatum Game*, R. Thaler, 1988). If Player 2 feels insulted after being offered a dollar out of 100, he will only have to give up that dollar in order to get revenge. The Ultimatum Game demonstrates that it is not as easy to predict people's behavior as some classical economists suggest.

What should our offer be, therefore? There is no clear answer to this question, as it will depend on the personality and conditions of Player 2, and the level of inequality he is willing to accept rather than run out of money.

³ Economic theory which states that the actions of individuals are driven by profit maximization and efficient allocation of resources.

If all people were fully rational, they would always have the same choice in the face of identical options, but in some cases people's choice depends on the way the options are presented. This is a cognitive bias⁴ that psychologists call the "Framing Effect". This effect, described by psychologists Amos Tversky and Daniel Kahneman (*The Framing of Decisions and the Psychology of Choice*, 1985), argues that the format and the words we use to present the different alternatives have an influence on individuals' decisions. According to this effect, options that are worded (framed) differently to appeal to our biases tend to be valued more positively and vice versa.

Returning to the example of the Ultimatum Game, let's imagine that Player 1 offers 10 dollars out of 100 to Player 2, and Player 2 decides to reject the offer. Now imagine that Player 2 is offered \$10 directly, eliminating the interaction with Player 1. It seems obvious that in this case Player 2 would accept, even though the gain is the same (\$10). The difference lies in the way the options are presented: by participating in the game, Player 2 has the feeling that he is losing \$90, even though the net gain is the same as without participating. It has been shown that people have a systematic aversion to loss, so if we associate one of the options with the feeling of loss, it is more likely to be rejected.

2.1.4 Econs and Humans

The effect of emotions and psychological biases on our actions illustrates the limited rationality that individuals demonstrate when making decisions in real life. Neoclassical Economic Theories, on the other hand, are developed for fictitious individuals, referred to as Homo Economicus "Econs".

According to the characteristics attributed to them in classical theories, we can say that Econs are (*Misbehaving: The Making of Behavioral Economics*, Thaler, R. H., 2016):

- **Perfect calculators:** they always choose the best option of those they can afford
- **Have rational expectations:** their beliefs about the future are realistic and unbiased
- **Have no self-control problems:** they always choose the exact amount of what they have to consume and they always know what's best for them.
- **Only care of themselves:** their decisions are always guided by their individual interests.

Unfortunately for Neoclassical Economists, Econs are fictional characters, and their behavior seems to be more similar to the behavior of robots than that of normal people (Humans). Humans are more irrational, are conditioned by more biases, and are not as individualistic in their behavior as Econs. Given this, can classical theories, built for Econs, be applied to

⁴ Systematic error in thinking that occurs when people are processing and interpreting information in the world around them and affects the decisions and judgments that they make.

Humans? And if not, how large are the disparities? Answering these questions is the real utility of the Behavioral Economics field.

According to Thaler (*The Behavioralizing of Economics, Richard Thaler, Talks at Google, 2015*) even the idea of optimization does not seem to be plausible, and this is mainly due to two ideas:

1. Some tasks are harder than others
2. Some people are smarter than other

The problem with classical theories is that the economists who develop them assume that all people are as intelligent as they are and that all tasks have the same degree of difficulty and require the same degree of effort. In real life this is not the case, as Humans make mistakes.

This may lead one to think that it is impossible to build any theory or model, since any of them would be useless due to the imperfect behavior of people. Fortunately this is not true, since human behavior, although often irrational, is not random. Kahneman and Tversky found that people's mistakes are systematic, i.e., they are predictable. This means that people tend to deviate from expected behavior in predictable ways. There are circumstances in which people make errors systematically, and in which it is possible to take action.

2.1.4.1 Raising the stakes

Human intuition may lead one to think that, in the same way that continued training in a sport leads to an improvement, continued repetition of a decision making process leads to an improvement in the making of that decision. There is no evidence that this is actually the case. That means that if you buy milk twice a week, for instance, you are not going to become a better decision maker the more milk you buy. Humans do not learn in the process. In fact, as said before, they always tend to commit the same systematic mistakes.

But what happens when we raise the stakes? When the importance of the decision increases, the number of times we make it decreases. As Thaler explains (*The 2018 Ryerson Lecture, University of Chicago, 2018*), it is not as important to buy a brick of milk (we do it every week) as it is to buy a car (perhaps once every ten years) as it is to get married (perhaps only once in a lifetime). In the same way that repetition of an action does not produce a better action, there is no evidence either that decision making gets better when stakes are raised. Irrationalities in behavior remain systematic.

Given these conditions, it is easier to make money by exploiting people's irrationalities than by trying to correct them. Applied to the field of business, it can be concluded that, in most cases, it is inefficient to try to educate consumers. It will be a long and costly process, and they will most likely continue to make the same mistakes at the end of it. It's simply too complicated to try to make money trying to convince people that they are wrong. They're not going to accept it.

2.1.5 Supposedly irrelevant factors

The law of supply and demand states that if the demand for a product rises and the quantity supplied remains stable, the price will rise. This statement is correct, but it is not very accurate, since it does not incorporate any kind of magnitude. This is repeated in most economic models, which tend to make vague predictions. Only in a few specific cases, economists make accurate predictions, which is when a variable will have exactly zero effect. These variables are known in Behavioral Economics as Supposedly Irrelevant Factors "SIF". Classical economists assume that they have no effect, when in fact they do, so sticking to the standard model alone can lead to problems in making predictions.

Some of the most relevant SIFs described by Kahneman are the following:

- **Sunk costs**⁵. Classical economists consider that, following rational behavior, sunk costs should not affect individuals' decisions, since past actions should not take precedence over future expenditures. They do not take into account the loss aversion of Humans, who see it as a waste not to make use of what they have already spent, so it does indeed have an effect on the final decision. If a person goes to the cinema to see a new movie, and despite not liking or enjoying the experience, continues to watch it simply because he/she already paid for the ticket, the "Sunk cost Fallacy" is being committed.
- **Framing**. Related to the "Framing Effect" described above. The theory of rational behavior suggests that the framing of options should not have an effect on the final decision. In reality, options that are framed positively tend to be better valued by individuals. It is not the same, for Humans, to hear that a draw will have one winner as it is to hear that it will have 999 losers. People are more willing to positively value an option when they receive positive inputs.
- **Defaults**. When making a decision, the default option should not have an effect on people, as they should be able to analyze both options separately and choose the best one, as is assumed in Econs. In real life it does have an effect, as Humans have a status quo bias⁶ that makes them more likely to accept the default option, rejecting the other option even though it may turn out to be better. Thaler demonstrated in a study that simply setting the default option for a company's employees to be assigned to a pension plan rather than letting them choose between the two options results in a significantly higher rate of enrollment (Benartzi, S., & Thaler, R. (2007). *Heuristics and Biases in Retirement Savings Behavior*. American Economic Association.).
- **Mental accounting**. As part of the Endowment Effect, evidence shows that Humans put labels on money when they should not. This type of "mental accounting" occurs when, in deciding what to choose, we weigh the amount we have to pay to keep an

⁵ Costs that have already been incurred in the past and cannot be recovered.

⁶ Type of cognitive bias that involves people preferring that things stay as they are or that the current state of affairs remains the same.

item we already have more heavily than the expense of acquiring an item of equal or greater value. Classical theories assume that this labeling of money should not occur.

Many economic theories have been developed without taking these effects into account, based on assumptions of how people should act rather than how they actually act. Moreover it has been proven that this SIF can strongly influence behavior. Econs would not care about these factors, but evidence shows that Humans actually do it.

2.1.6 Evidence-Based Economic Theory

After reviewing all these factors and taking into account the evidence shown, it is normal to wonder where the field of economics is heading. According to Kahneman (1985), there is no reason why economics should necessarily be based on rational and efficient decisions. Classical Economic Theory is based on the decisions of Econs, which are fictitious beings, so theories based on these beings can also be seen as fictitious theories.

Data and evidence show us that people's actual behavior is neither completely rational nor efficient. We make mistakes because we are Humans, not Econs. Following this idea, it is time for business policies and applications to be based on the behavior of Humans, and therefore based on evidence. This is the main idea of Evidence-Based Economic Theory. Theory builders need to become more open-minded and willing to incorporate new variables into their research, even if the theory says that these variables are supposedly irrelevant. The evidence shows that they probably are not.

This does not mean that traditional economic theories have to be completely dismantled, they simply have to adapt to the new times, take evidence and studies with real data and incorporate these new elements into existing theories, accepting the real effect of some SIFs.

Some critics of this theory argue that by incorporating these SIFs into traditional theories, they would lose their usefulness. According to this approach, the beauty of classical theories is that mathematics can be used to reach conclusions, and that by following EBET, no real conclusion can be drawn, except that people make stupid decisions. This is not really so, since as stated before, the mistakes people make are systematic, meaning that they behave irrationally, but in a predictable way. The point in Behavioral Economics is to take that predictable irrationalities into account, by considering the psychological effects of decision-making.

As said by Thaler (2015), "don't expect a new general theory. If you want a parsimonious theory, stick with the one we have, it's just wrong." Existing theories are useful as a reference point, but they need to be adapted to focus more on Humans and not Econs, which is achieved by using good psychology. The result will be an economics with more explanatory power that could be used to develop better business policies and strategies, as well as opportunities to help, or nudge for good.

2.2 Nudging

2.2.1 What is Nudging?

Bearing in mind that the field of Behavioral Economics is broad and encompasses a large range of concepts, the main part of that study will be focused on one of them: nudging. The concept of "nudge" was first introduced in 2008 by Nobel Prize winners Richard Thaler and Cass Sunstein in the book *Nudge: Improving Decisions About Health, Wealth, and Happiness* (2008). In it, the authors explain the concept of nudging and how, by using it, it is possible to affect the decisions of individuals and, therefore, modify their behavior and final choices.

But what exactly is the concept of nudging? We can understand a *nudge* as a change in the choice architecture⁷ presented to an individual or group of individuals with the aim of affecting the way in which these options are perceived and, therefore, modifying the final choice. It is important to note that a nudge is simply a little push that we give to the subject, not a prohibition or an obligation. As Thaler and Sunstein presented as an example, putting fruit at eye level counts as a nudge. Banning junk food does not.

Once the concept of nudge is understood, we can define nudging as the set of systems and techniques that introduce subtle changes in the way options and information are presented with the aim of inclining individuals to choose a specific option or modify their behavior.

There are different reasons for trying to influence a subject's choice through the use of nudging. One of the most common is to combat the limited rationality that people have when making decisions. This concept is known as bounded rationality⁸, and is mainly driven by 3 factors: limited cognitive ability, imperfect information, and time constraint. For example, when customers in a restaurant order their food, it is very common for them to make inefficient decisions if they feel rushed by the waiter. With the idea of bounded rationality, it is possible to explain the difference in decision-making between Humans and machines (or Econs), which are usually designed to always make the most efficient decision.

Other situations that can become an excuse for the use of nudging are the negative or financial externalities caused by certain actions of individuals. This is the case of advertisements on cigarette packs, which encourage individuals to quit smoking: the first objective of the advertisement is to eliminate the negative externality caused by the smoke for other people. The second objective is to eliminate the financial externality for the state. A person who smokes is likely to need more assistance to treat health problems, which will mean more public expenditure.

Generally, the different nudging strategies are used to influence the choice of the subject with the aim of choosing the one that is most beneficial for him and the environment around him, but that, due to the bounded rationality defined before, is not always the chosen option. It can be said, therefore, that nudging has a paternalistic objective, by inclining individuals to make the best decision for them.

Despite this paternalistic connotation that nudging has by definition, it must be said that in practice, it is often used as a tool to influence people's decisions for the benefit of, for

⁷ Design of different ways in which choices can be presented to decision makers, and the impact of that presentation on decision-making.

⁸ Human decision-making process in which we attempt to satisfice, rather than optimize.

example, a company, so instead of inciting buyers to choose the best option for them, it can be used to make them choose the option that the seller is most interested in.

2.2.2 Dual-Process Theory of Thinking

In order to correctly design methods to modify the behavior of individuals, we should pay attention to Dual-Process Theories of decision-making. These theories, despite differing in some details, are all based on the same idea: psychological studies that have investigated the drivers of human thought for decades have identified two agents that are responsible for driving our thoughts and the decisions we make from them. These agents are usually defined as System 1 and System 2, or “fast thinking” and “slow thinking” (Kahneman, D. (2011). *Thinking, Fast and Slow*).

System 1 is automatic and intuitive and is in charge of directing mental processes that require little effort, such as identifying and reacting to stimuli in our environment and making quick decisions that require little reflection. An example is an instantaneous reaction we have to avoid crashing into a car that suddenly crosses our path when we are driving. The abilities that System 1 controls include some skills that are natural and innate, so we share many of them with animals. Other skills related to System 1 are learned over time and become automatic for us. Being innate or learned, the mental actions directed by System 1 are completely involuntary and we can combine them with other actions at the same time, since they are easy and require little effort.

System 2 is slow and reflective, so it is in charge of directing processes that require a great mental effort that we are aware of. For this reason, the mental actions that pass through System 2 require attention and are interrupted when this attention disappears. This is why it is difficult for us to combine different actions belonging to System 2 at the same time, such as mentally calculating complex multiplication and reciting our phone number at the same time.

Most of the time, System 1 works automatically and unconsciously and System 2 is in “least effort” mode. When System 1 encounters a constraint, that is, a more effortful task, it requires the attention of System 2, which performs a more complex process and finds a solution to the problem at hand. For this reason it is estimated that 95% of our daily actions, which require little reflection, are directed by System 1. The rest, which require more effort, are handled by System 2.

Based on this Dual Process Theory of thinking, it is possible to classify nudges into 2 categories: Type 1 nudges, which address System 1 (just system one) and Type 2 nudges, which use system 1 to influence system 2, so it can be said that addresses both systems of thinking

2.2.3 Nudge Transparency

From all the sets of existing nudges, a way to categorize them is based on their transparency. Transparent nudges are those that are clearly visible to the individual that is being affected by them. Non-transparent nudges are those which are not directly visible from the individual's perspective, so he does not know that he is being nudged. This falls into an ethical discussion about if it is acceptable or not to use non-transparent nudges, especially in policymaking or marketing, since some of them can directly be considered as manipulations.

In their book *Nudge: Improving decisions about health, wealth, and happiness* (2008), Thaler and Sunstein establish a guiding principle for nudge transparency and cite 2 separate reasons to do it: the first reason is pragmatic, considering that if a government (or company's governance) adopts a policy that could not defend publicly, it is in risk of facing considerable embarrassment or desprestige, especially if at some point the details of the nudge are disclosed and become public.

The second reason cited by Thaler and Sunstein to establish a guiding principle for transparency in nudging is based on the idea of respect, defending that if a governance use tools to affect people's behavior that it will not make public, that governance fails to manifest respect for them and uses individuals as manipulative tools, used to fulfill some objectives. This is connected with the prohibition of lying. Someone who lies treats people as means, not as ends. This leads Thaler and Sunstein to consider John Rawls' publicity principle⁹ as a good guideline to apply in nudging mechanisms.

However, as argued by Hansen & Jaspersen in *Nudge and the Manipulation of choice* (2013), this strict principle of transparency may be considered too restrictive when applied to practical cases, and considerably limits the effectiveness of a long list of nudges, which are invisible or very difficult to monitor, and which, taking into account the principle of strict transparency defined by Thaler and Sunstein, should be considered as unacceptable.

With this view, they define a transparent nudge as one that is clearly visible in its objective and method to change behavior. Some examples of transparent nudges are the alarm in our car that activates when we do not buckle up or a message next to an elevator that reminds us of the positive health effects of taking the stairs and suggests that we do it. In both examples, the individual should be able to identify the objective which is the nudge pursuing and by which means it is trying to do it.

A non-transparent nudge is defined as a nudge in which the citizen has not the chance or is not able to identify the means or methods by which his behavior is trying to be influenced. Offering the decision-maker inferior alternatives to the preferred option or placing a multitude of people in front of a shop to make people feel that what it's sold there must be great are examples of tactics that are used in non-transparent nudges.

Nudging seems to be in a permanent conflict with the rule of transparency that Thaler and Sunstein proposed. Some critics such as Boven assess that non-transparent nudging works with the use of psychological manipulation, meaning that they take advantage of deception or even abusive techniques to be effective. The problem, according to Boven, is that nudging seems to work better when not perceived, so the more transparent a nudge becomes, the less effective it is. This is because if a nudge becomes too "obvious" for an individual, he will feel an attempt of manipulation against him, so his actions will proceed in order to avoid that nudge.

As pointed out by Hansen & Jaspersen, this argument of latent conflict of nudging against transparency seems to be overstated by Boven, as there are some clearly transparent nudges that are actually effective. The save-more-tomorrow-program, which prompted choice for organ donation, calorie-boards and energy bills allowing for social comparison of electricity consumption, may also be mentioned as counterexamples. These nudges have in common

⁹ Transparency and respect for the individual will be preserved if mechanisms applied can be publicly defended by the architect.

that they tackle the consistency capacity of an individual or “ego”, where an agent's long-term preferences are nudged into doing a reflective thinking, and then behavioral change is achieved.

Taking into account that there are some nudges that work because they are so obvious, it would make no sense to qualify them as working through manipulation of behavior or choice. In order to classify which nudges work through manipulation and not, Hansen & Jaspersen classify them taking into account 2 variables: the level of transparency of the nudge (transparent or not transparent) and the system of thinking it tackles (Reflective or automatic system).

2.2.4 Hansen & Jaspersen Nudge Classification Matrix

To classify all different nudging strategies into groups, Hansen & Jaspersen created the Nudge Classification Matrix (see Figure 1), which is driven by the two variables reviewed before: the system of thinking engaged by the nudge and its level of transparency. This resulted in 4 categories of nudges.

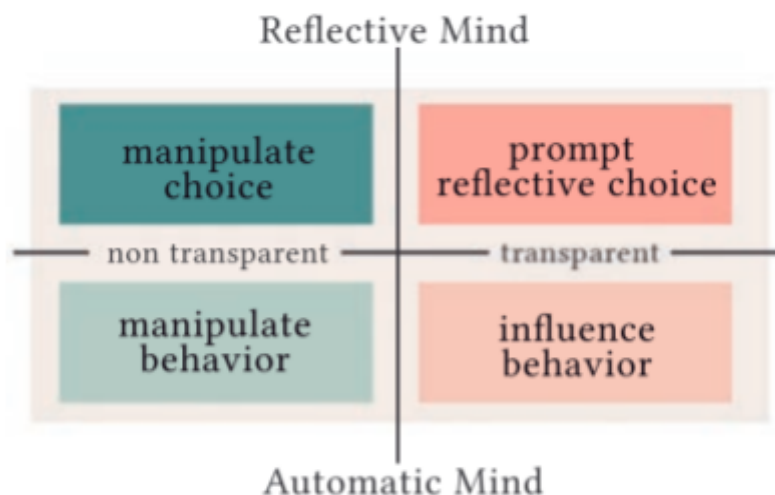


Figure 1: Four categories of nudges, adapted from Hansen and Jaspersen

Source: Caraban, A., Karapanos, E., Gonçalves, D., & Campos, P. (2019). *23 Ways to Nudge: A Review of Technology-Mediated Nudging in Human-Computer*

2.2.4.1 Transparent type 2 nudges - Prompt reflective choice

The first nudge category pointed out by Hansen & Jaspersen in their classification matrix is those engaging type 2 (reflexive) system of thinking in a transparent way, meaning that it is easy for the target individual to identify the means by which behavior change is pursued (the ends and means are epistemic transparent).

The objective is, at first, to engage the cognitive capacities of the individual (catch his attention), so then he focuses on the current action (an aiming action) and consciously adjusts it. As an example, graphically reminding negative smoking consequences in each pack of cigarettes is a clear example of this nudge category. The person buying a pack clearly

recognizes that reminder as a deliberate attempt to influence his behavior, (in this case, not smoking) so it is easy to recognize the means by which the nudging is working. The effect sought by this type of nudge is to provoke a quick reflection in the individual that influences the final choice.

This also means that the individual may deliberately resist behavioral change if he does not agree with the means used by the nudge or if the reflection is not deep enough to bring about change., so even if you are aware of the smoking effect and it is reminded to you in each pack you buy, you can decide whether to keep doing it or not. “Don’t smoke” nudge is an example that works by making the consequences of the decision taken patently clear. Other transparent type 2 nudges work by making aspects clear (like seat belt alarms) making preferences or particular actions salient (e.g. by the use of green arrows or footprints to nudge people to take the stairs) or raising the visibility of users actions (e.g electronic boards that make one’s real-time speed public, nudge users to adjust their speed and comply to the norms). Finally, there are also transparent nudges that work by benefiting from the commitment bias¹⁰, which makes us prone to be “true to our word”. For instance, getting people to verbally repeat a scheduled appointment with their doctor prompts decisions in consistency with the agreement made (A. Caraban, 2019).

2.2.4.2 Transparent type 1 nudges - Influence behavior

This type of nudges attempt to change behavior with transparent methods without engaging the reflective (type 2) system, but the unconscious thinking of the agent. A case example is playing relaxing music when passengers are landing a plane. This is done in order to relax them, even when they are not already thinking about it. As in transparent type 2 nudges, passengers recognize the means by which the nudge is working, and if they finally work, the result is a transparent but effective influence in the receiver’s behavior.

There are other examples of transparent type 1 nudges presented by Thaler and Sunstein, such as those that work by activating instinctive automatic responses (e.g., the use of the color red, or flashing lights to draw attention to a sign,), activating learned responses (e.g., placement of fake potholes on the road to make drivers slow down), nudges that work by changing the consequences of default in ways you are bound to notice (changing printer defaults from one-side to double-sided printing), or even one which consists on writing “you are breathing manually” which indeed leads the reader to breathe manually. For all these nudges, the behavior change is more or less unavoidable for the agent, but transparent in a way that he can easily recognize the intentions and means by which behavior is trying to be influenced.

2.2.4.3 Non-transparent type 2 nudges - Manipulate choice

This type of nudge, unlike the 2 categories seen previously, does not allow the user to identify that an attempt is being made to modify his behavior or bias his decision, so the methods that this type of nudge uses to affect the reflective system of thought are kept hidden. A clear example presented by Hansen & Jaspersen is when an individual has to choose among different options, present a model which includes different premises and emotional associations aiming to make that decision “not neutral”. By making the intentions and effects of this type of nudges likely to go unrecognized by users, such nudges may raise ethical

¹⁰ Tendency to remain committed to our past behaviors, particularly those exhibited publicly, even if they do not have desirable outcomes.

questions, since the objective is not to influence individuals' behavior, but to directly manipulate it to make them choose the preferential option.

Other examples of non-transparent type 2 nudges are those ones in general affecting decision-making by the clever framing of risk (when choosing between 2 medical treatments), aimed at improving compliance rates in subtle ways, using subtle cues to activate preferences for making a particular choice (e.g., taking the lid off the ice-cream freezer, leading more customers to crave and ultimately buy ice-cream), using lotteries to get people to overestimate the chance of obtaining a rare effect, and the "hint of scarcity"¹¹, like announcing that there are few units available for a new console to make people more interested in it. In all these cases the citizen is not aware of that biased model of choice but takes the decision anyway, so nudge transparency is not necessary to get an influence in reflective thinking.

2.2.4.4 Non-transparent type 1 nudges - Manipulate behavior

The last category in the H&JNCM is for nudges addressing automatic thinking in a non-transparent manner. The attempt of this type of nudges is, like in the previous section, to manipulate rather than influence, in this case, behavior. They affect behavior without engaging reflective thinking, and in a way that makes them not likely to be recognized. A perfect example to represent this type of nudge is the one found by Brian Wansink (2004), who discovered that, by reducing the size of plates in a cafeteria from a 12-inch to a 10-inch dinner plate, people reduced their calories consumption by a surprising 22%. The hidden mechanism behind this study is the automated habit of people of first filling the plate and then finishing it, so the nudge works without engaging reflective thinking and being non-transparent since people are not aware of that plate size reduction.

Other examples introduced by Hansen & Jaspersen are modifying background defaults, like changing from an opt-in to an opt-out procedure for registering as an organ donor; adding subtle changes to objects and arrangements in the behavioral context (removal of trays in cafeterias to reduce food waste); and the use of anchoring expectations¹², like announcing a longer waiting time than actually expected, so people become pleasantly surprised.

2.2.5 Caraban's 23 ways to nudge

Ana Caraban, in her review of *Nudging 23 Ways to Nudge: A Review of Technology-Mediated Nudging in Human-Computer Interaction* (2019), made a compilation of different studies related to nudging and, after analyzing them in depth, identified 23 different ways of nudging, clustered into 6 different groups, which she named Nudging Mechanisms (see Figure 2). These Nudging Mechanisms are: *Facilitate, Confront, Deceive, Social Influence, Fear, and Reinforce*. Finally, as can be seen in the Figure 2, she distributed the 23 nudging methods through the H&JNCM according to the characteristics of each of them.

¹¹ False indication that there is a shortage of a product, in order to make people more interested in buying it.

¹² Tendency for the first piece of information to be used as the 'anchor'. This 'anchor' is the reference point for future decisions, expectations, or judgments.

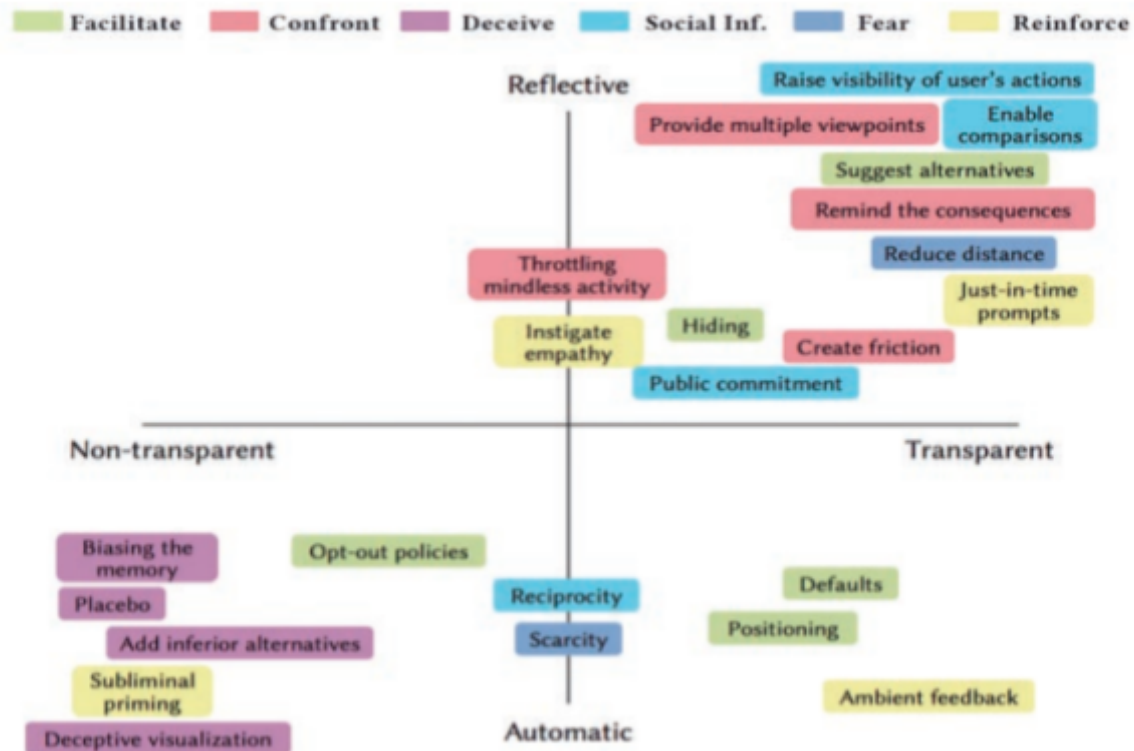


Figure 2: Nudges positioned along the transparency and reflective-automatic axes

Source: Caraban, A., Karapanos, E., Gonçalves, D., & Campos, P. (2019). *23 Ways to Nudge: A Review of Technology-Mediated Nudging in Human-Computer*

As can be observed in the matrix, the Nudge Mechanism group to which a nudge type belongs does not necessarily define the section of the matrix to which this nudge will belong. This means that two nudges can belong to the same Nudge Mechanism group, since they share the same nature or use a similar methodology to affect the individual's decision, but on the other hand they have a different assignment in the classification matrix, since they differ in the type of thinking (automatic or reflexive) they address or in the degree of transparency they present when are used.

If we look at how Caraban distributes the nudges in the matrix, we can see differences in the number of occupied sections between different Nudge Mechanisms. For the *Facilitate* (green) nudges for example, we find two examples in the Transparent Type 2 - Prompt reflective choice category, two more examples in the Transparent Type 1 - Influence behavior category, one in the Non-Transparent Type 1 - Manipulate behavior category, and none in the Non-Transparent Type 2 - Manipulate Choice category. Something similar happens with the Nudge Mechanism *Reinforce* (yellow), which has an example practically for each category of the matrix. It can be clearly seen, as mentioned above, that the Nudge Mechanism group is not always definitive for assigning each nudge in a particular category in the matrix.

However, it seems that some Nudge Mechanisms do have a tendency to limit themselves to a certain section of the matrix. This is the case of the *Deceive* (purple) mechanism, whose nudge forms are characterized by using deception mechanisms to affect how alternatives are perceived. The 4 forms of nudge in this group address the individual's automatic thinking in a non-transparent way, without extending to other areas of the matrix. We could therefore say that in order to modify the individual's choice by means of deceive mechanisms (or for these

mechanisms to be effective), it must be done with manipulation strategies. In the event that the mechanism was made in a transparent way or gave the opportunity to the recipient of the nudge to use reflective thinking, he would discover the methods of deception and, obviously, reject the manipulation attempt and the preferential choice offered.

Similar behavior can be observed in the *Confront* nudge mechanism (red). Nudges belonging to this group seek to instill doubt in the individual to pause an undesired action. For this to be possible, the individual needs to have the ability to reflect on his decision, so it is necessary to address the thinking of this type. All nudges belonging to this group fall into the category of reflective thinking and are transparent, to a greater or lesser extent. We can deduce, therefore, that some Nudge Mechanisms, by their nature, limit the areas of the matrix to which they can be extended, otherwise they would lose their effectiveness. Other mechanisms, on the contrary, are more "manageable", since they can be applied in different ways (transparent/non-transparent and automatic/reflective) without losing their essence or effectiveness.

It is easy to observe that there are no nudges assigned to the Non transparent Type 2 category, which would belong to the group of those that seek to manipulate choice. This is because Caraban, of the 74 examples of nudging found in all the literature reviewed, considered that none of them attacks reflective thinking in a totally non-transparent way. From this we can deduce that there is a conflict between the total non-transparency of a nudge and the effects it may have on the individual making the choice. If the individual reflects on his choice and identifies that he or she is identifying to modify his or behavior in a non-transparent way, the individual will reject the change. We can deduce then that for a reflexive nudge to be effective, it must have a minimum of transparency, and that is why Caraban assigns all examples of this type to the upper-right quadrant, and leaves the one on the left empty.

2.2.6 Facilitate Nudge Mechanism

In this paper we will not review the 23 ways to nudge defined by Caraban: we will focus specifically on those that will later be put into practice with the objective of measuring their effectiveness and the effect generated in the participants.

In order to establish a criterion and for the analysis to be as pure as possible, eliminating as much as possible the effects that distort the result, a type of nudge defined by Caraban were chosen for each existing category in the H&JNCM, all belonging to the same category of Nudging Mechanism. None of the Nudging Mechanisms defined by Caraban is considered as purely Non-transparent Type 2 nudges, so the total number of nudging strategies chosen for the study were 3, belonging to the remaining categories.

The Nudging Mechanism chosen for the study was *Facilitate*, the first of all defined by Caraban. In essence, the types of nudges belonging to this category are intended to facilitate the decision to the individual, who due to his bounded rationality or to different factors that condition the context, may be more prone to make an inefficient decision. As the name suggests, the nudges that make up this mechanism act as facilitators of the decision, making the desired option more evident to the subject or moving the rest of the options out of reach.

As explained by Caraban, Facilitate nudges seek to exploit the individual's status-quo bias mentioned above, also known as the "power of inertia". On many occasions, the process of searching for better alternatives to the current ones is slow and exhausting, or we simply feel

comfortable with our default option and do not feel the need to change it, even though there are clearly better alternatives. A good example of this resistance to change would be to stay with the current telephone company, despite others offer us better conditions. The process of switching companies is often cumbersome, so many people choose to stay with the current one even though it may not be the most efficient option. This clearly represents a non-Econ behavior. This resistance to change often causes Humans to become statist, and the nudges that belong to this category seek to take advantage of this non-efficient condition.

Nudge categories clustered into this group by Caraban are: *Suggesting Alternatives, Hiding, Positioning, Defaults and Opt-out policies*. Since only 3 of them are needed to represent the categories of the H&JNCM developed by Caraban, and the intention is to study them individually to measure their effects with maximum purity, the Nudges chosen for the study were: *Suggesting alternatives, Opt-out policies and Positioning*.

2.2.6.1 Suggesting alternatives nudge

The first type of nudge chosen to study was *Suggest alternatives*. The intention of this nudge is to make it easier for the recipient to make the desired decision. This is achieved by offering a greater number of "positive" alternatives among the different range of options, which perhaps had not been considered or had not been given enough importance. The methodology consists of, once the receiver has already made a choice among the different options, offering one or several alternatives that may be perceived as more positive for his interests and may cause a change in the final choice.

This type of nudge seeks to “force” the receiver to reflect on the decision he has made or usually makes, and it is easy for him to identify that the introduction of the new alternatives is an attempt to provoke a change in his behavior and in the option chosen, so this nudge clearly falls into the category of Transparent Type 2.

An interesting example presented by Caraban on the application of this nudge is that of the PTP system, which suggests to users more secure alternatives to their passwords once they have created them. Once implemented, the creators discovered a significant increase in the security of the passwords, which contained many more characters than they used to have previously.

2.2.6.2 Opt-out policies nudge

The intention of the *Opt-out policies* nudge is to take advantage of the potential of default options and the significant effect it has been shown to have on Humans' decisions. This is due to the status-quo bias that has been shown to be inherently present in people's behavior. This bias consists of a lack of initiative towards change and acceptance of default conditions. This tendency means that when faced with two options between which we do not have a clear preference or which do not make a great difference, people tend to accept one of the options if it is presented as the default option, without bothering to change it, even if the other alternative seems slightly superior.

This type of nudge seeks the automatic acceptance of the default option, System 1 (automatic) function, without the recipient being able to identify that this is happening, since it is not aware that it is trying to take advantage of this tendency to statism. For this reason

opt-out policies nudge is assigned to the category of Non transparent Type 1 nudges, since its intention is to manipulate the user's behavior.

This nudging strategy has been implemented in vaccination campaigns by Lehman (2016). Instead of using the usual system, in which patients are required to make an appointment to come in for vaccination, an automatic date was assigned to some of the patients, assuming prior consent. The result was that patients with an automatic date increased their acceptance of an appointment, thus increasing the likelihood of being vaccinated. This suggests that an opt-out policy is more effective than an opt-in policy, and that facilitating the process or forcing users to take an action if they wish to decline increases uptake.

2.2.6.3 Positioning nudge

Positioning nudge will be the last one to be implemented in this study, which works by visually altering the way in which the different options are presented, indicating to the receiver the preferred option instead of showing each alternative in a neutral way. This alteration can be done, for example, by associating a color with each of the alternatives. Some colors transmit very marked sensations to individuals, and can be used so that they unconsciously perceive an option as better or worse depending on whether it is associated with the color green or red, for example, thus facilitating decision making.

Another aspect that can make Humans act differently when making a decision is the way and order in which the different alternatives are arranged. As Caraban explains, Shun Cai and Yunjie Xu (2008) ordered the items on a web page according to their quality in different ways: ascending, descending and random. They found that by sorting items in descending order, consumers took the first item as the reference point and automatically compared it with the rest. In addition, they found that using the top-down format, consumers placed a higher value on product quality than using the bottom-up format, where they placed a higher value on price.

The intention of the *Positioning* nudge is to manipulate the way in which the receiver perceives the set of options so that he does so subjectively in an unconscious way (System 1), and makes a decision based on it. The receiver, moreover, is not aware that an attempt to bias his decision is being made, since he believes that the options are presented to him in a neutral way and he can make a free (unbiased) decision. This is why this nudge falls into the Non-transparent Type 1 category, and its procedure seeks to manipulate recipient behavior.

2.3 The research questions

There is a growing interest in nudging and how it can be used to modify choice architecture, given the extensive literature that has developed around this topic in recent years. The evidence shows that the cognitive biases and systematic errors that clearly mark human decision making, and that are the basis for the development of Behavioral Economics, can be exploited using the strategies described above, to modify consumer preferences and profit from it.

The primary objectives of this report will be to answer the following questions: How does choice architecture affect the formation of consumer choice and their considerations of a product's quality and benefits? Are there differences between the effects of the different

nudging strategies studied that might make one stand out as the most effective? Is there evidence that the system of thinking targeted or the degree of transparency of the nudge has an effect on the decision?

As a secondary objective, we will also seek to answer the following questions: Does the gender of consumers have an effect on their valuation of ecological food or on the effectiveness of nudging strategies on them? Does the difference in the price of the products represent a limit to the effects of nudging?

CHAPTER 3. METHODOLOGY

3.0 Introduction

This chapter presents the methodology used to answer the research questions. The objectives and reasons behind the choice of the survey as the method for conducting the experiment, the details of the design and the different questions, and how the choice architecture has been used to apply the nudging strategies studied to modify the choice of the participants.

3.1 Objective

The objective of the practical part of this report was to answer the questions presented in chapter 2 section 3. In connection with the objectives presented in the introduction, the intention was to implement different nudging strategies. These strategies were *Suggesting alternatives*, *Opt-out policies* and *Positioning*, all belonging to the *Facilitate* nudge mechanism described by Caraban and presented in the previous chapter.

The intention of this practical part was, by carrying out a study with the greatest possible purity, to find out to what extent each of the nudges studied has a real and measurable effect on the decisions of individuals. In the event that the results indicate that these nudges are effective and really manage to manipulate behavior, to analyze whether they all achieve a similar effect or, on the contrary, whether there are differences in the degree of effect that each of them seems to produce.

On the other hand, another objective of this section was also to study whether there is a significant difference in the effect achieved between different variables such as the gender of the participants, and whether some of the nudges seem to have a superior effect in any particular group of those studied.

Finally, and once the results have been obtained and analyzed, draw conclusions about the real effect of the nudging strategies studied, and give ideas, opinions and advice so that they can be applied by vendors and thus increase the sales of their high-end products.

3.2 Research Methodology

3.2.1 Survey

In order to carry out the objectives to be achieved in this practical part, a quantitative analysis was carried out in order to achieve maximum objectivity in the results of the study and in the subsequent conclusions.

Data collection was carried out through the responses to a survey (see Annex 1, p. 51-59), designed with the intention of showing the effect that choice architecture can have on the decisions of individuals and, therefore, of consumers. Once the results were obtained, a statistical study of the answers obtained was performed in order to develop conclusions about them.

The general idea of the survey was to put into practice the 3 nudging strategies previously presented.: *Suggest alternatives*, *Opt-out policy* and *Positioning*, and try to find differences in the respondents' answers according to the type of nudging applied. For this purpose, the sample was divided into 4 subgroups, each of which responded to a different survey.

Group 1 was considered the "Control Group": as its name indicates, it served as a control group in order to compare its results with those of the other groups. In order to do so, the questions that this group received were formulated as objectively as possible, trying not to include any type of external actor that could bias the respondents' answers. In this way, the aim was to obtain "free" and "standardized" answers, which could then be compared with the answers of the other groups.

The remaining three groups were the experimental groups, known as the "Suggest alternatives Group", the "Opt-out policy Group" and the "Positioning Group". Unlike the Control Group, the members of this groups received questions conditioned by one of the nudges implemented in this study. The intention was to obtain biased responses and to establish clear differences with the responses of the Control Group. The name of each of the experimental groups refers to the nudge strategy that conditioned the questions subsequently answered by its members.

It has been reported that the effects of nudging on individuals' decisions are limited in scope and have, as a general rule, a short duration in time after being applied. This is why the study was of a synchronic type, and therefore studied phenomena, those of nudging, that occur in a short period of time. The survey, therefore, is the tool within reach of the research that best fits these needs. It was designed with few questions and to be completed very quickly, so that respondents would give quick and instinctive answers, and thus get the effects of nudging to manifest themselves.

Considering that nudging, due to its characteristics, achieves a superior effect when the different options to choose from do not make a big difference to the recipient, the survey represented a situation of everyday consumption. Respondents chose whether to buy a food for everyday consumption, or whether they would prefer the same product but produced organically. The different nudging strategies used, therefore, focused on the respondent eventually discarding the "conventional" product and their final choice was to buy the organic product.

3.2.2 Form

This model and theme were chosen for the survey, over others, for the following reasons:

- It fits well with the fundamentals of nudging, which essentially seeks to help the recipient choose the most beneficial option for himself or the surrounding environment. In this particular study, the choice architecture focused on the respondent choosing the ecological food, as its characteristics make it the healthiest option for the voter and the most positive for the environment.
- The model is related to the business field. Encouraging consumers to purchase high-end products usually leads to higher markups and profits (Marn and Rosiello, 1992). If, through the use of nudging, it is possible to increase the consumption of ecological food, companies dedicated to this vertical will increase their sales. On the other hand, they will achieve a better corporate image by promoting the sale of healthier foods manufactured in an environmentally friendly way. The combination of these factors will result in increased revenues.
- It fits the survey model. Given the characteristics of the survey and the nudging strategies used, the "conventional vs. ecologic" theme is well suited to the needs of

the study. The items and products presented in the survey are easily recognizable and common to all respondents, so they did not disturb the results.

3.3.3 Structure

The structure of the survey was divided into 3 main sections:

3.3.3.1 Dichotomous question

The first section of the survey was a dichotomous question to divide the sample into 4 subgroups. The question was common to all respondents, with the aim of dividing them as purely and impartially as possible. To achieve this, the question was very simple: each respondent had to answer whether their birthday was on an odd or even day and month. Depending on their answer, they were directed to one of 4 subgroups.

With this question, a completely random distribution of respondents was sought in order to obtain the most homogeneous subgroups possible, since the question generates 4 possible answers and does not allow for any type of differentiation based on age, gender, race, social status, etc.

3.3.3.2 Descriptive questions

Depending on their answer to the first question, respondents were directed to the next page of the survey, the one corresponding to the group to which they were assigned. The first questions on the page were exactly the same for all groups and their intention was to collect descriptive data, which would allow us to better understand the properties of the sample obtained, classify better the quantitative data obtained and make more detailed conclusions.

Descriptive questions collected information on the age and gender of respondents, in addition to their prior knowledge of ecological food and frequency of consumption. By relating these descriptive data to quantitative data, we sought to reveal trends about the effects of nudge that may have been previously overlooked.

3.3.3.3 “Nudge” questions

Once the respondents answered the descriptive questions, the "nudge" questions appeared: these questions were adapted to the characteristics of each group. In the case of the Control Group, the format was neutral. In the rest of the groups, the way they were formulated or some of the elements they included were intended to bias the respondent's perception and modify his or her final choice. Despite this, we sought to follow a similar survey structure, so that possible differences between groups' behavior could be attributed to the nudging effect:

- The first question presented the respondent with 4 varieties of the same product: a one-liter container of milk. The varieties were: private label milk (priced at €0.59/liter), "standard" or typical brand milk (€0.85/liter), ecological milk (€1.5/liter) and "premium" or exclusive brand milk. The individual had to choose which of the varieties he/she preferred to buy.
- In the second question, participants had to choose between two options: a whole ecologically raised chicken (20€) or a whole chicken raised in a conventional way and therefore half the price (10€).

One of the reasons for choosing these two products (milk and chicken) is that they are both staple foods, so they are familiar to any of the respondents. Also because their ecological variants are within easy reach and it is simple for any individual to understand their properties and benefits over the conventional type.

Another reason for the choice is that between the two products can be established differences in price: in the case of organic chicken, its price is 10 times higher than its ecological variant. In the case of milk, the difference is less. This opens the possibility of studying whether the price of the product has an effect on the effectiveness of nudge, and whether its effect, as explained in the hypothesis above, is diluted as the price of the product increases.

The way in which each nudging strategy was adapted to its corresponding group was as follows:

1. **Control Group:** no nudging strategy was applied to this group. The questions were formulated in a neutral way and gave the respondent total freedom of choice, without introducing any element that could affect it or could bias the perception of the individual. The objective was to know the general sense of the "status quo" of the sample with respect to ecological food.
2. **Suggest Alternative Group:** the respondent had to choose, at first, between the 3 varieties of "non-ecological" milk (white-label, standard and premium brand). Once the first choice was made, the type of ecological milk was presented as a better alternative, explaining its properties and benefits. The respondent must decide, at that moment, whether to continue choosing the product he/she had previously desired, or on the contrary prefer to switch to the organic version.

Similarly, in the case of chicken, a situation was presented in which the respondent's base choice is to buy the conventional variety. The ecological food is then suggested as a better alternative, and the recipient must choose whether to stay with the first product or prefer to make the switch.

The intention was, in a transparent way for the respondent, to provoke a reflection on the decision to be taken, giving value to the quality and benefits of the product over its price, which would make him finally decide for the ecological variant.

3. **Opt-out policy Group:** in contrast to the previous group, the respondent is presented with a context in which he/she is going to buy ecological milk by default. Once the initial situation has been presented, the respondent is introduced to the other milk variants as alternative options, and is asked if he/she would be willing to change his/her choice to one of these variants, or if he/she would prefer to stick with the ecological milk.

Following the same logic, a new situation is presented in which the default choice is to buy the whole ecological chicken. Conventional chicken is then introduced as a new option, and the respondent must choose whether to buy the default product or to switch to the conventional type.

In this case, the intention behind the format of the questions was to exploit, in a non-transparent way, the assumed tendency of individuals to statism, part of the automatic thinking system. Respondents are forced to change their choice if they wish to buy the conventional product over the organic one, the default option.

4. **Positioning Group:** Respondents in the last group were presented with the 4 varieties of milk vertically, in descending order, taking into account the quality and benefits of the product. Ecological milk was therefore at the top of the list. This was followed by premium and standard milk, with private label milk at the bottom. Depending on the position in the list the background of the image goes from a friendly green at the top of the list (organic), to a striking red at the bottom (white brand), with intermediate colors between these two in the middle (premium and standard). Respondents are then asked to choose the preferred option.

In the case of chickens, the ecological whole chicken was presented in a similar way, first with a green background, and then the conventional variant with a garish red background. Respondents were then asked to answer which variant they preferred to buy.

By applying this type of nudge, we seek to influence the automatic thinking system in a transparent way, establishing the best and worst options through colors. It takes advantage of the positive valuation that we give unconsciously to the elements that are accompanied by the color green (in this case the ecological products). The color red generates a sense of danger, so we accompany it with the product that we do not want to choose.

The vertical structure for presenting products is also no coincidence: Shun Cai and Yunjie Xuse (2008) showed that Humans use the product at the top of the list as a reference point, and take its most positive feature to buy it with the rest of the options. Using a descending order (from highest to lowest quality) they automatically attribute more value to the quality of the product, giving less importance to the price. In the opposite case, the descending order makes us attribute greater value to the price of the product, so the tendency is to choose the cheapest option.

3.3.3.4 Participants

In order to get a large enough sample with the time available, the survey was sent in 2 waves. The first wave was only sent to a few participants through social networks . The objective was to get the first responses and analyze the first results, and thus check that the survey is working properly.

Once the first results were obtained and it was verified that the survey was working properly, the second wave was carried out a week later. In it, the first channels were repeated (social networks), together with new channels of reach such as university colleagues and work groups. With this second wave, a greater reach was achieved and the sample for the experiment was completed.

The survey mailing and data collection phase lasted a total of 15 days, which produced a total of 204 valid responses. Random assignment to the different groups using the dichotomous question generated 54 participants in the Control Group (26.5%), 44 in the Suggest alternative Group (21.6%), 56 in the Opt-out policy Group (27.5%) and 50 in the Positioning Group (24.5%). Respondents did not receive any compensation for their participation.

CHAPTER 4. DATA ANALYSIS

4.0 Introduction

This chapter analyzes the data obtained after the survey. A statistical analysis of the participants' responses is carried out. Using the statistical tool JMP, different tests and analyses are carried out to study whether the nudging strategies have produced an effect on the respondents' choice of the different products, and whether gender, as a categorical variable, produces an effect that generates different responses between men and women. In this way, conclusions are drawn about the outcome of the experiment and the research questions are answered.

4.1 Demographics

Of the 204 participants who returned a valid response, 78 were male (38%) and 125 were female (61%) (see Figure 3). One respondent preferred not to provide information about his or her gender (0.49%). The most common age range among the participants was between 18 and 25 years, with 131 (64%). The next age groups, in order of frequency, were 51-61 years with 31 cases (15%), 36-50 years with 20 cases (10%), 26-35 years with 12 cases (6%), 12-17 years with 6 cases (3%), and finally 66 years and older with 4 cases (2%) (see Figure 4).

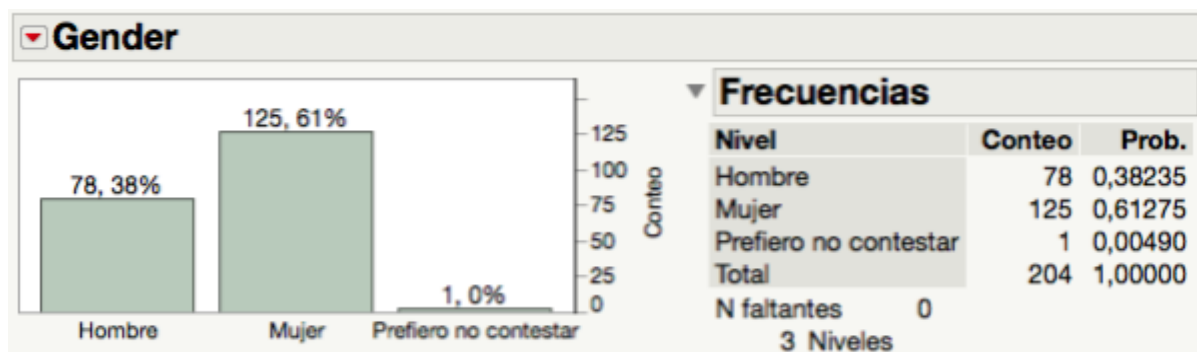


Figure 3: Sample's Gender distribution

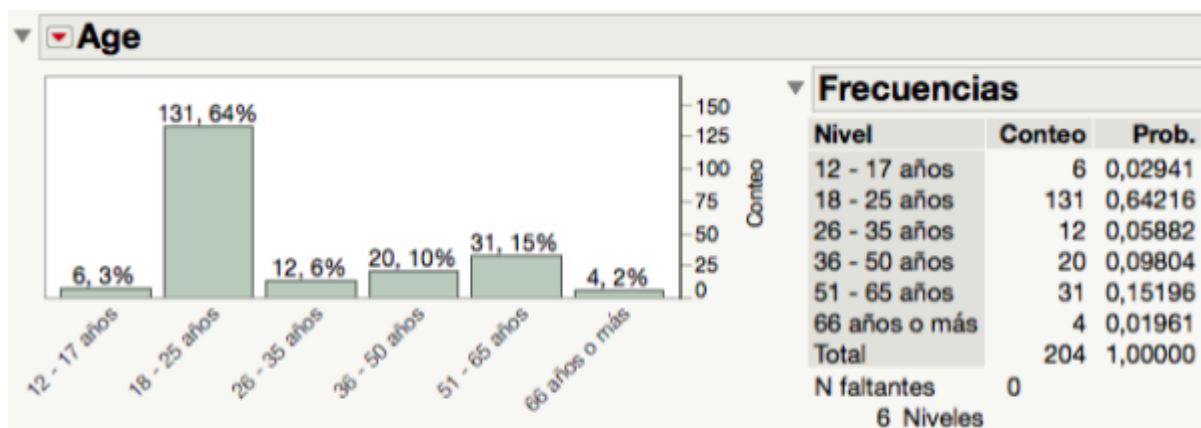


Figure 4: Sample's Age distribution

If we look at the contingency table (Table 1), we can see that the most common respondent profile in the sample is a woman between 18 and 25 years of age, with 77 cases (37.75% of the total). This is followed by a man in the same age range with 54 cases (26.47%). The third profile by weight is a woman between 51 and 65 years of age with 21 cases (10.29%).

▼ ☒ Tabla de contingencia

		Age						
Conteo		12 - 17 años	18 - 25 años	26 - 35 años	36 - 50 años	51 - 65 años	66 años o más	Total
% total								
% columna								
% filas								
Gender	Hombre	2	54	5	4	10	3	78
		0,98	26,47	2,45	1,96	4,90	1,47	38,24
		33,33	41,22	41,67	20,00	32,26	75,00	
		2,56	69,23	6,41	5,13	12,82	3,85	
	Mujer	4	77	7	15	21	1	125
		1,96	37,75	3,43	7,35	10,29	0,49	61,27
		66,67	58,78	58,33	75,00	67,74	25,00	
		3,20	61,60	5,60	12,00	16,80	0,80	
	Prefiero no contestar	0	0	0	1	0	0	1
		0,00	0,00	0,00	0,49	0,00	0,00	0,49
		0,00	0,00	0,00	5,00	0,00	0,00	
		0,00	0,00	0,00	100,00	0,00	0,00	
	Total	6	131	12	20	31	4	204
		2,94	64,22	5,88	9,80	15,20	1,96	

Table 1: Contingency table of survey participants classified by age and gender

4.2 Sample knowledge and consumption of ecologic food

Respondents were asked about their knowledge of ecological food (see Figure 5). Of the 204 participants, 166 (81%) stated that they knew what ecological food consisted of. On the other hand, 11 (5%) indicated that they did not know what organic food is and 27 (13%) were not sure. Overall, It can be considered that the sample obtained has, in general, knowledge about ecological foods and therefore the effect that nudging produces on them can be evaluated correctly.

Of the 167 respondents who said they were aware of what ecological food is, 38 (23%) indicated that they eat this type of food twice a week (see Figure 5). This was the most repeated choice. The least repeated choice was 6 times per week, chosen by only 8 respondents (5%). A total of 22 (13%) stated that they never consumed ecological food, while 12 (7%) indicated that they consumed it 7 or more times a week.

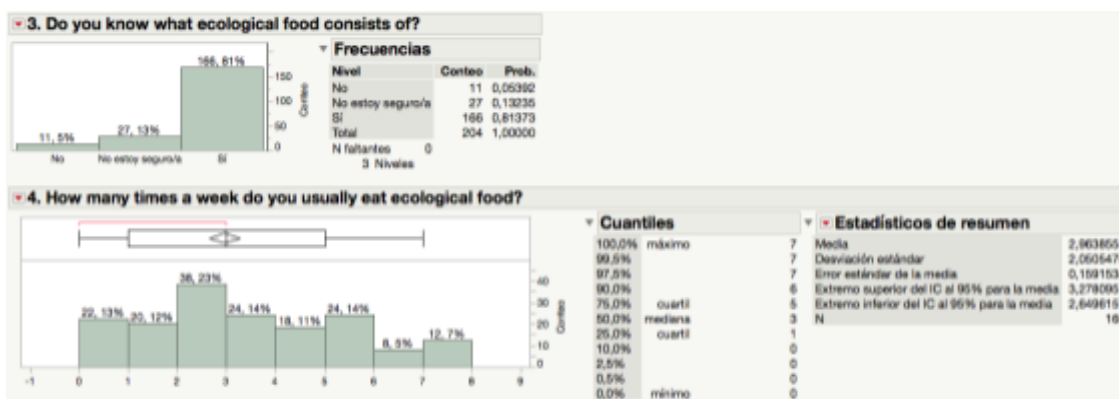


Figure 5: Sample knowledge and consumption of ecologic food

The sample mean of ecological food consumption is 2.96 per week, with a standard deviation of 2.05. The confidence interval developed shows that the mean is between 2.65 and 3.28. The standard deviation is between 1.85 and 2.29. Therefore, we can affirm that with a 95% probability, the mean consumption and standard deviation of the population will be between these values (see Table 2).

Intervalos de confianza				
Parámetro	Estimación	Extremo inferior del IC	Extremo superior del IC	1-Alpha
Media	2,963855	2,649616	3,278095	0,950
Desviación estándar	2,050548	1,851156	2,298458	0,950

Table 2: Confidence intervals on sample consumption of ecologic food

4.2.1 Sample consumption of ecologic food with respect to gender

As a last step before analyzing the effect of the nudging strategies on the different groups, we analyzed whether, in the sample obtained, gender has an effect on the amount of ecological food consumed by the participants. For this purpose, an analysis of variance (ANOVA) was performed, which consists of a comparison of the response means of the two populations (men and women).

The expectation is that there is no significant difference with respect to gender, so that we can conduct our study of the effects of nudging correctly. The null hypothesis (H_0) is that both means are equal, while the alternative hypothesis (H_1) is that the mean consumption of ecological food is different between the two genders.

To test this hypothesis, an F-test was performed, the result of which was 0.4739 (see Table 3). With this result, the null hypothesis cannot be discarded ($0.4739 > 0.05$), so there is no evidence that there is a difference between men and women, so it can be said that gender does not produce an effect on the consumption of ecological food.

Análisis de varianza					
Fuente	Grados de libertad	Suma de cuadrados	Media de los cuadrados	Razón F	Prob > F
Gender	1	2,15810	2,15810	0,5152	0,4739
Error	163	682,78736	4,18888		
C. Total	164	684,94545			

Medias para ANOVA de un factor					
Nivel	Número	Media	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%
Hombre	61	3,13115	0,26205	2,6137	3,6486
Mujer	104	2,89423	0,20069	2,4979	3,2905

Table 3: Oneway ANOVA. Ecologic food consumption respect to gender

The sample mean of weekly consumption obtained was 3.13 (SE=0.26) units of ecological food for men and 2.89 (SE=0.2) for women. As mentioned above, this difference is not statistically significant and is to be expected. By representing the confidence intervals of the participants' means as diamonds (see Figure 6), it can be seen that both genders are practically at the same level, very close to the general mean of consumption represented by the vertical line (2.96). We can affirm that gender has no effect on the number of ecological foods consumed per week in the sample.

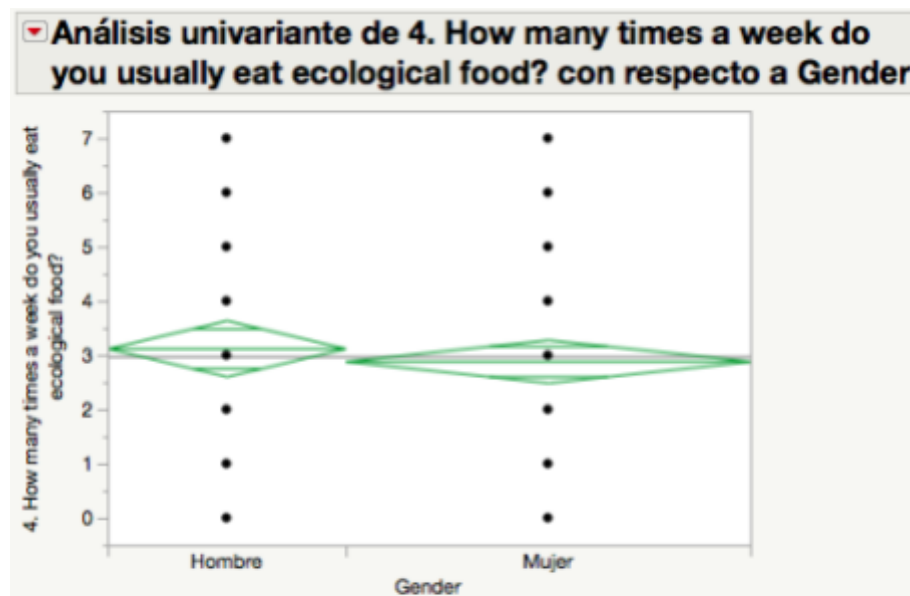


Figure 6: Means of Oneway ANOVA. Ecologic food consumption with respect to Gender

4.3 Nudging effects on milk type decision

4.3.1 Milk type mean comparison with respect to Group

The first analysis carried out was on the means of the participants' choice of milk type according to the group to which they belong. In order to compare the responses, an ANOVA was performed, for which a continuous variable and a categorical variable are required. As a categorical variable, the variable "Group" was used, which has as categories the 4 groups into which the participants were divided to carry out the survey.

A new continuous variable called "Milk type 2" was created by assigning a number to each of the possible milk categories. In ascending order according to the quality of the option, white-label milk represents level 1 (worst quality); standard milk represents level 2; premium milk represents level 3; finally ecological milk represents the highest level, number 4 (desired option). The objective of the ANOVA test is to define if there is a significant effect of the categorical variable on the numerical variable.

The means of the participants in each group were consistent with expectations: the mean choice on the quality scale was 2.15 (SE=0.18) for the Control Group, 2.75 (SE=0.18) for the Opt-out policy Group, 2.58 for the Positioning Group and 2.59 for the Suggest alternative Group (see Annex 2, p. 60). Visually it can be seen that the mean choice of the groups influenced by nudging is above the Control Group, closer to level 4 (ecological milk). However, the p-value obtained in the ANOVA test is not small enough to statistically affirm that there is a significant difference between the groups ($0.1163 > 0.05$).

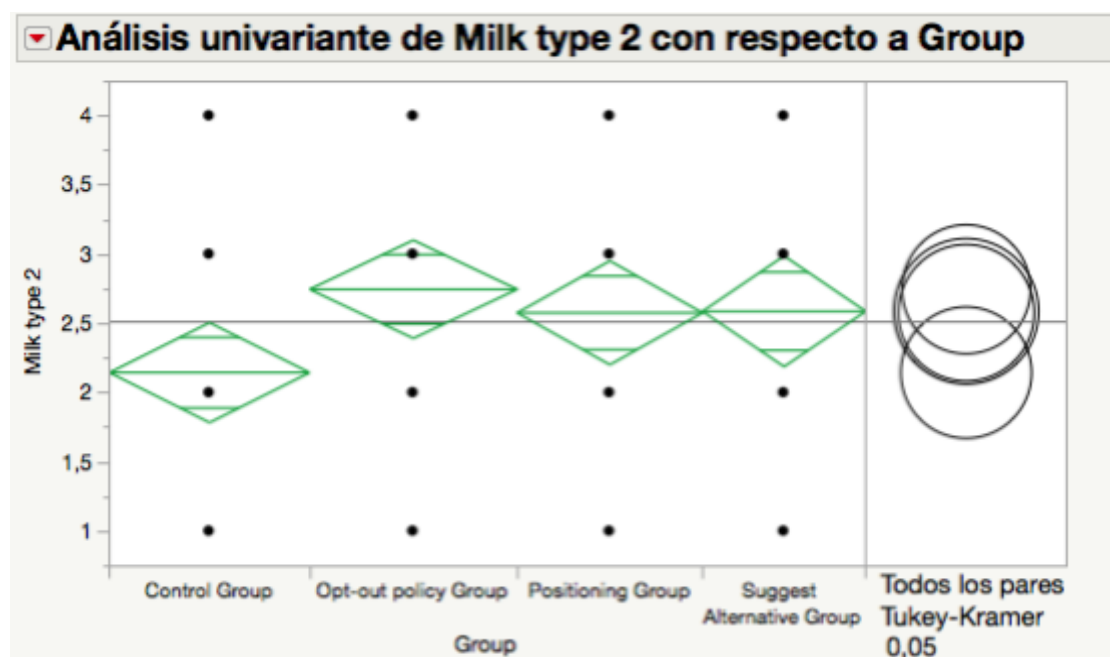


Figure 7: Means of Oneway ANOVA. Milk type selection with respect to Group

To confirm the previous results, a multiple comparison test was performed. For this purpose, the All pairs Tukey HSD test was used, since it is the most appropriate when the objective is to check for possible pairwise differences and there are several factor levels. The Tukey HSD test confirmed the previous results. The report of union letters shows that all groups are connected by the same letter (see Table 4), so it is not possible to establish a sufficiently significant difference between them, and therefore to affirm that the nudging strategies have produced an effect on the participants.

▼ Informe de letras de unión		
Nivel		Media
Opt-out policy Group	A	2,7500000
Suggest Alternative Group	A	2,5909091
Positioning Group	A	2,5800000
Control Group	A	2,1481481
Los niveles no conectados por la misma letra son significativamente distintos.		

Table 4: Letters report. Milk type selection with respect to Group

4.3.2 Milk type mean comparison with respect to “Nudge or Not”

Since it was not possible to find a significant difference comparing the Control Group with the other 3 groups with nudging strategies, the 3 groups were merged, considering the nudging mechanism "Facilitate" as the linking factor (since the 3 strategies used belong to this Nudge mechanism).

For this purpose, a new categorical variable was created with only 2 levels: "Control Group" and "Nudge". The first one counts the participants who have answered the neutral questions, and the second one groups all the participants on whom a nudging strategy has been applied. In this way it is possible to make a new comparison, increasing the number of observations for the new variable and refining the estimation of its mean.

In this situation, since the factor Nudge/Not has only two factors (Control Group and Nudge), we used the Each Pair, Student's t-test, which computes individual pairwise comparisons (see Annex 3, p. 61). The t-test and the ANOVA F-test show there is a significant difference in the average type of Milk chosen by Nudge/Not ($p\text{-value}=0.0024$). Hence we can reject the null hypothesis of both means being equal, since we found a difference in the average choice of the participants depending on the categorical variable.

In particular, examining the Means of Oneway ANOVA table, we can see that when a nudging strategy is applied to a group, the average choice in the quality scale is 2.65 ($SE=0.11$). On the other hand, if no strategy is applied the average choice is 2.15 ($SE=0.18$). Thus we could say with a significance level of 95% that the average quality of the milk product chosen by nudged participants is higher when a nudging strategy is applied on them (see Figure 8).

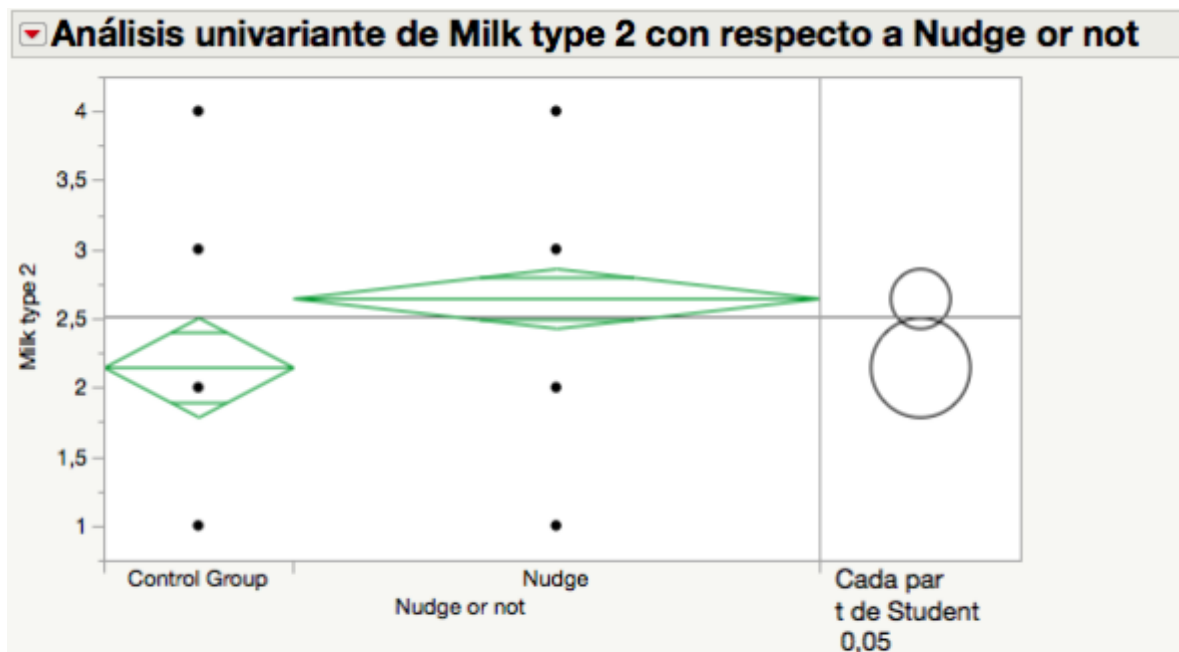


Figure 8: Means of Oneway ANOVA. Milk type selection with respect to "Nudged or not"

In this case we can say that there seems to be a significant difference between the choice of the respondents in the Control Group and those in the other Groups. We can join the 3 Nudge Groups and call them "Facilitate" or "Nudge" Group. According to the ANOVA results, it seems that this manipulated group chooses a healthier type of milk than the Control Group.

The Tukey HSD letters report confirmed the above result (see Table 5). The Control Group and the Nudge Group are linked by different letters, so we can show that there is a significant difference between the mean response of the two groups. This means that the group to which the participants belong has an effect on the choice, and therefore it can be shown that the Facilitate nudging mechanism succeeds in affecting the participants' choice of milk type.

Informe de letras de unión

Nivel		Media
Nudge	A	2,6466667
Control Group	B	2,1481481

Los niveles no conectados por la misma letra son significativamente distintos.

Table 5: Letters report. Milk type selection with respect "Nudged or not"

When we perform the tests of Equal Variances, we observe that the p-value for the Levene test is 0.0537 (see Figure 9), so we fail to reject the Null hypothesis of all variances being equal and move to the next part of the ANOVA study.

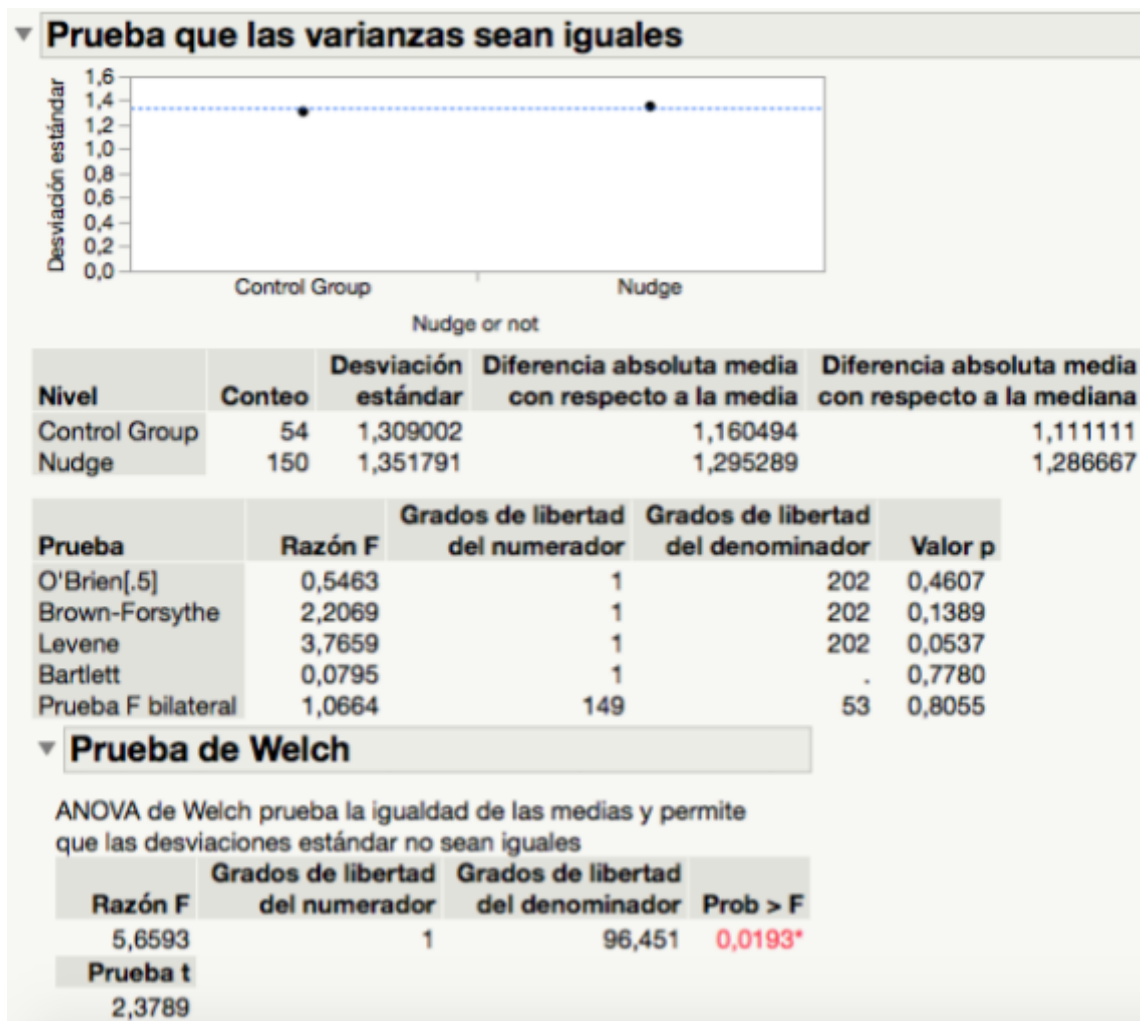


Figure 9: Test of Equal Variances. Milk type selection with respect to "Nudged or not"

After checking Welch's test, we can reject the Null hypothesis since the p-value is 0,0193 (smaller than 0.05). We can finally conclude that the pairs of means are significantly different from one another and that our attempt to influence participants to choose the healthiest type of milk (ecological milk) was effective.

4.4 Nudging effects on chicken type decision

4.4.1 Chicken type mean comparison with respect to Group

To test whether there is an effect on the participants' choice of chicken type (ecological or conventional) depending on the group to which they belong, we proceeded with the same methodology as the one used previously. A new numerical variable was created, "Chicken type 2", in which level 1 represents the conventional type of chicken, while level 2 represents the healthier option, the organic type.

As in the previous ANOVA, the new numerical variable "Chicken type 2" and the categorical variable "Group" were used to test whether there are differences in the mean quality of the type of chicken chosen by the participants depending on the group to which they belong (see Annex 4, p. 62).

The results showed very similar choice means among all groups (see Figure 10). The mean choice was 1.54 (SE=0.068) for the Control Group participants, 1.52 (SE=0.067) for the Opt-out policy Group, 1.5 (SE=0.071) for the Positioning Group and 1.57 (SE=0.076) for the Suggest Alternative Group. The result of the F-test is 0.9246 (much higher than 0.05), so it is not possible to reject the null hypothesis of one of the means being different. We can affirm that with a 95% probability there is no significant difference between the responses of the Control Group and those of the other groups.

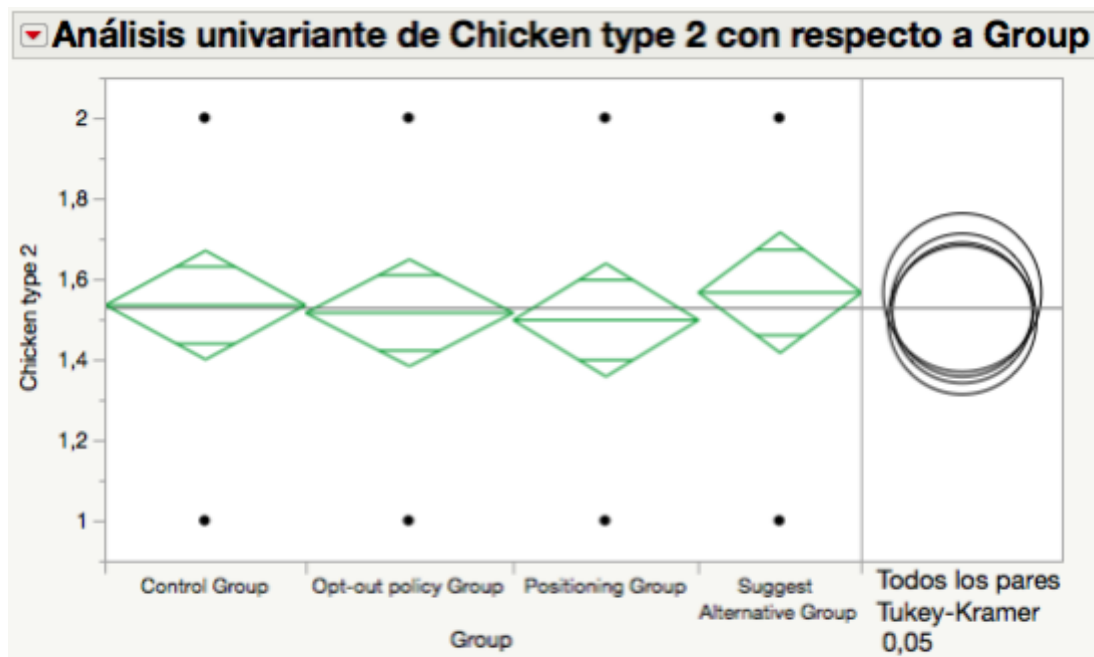


Figure 10: Means of Oneway ANOVA. Chicken type selection with respect to Group

Looking at the visual arrangement of the confidence intervals in Figure 10 above, it is clear that all means are practically at the same level. The same is true for the HSD Tukey test and the union letter report (see Table 6). It can therefore be said that the nudging strategies used have not produced an effect on the participants' chicken type choice.

Informe de letras de unión		
Nivel		Media
Suggest Alternative Group	A	1,5681818
Control Group	A	1,5370370
Opt-out policy Group	A	1,5178571
Positioning Group	A	1,5000000
Los niveles no conectados por la misma letra son significativamente distintos.		

Table 6: Letters report. Chicken type selection with respect to Group

4.4.2 Chicken type mean comparison with respect to “Nudge or Not”

Following the same methodology as in the analysis of milk type choices, the variable "Nudge or Not" was used to determine whether the three nudging strategies used, together representing the Facilitate mechanism, actually produce no apparent effect on the choice of chicken type on the participants.

The Oneway ANOVA performed with the new variables led us to the same conclusions as the previous analysis: the mean of choice for the Control Group, as seen previously, is 1.537 (SE=0.068), while the mean for the Nudge Group is 1.527 (see Annex 5, p. 63). The p-value obtained was 0.8965, clearly higher than 0.05 and far from allowing us to reject the Null hypothesis of both means being equal.

Both the visual representation of the confidence intervals (see Figure 11) and the Student's t-test letters report (see Table 7) make it clear that there is no difference between the groups, and that they therefore have the same tendency to choose the more ecological option, concluding that the *Facilitate* nudge mechanism has not produced the expected effect in this case.

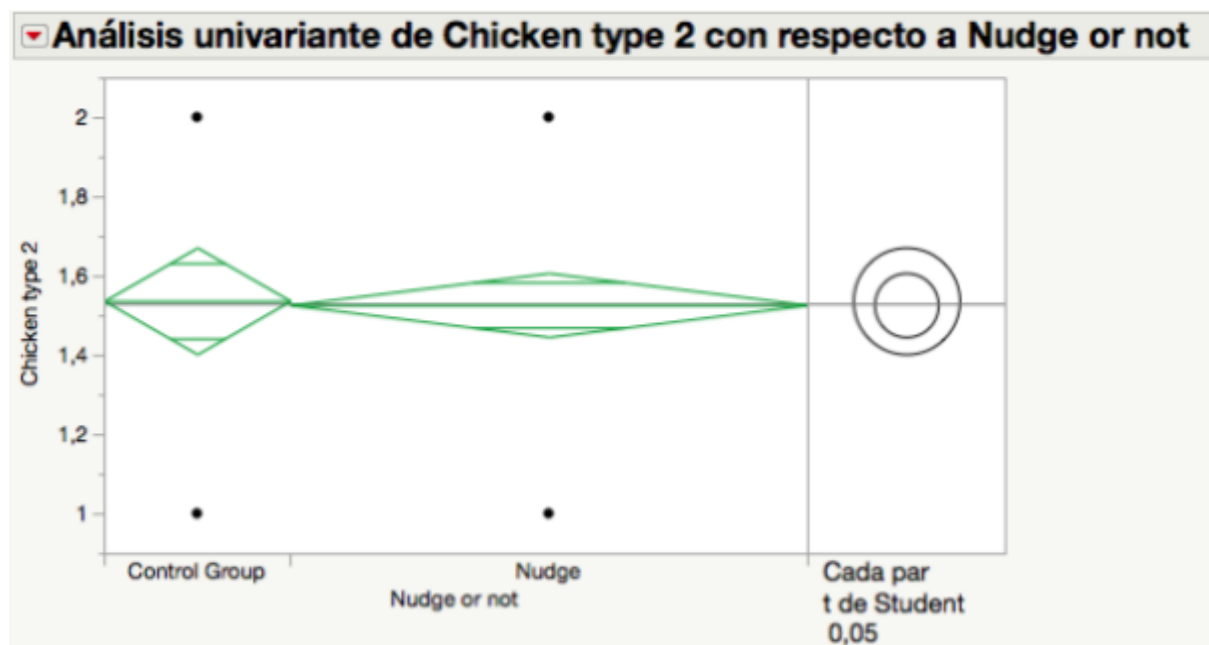


Figure 11: Means of Oneway ANOVA. Chicken type selection with respect to “Nudged or not”

Informe de letras de unión		
Nivel		Media
Control Group	A	1,5370370
Nudge	A	1,5266667
Los niveles no conectados por la misma letra son significativamente distintos.		

Table 7: Letters report. Chicken type selection with respect to “Nudged or not”

4.5 Gender effect

4.5.1 Milk and chicken type comparison respect to gender

A new Oneway ANOVA was then conducted to test whether there is an effect of participant gender on the final choice of both milk and chicken.

The comparison of the mean responses between both genders was surprising: for milk, the mean quality chosen by women was 2.74 (SE=0.12), while the mean for men was lower, 2.15 (SE=0.15) (see Table 8). The p-value obtained was 0.0024, indicating a significant difference between the two means and revealing an effect of the participants' gender on the quality of the milk chosen. According to the results, women tend to choose a higher quality milk than men with a significance level of 95%.

ANOVA de un factor						ANOVA de un factor					
Resumen del ajuste						Resumen del ajuste					
R cuadrado		0,044884				R cuadrado		0,015377			
R cuadrado ajustado		0,040132				R cuadrado ajustado		0,010479			
Raíz del error cuadrático medio		1,330772				Raíz del error cuadrático medio		0,49767			
Media de respuesta		2,517241				Media de respuesta		1,527094			
Observaciones (o suma de pesos)		203				Observaciones (o suma de pesos)		203			
Prueba t combinada						Prueba t combinada					
Análisis de varianza						Análisis de varianza					
Fuente	Grados de libertad	Suma de cuadrados	Media de los cuadrados	Razón F	Prob > F	Fuente	Grados de libertad	Suma de cuadrados	Media de los cuadrados	Razón F	Prob > F
Gender	1	16,72781	16,7278	9,4456	0,0024*	Gender	1	0,778113	0,778113	3,1391	0,0779
Error	201	355,96185	1,7710			Error	201	49,822872	0,247875		
C. Total	202	372,68966				C. Total	202	50,600985			
Medias para ANOVA de un factor						Medias para ANOVA de un factor					
Nivel	Número	Media	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%	Nivel	Número	Media	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%
Hombre	78	2,15385	0,15068	1,8567	2,4510	Hombre	78	1,44872	0,05637	1,3376	1,5599
Mujer	125	2,74400	0,11903	2,5093	2,9787	Mujer	125	1,57600	0,04453	1,4882	1,6638

Table 8: Oneway ANOVA. Milk and Chicken type selection with respect to Gender

In the case of chicken, the mean quality chosen by women is 1.57 (SE=0.044), also higher than that of men, 1.49 (SE=0.056). In any case, the p-value obtained indicates that the difference is not significant enough to affirm that there is an effect of the variable "Gender" on the type of chicken chosen.

Once the Means of Oneway ANOVA table and the Student's t-test circumferences are arranged (see Figure 12), it can be visually observed, in the case of milk, that the 95% confidence intervals obtained are completely separated between them, indicating a clear difference between the two genders. For the case of chicken, a higher mean quality of choice for females can also be observed, but as mentioned before, the difference is not large enough to be considered significant in this case. It would be necessary to increase the number of participants to reduce the size of the confidence interval and to ensure whether gender also produces an effect on the quality of the chosen chicken.

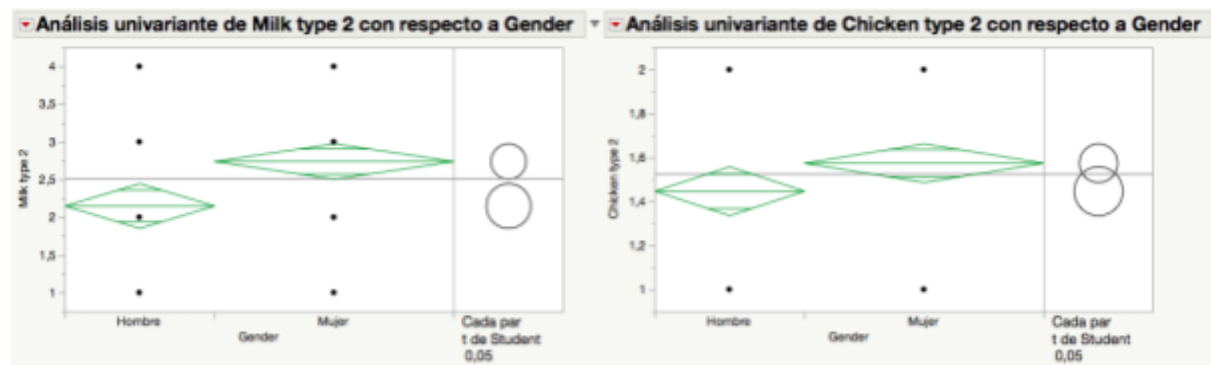


Figure 12: Means of Oneway ANOVA. Milk and Chicken type selection with respect to Gender

The results obtained are also surprising if we take the case of ecological milk as a reference. If we take into account the first ANOVA performed, which showed that there was no significant difference between men and women in the amount of ecological food consumed (even in our sample, men had a slightly higher average), it is surprising to note that after applying the nudging strategies, women tend to choose ecological products more frequently than men. This may be an indication that the nudging strategies used have had a greater effect on women than on men.

4.5.2 Choice comparison respect to gender for nudged and non-nudged participants

To be more certain about the previous result and its conditions, we performed the same ANOVA analysis, comparing the mean response in both products with respect to gender, but eliminating the participants belonging to the Control Group. For this purpose, the variable Gender (only nudged) was created, which has 150 participants, of which 95 are women and 55 are men.

Using the new variable, only the responses of the participants whose behavior was intended to be manipulated were analyzed, (leaving out those who responded to the neutral survey), and it was possible to analyze more clearly whether the strategies used had a different effect depending on gender.

The results that can be observed in Table 9 led us to the same conclusions in the case of the choice of the type of chicken: there is no significant difference between both genders when a nudging strategy is applied on them and they must choose between organic and conventional chicken, since the p-value obtained through the F-test is too large ($0.0931 < 0.05$). Therefore we cannot reject the null hypothesis that there is a difference between the mean choice of both genders.

▼ Análisis univariante de Milk type 2 con respecto a Gender (only nudged)						▼ Análisis univariante de Chicken type 2 con respecto a Gender					
▼ ANOVA de un factor						▼ ANOVA de un factor					
▼ Resumen del ajuste						▼ Resumen del ajuste					
R cuadrado		0,080125				R cuadrado		0,018838			
R cuadrado ajustado		0,07391				R cuadrado ajustado		0,012309			
Raíz del error cuadrático medio		1,30877				Raíz del error cuadrático medio		0,497868			
Media de respuesta		2,646667				Media de respuesta		1,526667			
Observaciones (o suma de pesos)		150				Observaciones (o suma de pesos)		150			
▼ Prueba t combinada						▼ Prueba t combinada					
▼ Análisis de varianza						▼ Análisis de varianza					
Fuente	Grados de libertad	Suma de cuadrados	Media de los cuadrados	Razón F	Prob > F	Fuente	Grados de libertad	Suma de cuadrados	Media de los cuadrados	Razón F	Prob > F
Gender (only nudged)	1	21,81592	21,8159	12,8914	0,0004*	Gender (only nudged)	1	0,708166	0,708166	2,8570	0,0931
Error	148	250,45742	1,6923			Error	148	36,685167	0,247873		
C. Total	149	272,27333				C. Total	149	37,393333			
▼ Medias para ANOVA de un factor						▼ Medias para ANOVA de un factor					
Nivel	Número	Media	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%	Nivel	Número	Media	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%
Hombre	55	2,14545	0,17541	1,7988	2,4921	Hombre	55	1,43536	0,06713	1,3037	1,5690
Mujer	95	2,93684	0,13347	2,6731	3,2006	Mujer	95	1,57895	0,05108	1,4780	1,6799

Table 9: Oneway ANOVA. Milk and Chicken type selection with respect to Gender (only nudged)

On the other hand, if we observe the result of the F-test in the case of the type of milk chosen, the p-value obtained is clearly lower ($0.0004 < 0.05$), which allows us to reject the null hypothesis, and to affirm with a 95% significance level that there is a difference between men and women when they must choose a type of milk and a nudging strategy is applied to them. According to the results, women choose a healthier type of milk than men when trying to apply a nudging strategy on both groups. The mean choice of females was 2.94 (SE=0.133) out of 4, while that of males was 2.145 (SE=0.175).

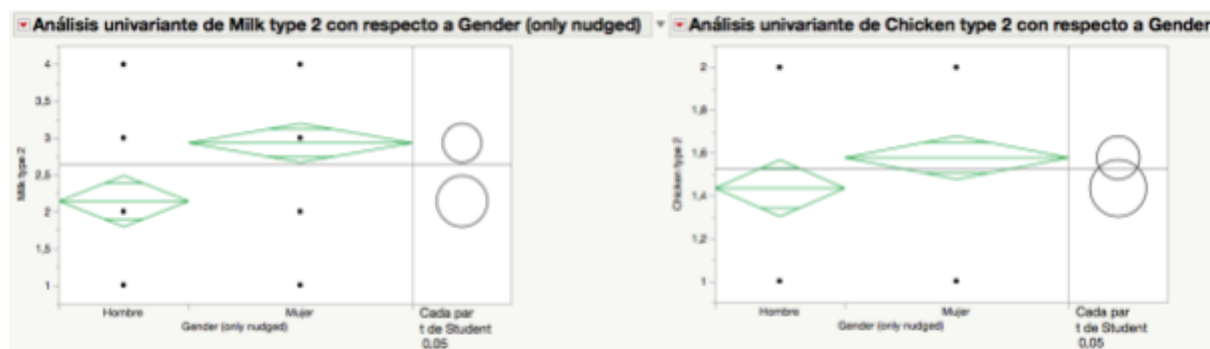


Figure 13: Means of Oneway ANOVA. Milk and Chicken type selection with respect to Gender (only nudged)

Figure 13 above allows us to visually observe the confidence intervals representing the means of the responses. In the case of the choice of the type of chicken, it can be seen that the mean obtained is higher for women, but in accordance with the previous result, this is not a sufficiently large difference to be considered significant. For the choice of milk, on the other hand, the difference between the two genders can be observed: the 95% confidence intervals clearly show that women are above the overall mean, while men are below. The Each pair t-student test shows that there is no possibility that the means of males and females are equal.

Continuing with the analysis, we performed the Test of Equal Variances for the case of milk (Annex 6, p. 64): the results of the Levene test is 0.1526, so we fail to reject the null hypothesis of all equal variances. The result of Welch's test, on the other hand, allowed us to reject the null hypothesis, so the means of males and females are different from each other. This allows us to affirm that the gender of the participants, once the nudging strategy has been applied, produces an effect on the quality of the chosen milk: women tend to consume more ecological milk.

To complete the analysis, a mean comparison of the type of milk selected according to the gender of the participants was carried out, differentiating between the members of the Control Group and the rest of the groups. After the Oneway ANOVA Means were available, clear results could be seen (see Figure 14): there is no difference between genders in the mean choice of respondents who received the neutral questions (Control Group), while, as seen above, women tend to choose a higher quality product than men when one of the nudging strategies is applied to them.

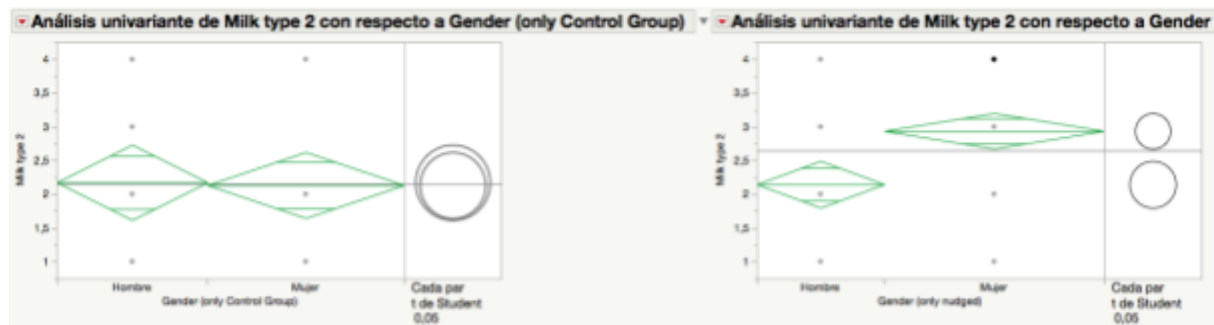


Figure 14: Means of Oneway ANOVA. Milk type selection with respect to Gender for Control and Nudged Group

The results were confirmed after performing the F-test (see Table 10). When participants answered the neutrally formulated questions, the mean choice between the two genders remained virtually identical. When a nudging strategy was applied on the sample, women increased the range of ecological milk choice, going from a mean choice quality of 2.133 to 2.937, obtaining a significant difference according to the F-test. Men, on the other hand, had no apparent change in their choice process after nudging, with a mean of 2.174 before and 2.145 after nudging. This means that the strategies used to try to manipulate consumer behavior to increase the average consumption of ecological milk were not effective for men, but were significantly effective for women.

▼ Análisis univariante de Milk type 2 con respecto a Gender (only Control Group)

▼ ANOVA de un factor

▼ Resumen del ajuste

R cuadrado

R cuadrado ajustado

Raíz del error cuadrático medio

Medio de respuesta

Observaciones (o suma de pesos)

0,000236

-0,01937

1,3341

2,150943

53

▼ Prueba t combinada

▼ Análisis de varianza

Fuente	Grados de libertad	Suma de cuadrados	Medio de los cuadrados	Razón F	Prob > F
Gender (only Control Group)	1	0,021438	0,02144	0,0120	0,9130
Error	51	90,771914	1,77982		
C. Total	52	90,792453			

▼ Medias para ANOVA de un factor

Nivel	Número	Medio	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%
Hombre	23	2,17391	0,27818	1,6154	2,7324
Mujer	30	2,13333	0,24357	1,6443	2,8223

▼ Análisis univariante de Milk type 2 con respecto a Gender (only nudged)

▼ ANOVA de un factor

▼ Resumen del ajuste

R cuadrado

R cuadrado ajustado

Raíz del error cuadrático medio

Medio de respuesta

Observaciones (o suma de pesos)

0,080125

0,07391

1,300877

2,646967

150

▼ Prueba t combinada

▼ Análisis de varianza

Fuente	Grados de libertad	Suma de cuadrados	Medio de los cuadrados	Razón F	Prob > F
Gender (only nudged)	1	21,81592	21,8159	12,8914	0,0004*
Error	148	250,45742	1,6923		
C. Total	149	272,27333			

▼ Medias para ANOVA de un factor

Nivel	Número	Medio	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%
Hombre	55	2,14545	0,17541	1,7968	2,4921
Mujer	95	2,93684	0,13347	2,6731	3,2006

Table 10: Oneway ANOVA. Milk type selection with respect to Gender for Control and Nudged Group

CHAPTER 5. CONCLUSIONS

5.0 Introduction

This chapter will present the conclusions following the analysis of the survey results. It will list the objectives of the study, answer whether it has been possible to modify the consumers' decision and the other research questions posted in Chapter 2, section 3, and give recommendations for possible practical applications. Finally, the limitations of the project will be shown and the final conclusions displayed.

5.1 Project Aims

The intention behind the development of this project, as explained in Chapter 1, section 2, was to conduct research in the broad field of Behavioral Economics, focusing particularly on the concept of nudging, and how individuals' cognitive biases and irrational behaviors can, using choice architecture, help modify the consumer decision making when faced with high and low quality everyday consumer products.

This study seeks to demonstrate that the way in which different options are presented can have an effect on the final decision maker, in this case the consumer. The use of choice architecture, therefore, seeks to encourage consumers to increase their consumption of ecological food, considered high-end products. This increase can generate an advantage in the fight against climate change, an improvement in the health of consumers, and an increase in the profits of producers.

Another of the objectives of this work was to study the two systems of thought that direct our actions and divide our decisions into automatic and reflexive, and how they can be affected by the use of nudging. Also to present different biases that individuals have inherent in their thinking, and that lead them to make irrational decisions and make mistakes in a systematic way that can be exploited by marketers.

This study also aims to provide knowledge, recommendations and key takeaways to be able to practically apply the nudging strategies specifically studied (*Suggest alternatives*, *Opt-out policy*, *Positioning*) and thus be able to generate strategies that can be used in the consumer sector, and help marketers of ecological food and ecological products to increase their sales, thus increasing profits, but also improving their brand awareness and giving a boost to their corporate culture.

After carrying out the study, it can be said that the project has fulfilled its primary and secondary objectives. The analysis of the results provides evidence that, by using the choice architecture, it has been possible to produce a difference between participants who were able to choose in an unbiased way and those who were exposed to different nudging strategies. The study also provides examples and recommendations on how to implement this choice architecture in the consumer section so that marketers can try to increase sales of ecological and higher quality products.

5.2 Answering research question

5.2.1 Manipulation effects

This project focuses on analyzing the extent to which cognitive biases and different nudging strategies affect the formation of consumer choice and their considerations towards the quality and benefits of a product. We particularly focus on the effect of three of the nudging strategies defined by Ana Caraban (2019), which are *Suggest alternatives*, *Opt-out policy* and *Positioning*, all belonging to the Facilitate nudging mechanism. These strategies were applied in a context of everyday food consumption, in which participants had to choose, among different alternatives, the variant of milk and chicken they wanted to buy, focusing the design of the choice architecture to the fact that participants chose the ecological variant.

The participants were distributed almost equally among the different groups, ensuring that each of the strategies used was applied to a similar number of individuals and under the same conditions. The data obtained from the sample indicated that, prior to nudging, there was no significant difference between the frequency and quantity of ecological food consumption between men and women.

The empirical test indicates that, in terms of the milk and chicken variants chosen, no sufficiently significant difference can be established between the control group and each of the three experimental groups. On the other hand, when the three experimental groups are merged into one, using the *Facilitate* mechanism as a linking factor, the result shows a difference in the case of ecological milk choice. The participants on whom a nudging strategy was applied increased the quality of the chosen alternative with respect to the Control Group.

In the case of the chicken type choice, despite clustering the three experimental groups into one, no significant difference can be established between the participants to whom some type of nudging was applied and the members of the control group. The evidence shows that, for this product, the nudging mechanism used has no significant effect on the choice of the participants.

5.2.2 Gender factor

When analyzing the variance in the participants' choice of chicken and milk using gender as a categorical variable, the evidence shows that there is no significant difference between the choice of men and women when only the Control Group is taken into account. It can be stated, therefore, that both genders choose the ecological products with the same frequency when there is no attempt to manipulate their behavior.

On the other hand, when taking into account the 150 participants on whom the *Facilitate* nudging mechanism was applied, the empirical test shows that, while men do not experience any difference in their choice, women have a surprisingly high average choice of ecological milk. The difference is not statistically significant in the case of chicken. With an increase in the number of participants it would be possible to refine the confidence interval for both groups, so that it would be possible to see with certainty whether gender also has an effect on the quality of the chosen chicken.

Comparing the Control Group with the 150 nudged participants, evidence shows a clear trend regarding the type of milk chosen: when the questions are presented in a neutral way, there is no difference between the choice of men and women, both genders have the same average milk quality. But when a nudging strategy is applied, men maintain the same mean choice while women choose better quality milk. The nudging strategies used have no apparent effect in the case of males, but do have an effect in the case of females.

This result is surprising and is not in line with the initial hypothesis. It may indicate that women attach greater importance to the quality of the chosen milk, so they are more likely than men to choose ecological milk if the correct nudging mechanisms are applied. Further research in this direction would be interesting.

5.2.3 Theoretical implications

This study extends the existing literature on choice architecture and the effects on consumers and their perception of ecological and conventional variants of the same product, adapting it to a decision-making context in which a choice must be made between everyday consumer products and their ecological option.

The study proposes a mechanism to evaluate the effectiveness of three of the nudging strategies defined by Caraban, all within the *Facilitate* mechanism. The proposal of this mechanism consists of dividing the participants of the experiment into different groups, each of which must answer a series of questions, with a similar structure for all groups. The questions of one of the groups are formulated in a neutral way, while those of the others receive subtle changes in the choice architecture in relation to the nudging strategy they intend to test.

No evidence has been found that any of the nudging strategies has a superior effect to the rest. Therefore, neither the degree of transparency of the nudges used nor the system of thinking they target can be said to be a differential factor when attempting to manipulate participants, as Caraban (2019) already said.

The results suggest that the effects of nudging may limit certain price differences, since we did not obtain an increase of the same magnitude in the consumption of milk and chicken. This may be due to consumers having some sensitivity to greater price differences, so it may be of interest to further study whether the effects of nudging are reduced when the price is higher or the difference between one product and another is greater.

The results also show that the "choice architecture" employed did not manipulate the behavior of males, but did manipulate the behavior of females. The evidence shows that the nudging mechanism used had the desired effect on the female gender when choosing the milk variant. For future studies, it may be interesting to corroborate this result and investigate whether this effect can be generalized to other nudging mechanisms or other consumption contexts.

5.2.4 Practical implications

This study proposes different approaches that, in a simple way, can be used to try to increase the overall consumption of ecological products, using milk as example. Achieving this increase can be beneficial for the health of consumers and the environment, as it would lead to an improvement in the quality of the products consumed. This would also lead to a boost in the vendor's corporate image, as well as an increase in profits by increasing sales of high-end products.

The evidence suggests that it may be interesting, in some way, to focus the sales campaigns of ecological food to the female gender. The results show that women may be more willing to buy ecological food when given a little nudge, whereas the same effect cannot be observed in men.

As Thaler argues, people make mistakes systematically, and it is often more effective to take advantage of these mistakes rather than try to correct them. Instead of spending excessive resources trying to educate consumers, it may be more effective to use choice architecture to try to nudge them. In this way you can increase the sale of ecological food and take advantage of all the benefits described above that this can bring.

5.3 Limitations and final conclusion

Before concluding this study, it is necessary to name the limitations faced during its development. To begin with, the survey participants were obtained with the limited outreach tools available, so it may not be representative of all types of consumers. The sample, therefore, should be considered a convenience sample. To reach an empirical generalization it would be important to replicate this study on real consumers. Another limitation was the difficulty in achieving a large survey reach due to the limited scope of the social networks and media available, and the narrow age range that could be obtained.

Only one of Caraban's nudging mechanisms, *Facilitate*, could be analyzed. Some of the other mechanisms do not have enough examples or are very difficult or impossible to test in an online survey. If more resources were available, it would be desirable to conduct similar studies for other ways of nudging and to broaden the representation of each age range in the participants.

In conclusion, this Final Thesis presents different ways in which, through choice architecture, it is possible to modify the behavior of individuals to encourage them to consume more ecological food. An online survey method has been proposed, which can be applied to real web portals, and which implements the three nudging strategies studied, *Suggest alternative*, *Opt-out policy* and *Positioning*, all part of the *Facilitate* nudging mechanism defined by A. Caraban..

Results showed that the methods used were effective in increasing the quality of the milk chosen by consumers, specifically women, who surprisingly demonstrated a higher average quality choice than men, indicating that choice architecture had a superior effect on the female gender. Overall, *Facilitate* nudge mechanism has proven effective in increasing the

choice of ecological milk, so it can be applied to similar high-end products and thus increase their sales, improving consumers' experience, lowering the impact on the environment and raising the profit of producers. This can help to encourage the production and sale of more ecological products, with all the benefits that this entails.

Annexes

Annex 1. Survey material

Common Questions

Cumplo años en... *

☐ Mes impar (Enero, Marzo, Mayo, Julio, Septiembre, Noviembre) y día par (acaba en 0, 2, 4, 6, 8)

☐ Mes impar (Enero, Marzo, Mayo, Julio, Septiembre, Noviembre) y día impar (acaba en 1, 3, 5, 7, 9)

☐ Mes par (Febrero, Abril, Junio, Agosto, Octubre, Diciembre) y día par (acaba en 0, 2, 4, 6, 8)

☐ Mes par (Febrero, Abril, Junio, Agosto, Octubre, Diciembre) y día impar (acaba en 1, 3, 5, 7, 9)

1. ¿Cuál es tu edad? *

☐ 12 - 17 años

☐ 18 - 25 años

☐ 26 - 35 años

☐ 36 - 50 años

☐ 51 - 65 años

☐ 66 años o más

2. ¿Cuál es tu género? *

☐ Hombre

☐ Mujer

☐ Prefiero no contestar

3. ¿Sabes en qué consisten los alimentos ecológicos? *

☐ Sí

☐ No

☐ No estoy seguro/a

4. En el caso de que tu respuesta anterior sea afirmativa, selecciona cuántas veces a la semana sueles consumir alimentos ecológicos:

	0	1	2	3	4	5	6	7	
Ninguna	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	7 o más

"Control" Group

Observa los siguientes productos:



Leche de marca blanca (0,59€/litro)



Leche estándar (0,85€/litro)



Leche ecológica (1,5€/litro)
Producto sano y natural. Contiene más ácidos grasos benéficos, antioxidantes y vitaminas. No contiene ningún tipo de sustancia química.



Leche premium (2,5€/litro)

5. ¿Cuál de los productos vistos estarías más dispuesto/a a comprar? *



☐ Leche de marca blanca (0,59€/litro)



☐ Leche estándar (0,85€/litro)



☐ Leche ecológica (1,5€/litro)



☐ Leche premium (2,5€/litro)

Ahora observa los siguientes productos:

Pollo entero convencional (10€)



Pollo entero ecológico (20€): es criado en semi libertad, al aire libre, se alimenta exclusivamente de productos 100% naturales y orgánicos, libres de transgénicos y sustancias químicas.



6. De los productos vistos anteriormente, ¿cuál de los dos comprarías? *



☐ Pollo entero convencional (10€)



☐ Pollo entero ecológico (20€)

"Suggest alternative" Group

5. ¿Cuál de los siguientes productos estarías más dispuesto/a a comprar? *



☐ Leche de marca blanca (0,59€/litro)



☐ Leche estándar (0,85€/litro)



☐ Leche premium (2,5€/litro)

Ahora observa el siguiente producto:

Leche ecológica (1,5€/litro): Producto sano y natural. Contiene más ácidos grasos benéficos, antioxidantes y vitaminas. No contiene ningún tipo de sustancia química.



6. Basándote en tu elección anterior, cambiarías el producto que has elegido por el producto ecológico? *



☐ Me quedo con el que he elegido



☐ Prefiero cambiar al ecológico (1,5€/litro)

Imagina que vas a comprar el siguiente producto:

Pollo entero convencional (10€)



7. Ahora imagina que tienes la opción de comprar un tipo de pollo ecológico, * criado en semi libertad, al aire libre, se alimenta exclusivamente de productos 100% naturales y orgánicos, libres de transgénicos y sustancias químicas. ¿Considerarías cambiarlo por el convencional?



☐ Me quedo con el pollo convencional (10€)



☐ Prefiero cambiar al pollo ecológico (20€)

"Opt-out policy" Group

Imagina que sueles comprar el siguiente producto

Leche ecológica (1,5€/litro): Producto sano y natural. Contiene más ácidos grasos benéficos, antioxidantes y vitaminas. No contiene ningún tipo de sustancia química.



Ahora observa los siguientes productos:

Leche de marca blanca (0,59€/litro)



Leche estándar (0,85€/litro)



Leche premium (2,5€/litro)



5. Teniendo en cuenta que vas a comprar el producto ecológico, ¿considerarías * cambiarlo por alguno de los vistos anteriormente?



☐ Sí, por la leche de marca blanca (0,59€/litro)



☐ Sí, por la leche estándar (0,85€/litro)



☐ Sí, por la leche premium (2,5€/litro)



☐ No, me quedo con la leche ecológica (1,5€/litro)

Imagina que vas a comprar el siguiente producto:

Pollo entero ecológico (20€): es criado en semi libertad, al aire libre, se alimenta exclusivamente de productos 100% naturales y orgánicos, libres de transgénicos y sustancias químicas.



6. Ahora imagina que tienes la oportunidad de comprar el mismo tipo de producto, pero con un estilo más convencional (no ecológico). ¿Considerarías hacer el cambio? *



☐ Me quedo con el pollo ecológico (20€)



☐ Prefiero comprar el pollo convencional (10€)

"Positioning" Group

Observa los siguientes productos:



Leche ecológica (1,5€/litro)

Producto sano y natural. Contiene más ácidos grasos beneficios, antioxidantes y vitaminas. No contiene ningún tipo de sustancia química.



Leche premium (2,5€/litro)



Leche estándar (0,85€/litro)



Leche de marca blanca (0,59€/litro)

5. ¿Cuál de los siguientes productos estarías más dispuesto/a a comprar? *



☐ Leche ecológica (1,5€/litro)



☐ Leche premium (2,5€/litro)



☐ Leche estándar (0,85€/litro)



☐ Leche de marca blanca (0,59€/litro)

Ahora observa los siguientes productos:

Pollo entero ecológico (20€): es criado en semi libertad, al aire libre, se alimenta exclusivamente de productos 100% naturales y orgánicos, libres de transgénicos y sustancias químicas.



Pollo entero convencional (10€)



6. De los productos vistos anteriormente, ¿cuál de los dos comprarías? *



☐ Pollo entero convencional (10€)



☐ Pollo entero ecológico (20€)

Annex 2: Oneway ANOVA. Milk type selection with respect to Group

ANOVA de un factor

Resumen del ajuste

R cuadrado	0,029024
R cuadrado ajustado	0,014459
Raíz del error cuadrático medio	1,345606
Media de respuesta	2,514706
Observaciones (o suma de pesos)	204

Análisis de varianza

Fuente	Grados de libertad	Suma de cuadrados	Media de los cuadrados	Razón F	Prob > F
Group	3	10,82470	3,60823	1,9928	0,1163
Error	200	362,13118	1,81066		
C. Total	203	372,95588			

Medias para ANOVA de un factor

Nivel	Número	Media	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%
Control Group	54	2,14815	0,18311	1,7871	2,5092
Opt-out policy Group	56	2,75000	0,17981	2,3954	3,1046
Positioning Group	50	2,58000	0,19030	2,2048	2,9552
Suggest Alternative Group	44	2,59091	0,20286	2,1909	2,9909

El error estándar utiliza una estimación combinada de la varianza del error

Annex 3: Oneway ANOVA and t-test. Milk type selection with respect to "Nudged or not"

Annex 4: Oneway ANOVA. Chicken type selection with respect to Group**ANOVA de un factor****▼ Resumen del ajuste**

R cuadrado	0,002361
R cuadrado ajustado	-0,0126
Raíz del error cuadrático medio	0,503505
Media de respuesta	1,529412
Observaciones (o suma de pesos)	204

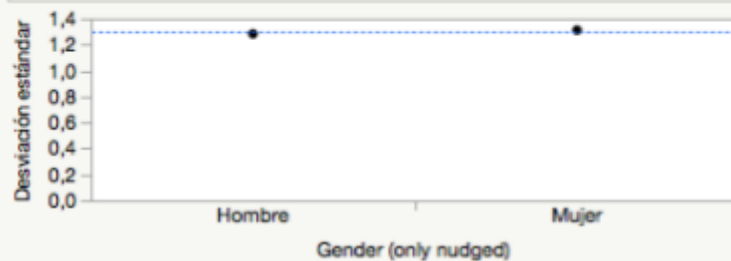
▼ Análisis de varianza

Fuente	Grados de libertad	Suma de cuadrados	Media de los cuadrados	Razón F	Prob > F
Group	3	0,120006	0,040002	0,1578	0,9246
Error	200	50,703523	0,253518		
C. Total	203	50,823529			

▼ Medias para ANOVA de un factor

Nivel	Número	Media	Error estándar	Extremo inferior del IC al 95%	Extremo superior del IC al 95%
Control Group	54	1,53704	0,06852	1,4019	1,6721
Opt-out policy Group	56	1,51786	0,06728	1,3852	1,6505
Positioning Group	50	1,50000	0,07121	1,3596	1,6404
Suggest Alternative Group	44	1,56818	0,07591	1,4185	1,7179

Annex 5: Oneway ANOVA and t-test. Chicken type selection with respect to "Nudged or not"

Annex 6: Test of Equal Variances. Milk type selection with respect to Gender**Prueba que las varianzas sean iguales**

Nivel	Conteo	Desviación estándar	Diferencia absoluta media con respecto a la media	Diferencia absoluta media con respecto a la mediana
Hombre	55	1,282621	1,110083	1,054545
Mujer	95	1,311249	1,233684	1,063158

Prueba	Razón F	Grados de libertad del numerador	Grados de libertad del denominador	Valor p
O'Brien[.5]	0,1240	1	148	0,7252
Brown-Forsythe	0,0020	1	148	0,9643
Levene	2,0675	1	148	0,1526
Bartlett	0,0330	1	.	0,8558
Prueba F bilateral	1,0451	94	54	0,8729

Prueba de Welch

ANOVA de Welch prueba la igualdad de las medias y permite que las desviaciones estándar no sean iguales

Razón F	Grados de libertad del numerador	Grados de libertad del denominador	Prob > F
13,0451	1	114,94	0,0005*
Prueba t			
3,6118			

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