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Ecolabels and Greenwashing

Which factors influence the way consumers perceive and differentiate between official and fraudulent ecolabels?

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Declaration

During the preparation of this master's thesis, we utilized DeepL and ChatGPT for the following purpose:

1. Translation: We used DeepL to translate some words or to find synonyms.

2. **Reformulation:** We sometimes used ChatGPT to explain some sentences by some authors we have read in the literature review, so we could better understand and reformulate them ourselves.

After using DeepL and ChatGPT, we diligently reviewed and edited the content produced by the tool. We take full responsibility for the final content presented in this thesis.

By signing this declaration, we affirm that the content of this master's thesis reflects our original work, augmented by the responsible use of AI.

Signatures:

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I. Introduction

Ecolabels, whose role is to help consumers in their purchasing choices by informing them about a product's environmental preference or its compliance with an environmental standard, have been steadily gaining in popularity since they first appeared (Mogyoros, 2023). Different types of ecolabels have emerged, such as self-declared ecolabels. Manufacturers use these types of ecolabels to claim an environmental characteristic for their product, but they do not obtain any third-party certification, unlike official labels (Courtat et al, 2023). There is therefore no way of ensuring the veracity of a self-declared label, and producers can use it to mislead consumers (Iraldo, 2020).

The popularity of ecolabels has led to a veritable proliferation of all kinds of ecolabels. This means that just as many products can be found on the market with an official label, certified by a third party, as with a fraudulent label, which are simply self-declared labels (Nygaard, 2023). Faced with the multiplicity of ecolabels, how can consumers distinguish the real from the fake? This is what we set out to investigate in our master thesis. We first wanted to measure consumers' ability to distinguish an official label from a self-declared one. Secondly, we wanted to study what differentiates consumers who can distinguish between ecolabels from those who cannot. This is how we came to formulate the following research question: "Which factors influence the way consumers perceive and differentiate between official and fraudulent ecolabels?".

A lot of research has already been conducted on ecolabels. We have therefore found a lot of interesting studies about the potential negative impact of certifications (Nygaard, 2023), the attitude and perception of consumers towards ecolabels (Paul et al, 2023), the organic character attributed by consumers to products with third-party certified ecolabels and with non-certified organic claims (Vázquez et al, 2021), the capacity of third-party certification to reduce consumers' skepticism of ecolabels (Darnall et al, 2016). However, it seemed that for the moment, none has yet looked at the factors that can influence consumers' ability to differentiate between ecolabels. That is why we think it is relevant to answer our research question. By knowing more about the profiles of consumers who cannot make the difference between official and fraudulent ecolabels, there are opportunities for the future to remedy this situation.

To address this question, we began by reviewing the existing literature on our subject. Based on the information we found, we were able to formulate the different hypotheses we wanted

to test and we have included them in our research model. By exploring the literature, we turned our attention to a recent indicator of a product's environmental impact, the eco-score. This led us to the following second research question: "Do consumers trust the eco-score?" and therefore to a secondary research model including four hypotheses. It was only after defining all our hypotheses that we were able to create our questionnaire to collect data for our quantitative analysis. We used convenience sampling and distributed our survey on social media. Once data was collected, we performed statistical analyses using SPSS to test our hypotheses.

Our analyses to answer our first research question show that none of the factors tested has any influence on consumers' ability to differentiate between official and fraudulent ecolabels. The vast majority of consumers tend to fall into the greenwashing trap, choosing the fraudulent ecolabel as the one they perceive as official and it does not matter how old they are, how much they know about greenwashing, or how expensive or green the eco-labeled product is. However, the study revealed that green color influences perceived credibility, with consumers tending to give more credibility to the ecolabel when they see it in green than in black.

About the results of our analyses on the second research question, it appears that consumers with a greater environmental concern tend to have higher trust in the eco-score and that consumers' trust influences their intention to buy eco-scored products. In addition, nearly 75% of respondents would prefer the eco-score to ecolabels. It therefore seems essential to replace ecolabels with a single indicator, such as the eco-score.

To present our work, we structured our paper into three principal parts. The first part is dedicated to the literature review where we will provide a context relevant to our research question. Therefore, we will take a closer look at the concepts of ecolabels, greenwashing and eco-score. The second part is the empirical part of our master thesis. This part consists of the construction of our models and hypotheses based on our research questions, our study methodology and the analysis of our results. Finally, the last part contains the conclusions of our study. It is in this section that we will discuss the results obtained from our quantitative analysis, as well as the research perspectives and limitations of our work.

II. Literature Review

In the first part of this master thesis, we will begin by exploring the literature on topics that seem relevant to our research question, which is as follows: “Which factors influence the way consumers perceive and differentiate between official and fraudulent ecolabels?”. We will therefore begin by defining the concept of ecolabels, detailing their functions and objectives, their classification, the process for companies to obtain them but also their challenges and limitations. Then, we will give explanations about the practice of greenwashing by defining it, illustrating the different types, and exploring the factors that push companies to resort to this practice, its impact on consumers, and strategies to fight it. It seemed important for us to give explanations about greenwashing as this is the practice we are referring to in the research question when we mention “fraudulent” ecolabels. We will end this literature review with a quick look at the eco-score, an indicator of the environmental impact of products, which caught our attention because it could prove interesting for future research purposes.

1. Ecolabels

1.1 Definition

Environmental labels, also known as ecolabels, are logos or signs attesting to the compliance of a product or service with an environmental standard or its environmental preference (Mogyoros, 2023). The role of ecolabels is therefore to inform consumers and encourage change in production to move towards a more sustainable society (Bratt et al, 2011).

Products and services are assessed according to their entire life cycle and then compared to other products and services of their category to determine if they deserve to receive an ecolabel (Bratt et al, 2011). These labels come in many different forms, whether at national, European, or international levels (Bratt et al, 2011) but also with different sponsors, ownership agreements, inspection agencies, and corporate governance structures (Gorton et al, 2021).

At first, labels were introduced to help consumers make better choices in their purchases. Labeling was indeed a way to provide consumers with better information about the quality and safety of the product. After that, labeling has been expanded to the field of environmental quality leading to the development of ecolabeling as a crucial instrument in environmental policy (Iraldo et al, 2020).

The first ecolabeling program, called the “Blauer Engel” was launched in Germany in 1977 (Bratt et al, 2011). A decade later, ecolabeling programs started to take more and more importance and, with the growing concern for the environment, the popularity of these labels continues to increase. This is how the market now boasts over 400 different labels according to the International Institute for Sustainable Development (IISD) (Nygaard, 2023). However, unlike the Blauer Engel, which was a third-party certification, many later labels were self-declared or certified by private entities, often focusing on particular ecological characteristics or making general statements about environmental friendliness (Iraldo et al, 2020). Unexpectedly, these last forms of ecolabels became a success. Multinationals and other companies started to use self-declared labels or private certifications as a marketing tool to gain a competitive advantage. The proliferation of this type of ecolabels stressed the importance of regulating the ecolabeling landscape. This led to the classification of ecolabels which we will detail in section 3 (Iraldo et al, 2020).

1.2 Functions and objectives

Many functions and objectives of labels are described in the literature as they can vary depending on the type of labels but also on the context.

What concerns functions of product labels, Schafeld (2019) cites three main ones. Firstly, labels transfer product information by bringing attention to particular characteristics of the product such as the origin of ingredients or verification of sustainable production processes. Secondly, as labels help to promote product value, they can increase revenues through higher pricing. Lastly, labels support the implementation of public objectives as, for example, reducing the use of pesticides in agriculture.

Then, about the functions of environmental labels, which concern both products and services, two main objectives are highlighted. On the one hand, the first objective is focused on consumers, as ecolabels aim to help them in their purchasing decisions by providing them with accurate and reliable information about the environmental performance and benefits of the products. In this way, environmental labels can help raise consumer awareness of the environment and encourage the consumption of environmentally friendly products (Iraldo et al, 2023). They constitute therefore a good mean to reduce the asymmetry of information between producers and consumers regarding the environmental characteristics of a product or service (Gorton et al, 2021). On the other hand, the second goal is focused on producers. Ecolabels were introduced to incentivize companies to improve the environmental impact of

their products, particularly through technology innovation. They enable companies to obtain official recognition of the quality of their products or services from a third party (Iraldo et al, 2023). Obtaining an ecolabel can therefore represent a strategic decision for producers to gain a competitive advantage and enable them to differentiate their products from those of their competitors (Paul et al, 2023; Yokessa & Marette, 2019). These two primary objectives are in line with the general aim of these public policies which are the improvement of environmental sustainability of products and consumption habits (Iraldo et al, 2023).

In the context of the Paris Agreement, the ecolabel can be defined as one of the systems used by countries to fulfill their national contributions to post-2020 climate action. Ecolabels are also considered by the European Union as a way to achieve some of the Sustainable Development Goals, especially SDG 12 which refers to responsible consumption and production (Paul et al, 2023). Indeed, ecolabels can be useful instruments to make production sustainable by minimizing environmental impact and encouraging responsible use of resources. They also help to phase out hazardous emissions and promote materials reuse and recycling, concerning quality standards. Ecolabels are also powerful tools enabling companies to support sustainable public procurement and report on their sustainability initiatives (Paul et al, 2023).

1.3 Classification

Over the years, different authors have proposed classification systems based on different criteria to categorize labels. Vázquez and Lanero (2021) have created a summary table showing the criteria used by various authors to classify labels and differentiate them into categories.

Firstly, Hartlieb and Jones, in the Journal of Business Ethics in 2009, justified their classification system on the criterion of content. In this way, they determined three categories: labels based on environmental protection, social justice, and animal welfare.

Secondly, the International Organization for Standardization (ISO) identified three different types of ecolabels according to the way of granting (Vázquez & Lanero, 2021). The first type are ecolabels assessed by multi-criteria and certified by third-party to arm consumers with information and give more credibility to the label. This type of ecolabel therefore follows the objective to help consumers in their purchase decisions and to raise their awareness for the environment. To obtain this type of ecolabel, companies have to make a real improvement on

the environmental impact of their products which relates to the second function of ecolabels to incentivize companies to have a better environmental impact and to gain a competitive advantage. Then, type II are “self-declared environmental claims” (Bratt et al, 2011) which refers to ecological claims produced by manufacturers but not verified by third parties (Courtat et al, 2023). Because these ecolabels do not receive any external verification, there is no way to be sure that companies using them reduce their environmental impact. However, as consumers lack knowledge about the different ecolabels, they could trust these as much as ecolabels of type I. Finally, type III is composed of quantitative environmental declarations based on the Life Cycle Assessment with third-party verification. These types of labels are mainly employed for business-to-business information (Courtat et al, 2023).

Finally, Zadek, Lingayah, and Forstater (1998) categorized social labels into five distinct categories. They based these categories according to the granting entity and defined them as follows: labels attributed by the entity itself, attributed by an industrial body, attributed by NGOs or non-profit organizations, attributed through partnerships, and attributed by an official entity such as a government organization.

As part of this master thesis, we are especially interested in labels based on environmental protection called ecolabels and therefore the three types of ecolabels defined by ISO. However, it is important to notice that the categories created by ISO are not sufficient to include all labels of the European market. Indeed, there is now a large number of diversified labels and some do not fit into any of the three types identified (Courtat et al, 2023).

1.4 Procurement process

Companies can obtain ecological certification by reducing their waste production, emitting fewer pollutants, and making efforts to reduce various other forms of nuisance. Several standards exist in this respect, such as the European ecolabel awarded to products (Labels écologiques, n. d.). The procurement process may vary from one label to another.

The assessment and criteria used by national and supranational programs to evaluate products and services share characteristics distinct from the usual environmental labels. The EU Ecolabel, being a supranational label, therefore has characteristics similar to those of other national and supranational schemes (Iraldo, 2020).

The first characteristic of these programs is that they are based on the voluntary participation of companies. Another feature is that they include as many product categories as possible. In

addition, they ensure that the ecolabel is awarded to a product only after a detailed assessment of all its environmental impacts throughout its life cycle and that it has a better environmental performance than other products in the same category (Iraldo, 2020).

To establish the criteria for awarding ecolabels, the programs select a category of equivalent products including competing products in the eyes of consumers, and assess their environmental impacts using the Life Cycle Assessment (LCA) method. In this way, the competent body defines the criteria based on the impacts considered as the most significant. The assessment of environmental impact is therefore essential, as it lends credibility to the program and the LCA is now the most widely used method, playing a role in the success of these initiatives (Iraldo et al, 2020).

1.5 Limitations

As we have seen in the first part of this literature review, ecolabels became very popular after the launching of the first ecolabel in 1978. This led to a veritable proliferation of all types of labels, including self-declared claims and labels certified by private entities. The problem with these types of labels is that they often focus on particular product characteristics and are based on simple and single criteria, without taking into account the entire life cycle of the product. In addition, they tend to declare that the product is environmentally friendly in a simplistic, all-encompassing way (Iraldo, 2020). Retailers sometimes use this type of label for products that do not meet any standards, to mislead consumers. Indeed, empirical evidence coming from a study conducted by Hoek, Roling and Holdsworth published in the Journal of Marketing Management has shown that consumers often do not have the time or ability to assess the validity of a label. Furthermore, they often lack knowledge about the meaning of a third-party certified label. For these reasons, consumers tend to make simple links between a product's logo and its sustainability credentials. However, it is important to note that this is not the case for all labels. Some third-party certified labels are better known to consumers than others but consumers often draw the wrong conclusions when confronted with a lesser-known label (Vázquez & Lanero, 2021). The fact that all labels are not reliable constitutes their first limitation. It also represents a challenge for both consumers, who must know how to differentiate the real from the fake, and for producers with a lesser-known certified label, who must fight to maintain consumer confidence.

The proliferation of ecolabels leads also to an increase in competition among certifiers. They all want to be perceived as providing higher value than others to be chosen by producers. This

increased competition leads to two possible issues. On the one hand, it can motivate certifiers to develop stricter standards than others. Certifiers compete to be chosen by producers as offering more value than others. Therefore, seeking to establish this value may likely drive certifiers to develop more rigorous standards. On the other hand, it can also lead certifiers to lower their standards or processes to gain popularity. By lowering their standards, producers will find it easier to obtain certification. As a result, more producers will be awarded certification, making it more widespread and therefore popular. These lower standards lead to greenwashing practices because instead of ensuring sustainability, these fraudulent ecolabels deceive consumers and give them a false impression of environmental responsibility (Mogyoros, 2023).

The complexity of ecolabeling programs represents another important challenge. Firstly, standards and criteria of ecolabeling programs must constantly be revised to adapt to the changing environment and technological innovations (Nygaard, 2023). Secondly, ecolabeling programs are costly to implement, and it is not easy to guarantee the precision and trustworthiness of the system. There is always a risk of fraud and mismanagement, as it is difficult to control and ensure compliance by all producers (Nygaard, 2023). Because of this complex and expensive system, small companies find it difficult to obtain or maintain their certification as they lack the necessary resources and so, many companies put an end to it (Flagstad & al, 2022).

As it is difficult for green certification systems to ensure that all certified producers respect the standards and criteria, some of them have to face different scandals because they were accused of illegal, unethical, or fraudulent actions (Schafeld, 2019). These fraudulent actions from producers can happen when the government imposes on companies to comply with standards. To avoid sanctions, companies can practice greenwashing to give the impression that it complies with imposed standards (Wang & Walker, 2023). But they can also happen because companies want to “obtain better consensus from stakeholders” and therefore, improve their brand image (Colamartino, 2022).

The effectiveness of ecolabels in delivering environmental benefits, especially in reducing carbon emissions, remains uncertain and is subject to permanent control. To date, no study has been able to prove a correlation between the adoption of ecolabels and a significant reduction in carbon emissions (Paul et al, 2023). This contributes to the challenges and limitations associated with these labels. Ecolabels are only instruments that, when combined with other

policies and political initiatives, can contribute to a more sustainable society, but cannot do so on its own (Bratt et al, 2011).

All these challenges and limitations of ecolabels led us to our research question. Wondering how consumers can make the difference between trustworthy and fraudulent ecolabels, we considered the factors that may influence how consumers can differentiate between the two types of labels. To better understand producers' practices when it comes to fraudulent labels, we will look at the concept of "greenwashing" in the next chapter.

2. Greenwashing

2.1 What is greenwashing?

2.1.1 Definition

Greenwashing, recognized as a deceptive marketing practice since the mid-1980s, has evolved into a prevalent and concerning phenomenon. Basically, greenwashing entails making unwarranted or exaggerated claims about sustainability or environmental friendliness, strategically aimed at gaining a larger market share (Dahl, 2010).

The rise in greenwashing reflects the industry’s response to growing consumer interest in sustainable products. As environmental consciousness increases and standards become stricter, companies are prioritizing the cultivation of a positive green brand image (Colamartino, 2022).

While some companies actually reduce their environmental footprints, others resort to greenwashing by exaggerating their efforts or making false claims about their environmental responsibility. Green marketing, also referred to as ecological or environmental marketing, broadly involves any forms of advertising that implies an environmental benefit. In contrast, greenwashing specifically encompasses misleading consumers about a company's environmental practices or the environmental benefits of a product or service (Szabo & Webster, 2020).

According to the advertising consultancy TerraChoice Environmental Marketing (as cited by Dahl, 2010), 98% of the products they analyzed were found guilty of greenwashing upon closer scrutiny. This alarming statistic highlights the omnipresence of the problem and underscores the extent to which companies are willing to engage in deceptive marketing practices to tap into the lucrative market for environmentally conscious products.

Consumers, driven by a desire to make environmentally responsible choices, are particularly susceptible to greenwashing. The misleading claims create a false sense of security and trust, leading consumers to believe they are making environmentally friendly choices when, in reality, the products may not live up to the advertised claims. Companies can do that thanks to information asymmetry, creating a gap between what companies claim and the actual environmental practices they employ. This not only undermines the trust between consumers and businesses but also poses a threat to the overall sustainable development goals (Jakubczak & Gotowska, 2020).

Moreover, greenwashing not only misleads consumers but also disturbs competition within the market (Schafeld, 2019). Companies that really invest in sustainable practices may find it challenging to compete with those engaging in greenwashing, as the latter can offer the appearance of environmental responsibility without necessarily implementing meaningful changes. This distortion obstructs the progress of sustainable development by diverting attention and resources away from companies committed to eco-friendly practices.

2.1.2 Challenges

Governments and marketing regulators face major challenges when attempting to identify and address the issue of greenwashing. The unclear characteristics of greenwashing practices make it a complex task to distinguish real environmental commitments from misleading claims (Wang & Walker, 2023).

One of the primary challenges faced by regulatory bodies is the intangible nature of greenwashing. The deceitful methods sometimes include sophisticated tactics that mix simple business tricks with true environmental responsibility. Businesses that engage in greenwashing may utilize ambiguous language, utilize green images without taking significant environmental steps, or even abuse eco-friendly labels. As a result, it may be difficult for authorities to quickly detect and punish such activity.

Such a technique has a significant negative environmental impact. By engaging in greenwashing, businesses might appear environmentally conscious without actually modifying their methods of operation. This weakens international efforts to address climate change and other ecological concerns, in addition to contributing to the loss of natural resources. The prolonged reaction to stop greenwashing permits businesses to carry on damaging activities while disguising them as sustainable, thereby accelerating the deterioration of the environment.

The devastating consequences of greenwashing on consumers, competitors, and the environment underscore the urgency of effective measures to combat this unethical practice. By enhancing regulatory frameworks, promoting consumers education, and fostering a culture of transparency, stakeholders can work together to create a marketplace where veritable environmental responsibility is rewarded, and greenwashing is effectively curtailed (Delmas & Burbano, 2011).

2.2 Types of greenwashing

TerraChoice Environmental Marketing (Dahl, 2010) has played a leading role in recognizing and classifying the many forms of greenwashing. Their "7 Sins of Greenwashing" provide a comprehensive framework to understand the tactics employed by organizations to portray themselves as environmentally responsible while engaging in deceptive practices. These sins include the sin of the hidden tradeoff, fibbing, no proof, vagueness, irrelevance, the lesser of two evils, and worshiping false labels. This last form of greenwashing will be the primary focus of this thesis and can be defined as the sin of relying on misleading certifications or labels to create an illusion of environmental responsibility. Companies may use labels that are vague or lack credibility, giving consumers a false sense of security in their purchasing decisions.

In addition to TerraChoice's sins of greenwashing, it is important to consider different perspectives on green marketing. Szabo and Webster (2020) introduce the idea that organizations may approach green marketing from multiple angles, distinguishing between "intentional greenwashing (the 'evil greener'), unintentional greenwashing, truthful green marketing, and unadvertised green initiatives (the 'green blusher')".

The "evil greener" represents intentional greenwashing, where businesses purposefully use dishonest tactics to profit from the rising demand for environmentally friendly goods. This perspective aligns with TerraChoice's sins, as it involves conscious efforts to mislead consumers through false claims, hidden tradeoffs, and other deceitful tactics.

On the other hand, unintentional greenwashing occurs when organizations inadvertently make misleading environmental claims, often due to insufficient understanding of their supply chains or the complexities of sustainability.

> "*'Unintentional greenwashers' may fall victim to greenwashing done by their middle agents. The middle agents, where they source their materials or products,*

> *may be the actual 'evil greeners'. The reasoning behind this observation was that many companies are not working vertically: for example, in the clothing industry they may not be working directly with mills for their fabrics or yarns."* (Szabo & Webster, 2020).

While not malicious in intent, unintentional greenwashing can still have negative consequences, as it misguides consumers who rely on inaccurate information to make informed choices.

Truthful green marketing, as the name suggests, refers to transparent and honest communication about a company's environmentally friendly practices. (Szabo & Webster, 2020).

The "green blusher" involves companies that implement environmentally friendly practices but choose not to actively promote them. This perspective suggests that some organizations prioritize sustainability without seeking recognition for their efforts, perhaps due to a true commitment to the cause rather than a desire for marketing leverage (Szabo & Webster, 2020).

2.3 Factors that influence companies to greenwash

2.3.1 Environmental trend

Consumer pressure, along with expectations from other stakeholders and government regulations, serves as a significant motivator for companies to adopt more environmentally friendly practices. As consumers increasingly prioritize health and environmental concerns, they are inclined to choose products that boast quality labels and demonstrate a commitment to sustainability. Greenwashing takes advantage of this consumer shift by presenting a facade of environmental responsibility, diverting attention from the actual environmental impact of a product or company. By misrepresenting their environmental efforts, these companies seek to attract environmentally conscious consumers who are willing to pay a premium price for products with perceived green credentials (Schafeld, 2019).

The misrepresentation serves a distinct purpose: to command premium prices for products that may not align with their so-called environmental benefits (Schafeld, 2019). In 2016, De Medeiros, Ribeiro, and Cortimiglia (cited by Schafeld, 2019) emphasize a key insight into consumer behavior: individuals are willing to pay more for products perceived as environmentally friendly due to growing environmental awareness. Companies engaging in

greenwashing exploit this willingness by inflating the perceived environmental benefits of their products, leading consumers to justify the premium price tag. The financial gains derived from greenwashing can be significant, creating a powerful incentive for companies to adopt this strategy to maximize profits.

Dodds and Monroe in 1985 (cited by Schafeld, 2019) contributed to this understanding by highlighting the importance of perceived value in consumer purchasing decisions. This includes both tangible and intangible aspects, such as environmental benefits, which enhance a product's overall value to consumers.

2.3.2 Corporate image

In 2011, Delmas and Burbano (cited by Jakubczak & Gotowska, 2020) pointed out that companies often resort to greenwashing as a means to improve their corporate image. Companies aim to cultivate a positive image of environmental sustainability by presenting an idealized picture that may not reflect their true environmental impact. This constructed impression of environmental responsibility may be more of a marketing tactic than a commitment to sustainable operations.

The inconsistency between the image projected by a company and its actual environmental impact can lead to confusion among consumers. This intentional introduction of confusion allows companies to benefit from the positive associations with environmental responsibility without necessarily making substantive changes in their operations. In this way, businesses may use greenwashing as a technique to improve their brand image and manage the complexity of public perception (Jakubczak & Gotowska, 2020).

2.3.3 Lack of regulation

The absence of institutional regulation contributes to the prevalence of greenwashing. Delmas and Burbano (2011) highlight the lack of consistent international regulation and uncertainty about enforcement in the U.S. This regulatory gap creates a favorable environment for companies to engage in greenwashing without facing severe consequences.

Activists, NGOs, and the media serve as a threat to public exposure, which can act as a deterrent for companies engaging in greenwashing practices (Delmas & Burbano, 2011). The efficacy of this unofficial surveillance varies with more successful businesses being better able to tolerate damage to their reputations.

2.3.4 Organizational inertia

Organizational inertia, or the persistence of current systems that limit strategic change, is identified as the reason why larger and more established organizations can face such storms. This inertia is more prevalent in established firms, making them more likely to engage in greenwashing (Delmas & Burbano, 2011).

The resistance to change within these organizations complicates the implementation of sustainable practices and can lead to inadvertent greenwashing. The lack of effective communication between marketing/public relations departments and other departments such as product development, production, or packaging may result in non-optimal internal knowledge transfer, which can hinder innovation and contribute to greenwashing. As indicated by Delmas and Burbano (2011), a lack of coordination within a company can result in an unintentional misrepresentation of a product's environmental benefits.

2.3.5 Dominant firms

Another thing with larger firms involves the nuanced relationship between consumer perceptions, trust in dominant companies, and the potential for greenwashing activities. Wallach & Popovich (2023) shed light on a crucial aspect of this dynamic, indicating that consumers often experience lower risk perceptions and derive psychological benefits when dealing with dominant firms in the market. This perceived trust in well-established companies creates a more forgiving attitude towards potential greenwashing activities, leading consumers to be less inclined to scrutinize the environmental claims of these giants.

Well-established companies, distinguished by their history, market dominance, and broad recognition, have increased consumer trust due to their constant quality and positive image as a brand. Within the context of greenwashing, this trust offers substantial benefits. Customers may analyze these bigger corporations' environmental statements less carefully since they perceive these businesses to be reliable and secure. Customers give faith to well-established organizations without scrutinizing them as much as they would smaller or younger entrants in the market (Wallach & Popovich, 2023).

The lower perceived risk associated with purchasing from dominant firms is a double-edged sword. While it fosters a sense of security for consumers, it also enables these corporations to engage in greenwashing without facing consequences. The perceived trust acts as a shield,

allowing larger firms to present themselves as environmentally responsible without facing the same level of skepticism that smaller or less-established competitors might encounter (Wallach & Popovich, 2023).

2.3.6 Optimistic bias

The last factor is the optimistic bias, a psychological tendency to overestimate the likelihood of positive events and underestimate the likelihood of negative events, which plays a role in contributing to greenwashing within companies. When it comes to environmental commitments, companies could have an incentive to base their projections on optimistic scenarios instead of evaluating historical performance with objectivity. This optimism can lead to an exaggeration of their environmental efforts, creating a misleading perception of their commitment to sustainability (Delmas & Burbano, 2011).

Additionally, the optimistic illusion of control reinforces this bias. This is the belief that individuals have more influence or control over outcomes than they objectively do. In the context of greenwashing, companies may falsely perceive that they have greater control over the narrative surrounding their environmental practices. This exaggerated sense of control can fuel misleading practices, as companies may - present an overly positive image of their sustainability efforts, even if the reality does not align with their claims (Delmas & Burbano, 2011).

2.4 The impact of greenwashing on consumers

2.4.1 Green consumerism

In the contemporary landscape, the surge in green consumerism has been fueled by a growing awareness of the environmental impact of consumer decisions and the belief in responsible consumption's potential to address environmental challenges. However, this eco-conscious movement is shadowed by the pervasive issue of greenwashing, significantly influencing consumer behavior and trust in products claiming to be environmentally friendly (Jakubczak & Gotowska, 2020).

Consumer decisions have a strong influence on the natural environment, especially in rural areas, driving the rise of green consumerism. The desire to positively contribute to environmental well-being has led to an increased demand for products perceived as eco-friendly. However, as consumers lean towards green choices, they fight with the challenge of navigating a landscape full of greenwashing practices. Indeed, companies eager to capitalize

on trends often take advantage of consumers' short attention spans by disseminating misleading information about their environmental initiatives (Jakubczak & Gotowska, 2020).

Consumers face a critical challenge in verifying information provided by companies, as underscored by Jakubczak & Gotowska (2020). Limited, incomplete, and sometimes subliminal information makes it difficult for target groups to discern true eco-friendly products from those simply claiming to be.

One significant outcome of the market's greenwashing problem is the general uncertainty experienced by customers (Schafeld, 2019). Green trust, defined as the “willingness to depend on a product or service based on the belief or expectation resulting from its credibility, benevolence, and ability about environmental performance” (Chen & Chang, 2012), plays a pivotal role in consumers' decision-making processes. Trust in the green attributes of products induces a lower perceived risk, removes barriers to purchasing, and fosters brand loyalty.

Once green trust has been violated, consumers worried about further transgressions (Wang & Walker, 2023). Unconscious influences, like confirmation bias, may deter green consumers, maintaining a sense of mistrust until sufficient reasons to change their perspective are provided.

Whether consumers unknowingly support greenwashing activities or consciously lose confidence in quality labels, the consequences are substantial. The danger, as noted by Dahl (2010), is not just that greenwashing is deceptive but that it breeds skepticism, making people doubt the validity of any environmental statements. Overuse and misuse of "green" claims can saturate the market, diminishing the perceived value of quality labels and directly influencing purchasing decisions.

Delmas and Burbano (2011) raise concerns about the lack of confidence consumers have in holding companies accountable for false communication about environmental practices. Without effective regulation, greenwashing methods may increase consumer skepticism toward environmental claims. This skepticism has the potential to undermine the market for green products and services, highlighting the necessity for strong regulatory frameworks to ensure transparency and authenticity in environmental communication.

Perceived risk, a subjective estimation by consumers connected with the possible consequences of wrong decisions, becomes a significant factor in the presence of

greenwashing (Chen & Chang, 2012). The skepticism induced by greenwashing practices creates a barrier to developing effective green marketing strategies and disrupts this equilibrium by introducing skepticism and uncertainty.

The failure to develop a correct interpretation of multiple aspects of a product or service during the information processing procedure contributes to misunderstanding and misinterpretation. This confusion is exacerbated by over-choice, similarity, and unclarity confusion, all stemming from information overload, perceived physical similarities of products, and ambiguous marketing communications (Chen & Chang, 2012).

2.4.2 Authenticity

Nyilasy, Gangadharbatla & Paladino (2013) shed light on a potential paradox in green advertising. While companies may leverage green marketing to showcase their commitment to environmental values, consumers can become skeptical when they perceive inconsistencies between these green ads and the actual corporate performance. This skepticism intensifies in the context of green advertising compared to general corporate advertising or no advertising at all. Such inconsistencies can erode the trust that consumers place in companies, highlighting the delicate balance between rhetoric and action.

Consumer preferences are increasingly aligning with ethical considerations, as emphasized in the subsequent points. Companies that not only provide high-quality products but also demonstrate ethical behavior tend to gather positive perceptions from consumers. The positive view of a superior product is further strengthened when the company is perceived as acting ethically. Conversely, even if a product excels in quality, engagement in unethical practices can tarnish the company's image in the eyes of consumers. This underlines the interconnected nature of product quality, ethical behavior, and consumer perceptions (Nyilasy et al, 2013).

90% of consumers emphasize the significance of authenticity when choosing which brands to support (Wallach & Popovich, 2023). However, many consumers agree that labeling a product as "green" is often seen as a mere marketing strategy, leading to mistrust of such claims (Chen & Chang, 2012). These findings highlight the importance of authenticity in consumer decision-making.

Greenwashing can reduce the intention of environmentally conscious consumers to buy green products and even lead to boycotting specific products (Wang & Walker, 2023). However, it

is interesting to note that not all consumers lose trust after encountering greenwashing. Some actively seek positive information to support their initial trust, creating a varied response.

2.5 Strategies to fight greenwashing

To address the negative impact of greenwashing, intervention strategies become crucial. Distrust regulation is an approach that aims to overcome consumer distrust by confronting negative expectations. This involves implementing regulatory controls, such as green certification and environmental protection information disclosure, to prevent or constrain greenwashing. Ratings launched by public associations, like Greenspace, can also play a significant role in preserving the credibility of green consumers and preventing misleading labels (Wang & Walker, 2023).

Imposing interventions, whether by the government or voluntarily by companies, poses unique challenges. While mandatory interventions may be seen as compliance to avoid sanctions, voluntary efforts are viewed as expressions of a company's commitment to change (Wang & Walker, 2023).

Trustworthiness demonstration is another key intervention, involving actions to overcome negative expectations and distrust. This process is essential for regaining trust but needs to be complemented with a restoration of positive expectations and a sense of good faith (Wang & Walker, 2023).

Positive promotion of renewed trustworthiness is another intervention strategy that actively demonstrates a company's commitment and integrity. Participation in green economic forums, climate summits, and social responsibility ratings showcases a dedication to public welfare and the building of green communities. This strategy focuses on both symbolic and actual displays of positive trustworthiness, fostering goodwill and reducing negative brand image (Wang & Walker, 2023).

For the mutual benefit of the green industry, both companies engaging in greenwashing and veritable green companies should make efforts to regain green consumer trust after instances of greenwashing. The two primary intervention strategies, distrust regulation, and trustworthiness demonstration, effectively counter the negative impact of greenwashing. Sequentially, distrust regulation, followed by trustworthiness demonstration, has been shown to have the best effect on increasing green trust after intervention (Wang & Walker, 2023).

3. Eco-score

Based on the limitations of the ecolabels we saw in the first part of this literature review and the practice of greenwashing to create false labels, we wanted to explore the possibility of centralizing all ecolabels into a single indicator of a product's environmental impact. That is why we have turned our attention to the eco-score indicator, a relatively recent system.

The eco-score is an experimental indicator representing the total environmental impact of food products. Inspired by the Nutri-score, products are classified into five categories of scores from A to E, with A corresponding to the lowest impact and E for the highest impact (*Presentation Eco-score*, n. d.). The score is calculated by considering factors that have an impact on the environment throughout a product's life cycle based on the Agribalyse database, which is built according to the Life Cycle Assessment (LCA) (*Homepage Agribalyse*, n. d.). Resulting from the assessment, a score from 1 to 100 is assigned to the product. In addition to this, each product receives up to 25 additional bonuses and penalty points for other factors impacting the environment but not taken into account in the LCA. These additional indicators relating to product characteristics include, for example, the transportation of raw materials, the recyclability of packaging, environmental practices of producing countries, etc (*Presentation Eco-score*, n. d.).

The eco-score is at the moment only at the experimental stage. Indeed, the trademark is registered in France and owned by ADEME but this last did not yet validate the method and visuals used by Eco-score. For this reason, the collective has only received a temporary right, as they await the publication of an official scheme supported by the public authorities. Different players such as Colruyt or Lidl have decided to take part in the experiment by displaying eco-score on some of their products. In this way, several products from the brand “Boni Selection” in Colruyt present an eco-score (*Eco-score: calcul*, n. d.).

This new indicator of a product's environmental impact caught our attention because we were wondering about its future potential. Indeed, would consumers be more inclined to trust the eco-score than ecolabels? This led us to the formulation of a second research question, which is the following: “Do consumers trust the eco-score?”.

III. Empirical part

In the second part of this master thesis, we will establish the models we have created based on the different hypotheses derived from our two research questions. After that, we will detail the study methodology we followed, from the questionnaire design and the choice and validity of our measurement scales to the results analysis with the testing of our hypotheses using the SPSS tool.

1. Research questions, models and hypotheses

1.1 Research questions

The literature review enabled us to highlight the fact that consumers are often confused by the proliferation of labels and that producers can take advantage of this to engage in greenwashing by using "self-declared environmental claims" which we call "fraudulent labels" because they are not certified by a third party.

The objective of the second part of this master thesis is at first, to answer our main research question which, as a reminder, is the following: "Which factors influence the way consumers perceive and differentiate between official and fraudulent ecolabels?". In a second step, we will also answer our secondary research question "Do consumers trust the eco-score?".

1.2 Research models

Firstly, to address our main research question and discover the different factors influencing how consumers differentiate official ecolabels from fraudulent ecolabels, we wanted to test two types of factors: personal factors such as age, education level, environmental concern and greenwashing knowledge, and product-related factors such as color and price. These factors constitute our independent variables, except the concern for the environment, which we will consider as the mediator variable of the relationship between education level and knowledge of greenwashing in our hypotheses. The labels distinction, which refers to the ability of consumers to differentiate certified ecolabels from self-claimed ecolabels, constitutes our dependent variable. Based on the relationships between our independent variables and our dependent variable, we have created the model below that includes all the hypotheses we will test in our study. Factors in blue correspond to personal factors while factors in orange correspond to product-related factors.

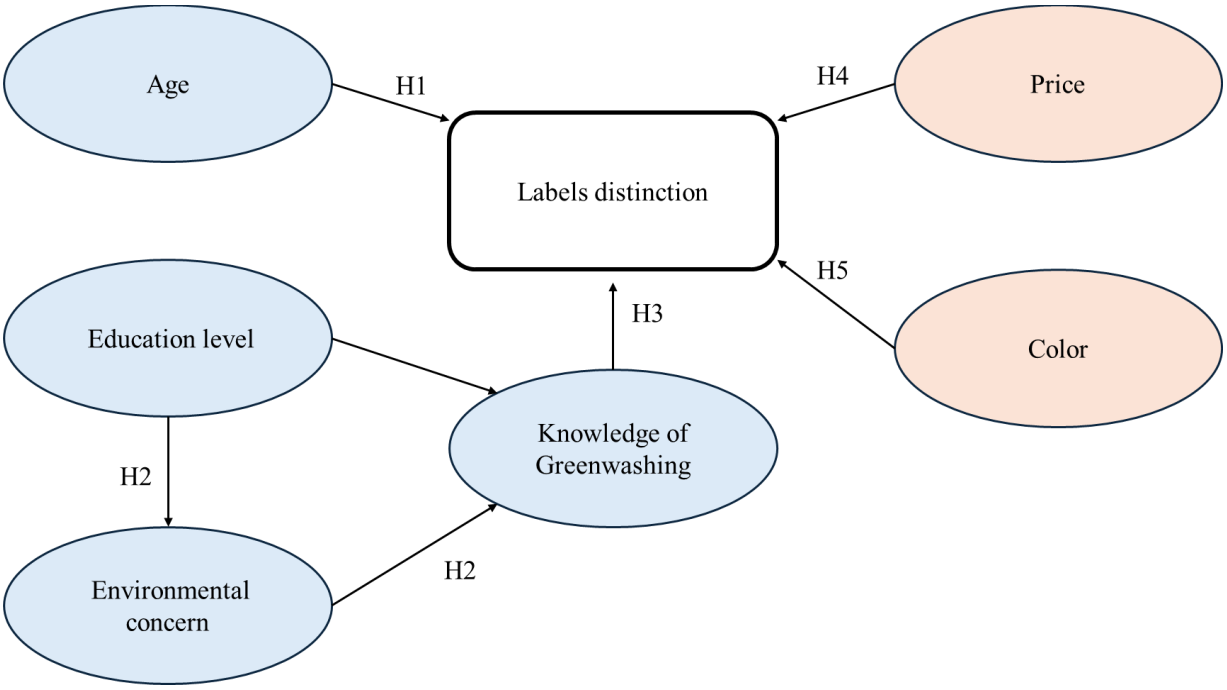

Figure 1: Principal research model

Secondly, to answer our second research question, we will study the antecedents likely to induce greater trust in the eco-score among consumers. To do this, we will use three of the six independent variables from the first model, namely age, education level and environmental concern. Our central variable, consumers' trust in the eco-score, will constitute both a dependent and an independent variable, as we will also study whether the intention to buy products with an eco-score, i.e. purchase intention, is influenced by consumers' trust in the eco-score. The purchase intention is therefore the output variable of our second model.

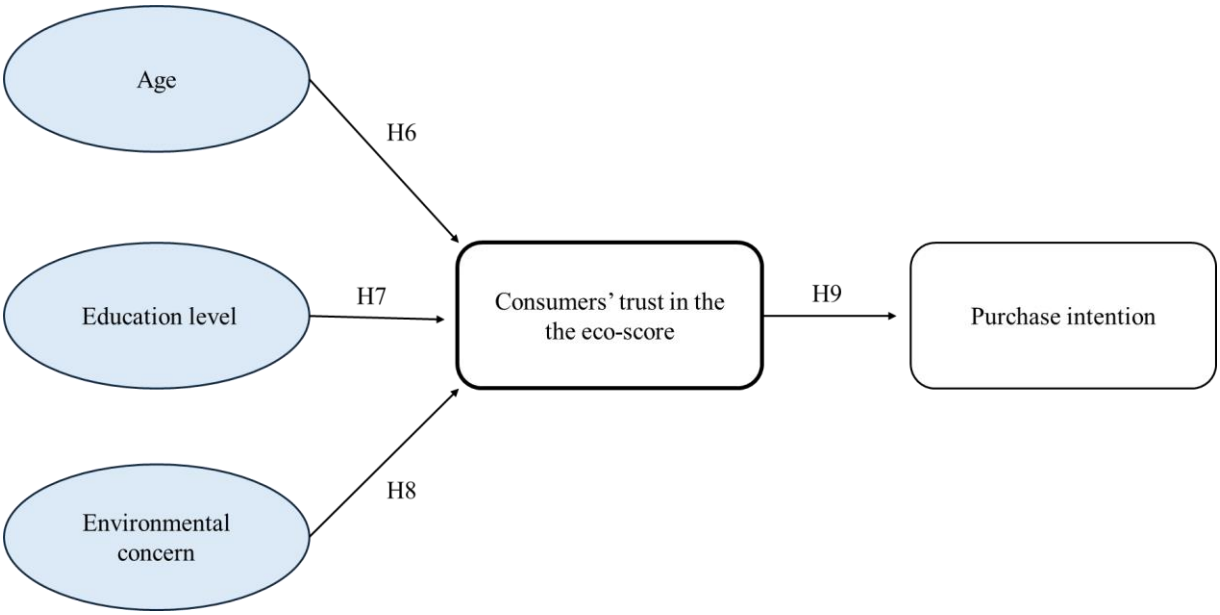

Figure 2: Secondary research model

1.3 Hypotheses

1.3.1 Hypotheses of the main research model

As said by Vázquez and Lanero (2021), young people represent a group especially vulnerable to greenwashing. The study of our first hypothesis will show us if people of young age can make the difference between official labels and fraudulent ones even if they belong to the age category most likely to buy greenwashed products.

H1: **Younger consumers** are less likely than older consumers to distinguish official labels from fraudulent ones.

Several studies have shown that education level and concern for the environment are positively correlated (Arcury & Christianson, 1990; Howell & Laska, 1992; Schahn & Holzer, 1990; Scott & Willits, 1994). It is also the case of a study by Shen et Saijo (2008), where the results prove that people with a higher education level appeared to be more concerned about the environment than those with a lower education level.

Secondly, "it has been recognized that universities play a pivotal role in promoting sustainability principles" (Disterheft et al., 2013). For this reason, we believe that people with a higher education level should have a better knowledge of everything to do with sustainability, including a better knowledge of greenwashing. We will verify whether this is the case and whether this relation can be explained by environmental concern, which would then act as a mediating variable. This is how we formulate the following hypothesis.

H2: The relation between **education level** and **knowledge of greenwashing** can be explained by **environmental concern**.

Consumers who claim knowledge about greenwashing adopt a more vigilant and critical approach, consistently checking information on packaging or conducting periodic assessments of product claims (Jakubczak & Gotowska, 2020). Consequently, consumers who claim to know a lot about greenwashing should be more likely to differentiate official labels from fraudulent ones than others. This constitutes our third hypothesis.

H3: Consumers with a **greater knowledge of greenwashing** are more likely to distinguish official labels from fraudulent ones.

Environmentally concerned consumers are ready to pay a higher price for items with perceived green credentials (Schafeld 2019). Companies take advantage of this willingness by

inflating their products' perceived environmental benefits, causing customers to justify the higher price. For this reason, we will test the below hypothesis to see if price influences the way consumers distinguish between ecolabels.

H4: Consumers are less likely to distinguish official labels from fraudulent ones when the **price** of the product is **higher**.

Some studies have shown that consumers may have a higher level of trust in items with the color green on a product's packaging, even when they know nothing about greenwashing (Jakubczak & Gotowska, 2020). This confidence may be misguided since greenwashing frequently employs smart labeling and branding techniques to present a false feeling of environmental commitment. That is why we want to check whether there is a relationship between label color and the ability to distinguish ecolabels.

H5: Consumers are less likely to distinguish official labels from fraudulent ones when they see a **green label** appearing on the product.

1.3.2 Hypotheses of the secondary research model

For consistency, we decided to retain as independent variables the same personal factors used in the first model. However, we have eliminated knowledge of greenwashing to take direct account of education level and environmental concern, as these seem to us to be more relevant in influencing consumers' trust in the eco-score. This is how we formulate the first three hypotheses of this secondary research model.

H6: **Younger consumers** trust the eco-score more than older consumers.

H7: Consumers with a **higher education level** trust the eco-score more than others.

H8: Consumers with a **greater environmental concern** trust the eco-score more than others.

A study entitled "Trust and Consumers' Purchase Intention in a Social Commerce Platform" (Wang et al., 2022) showed that trust has a positive influence on purchase intention. As this study focuses on social commerce platforms, we wanted to check whether we could also establish a link between consumers' trust and purchase intention about the eco-score.

H9: **Consumers' trust in the eco-score** influences their purchase intention on products with an eco-score.

2. Study methodology

We have conducted a quantitative study based on a structured questionnaire because it is the most accurate, but also generalizable, which enabled us to infer the sample results to the entire population.

What concerns the sampling method, we used convenience sampling and distributed our questionnaire on several social networks namely on Facebook, Instagram and LinkedIn. We have chosen this method because it is efficient in terms of time and money as participants are simple to reach. Therefore, we rapidly collected a considerable number of answers. However, we must note that the sample does not exactly reflect the entire population as we mostly have people "like us" on our social networks.

Most of the questions in our survey required a response based on a seven-point Likert scale, which enabled respondents to give a precise answer. We chose to use a seven-point Likert scale as it allows us to better distinguish between the answers given by the participants. The primary advantage of these scales is that they can be used as metrics for statistical analysis. In 1932, Likert himself said that summing the responses to the related questions formed a relevant measure of the scale (Batterton, 2017). Additionally, the seven-point scale enables participants to make more nuanced responses because they have more choices than on the usual five-point scale (Lu et al, 2022).

2.1 Questionnaire design

2.1.1 Questionnaire structure

In our questionnaire, we began with a small introduction to present ourselves and the purpose of our survey. We have kept the subject of our master thesis vague so as not to influence responses, so we have decided to only mention that our study concerns ecolabels. To make sure everyone is familiar with the term, we have provided a clear definition which is as follows: "Ecolabels are logos or signs attesting to the environmental preference of a product (or service), or its compliance with an environmental standard". We have also mentioned that all responses would remain confidential and completely anonymous.

After this small introduction, we started by asking demographic questions to respondents as their gender, their age, their education level, and their profession. In this way, we obtained the answers to measure two of our independent variables: age and education level. We decided to ask two other demographic questions only as control variables. Concerning the age, a filter was applied in order to exclude respondents aged under 18 years from our sample.

Section 2 of the questionnaire was devoted to measuring our third independent variable: environmental concern. To do that, we used a measurement scale with six items from Haws, Kelly, Winterich, and Naylor developed in 2013.

The section 3 was dedicated to the differentiation of the labels. The idea was to first present to respondents a product with an official label and measure the perceived credibility they assign to the label with the help of a scale created by Moussa & Touzani in 2008. Secondly, we present to respondents the same product but this time with a self-claimed label. However, as two of our hypotheses concern product-related factors, we had to test if the color or the price of the product influences their ability to differentiate the two labels. For this reason, we used a 2x2 experimental design in which we manipulated our two variables: color and price. This led us to four different versions randomly assigned to respondents. In this way, the first quarter of our sample received a fraudulent label in black at a low price of 3 euros (version A1) while the second quarter also received a fraudulent label in black but with a high price of 5 euros (version A2). The third and fourth quarters both received a green fraudulent label, the third one with a low price of 3 euros (version B1) and the fourth quarter with a high price of 5 euros (version B2). You can see the different versions below.

Figure 3: Product's versions with fraudulent ecolabel

To verify that the color and the price were taken into account in the respondents' decision, we introduced two manipulation checks at the very end of the questionnaire. We also asked a final question about which label they considered to have been officially certified. Indeed, we wanted to measure the ability of respondents to differentiate between the official ecolabel and the fraudulent one in two different ways: directly, by asking consumers which ecolabel they considered as official, and indirectly, by measuring the credibility they assigned to the official and the fraudulent ecolabel.

After testing their ability of differentiation, we had to measure their knowledge of greenwashing. We wanted to ask this question after section 3 because we did not want the mention of greenwashing to influence respondents. We first applied a filter question so that participants who had never heard of greenwashing would not be able to access subsequent questions about their knowledge of greenwashing. For participants who had already heard about greenwashing, we measured their greenwashing knowledge by adapting the measurement scale of subjective knowledge with six items from Budzanowska-Drzewiecka and Proszowska (2023) based on previous scales developed by Flynn and Goldsmith in 1999 and Eng, DiRusso, Troy, Freeman, Liao, and Sun in 2021.

Finally, the last part of our questionnaire was dedicated to collecting the data needed to answer our second research question about consumers' trust in the eco-score. We began by giving a brief description of the eco-score, to make sure everyone knew what it consisted of. Next, we asked them whether the presence of an eco-score on a product was likely to influence their purchase intention, using the measurement scale on purchase intention (Biscaia et al, 2013). We also asked them if they would be more likely to trust a product with a centralized eco-score than one with an individual eco-label and we concluded by measuring their trust in products with eco-score using the credibility dimension items from Gurviez and Korchia's trust measurement scale (2002).

2.1.2 Choice of the product

We chose to show respondents the labels on a product, to be more realistic and place them in real-life conditions. We decided to show a chocolate bar because it is a product people are used to finding in stores, and Belgians prove to be big chocolate eaters (Le Soir, 2023). We opted for a fictitious brand to eliminate any effect of familiarity with a real brand, which might have influenced the credibility accorded to the product. What concerns the design of the product, we tried to keep it simple to ensure that labels are visible.

2.1.3 Choice of the ecolabels

For the official ecolabel, we chose the label “Biogarantie” because it is Belgian and certified by a third party. About the fraudulent label, we wanted to keep an ecolabel guaranteeing the same biological properties as the first, so we chose this fraudulent “Bio” label.

Figure 4: Official ecolabel "Biogarantie"

Figure 5: Fraudulent ecolabel "Bio"

2.1.4 Choice of the prices

For the two prices, we first decided to put 5 euros as a high price because it is a much higher price than the average price of a chocolate bar but it is still a realistic price. Then, for the lower price, we did not want to put a too low price to not influence consumers about the quality of the product so we based ourselves on the average price of a chocolate bar of good quality. We, therefore, looked at the average price of well-known quality chocolate bars on the websites of various supermarkets and came up with a price of 3 euros.

2.2 Measurement scales

To measure our variables, we used different measurement scales developed in the literature. The concepts studied, the items and the authors who developed them are listed in the table below.

Table 1: Measurement scales

Concepts	**Items**	**Authors**
Environmental concern	1) It is important to me that the products I use do not harm the environment. 2) I consider the potential environmental impact of my actions when making many of my decisions. 3) My purchase habits are affected by my concern for our environment. 4) I am concerned about wasting the resources of our planet. 5) I would describe myself as environmentally responsible.	Adapted from Haws et al, 2013 (Environmental attitude)

	6) I am willing to be inconvenienced to take actions that are more environmentally friendly.	
Perceived credibility of quality labels	1) I can trust this label. 2) This label comes from a recognized organization or expert. 3) This label is honest. 4) The organization awarding this label has good intentions. 5) The certifying body has carried out serious tests before issuing this label. 6) I trust this label.	Moussa & Touzani, 2008
Knowledge of greenwashing	1) I know pretty much about greenwashing. 2) I pretty much know what greenwashing is. 3) I do not feel that I know much about greenwashing *(reverse rating)*. 4) Among my friends, I am one of the "experts" on greenwashing. 5) Compared to other people, I have the impression of being an expert on greenwashing. 6) When it comes to greenwashing, I do not know much *(reverse rating)*.	Adapted from Flynn & Goldsmith, 1999; Eng et al., 2021; Budzanowska-Drzewiecka & Proszowska, 2023 (Subjective knowledge)
Purchase intention	1) I would buy a product with an eco-score. 2) Next time I need to buy a product, I would consider buying a product with an eco-score. 3) The eco-score on a product makes me more likely to buy this product. 4) I would be more likely to buy a product with an eco-score than a product without it.	Adapted from Biscaia et al., 2013
Consumers' trust in the eco-score	1) The product with an eco-score gives me security. 2) I trust the quality of products with an eco-score. 3) Buying products with an eco-score is a guarantee.	Adapted from Gurviez, P., & Korchia, M., 2002 (Consumer trust)

3. Results analysis

Our methodology consists of beginning with a comprehensive descriptive analysis of each variable, encompassing gender, age, education level and profession, to discern potential clusters. Subsequently, we will undertake dimension reduction, as detailed later, to ensure the reliability of our measurement scales. Following this, we will conduct correlation tests and linear regression analyses to evaluate the validity of our hypotheses.

3.1 Descriptive analysis of the sample

After analyzing the socio-demographic data, it emerges that women represent a majority share of 54.3%, while men account for 45.7% of the sample.

In terms of age, almost 50% of respondents are in the 18-24 age category. Only four respondents were over 65, indicating a significant concentration of participants in the younger age class.

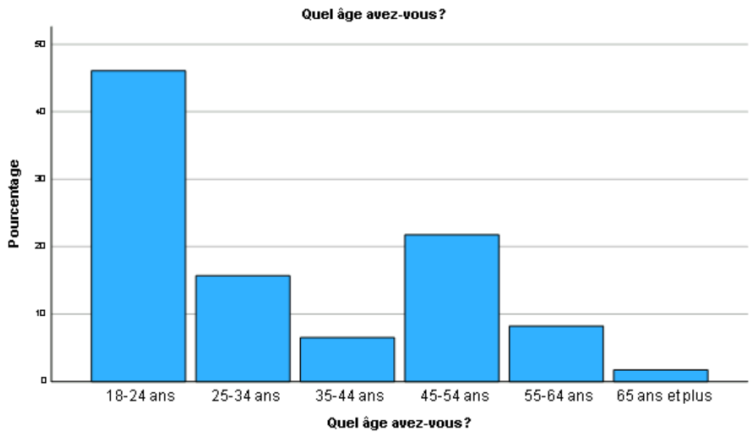

Figure 6: Age repartition

Over 75% of participants have achieved a higher level of education. This finding is particularly relevant given that we shared the questionnaire with our peers. We can see from the second graph below that students make up around 40% of our sample.

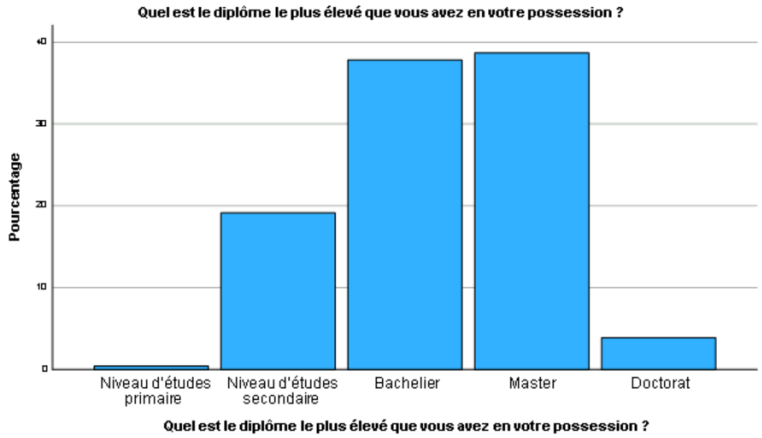

Figure 7: Education level repartition

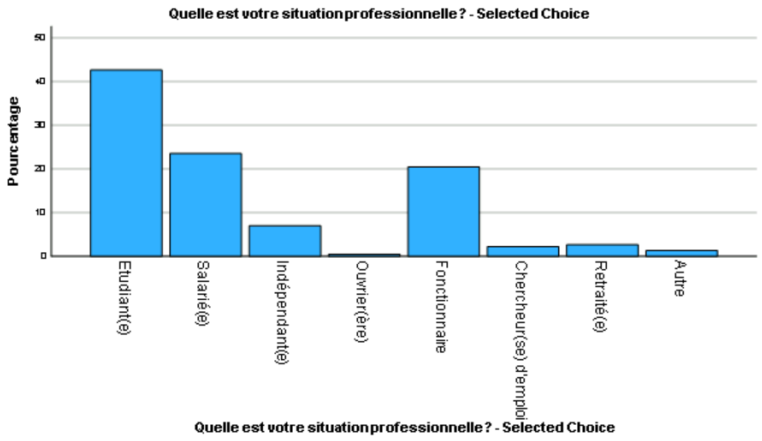

Figure 8: Professions repartition

3.2 Reliability of measurement scales

Once we had identified the profiles within our sample, we focused on examining the dimensions to assess the internal validity of our measurement scales. This involves checking whether all the questions in each measurement scale are used to explain the model, using Principal Component Analysis, a descriptive statistical tool able to summarize a set of variables into a handful of axes and to discern the minimum number of factors, or principal components, based on the total variance of the data. This technique reveals which variables are correlated with each other and which can be grouped (Pleyers, 2023).

The first step is to test the significance of the model, assessed by the Kaiser, Meyer and Oklin (KMO) coefficient, as well as the Bartlett test. At a significance level ($p < 0.05$), rejection of the null hypothesis (H0) indicates significant correlations between variables for factorial analysis.

The next step is to determine the validity of each variable in the model. Each variable should account for at least 50% of the variation due to the whole model (Pleyers, 2023).

After that, we have to choose components with eigenvalues greater than one, guaranteeing that their combined explained variance accounts for at least 60% of the overall variance explained. A detailed investigation of correlation coefficients may be required to refine the interpretation if judged relevant (Pleyers, 2023).

Finally, we must calculate Cronbach's alpha to determine the reliability of the scale created from our dimensions. Cronbach's alpha is a coefficient that evaluates the internal consistency, or reliability, of a scale by measuring how much all items within the scale converge in the same direction. The higher the Cronbach's alpha value, the greater the reliability of the scale. Typically, a value exceeding 0.7 is considered satisfactory.

In our analysis, all dimensions show Cronbach's alpha values above the threshold, signifying acceptable internal consistency. Consequently, we merged the individual items of each dimension to form a composite scale. This involved calculating the average score of all responses to each item, thereby creating a comprehensive measure that encompasses the underlying construct.

We will make an in-depth analysis for the first measurement scale called "Environmental concern" and put the five others in the appendices as the procedures and results are the same.

The first table presents the average responses from our respondents for each item of the scale. We observe that these averages are above the midpoint of the scale, indicating that people generally perceive themselves as having a strong concern for the environment.

Table 2: Descriptive statistics

	Moyenne	Ecart type	Analyse N
Item 1 - Il est important pour moi que les produits que j'utilise ne nuisent pas à l'environnement.	5,8	1,044	230
Item 2 - Je tiens compte de l'impact potentiel de mes actions sur l'environnement lorsque je prends de nombreuses décisions.	5,25	1,173	230
Item 3 - Mes habitudes d'achat sont influencées par mon souci de l'environnement.	4,69	1,420	230
Item 4 - Je suis préoccupé(e) par le gaspillage des ressources de notre environnement.	5,85	1,080	230
Item 5 - Je me décrirais comme une personne respectueuse de l'environnement.	5,25	0,988	230
Item 6 - Je suis prêt(e) à subir des désagréments afin de prendre des mesures plus respectueuses de l'environnement.	5,01	1,357	230

The correlation matrix illustrates the degree of correlation between the various items. We can observe that, in general, there is a high level of correlation among the items, indicating a strong relationship between them.

Table 3: Correlation matrix

		Item 1	Item 2	Item 3	Item 4	Item 5	Item 6
Corrélation	**Item 1**	1,000	0,623	0,570	0,485	0,338	0,550
	Item 2	0,623	1,000	0,690	0,550	0,447	0,605
	Item 3	0,570	0,690	1,000	0,571	0,405	0,559
	Item 4	0,485	0,550	0,571	1,000	0,371	0,603
	Item 5	0,338	0,447	0,405	0,371	1,000	0,396
	Item 6	0,550	0,605	0,559	0,603	0,396	1,000

The KMO measure of sampling adequacy is greater than 0.5 showing that the sample size is sufficient for the analysis. Also, the significance value is less than 0.05, confirming that the correlations between the items are statistically significant. These results collectively suggest that the data are suitable for factor analysis.

Table 4: KMO index and Bartlett test

Indice de Kaiser-Meyer-Olkin pour la mesure de la quantité d'échantillonnage.		0,882
Test de sphéricité	Khi-carré approx	600,408
	ddl	15
	Signification	<0,001

The table of commonalities provides insight into the relevance of each item for the analysis. In this context, all items are deemed relevant as their commonalities are greater than 0.5, except for one item. Despite this exception, the subsequent tables demonstrate that this particular item does not pose any significant issues or disrupt the overall analysis. Therefore, we retain item number 5 in our analysis.

Table 5: Commonalities table

	Initiales	**Extraction**
Item 1	1,000	0,597
Item 2	1,000	0,728
Item 3	1,000	0,683
Item 4	1,000	0,598
Item 5	1,000	0,365
Item 6	1,000	0,648

The analysis reveals that there is only one dimension capable of explaining 60% of the variance in the model. This means that a significant portion of the variability in our data can be attributed to this single factor. We define a component as a dimension if its eigenvalue is greater than one.

Table 6: Total variance explained

	Valeurs propres initiales			**Sommes extraites du carré des chargements**		
Composante	**Total**	**% de la variance**	**% cumulé**	**Total**	**% de la variance**	**% cumulé**
1	3,619	60,319	60,319	3,619	60,319	60,319
2	0,715	11,912	72,230			
3	0,548	9,126	81,356			
4	0,445	7,410	88,766			
5	0,381	6,345	95,111			
6	0,293	4,889	100,000			

A visual way to understand the dimensions is through a scree plot. When the line becomes horizontal, we no longer consider those components as dimensions.

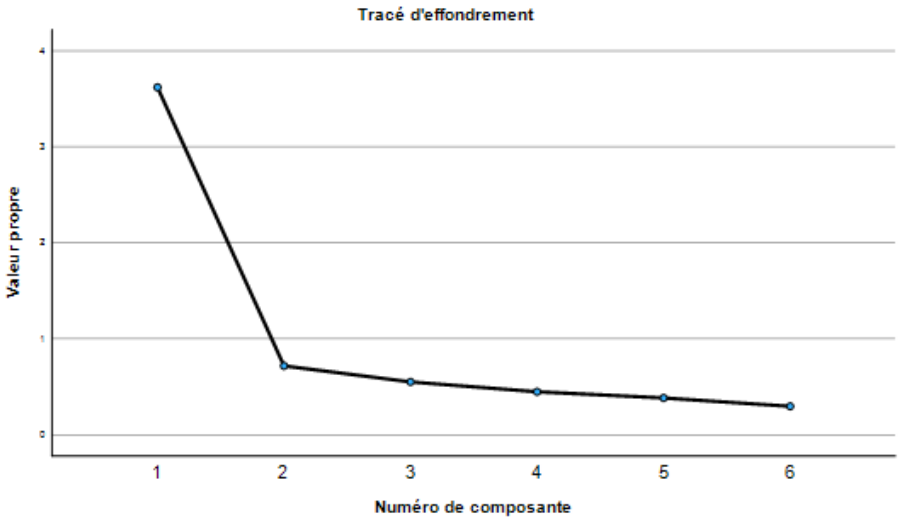

Figure 9: Scree plot of the principal component analysis

The component matrix indicates the correlation between each item and the dimension. All values are greater than 0.5, which signifies that the items are well correlated with the dimension.

Table 7: Component matrix

	Composante 1
Item 1	0,773
Item 2	0,853
Item 3	0,827
Item 4	0,773
Item 5	0,605
Item 6	0,805

The value of Cronbach's alpha exceeds 0.7 so it confirms that the scale is reliable and that the items are aligned. This reliability threshold ensures that the data collected can be used for further analysis.

Table 8: Cronbach's alpha

Alpha de Cronbach	**Nombre d'éléments**
0,865	6

Below, you can find a summary table of all the dimension reductions we have conducted. This table provides an overview of the key findings from our analysis. The scale of perceived credibility has been divided into two: one for the official ecolabel and one for the fraudulent ecolabel. For more detailed information, please refer to the appendices.

Table 9: Dimensions reduction summary table

Scale's name	Initial number of items	Final number of items (after PCA)	Dimension number	Percentage of explained variance	Cronbach's alpha
Environmental concern (PCA1)	6	6	1	60,30%	86,50%
Perceived credibility of the official ecolabel (PCA2)	6	6	1	74,80%	93,00%
Perceived credibility of the fraudulent ecolabel (PCA2.bis)	6	6	1	81,20%	95,30%
Knowledge of greenwashing (PCA3)	5	5	1	60,60%	83,40%
Purchase intention (PCA4)	4	4	1	75,80%	89,10%
Consumers' trust in the eco-score(PCA5)	3	3	1	82,30%	89,10%

3.3 Variables recoding

In the context of our study, we felt it necessary to reorganize certain variables to facilitate analysis and ensure methodological consistency. The first of these variables concerns the level of education, where we distinguished between individuals who had attended university and those who had not. This approach enabled us to create homogeneous groups for more accurate and meaningful comparisons throughout our research. As a result, we found that 19.5% of participants had not attended university, while 80.5% had.

We did the same for the age groups. Having most participants falling in the category of "18-24 years old", we separated our sample into two; the young participants (18-24 years old) and the older participants (25 years old and more). Doing so, we obtained a more balanced sample with 46.1% young respondents and 53.9% older ones.

Similarly, we applied a recoding approach to another variable, derived from the question on the perceived legitimacy of labels. We have segmented the responses into two categories: the first includes only “Biogarantie”, which we define as the correct answer, while the second corresponds to the wrong answer and therefore includes all the other options: “Bio”, “Neither” and “Both”. This classification enabled us to gain a better understanding of participants’ perceptions and to analyze their preferences and opinions in greater depth. We can see below that only 19.1% had the right answer. Right under, there is the graph with the two categories.

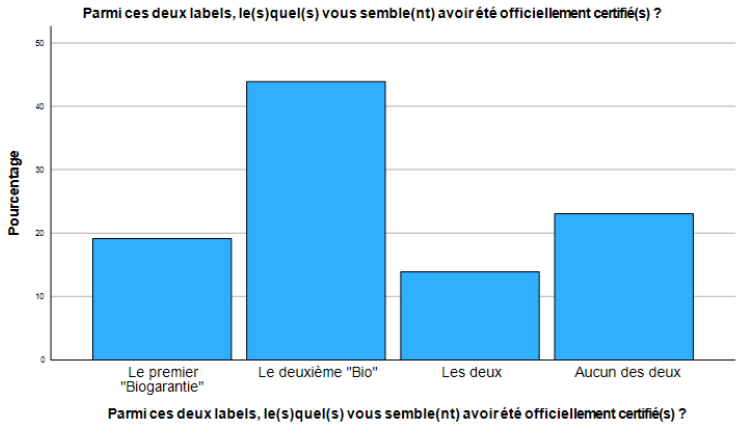

Figure 10: Labels distinction before clustering

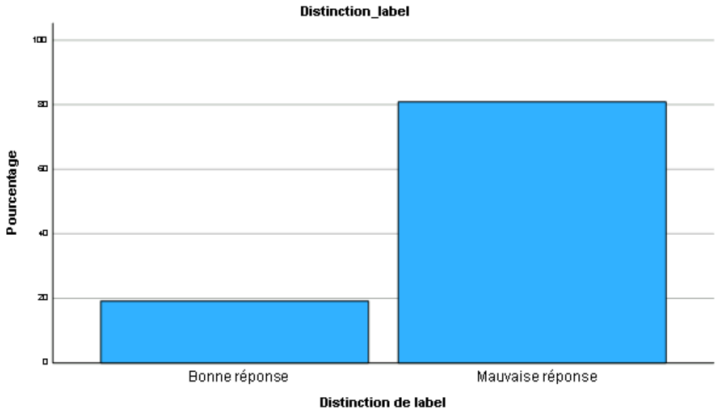

Figure 11: Labels distinction after clustering

3.4 Hypotheses testing of the main research model

3.4.1 Hypotheses testing

This section details the statistical tests we have conducted to determine the validity of the hypotheses of our first research model.

H1: **Younger consumers** are less likely than older consumers to distinguish official labels from fraudulent ones.

This first test aims to demonstrate that younger consumers discern fraudulent labels less effectively than older individuals due to their vulnerability to greenwashing. We therefore construct the following hypotheses:

- H0: $\rho = 0$, which means that there is no linear relationship between the variables.
- H1: $\rho \neq 0$

The table below presents our findings on the proportion of respondents across different age categories. However, based on this analysis, we cannot confirm a significant difference between the age groups.

Table 10: Cross table between age and labels distinction

			Distinction des label		
			Bonne réponse	**Mauvaise réponse**	**Total**
Quel âge avez-vous?	**18-24 ans**	**Effectif**	21	85	106
		%	19,80%	80,20%	100,00%
	25-34 ans	**Effectif**	6	30	36
		%	16,70%	83,30%	100,00%
	35-44 ans	**Effectif**	3	12	15
		%	20,00%	80,00%	100,00%
	45-54 ans	**Effectif**	9	41	50
		%	18,00%	82,00%	100,00%
	55-64 ans	**Effectif**	3	16	19
		%	15,80%	84,20%	100,00%
	65 ans et +	**Effectif**	2	2	4
		%	50,00%	50,00%	100,00%
Total		**Effectif**	44	186	230
		%	19,10%	80,90%	100,00%

We conducted a Spearman test to examine the correlation between the two variables. To do that, we utilized the age variable where the sample is divided into two categories: younger and older participants. The results indicate that this correlation is not statistically significant as the significance is greater than 0.05.

Table 11: Correlation test between age and labels distinction

			Distinction des labels	**Age**
Rho de Spearman	**Distinction des labels**	**Coefficient de corrélation**	1,000	0,016
		Sig. (bilatérale)	.	0,809

These analyses collectively suggest that age may not be a significant factor in consumers' ability to discern fraudulent labels, contrary to our initial hypothesis.

H2: The relation between **education level** and **knowledge of greenwashing** can be explained by **environmental concern**.

For the second hypothesis, we proceeded with the Hayes test to calculate a mediation which is a process where the effect of the independent variable (X) on the dependent variable (Y) occurs through the intermediary of the mediator (M).

First, we checked the relationship between X (education level) and M (environmental concern), followed by the relationship between M and Y (knowledge of greenwashing). After that, we calculated the indirect effect, which is XM*MY. All three must be significant. If the direct relationship between X and Y is not significant (which is not the case here), we have a full mediation. However, since the relationship between X and Y is significant, indicating a direct effect of X on Y, the mediation is partial, suggesting that other elements may explain the results.

There are two things to check. First, the simple regression XM ($M= \alpha + \beta*X$) and then the multiple regression MY and XY ($Y= \alpha+ \beta*X + \gamma*M$), which could be synthesized in these two following hypotheses:

- H0: $\alpha * \beta = 0$
- H1: $\alpha * \beta \neq 0$

We can see below that the relationship between the education level and environmental concern is significant, as the p-value is below 5%. This signifies a potential mediating effect of M on the relationship between X and Y.

Table 12: Simple regression XM

Y: Greenwashing knowledge (Greenwas)
X: Education level (Diplôme)
M: Environmental concern (EConcern)

Outcome variable : EConcern

	coeff	**p**	**LLCI**	**ULCI**
constant	4,7522	0,0000	4,1826	5,3218
Diplôme	0,1897	0,0181	0,0344	0,363

In the following table, it becomes apparent that both the relationships MY and XY hold statistical significance because the p-value for both relationships is lower than 0.05.

Table 13: Multiple regression MY and XY

Outcome variable: Greenwashing knowledge

	coeff	**p**	**LLCI**	**ULCI**
constant	2,3931	0,0001	1,2305	3,5556
Diplôme	0,2148	0,0471	0,0028	0,4268
Econcern	0,2489	0,0112	0,0574	0,4405

We observe that the indirect effect of variable X on Y retains significance, as evidenced by the confidence interval not passing by zero. This signifies a partial mediation effect of the intermediary variable. We can therefore reject the null hypothesis, which means that our hypothesis is validated.

Table 14: Indirect effect of X on Y

	Effect	**BootSE**	**BootLLCI**	**BootULCI**
Econcern	0,0495	0,0307	0,0016	0,1199

H3: Consumers with a **greater knowledge of greenwashing** are more likely to distinguish official labels from fraudulent ones.

24.8% of respondents had never heard of the term greenwashing. As a result, only 173 people in our sample answered questions assessing their knowledge of greenwashing.

To test the relationship between greenwashing knowledge and the ability to distinguish between labels, we proceeded with a T-test on independent samples. The principle of the T-test is to compare the means of two different groups to determine if there is a significant difference between them.

In this context, the T-test helps us examine whether individuals with higher knowledge of greenwashing are better at distinguishing between official and fraudulent ecolabels compared to those with lower greenwashing knowledge. By comparing the average scores of these two groups, we can assess whether the differences in their label distinction abilities are significant or if they could have occurred by chance (Pleyers, 2023).

For the T-test, the hypothesis are the ones below:

- H0: $\mu 1 = \mu 2$
- H1: $\mu 1 \neq \mu 2$

Table 15: T-test on independent samples

		Test de Levene sur l'égalité des variances		Test t pour l'égalité des moyennes			
				Signification			
		F	Sig.	p unilatéral	p bilatéral	Différence moyenne	Erreur standard
Connaissance en greenwashing	**Hypothèse de variances égales**	8,120	0,005	0,367	0,733	0,7138	0,20907
	Hypothèse de variances inégales			0,336	0,671	0,7138	0,16754

Our analysis reveals that the differences in means between the two groups are not significant. Therefore, we cannot conclude that greenwashing knowledge is a determining factor in the ability to differentiate between fraudulent and official labels. We can also see on the graph below that visually, the means are almost the same.

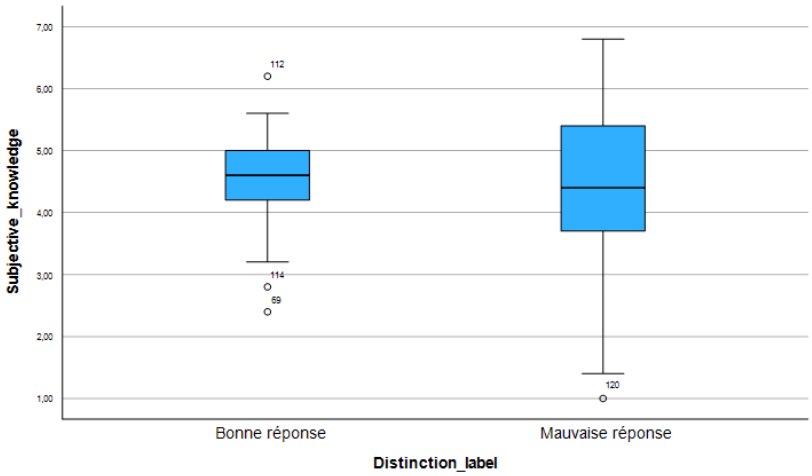

Figure 12: Boxplot of greenwashing knowledge

H4: Consumers are less likely to distinguish official labels from fraudulent ones when the **price** of the product is **higher**.

We created a cross-tabulation to examine which prices respondents who were able to distinguish the official label from the fraudulent one had seen. By analyzing the table, we observe that the results are relatively similar for the price of €3 and €5. This means that the distribution of responses does not vary significantly between the two prices.

Table 16: Cross table between price and labels distinction

		Distinction des labels		
		Bonne réponse	**Mauvaise réponse**	**Total**
Prix	**3 €**	21	99	120
	5 €	23	87	110
Total		44	186	230

For further analysis, we conducted a correlation test between the price and the label distinction with the following hypothesis:

- H0: $\rho = 0$
- H1: $\rho \neq 0$

The test shows that there is no significant association between the two categorical variables as the significance of the test is higher than 0.05.

Table 17: Correlation test between price and labels distinction

	Valeur	**df**	**Signification asymptotique (bilatérale)**
Khi-deux de Pearson	0,431	1	0,511
Rapport de vraisemblance	0,431	1	0,512

We performed manipulation checks to ensure that the participants did not make errors in reporting the price they received. The results you can see on the table below show that nearly all participants accurately reported the correct price.

Table 18: Price manipulation check

	Quel était le prix du deuxième produit?	**N**
Version A1 (3€)	**3 €**	50
	5 €	3
Version A2 (5€)	**3 €**	6
	5 €	51
Version B1 (3€)	**3 €**	56
	5 €	11
Version B2 (5€)	**3 €**	3
	5 €	50

In conclusion, we cannot reject the null hypothesis saying that there is no linear relationship between price and labels distinction.

H5: Consumers are less likely to distinguish official labels from fraudulent ones when they see a **green label** appearing on the product.

We followed the same procedures as for the price to test the color, and the results were equivalent.

Table 19: Cross table between color and labels distinction

		Distinction des labels		
		Bonne réponse	**Mauvaise réponse**	**Total**
Couleur	**Noir**	19	91	110
	Vert	25	95	120
Total		44	186	230

The hypothesis are :

- H0: $\rho = 0$
- H1: $\rho \neq 0$

We cannot confirm that the color has an impact on the label distinction as we cannot reject the null hypothesis. Indeed, according to the results of the Pearson test, you can see on the table below that the p-value is higher than 5%.

Table 20: Correlation test between color and labels distinction

	Valeur	**df**	**Signification asymptotique (bilatérale)**
Khi-deux de Pearson	0,470	1	0,493
Rapport de vraisemblance	0,472	1	0,492

We also made sure that the manipulation worked correctly. We can see from the table below that this was the case, as the majority of respondents remembered the ecolabel's color they saw on the second product. However, we can notice that the manipulation better worked on respondents who saw the ecolabel in green.

Table 21: Color manipulation check

	De quelle couleur était le label du deuxième produit?	N
Version A1 (Noir)	**Noir**	36
	Vert	17
Version A2 (Noir)	**Noir**	41
	Vert	16
Version B1 (Vert)	**Noir**	8
	Vert	59
Version B2 (Vert)	**Noir**	5
	Vert	48

3.4.2 Additional test

To further our research, we made a binary logistic regression. This regression is used to model the relationship between a binary outcome variable and one or more independent variables. This technique is valuable when the dependent variable is dichotomous, meaning it has only two possible outcomes. This is the case of our variable labels distinction because its two possible outcomes are right or wrong answers. The main purpose of this regression is to predict the probability of a certain event occurring based on the values of the independent variables and to understand the influence of each predictor on the likelihood of the event (*Régression logistique*, n. d.). We, therefore, made this regression between our dependent binary variable, distinction label, and our other independent variables: age, knowledge of greenwashing, color and price.

The initial logarithm of the likelihood, i.e. before integrating the variables into the model, was 179.589. After iterations and implementations of the variables, we found 178.450. As the log-likelihood decreases, it reduces the quality of the model.

Table 22: Iteration history

Itération		Log de vraisemblance -2
Pas 0	**1**	180,329
	2	179,590
	3	179,589
	4	179,589

Log de vraisemblance -2 initial: 179,589
The estimate stopped at iteration number 4 because the number of changes in the parameter estimates is less than 0.01

The following table shows that the independent variables explain 0.01% of the variance of the distinction label, which is not a high value.

Table 23: Logistic regression model

Pas	Log de vraisemblance -2	R-deux de Cox et Snell	R-deux de Nagelkerke
1	178,450	0,007	0,010

the estimate stopped at iteration number 4 because the number of changes of parameter's estimates is lower than 0,001.

In the next table, we can see the B values, which represent the estimated coefficients for each predictor, the Exp(B) values indicating how the odds of the outcome change with a one-unit increase of the independent variable and Sig., showing that the predictor is a significant contributor to the model (< 0.05).

Table 24: Logistic regression variables

		B	Exp(B)	Sig.
Pas 1	**Age**	0,130	1,139	0,734
	Connaissance du greenwashing	-0,058	0,944	0,729
	Couleur	-0,293	0,746	0,445
	Prix	-0,274	0,760	0,468
	Constante	1,800	6,047	0,039

As a result, we can see that no independent variables are significant to predict the value of the labels distinction. But the fact that the coefficient value of price and color are negative reassures us in the fact that a higher price and the green color lead people to choose the wrong ecolabel.

3.4.3 Perceived credibility

As we mentioned in the questionnaire design, we decided to measure our dependent variable labels distinction in two different ways. So far, in testing our hypotheses, we have relied on the direct method, i.e. we have based ourselves on the answers collected to the last question of the questionnaire, which asked consumers to choose which label they considered to be official. This is the direct way to measure consumers' ability to differentiate between the official and the fraudulent ecolabel. However, we also decided to measure our dependent variable indirectly by using the perceived credibility of the quality labels scale. We therefore had to see if our independent variables influenced the credibility consumers assigned to the official and the fraudulent ecolabel.

We began by testing the relationship between perceived credibility (for both official and fraudulent ecolabels) and three independent variables: age, education level and knowledge of greenwashing. To do this, we need to run two multiple linear regressions. However, before doing so, we drew up two correlation tables. One between the three independent variables and the perceived credibility attributed to the official ecolabel, and the second with the perceived credibility attributed to the fraudulent ecolabel. You can see from the two tables below that our two dependent variables are not correlated with our independent variables. It is therefore not relevant to run multiple linear regressions, as we will not receive any useful additional information. It would simply confirm that there is no significant relationship between the variables, as the correlation test already told us.

Table 25: Correlation test between age, education level, knowledge of greenwashing and perceived credibility for the official ecolabel

		Niveau d'éducation	**Age**	**Connaissance en greenwashing**	**Crédibilité perçue (vrai label)**
Corrélation de Pearson	**Niveau d'éducation**	1,000	0,182	0,176	-0,019
	Age	0,182	1,000	-0,095	-0,099
	Connaissance en greenwashing	0,176	-0,095	1,000	-0,079
	Crédibilité perçue (vrai label)	-0,019	-0,099	-0,079	1,000
Sig. (bilatéral)	**Niveau d'éducation**	.	0,006	0,021	0,779
	Age	0,006	.	0,214	0,134
	Connaissance en greenwashing	0,021	0,214	.	0,299
	Crédibilité perçue (vrai label)	0,779	0,134	0,299	.

Table 26: Correlation test between age, education level, knowledge of greenwashing and perceived credibility for the fraudulent ecolabel

		Niveau d'éducation	Age	Connaissance en greenwashing	Crédibilité perçue (faux label)
Corrélation de Pearson	**Niveau d'éducation**	1,000	0,182	0,176	0,010
	Age	0,182	1,000	-0,095	-0,076
	Connaissance en greenwashing	0,176	-0,095	1,000	-0,083
	Crédibilité perçue (faux label)	0,010	-0,076	-0,083	1,000
Sig. (bilatéral)	**Niveau d'éducation**	.	0,006	0,021	0,882
	Age	0,006	.	0,214	0,252
	Connaissance en greenwashing	0,021	0,214	.	0,279
	Crédibilité perçue (faux label)	0,882	0,252	0,279	.

Then, to see if price and color influence perceived credibility, we compared the means of perceived credibility using a paired-sample t-test. This test seems to be the most appropriate because we want to compare the means of two variables at time 1 (when consumers faced the official label) and at time 2 (when they faced the fraudulent label). As we detailed in the questionnaire design, for the fraudulent ecolabel, respondents were randomly assigned to one of the fourth versions. Therefore, by dividing our sample according to the four versions, respondents at times 1 and 2 are the same and this is why we can say that the samples are paired (Wanlin, 2019).

About the statistics of the paired samples, we can see the means below.

Table 27: Paired samples statistics

		Moyenne
Paire 1	**Perceived credibility**	4,2516
	A1 Perceived credibility	4,3742
Paire 2	**Perceived credibility**	4,2251
	A2 Perceived credibility	4,3918
Paire 3	**Perceived credibility**	3,9478
	B1 Perceived credibility	4,5199
Paire 4	**Perceived credibility**	4,2736
	B2 Perceived credibility	4,6101

To see if there is a significant difference between the means of the two variables for each pair, we need to test the paired samples. In the table below, we can see that the difference in means is significant for two pairs: pairs 3 and 4, as their p-values are less than 5%. Pairs 3 and 4 correspond to the difference in means between the perceived credibility of the official label and that of the fraudulent green label. We can therefore conclude that respondents who saw the fraudulent label in green tend to attribute more credibility to the label than those who saw it in black.

Table 28: Paired samples test

				Signification	
		Moyenne	**Ecart type**	**p unilatéral**	**p bilatéral**
Paire 1	**Perceived credibility** / **A1 Perceived credibility**	-0,12264	1,21254	0,232	0,465
Paire 2	**Perceived credibility** / **A2 Perceived credibility**	-0,16667	0,99003	0,104	0,209
Paire 3	**Perceived credibility** / **B1 Perceived credibility**	-0,57214	1,24425	<0,001	<0,001
Paire 4	**Perceived credibility** / **B2 Perceived credibility**	-0,22648	0,95491	0,007	0,013

3.5 Hypotheses testing of the secondary research model

As we explained in our study methodology, we decided to investigate a secondary research question about the trust of consumers in the eco-score and formulate four hypotheses on this subject.

H6: **Younger consumers** trust the eco-score more than older consumers.

H7: Consumers with a **higher education level** trust the eco-score more than others.

H8: Consumers with a **greater environmental concern** trust the eco-score more than others.

To test our first three hypotheses, we proceeded in different steps to verify whether there is a relationship between consumers' trust in the eco-score and age, education level and environmental concern of the participants. We started with the Pearson correlation. We can see that environmental concern and consumers' trust could be related. Education level is also logically linked to age and, as indicated in the second hypothesis, environmental concern and level of education are also correlated.

Table 29: Correlation test between age, education level, environmental concern and consumers' trust

		Confiance des consommateurs	Age	Conscience environnementale	Niveau d'éducation
Corrélation de Pearson	**Confiance des consommateurs**	1,000	0,028	0,208	0,092
	Age	0,028	1,000	0,082	0,182
	Conscience environnementale	0,208	0,082	1,000	0,195
	Niveau d'éducation	0,092	0,182	0,195	1,000
Sig. (unilatéral)	**Confiance des consommateurs**	.	0,336	<0,001	0,082
	Age	0,336	.	0,109	0,003
	Conscience environnementale	<0,001	0,109	.	0,001
	Niveau d'éducation	0,082	0,003	0,001	.

Before conducting the test, we had to verify the four assumptions of multiple linear regression analysis, namely the conditions of linearity, normality, homoscedasticity, and non-collinearity. Once these conditions had been verified, we formulated the following hypotheses:

- H0: $\alpha * \beta = 0$
- H1: $\alpha * \beta \neq 0$

The R-square is the percentage of variance explained by the model. 4.6% of the variance of consumers' trust is explained by the three variables (age, environmental concern and education level), which is not good at all. This suggests that the linear relationship between variables is very weak.

Table 30: Explained variance of consumers' trust

R	R-deux	R-deux ajusté
0,214	0,046	0,033

The p-value from the analysis of variance lower than 5% indicates that the model is good. It means that, even if the proportion of variance explained is low, the likelihood of the observed relationship occurring by chance is very small, thus validating the robustness of our model.

Table 31: ANOVA for linear regression

	Sommes des carrées	ddl	Carré moyen	F	Sig.
Régression	15,377	3	5,126	3,622	0,014
Résidus	319,841	226	1,415		
Total	335,218	229			

This last table shows the coefficients and the significance of the variables. We can see that only the environmental concern is a legitimate variable to explain consumers' trust. This explains, in part, why the R-squared was low. Here, we see that only one of the three variables explained the dependent variable. What could have been done to improve the R-squared is adding some significant variables, which we do not have in hand.

Table 32: Linear regression coefficients

	Coefficients non standardisés		Coefficients standardisés		
	B	**Erreur standard**	**Bêta**	**t**	**Sig.**
(Constante)	2,984	0,560		5,328	<0,001
Age	0,005	0,160	0,002	0,034	0,973
Conscience environnementale	0,260	0,087	0,197	2,971	0,003
Niveau d'éducation	0,162	0,205	0,053	0,790	0,430

H9: **Consumers' trust in the eco-score** influences their purchase intention on products with an eco-score.

As the second part of this second model, we did a simple linear regression analysis between the consumers' trust and the purchase intention.

We first made a cross table to check if people who answered that they would be more inclined to trust a product with an eco-score than a product with an ecolabel were also the ones who could not be able to distinguish the official label from the fraudulent one. We can see that this is the case for 82.5%.

Table 33: Cross table between eco-score and labels distinction

			Distinction des labels		
			Bonne réponse	**Mauvaise réponse**	**Total**
Seriez-vous plus enclin à faire confiance à un produit doté d'un éco-score centralisé comparé à un produit avec un écolabel individuel?	**Oui**	**Effectif**	30	141	171
		%	17,50%	82,50%	100,0%
	Non	**Effectif**	14	45	59
		%	23,70%	76,30%	100,0%

As already mentioned above, we first did a correlation test between the variables, and we can see in the table below that there is a strong relationship between the two variables.

Table 34: Correlation test between purchase intention and consumers' trust

		Intention d'achat	**Confiance des consommateurs**
Corrélation de Pearson	**Intention d'achat**	1,000	0,702
	Confiance des consommateurs	0,702	1,000
Sig. (unilatéral)	**Intention d'achat**	.	<0,001
	Confiance des consommateurs	0,000	.

After confirming the three conditions of the simple linear regression, we were able to create these hypotheses to test:

- H0: $\alpha * \beta = 0$
- H1: $\alpha * \beta \neq 0$

Consumers' trust explains nearly 50% of the variance of the purchase intention. This suggests a moderately strong relationship between the variables. The following table shows that the model does explain the relationship between the variables, as the p-value is lower than 5%.

Table 35: Explained variance of purchase intention

R	**R-deux**	**R-deux ajusté**
0,702	0,492	0,490

Table 36: ANOVA for linear regression

	Sommes des carrées	**ddl**	**Carré moyen**	**F**	**Sig.**
Régression	176,293	1	176,293	220,995	<0,001
Résidus	181,881	228	0,798		
Total	358,174	229			

With this last table, we obtained the coefficients of the linear regression, and we can see that they are significant, meaning that consumers' trust is a crucial predictor of purchase intention. Consequently, we can establish the following equation:

Purchase intention = 1,717 + 0,725 * consumers' trust

Table 37: Linear regression's coefficients

	Coefficients non standardisés		**Coefficients standardisés**		
	B	**Erreur standard**	**Bêta**	**t**	**Sig.**
(Constante)	1,717	0,235		7,307	<0,001
Consumer trust	0,725	0,049	0,702	14,866	<0,001

IV. Conclusions

To conclude our master thesis, we will first discuss the results of our study coming from our quantitative analyses conducted to answer our main research question. Then, we will approach research perspectives by developing the results obtained about our secondary research question. Finally, we will close our study with the limitations we have identified in our study.

1. Results discussion

The main objective of this master thesis was to study whether there are factors that determine consumers' ability to differentiate between official labels certified by a third party and self-claimed labels. To answer this research question, we formulated five hypotheses based on the literature and conducted a quantitative study. However, by testing our hypotheses, we were not able to confirm all of these. According to our analyses, it seems that there exists no real factor that can influence how consumers differentiate between an official label and a fraudulent one.

Firstly, young consumers are not less likely to distinguish labels than older consumers. Although we have read in the literature that young people tend to be more vulnerable to greenwashing (Vázquez & Lanero, 2021), it does not mean they are any less able to distinguish labels than others or at least our results showed no significant difference between the different age categories.

The second hypothesis is the only one we could confirm because we found that the concern for the environment is the mediator of the relation between education level and knowledge of greenwashing. It means that consumers who have a university diploma would have a greater knowledge of greenwashing partly due to their concern for the environment. As the mediation effect we found is partial, it suggests that there are probably other mediator variables explaining the relation between education level and greenwashing knowledge. The result obtained is not surprising as several international studies have already built the link between education and environmental concern. Studies have shown that people with a higher education level would have a better understanding of the risks associated with environmental deterioration and therefore that people with higher degrees would be more sensitive to environmental problems on a more global scale, such as climate change (Jaoul-Grammare & Strenger, 2022). Therefore, it is not unexpected they are also more aware of greenwashing than others.

Although we have shown that people with a higher level of education have a greater greenwashing knowledge, we could not confirm our third hypothesis which stated that consumers with a greater knowledge of greenwashing are more likely to know how to differentiate between labels than those with less knowledge. It appears that it is not because someone has a good knowledge of greenwashing that they will have a good knowledge about the different types of ecolabels and be able to recognize official and self-declared labels. This result may be in line with that of a study carried out by Urbański and Haque in 2020, which found that "participants classifying themselves as high environmentalists compared to low and moderate environmentalists, despite their skepticism, fall into the trap of identifying 'greenwashed' products as sustainable."

What concerns our last two hypotheses, we wanted to see if two product-related factors, namely price and green color, could have an influence on consumers in their way to discern the real ecolabel from the fake. Our analyses showed that these factors had no influence: consumers fell into the trap of not finding the right ecolabel, regardless of the ecolabel's color or the price of the product. The result for color is surprising, as several studies have shown that consumers tend to associate the green color of a product's packaging with the brand's positive environmental impact, which can lead to misperceptions (Seo & Scammon, 2017). However, when we tested the relation between color and perceived credibility of the label, results showed that consumers who saw the fake ecolabel in green gave it greater credibility than the official label, while this difference was not significant for consumers who saw the fake label in black. We can therefore say that color has influenced the consumer, even if this does not mean that consumers who saw the false label in black designated the first label as official.

Finally, we can draw from the analysis of all our hypotheses that if there are no factors we have tested that seem to have a significant influence on how consumers distinguish official labels from fraudulent ones, this may be due to several reasons. The first reason we can put forward is a lack of knowledge and interest on the part of consumers for ecolabels. Indeed, we chose the official Belgian bio label so, if consumers had sufficient knowledge of ecolabeling, they would have recognized it. The report « Baromètre de la consommation de produits BIO », from the Walloon Agency for the Promotion of Quality Agriculture (Apaq-W), conducted a study on 1.500 Belgians about their consumption of organic products. The survey revealed that 25% of respondents were aware of the Biogarantie label. However, the survey also revealed that it is not because consumers are aware of the ecolabel that they are able to

give it the right meaning. This may show that Belgian consumers are unfamiliar with ecolabels. This lack of knowledge can also be related to the proliferation of ecolabels. Consumers might not be interested in learning more, as there are too many labels on the market. Moreover, because of this proliferation of ecolabels (Iraldo et al, 2020), consumers are also confused and lost and do not know which label they can trust anymore (Colamartino, 2022). The last reason we can identify is the effectiveness of greenwashing. Producers are aware of the public's growing interest in the environment and take advantage of the lack of knowledge and the number of labels on the market to engage in greenwashing (Wang & Walker, 2023). Results from our study show that we are all just as vulnerable to greenwashing as anyone else.

2. Research perspectives

As the results of our study have shown, consumers have difficulties making the difference between certified and self-declared labels. This result confirms the first limitation of labels that we have identified in the literature review. Indeed, we saw that consumers often lack knowledge about labels and therefore, tend to draw wrong conclusions when they are facing a label they do not know (Vazquez & Lanero, 2021). Consumers are also often confused by the proliferation of labels, and no longer know which one to trust (Chen & Chang, 2012).

For this reason, we wanted to explore the possibility of centralizing all ecolabels into a single indicator of a product's environmental impact, such as the eco-score, in the future. We have therefore chosen to take advantage of our survey to address a secondary research question to know if consumers trust the eco-score.

We evaluated consumers' trust in the eco-score, the personal factors that could have an impact on their trust and if trust influence their intention to buy eco-scored products. It appears that the mean of consumers' trust in the eco-score is equal to 4.66 out of 7, which is quite high. The results from our hypotheses testing also showed that people with greater environmental concern trust eco-scored products more than others and that consumers with higher trust have higher purchase intentions for eco-scored products. In addition, results showed that 74.3 % of respondents would be more likely to trust a product with a centralized eco-score than one with an individual ecolabel. These results show that it will be maybe interesting in the future to extend the eco-score to all products. We believe eco-score has a good potential to replace ecolabels thanks to its single system and that it could facilitate consumers in their purchasing choices. This constitutes therefore an interesting research path for the future.

3. Limitations

At the end of this master thesis, it is important to mention the limitations of our study.

The first limitation we can identify concerns the distribution of our questionnaire. Indeed, we decided to share our survey on social networks. This allows us to obtain easily and quickly a large number of responses. However, it limited its reach to members of the same social circle which restricted the diversity of profiles of our sample. This is how we obtained a large number of respondents in the age category of 18 and 24, the majority of whom were students and 80% had a university education. In addition, respondents could give up in the middle of the questionnaire if they do not want to continue which leads to self-selection of candidates. We could obtain more significant results if we had a more homogeneous sample.

Another limitation of our study regarding our questionnaire could be in its design. We decided to present two ecolabels to respondents: one official and one fraudulent. For the official, we decided to choose the “Biogarantie” label as it is the official Belgian organic label. However, it appears that a lot of consumers did not know this label at all. The results would probably have been different if we had chosen a label more familiar to consumers, such as the official European organic label. Moreover, about the prices we attributed to the product presenting the fraudulent label, we chose a low price of 3 euros and a high price of 5 euros. The difference between the two prices could be more accentuated so that people really realize whether they are facing a low or a high price.

Finally, the choice of the factors we decided to test can also constitute a limitation of our study. According to what we have read in our literature review, we chose to study the influence that these five factors could have on the ability of consumers to distinguish between official ecolabels from fraudulent ones. However, we could have tested other or more factors as there has been a lot of research into ecolabels in the literature.

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Abstract :

Ecolabels have gained in popularity since their appearance, leading to a veritable proliferation of all types of ecolabels. Among them, there are self-declared ecolabels. These types of ecolabels, in contrast to official ecolabels, do not receive any external certification and manufacturers can self-assign ecolabels to mislead consumers by giving the impression that their product is environmentally friendly. Through this study, we will discover if consumers can differentiate between official and fraudulent ecolabels. The study aims to explore the factors that might explain why some consumers can make the difference while others cannot.

After quantitative analyses to test if the age and the greenwashing knowledge of consumers but also if the product's price and the ecolabel's color can influence how consumers distinguish ecolabels, our results showed that none of these factors had a significant influence. The vast majority of consumers tend to fall into the greenwashing trap, choosing the fraudulent ecolabel as the one they perceive as official. However, the study revealed that the green color has an influence, not on the ability to distinguish ecolabels, but on perceived credibility, as consumers tend to give more credibility to the ecolabel when they see it in green than in black.

Based on results showing that consumers are unable or willing to draw a difference between the different types of labels, the study highlights the need to find an alternative system to ecolabels. Confronted with too many ecolabels, consumers are confused and no longer know who to trust. This is why the study also looked at the eco-score, to measure consumers' trust in this indicator of the environmental impact of products, and to see whether it could replace ecolabels in the future. It appears that consumers tend to trust the eco-score and that this trust is linked to their intention to purchase eco-scored products. In addition, nearly 75% of respondents answered they would prefer the eco-score to ecolabels. It therefore seems essential to replace ecolabels with a single indicator, such as the eco-score. This constitutes an interesting research path to explore in the future.

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