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# Measuring the Impact of Sustainability Certifications on Price: A Data-Driven Analysis of Key Influences


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# Abstract

As the sustainability topic becomes more important in global markets, sustainable certifications containing Organic and Fairtrade benefits have become widely used to signal ethical value to consumers. But there has not been much research done on how well these certifications actually affect the final product retail price and how consumers perceive them.

This thesis addresses the following research question: **How do different types of sustainability certifications Organic, Fairtrade, and Multi-Criteria (Organic + Fairtrade) affect product retail price and consumer value perception across cheap and premium product tiers?**

To investigate this, a two-phase mixed-methods approach was employed. The first phase involved a secondary data analysis of over 200,000 fashion products sourced from the GreenDB database (Jäger et al., 2022). The analysis followed a multi-step procedure: ANOVA was used to test initial price differences across certification types, followed by independent samples t-tests to explore pairwise differences. Finally, moderation analysis was conducted using the PROCESS macro (Model 1) to examine whether the effect of certification type on retail price was moderated by product tier (cheap vs. premium). The second phase utilized a 3 (certification type) × 2 (product tier) within-subjects experimental design (N = 92), where participants evaluated six t-shirt product profiles, providing responses on perceived value, perceived worth, and willingness to pay.

The results provided two main findings. First, multi-criteria certifications consistently generate the highest product valuations, both in real-market pricing and in consumer assessments of value and willingness to pay. Secondly, and more importantly, we see a Fairtrade-Premium interaction effect in both phases: Fairtrade certifications significantly increase product pricing and perceived worth only when attached to premium products. This effect was statistically significant in the moderation model and was confirmed experimentally in both willingness to pay and perceived worth, though not in perceived value. This shows that Fairtrade certifications are more about ethics and identity than just the financial side of things, highlighting the psychological layers of sustainability messaging. The study adds to the theory by expanding on signalling theory, showing that how strong and effective ethical signals are depends on how well they fit with the positioning of the product. It also takes the SHIFT framework further by showing how tangibility (certifications) and individual identity (premium positioning) work together to shape how consumers see the brand and how retailers are pricing their products. Managerially speaking, the findings emphasise the importance of strategically using certifications. Multi-criteria certifications have wide-ranging positive effects, while Fairtrade certifications should be used selectively in premium products, where consumers are more responsive to social impact signals.

# Introduction

Consumer demand for sustainability is increasing, when consumers are asked whether they care about purchasing environmentally and ethically sustainable products, they say yes (Consumers Care about Sustainability—and Back It up with Their Wallets, 2023), which has led to an increase in the number of sustainable brands.

On the other hand, some studies show that while marketers are trying to emphasize the sustainability of their brands, they may be overemphasizing its significance to consumers, who still prioritize convenience and price during the buying decision-making process (Fleming, 2020).

On this day, more and more companies are adding sustainability certifications to their products to stand out from the competition and help consumers in their decision-making, which is happening because certifications can provide a tangible evidence base for claims made. For instance, a survey of B-Corps showed that 88% of respondents perceive certification standards to be either somewhat or very rigorous, with 63% stating that they actively seek certification when making purchasing decisions (Rothschild, 2023).

However, a survey from the European Commission of green claims across Europe showed that 42% of them (green claims) were found to be exaggerated, false, or deceptive. This indicates a significant issue of "greenwashing" on a large scale (European Commission, 2021). Consumers, nowadays, are aware of this, leading to a decrease in their reliance on Sustainable Certifications, which can have a potential effect on the retail price of those products since the demand might drop.

The question that arises here is: *How does the type of sustainability certifications on a product relate to its retail price?*

From the management side, companies have to solve the problem of how sustainability certifications influence their prices for products. The certifications are supposed to show that a product is sustainable, but this is not happening. This makes it hard for companies to properly use these certifications, and thus, managers should not rely on those certificates in isolation but also factor in other aspects that may influence the price apart from the certifications. Marketing managers need to know such pricing influencing factors of a sustainable brand to not only properly market their sustainable brands but also properly design and price them from the very beginning, according to what consumers want.

## Research Gap

The growing interest in sustainability among consumers has been met with a paradox. While many consumers express positive attitudes toward sustainable products, their actual purchasing behaviors often

do not align with these attitudes. A recent survey highlighted that 65% of consumers indicated a desire to buy purpose-driven brands advocating sustainability, but only about 26% actually bought them (White, Hardisty, et al., 2019). There is a big gap between what people say they will do and what they do.

As Erik Olson, my professor at BI Norwegian Business School, mentioned, despite the widespread adoption of eco-friendly practices, consumers often opt for non-green alternatives. One potential explanation for this inconsistency is the trade-offs associated with green products. Despite the prevalence of pro-green attitudes, consumers often opt for non-green alternatives, often because of the higher prices, reduced quality, and/or performance (Olson, 2013).

Firstly, recently, in their publication, Kim et al. (2024) propose a future line of research by asking the following question: "How do industry-wide certifications can help businesses be more profitable and sustainable?"(Kim et al., 2024). This question is very relevant to the question of whether or not product price is influenced by sustainability certification. Through an answer to this, Kim et al. (2024) emphasize the importance of diving deeper into the dynamics between sustainability certifications and their real-world implications for businesses and consumers. This gap in the existing literature is significant because marketers can use the information to understand how such certifications affect profitability, which is useful for pricing sustainable brands effectively. Thus, in this research, this will be built upon by looking at the role of sustainability certifications within the broader context of pricing strategy for sustainable products.

Besides, recent studies highlight the role of moral obligations and personal norms in motivating pro-social behaviors in the context of sustainability. The authors of a study conducted in 2022 propose that such psychological factors need to be explored further in subsequent research (Nascimento & Loureiro, 2022). This aligns with my research, which also examines the non-certificate factors affecting the price of sustainable products. The article by Nascimento et al. does not mention how other variables, like the type of product and product type (cheap or premium), decide the price of a product. My research aims to provide a more tangible understanding of pricing dynamics and their application in creating marketing strategies that align with customers' values and behaviors.

Moreover, the article by White et al. (2019) presents a comprehensive framework for understanding the psychological factors that drive sustainable consumer behavior, summarizing in the acronym SHIFT, which stands for Social influence, Habit formation, Individual self, Feelings, Cognition, and Tangibility. This framework emphasizes the importance of social influence and community dynamics in encouraging sustainable consumption (White, Habib, et al., 2019). However, while the authors identify social influence as a significant driver of sustainable behavior, there is a gap in examining how specific psychological factors, such as product type and product segment perception, interact with sustainability

certifications to influence the price. This study aims to fill this gap by focusing on these elements and their roles in shaping the prices for sustainable brands. By investigating these interactions, this research will contribute to providing actionable insights for marketers looking to improve the effectiveness of sustainability certifications.

Furthermore, while Thøgersen et al. (2010) provide valuable insights into the factors driving early consumer adoption of eco-labels, their study has several limitations that this research aims to overcome. First, Thøgersen et al. (2010) acknowledge that their analysis could not fully account for the role of environmental and product-related factors, as these did not vary significantly within their sample. Second, their focus on early adoption provides a limited perspective on the long-term market effects of ecolabels. Third, their research primarily shows consumer perceptions and motivations rather than the economic consequences of ecolabeling, such as the impact on product retail pricing.

In contrast, my research directly addresses these limitations by examining a range of product categories to understand how the relationship between certifications and price varies across different categories, focusing on the price of products as the dependent variable, providing a direct measure of the economic impact of sustainability certifications, analyzing a large real-world dataset to measure the effects of certifications beyond the initial adoption phase, studying the moderating factors such as consumer gender, and product color to provide a more practical understanding of how the impact of certifications varies across different segments.

Additionally, while a literature review study of the impact of eco-labels on consumer willingness to pay (WTP) is helpful, its applicability is limited by its analysis only applying to food products (Bastounis et al., 2021). This means that the findings cannot be applied to other product categories, especially those in the wearing segment (e.g., t-shirts, jackets, bags), where signaling value and price effects of sustainability certification may vary due to varying consumer beliefs, purchasing frequencies, and life cycles.

Further, Bastounis et al. (2021) consider willingness to pay, a metric of self-reported preferences, rather than examining actual retail prices. This is significant since WTP does not always translate to real purchasing behavior in reality due to constraints of budget, availability of substitutes, and situational influences. My research addresses these issues by investigating the connection between sustainability certification and actual prices at the point of retail for clothing using a large database of real consumers' purchases. This allows us to make a simpler and ecologically valid measurement of the economic impact of certifications on product prices in a non-food product category.

# Literature Review

Product labels are generally used to inform consumers about product quality and performance, ingredients, and safe use and care. The information consumers gain from product labels and labeling programs can result in improved decision-making, reduced prices, and enhanced product quality and safety. To regulate the health, safety, and environmental risks associated with consumer products, the government has instituted specific programmes whereby important information is provided to consumers via product labels (Mangleburg et al., 1997).

These have included programmes targeted at nutrition, cigarettes and smokeless tobacco, energy consumption, hazardous substances, and alcoholic beverages. Consumers must be able to read product labels, as these reveal important information about product use, ingredients, and risks. This is a key skill that helps to ensure consumer health, safety, and well-being (Mangleburg et al., 1997).

The recent years, we see that other product categories are adapting the use of the labels. The interesting part here is that the labels are being adapted from products that do not directly harm the consumer, like clothing products that we are testing in this study, but the production and supply of those can harm the environment in which the consumers live, as long as the production and supply can harm other people due to inappropriate operating conditions.

The difference between the labels that this study is focusing on and the product labels that are well documented, as those found in cigarettes and alcoholic beverages, is that those labels are not considered warning labels, but they are certifications. Warning labels are there to tell consumers about the risks of using a product. Warning labels on product packaging are a long-standing practice, especially for hazardous items like cigarettes and spirits (Novrianda et al., 2024).

Product labels and certifications are visible marks or seals on products that verify certain attributes or standards. They are issued by independent third parties (e.g., regulators, industry groups, or NGOs) only when a product passes prescribed testing or audits, and thus signal that the product meets specific quality, safety, or ethical criteria (Vertinsky & Zhou, 2000).

Some labels give information that is directly relevant to the person who will use the product. For example, hazard warning labels on cigarettes and domestic pesticides are there to protect the user or anyone else nearby. Other labels give information that is only relevant to the extent that the user is concerned about more widespread environmental effects, which are hard for consumers to have a significant impact on. For example, some of those include 'ethical' labels like the Honest that are linked to animal welfare (e.g., the US dolphin-safe tuna label) or 'fair trade' with developing countries (e.g., the Max Havelaar and the TransFair labels) (Bjørner et al., 2004).

Eco-labels, on the other hand, are defined as a type of information tool that enables consumers to make an informed decision when purchasing goods and services. The price premium that consumers pay for An ecologically friendly product is considered to cover the additional costs associated with the environmental benefits (Bougherara & Combris, 2009).

Thus, eco-labeling aims to reduce the information asymmetry between producers of green products and consumers by providing credible information on the environmental attributes of the product and signaling that the product is superior to a non-labeled product in this respect (Crespi & Marette, 2005). Moreover, eco-labels can be described as CSR activities of the company that are helping the consumers by reducing their searching time, indicating a socially responsible product (Atkinson, 2014).

CSR activities are broadly defined as the company's status and activities to its perceived societal obligations (Brown & Dacin, 1997), and communications regarding CSR activities have been shown to enhance purchase intentions and evaluations of the company or brand (Sen & Bhattacharya, 2001). Furthermore, CSR can positively influence immediate purchase behavior and the building of brand equity and identity (Lichtenstein et al., 2004).

However, all of these studies emphasize how CSR initiatives (including sustainability certifications) enhance consumer perceptions and build brand equity, but do not dive into the economic value or the pricing associated with sustainability efforts.

Specifically, there is a lack of research examining how sustainability certifications, an increasingly popular CSR tool, translate into tangible outcomes such as retail pricing.

However, sustainability labels, in practice, are not only used as a CSR tool or as a tool to reduce information asymmetry, they are often used as nudging instruments. In the context of choice architecture, the term 'nudge' refers to any aspect that has the potential to influence behavior, encouraging a specific outcome. The goal of the nudge is to lead consumers to a choice without forbidding them from all the available choices (Adkisson, 2008). Humans are influenced by things like default selections, the order of how things are presented, and how other people behave (Adkisson, 2008), and this is one of the goals of sustainability labels on products, leading people to make sustainable choices by taking advantage of the nudging theory. While this strategy may appear unethical from the retailers' perspective, it has the potential to benefit consumers and the environment, provided it results in sustainable purchasing.

Building on this, it is important to recognize that consumers often do not have a clear understanding of what they truly want or need (Adkisson, 2008), especially in complex product environments, and this leads to purchases that the consumers didn’t need. In the context of retail, these decision errors can lead to impulsive purchases and even increased product returns (Ghose et al., 2024).

Appropriate application of nudging can help to minimise these issues by structuring the choice environment to guide consumers towards decisions that are more aligned with their long-term interests and values.

Understanding this relationship is important for businesses that are looking to optimize their pricing strategies and quantify the economic impact of their sustainability investments. By addressing this gap, this research shifts the focus from consumer attitudes and brand reputation to the economic implications of sustainability certifications, providing actionable insights for both marketers and pricing strategists.

In their study, Luchs and Kumar (2017) critically studied the trade-offs consumers face when evaluating sustainable products, particularly in terms of perceived quality and price (Luchs & Kumar, 2017). They showed that while sustainability certifications can enhance a product's perceived ethical value, they can also raise concerns about performance or justify higher prices, creating tension for consumers. This is particularly relevant to wearable products, where aesthetic and functional considerations often compete with sustainability claims.

While Luchs and Kumar (2017) focus on consumer perceptions and decision-making processes, they do not explore how these trade-offs translate into actual retail pricing or how factors such as product category and certification type moderate these dynamics. By analyzing real-world pricing data and examining these moderating factors, this study builds on Luchs and Kumar's findings by providing empirical evidence on how sustainability certifications influence product prices in the apparel and accessories market. This contribution extends the understanding of how certifications interact with consumer expectations and market realities to shape pricing strategies.

Moreover, a study investigates the role of third-party certifications and sponsorship in influencing consumer use of ecolabels (Darnall et al., 2018). Their findings highlight that third-party certifications are perceived as more credible compared to self-declared labels or corporate-sponsored claims.

This credibility is crucial in driving consumer trust and ecolabel adoption. However, while their research focuses on consumer perceptions and behavioral intentions regarding ecolabels, it does not address how the number of certifications impacts actual product retail pricing. Furthermore, this study does not explore how product characteristics and price premiums moderate the relationship between certifications and economic outcomes. By analyzing real-world pricing data and incorporating these moderating factors, my study builds upon Darnall et al.'s work by investigating the tangible economic impact of sustainability certifications.

Furthermore, previous research has consistently shown that combining sustainability elements into products positively influences brand equity, perceived value, and consumer trust (Sen & Bhattacharya, 2001; Lichtenstein et al., 2004). For instance, studies have demonstrated that sustainability certifications and eco-labels enhance a brand's reputation by signaling ethical practices and environmental stewardship, which are increasingly valued by consumers (Darnall et al., 2018).

Most importantly, research made on eco-labels in the fashion industry, the same industry that my research is in, found that consumers rarely identify these eco-friendly products while they are shopping, they are not aware of the meaning of all the different eco-labels, finding that those eco-labels have neither positive nor negative effect on the overall business operation (Henninger, 2015). However, a key limitation of this study is the fact that it has been conducted with one-to-one interviews and questionnaires and not with real retail data. In the same direction, Testa et.al (2015) found that eco-labels are able to achieve their goal only if consumers are informed and aware of their meaning, characteristics, requirements, and guarantees provided (Testa et al., 2015).

To strengthen this, Atkinson found that the specificity and credibility of eco-labels significantly increase consumer trust and willingness to pay, suggesting that multiple certifications could amplify this effect (Atkinson, 2014).

On the other side of the coin, the primary objective of eco-labeling is to reduce information asymmetries between producers and consumers regarding the environmental attributes of products. However, the lack of credibility or understanding of certain eco-labels may result in consumer confusion or negative reactions (Delmas & Grant, 2014). For example, consumers might get confused by the presence of competing eco-labels (Leire & Thidell, 2005). Moreover, interesting study results show that eco-labeling has a negative impact on prices in the wine industry, although there is a price premium associated with the eco-certification (Delmas & Grant, 2014), and the negative outcomes associated with eco-labeling can be attributed to a lack of understanding of the eco-certification process (Delmas & Grant, 2014).

Therefore, I hypothesize that the effect of the number of certifications on the retail price depends on the type of certifications, with those that are perceived as more credible, relevant, and transparent having a stronger positive influence.

However, the potential positive effect of the number of certifications on the retail price of the product cannot be assumed to be the same across all product categories within the wearables market; for example, the idea of self-expression is important here, because people who wear green products can show that they care about the environment (Park & Lin, 2020), People like to show off that they're eco-friendly

by buying green products, they might be motivated to adopt these products to appear like pro-environmental consumers (Noppers et al., 2014) because the products allow them to express their environmental consciousness to others. Thus, this research is focusing on the certification type instead of the number of certifications that each product has.

Also, certifications might show that something is high quality, like expensive jackets and shoes, but people might care more about style and trends for cheaper things like t-shirts, which means certifications don't have as much of an effect on the price.

Moving forward, as mentioned before, eco-labels are a way for consumers to make an informed decision when buying goods and services (Bougherara & Combris, 2009), however not all eco-labels or sustainability certifications are the same, the type of certification – whether third-party verified, industry-specific, or self-declared – plays a role in determining its impact on consumer perceptions (Atkinson, 2014). On the other side, studies have shown that even though consumers today are more skeptical about the environment and how brands are acting regarding environmental-related problems, this skepticism is not reflected in the actual purchase decision leading to the fact that ethical purchasing is only feasible if there are no additional costs to the consumer, such as increased prices, diminished quality, or the necessity to "shop around" (Carrigan & Attalla, 2001).

The effectiveness of sustainability certifications in influencing price is dependent on their credibility, relevance, and rigor. For example, Third-party certifications from reputable organizations are more likely to enhance consumer trust and willingness to pay, while self-declared labels may fail to justify higher prices due to their perceived lack of independence (Atkinson, 2014). Moreover, certifications that match what consumers care about for certain products have more impact on consumers than those that deal with less important issues (Henninger, 2015).

Those prior studies make us hypothesize that the type of certification affects how consumers see the number of certifications on a product. For example, a product with lots of third-party certifications might seem more trustworthy and high-quality, which could lead to higher retail prices. But a product with lots of self-declared labels might be seen as greenwashing, which can damage its reputation. While prior research has studied how individual certifications influence consumer perceptions (Atkinson, 2014), there is limited empirical evidence on how the type of certifications interacts with the retail price.

We know from the signaling theory that multiple signals can improve the perceived quality if the signals are credible and consistent (Spence, 1973), and this can possibly be applied to the case of environmental certifications in the wearable industry. But, if signals are in conflict or lack credibility - for example, if a product has many low-quality or irrelevant certifications - they can reduce the overall effect

on perceived value (Delmas & Grant, 2014). This shows how important the type of certification can potentially be when it comes to the relationship between the certifications and retail price. Moreover, this study extends signaling theory by testing whether multi-dimensional certifications (stronger signals) generate proportionally higher willingness to pay and retail prices than unidimensional ones.

Moving forward, studies have shown that gender has an impact on attitudes towards sustainability and ethical consumption. Women tend to care more about sustainability and are more likely to buy eco-friendly products and do things that are good for the environment (Laroche et al., 2001). This can be explained by the socialization theory, which says that how people act is based on how they're influenced by gender expectations in the culture they're part of (Zelezny et al., 2000), women from all over the world are socially raised to be more expressive, to have a stronger "ethic of care" and to be more interdependent, compassionate, nurturing, cooperative and helpful in their caring roles (Beutel & Marini, 1995). On the other hand, males are socialized to be more independent and competitive (Gilligan, 1982). As a result, products with sustainability certifications may have a stronger effect on female consumers, leading to a greater willingness to pay for such products compared to male consumers. Although this relationship is not tested in the current thesis, the same methodology presented in the methods part can be used to test the relationship.

Research has shown that women tend to have stronger attitudes toward environmental quality than men and tend to be more environmentally friendly than men when it comes to recycling and shopping (Diamantopoulos et al., 2003). This also indicates that the number of sustainability certifications on a product may have a stronger impact on the perceived value and price of products targeted at women. For example, people who act in an eco-friendly way are often seen as more feminine and even see themselves that way, which goes in conflict with the traditional norms of masculinity, leading men not to buy products with sustainability certifications (Brough et al., 2016).

Additionally, Mangleburg et al. (1997) determined that there is a difference in the way male and female teenagers use product labels; the research found that females tend to read the labels more than males (Mangleburg et al., 1997). However, a more recent study conducted on specific certifications found that there is no significant difference in reading the product labels between genders for the organic labels (Furlow & Knott, 2009), this is very important to the current study, since the majority of wearable products out in the market, which have sustainability labels, are using organic ones like gots organic and global recycled standard certifications. Moreover, previous research showed that while women are more concerned about sustainability and use labels more often than men, there is no difference in the level of understanding those labels between the two groups (Grunert et al., 2014).

Moreover, research has shown that the effects of color on human cognitive interpretation can provide evidence of potential consumer reactions (Jacobs & Suess, 1975), leading to a potential influence on the retail prices of the products. The color of an item is determined by the wavelength of the light it absorbs. Short wavelengths are linked to 'cool' colors, with violet being the most extreme, followed by blue, while long wavelengths are linked to 'warm' colors, with red being the most extreme, followed by orange (Valdez & Mehrabian, 1994). It is well-known that people prefer short (long) wavelengths, which creates a link between how colors make us feel and their wavelength (Valdez & Mehrabian, 1994).

This means that blue is generally associated with positive feelings, while orange is generally associated with negative feelings. The effects of colors on human performance and how they are understood provide important evidence of potential consumer reactions (Valdez & Mehrabian, 1994).

In the environmental context, green is a color that represents growth, rebirth, renewal, nature, fertility, youth, good luck, generosity, health, abundance, stability, and creativity (Singh & Srivastava, 2011), when it's in small amounts, yellow is a happy color. But if it's too much, it can look angry. It's used to represent all sorts: sunlight, joy, the earth, optimism, intelligence, hope, liberalism, wealth, dishonesty, weakness, greed, decay, aging, femininity, gladness, sociability, and friendship(Singh & Srivastava, 2011), and the color orange is linked to happiness, balance, and enthusiasm. It's used to represent energy, heat, fire, playfulness, silliness, arrogance, warning, danger, desire, royalty, and religious ceremonies and rituals (Singh & Srivastava, 2011).

These associations indicate that products in colors perceived as 'environmentally friendly' (e.g., green, natural tones) may increase the effect of sustainability certifications on retail, while non-natural colors may weaken this effect.

Moreover, based on the halo effect theory, people tend to assume that something is true of an object because of one of its features, and they might even use that to make up their overall impression of it (Juan Luis Nicolau et al., 2020), this can indicate that consumers may associate the green or orange color to environmental values and when it combines with sustainability certifications those colors might strengthen the perceived credibility of the certifications leading to a stronger effect to the final retail price of the products. On the other side, this halo effect might weaken the effect of the sustainability certifications on the products whose colors are not linked with the environment (e.g, red and black). This relationship is also out of the scope of the current thesis work; however, future research can build on the well-structured methodology explained in the next chapter to test this relationship.

Finally, a recent and highly relevant study by Gossen et al. (2022) provides a large-scale analysis of sustainability labels in the online fashion retail sector, focusing on how such labels are used by leading

German e-commerce platforms (Zalando and Otto) to nudge consumer behavior toward sustainable choices. Their research is based on a dataset containing nearly 17,000 fashion products and investigates both the prevalence and credibility of sustainability labels, distinguishing between third-party and private (self-declared) labels. Gossen et al. find that while a significant share of products are tagged as sustainable, only a small proportion (14%) carry credible third-party verified labels, with the majority relying on private labels that often address only single sustainability issues and may contribute to consumer confusion and greenwashing risk. Their findings highlight the current limitations of sustainability labeling in online retail, particularly the challenges consumers face in interpreting and trusting the available labels, which are too many, and the potential for such labels to act as nudging instruments in digital choice environments (Gossen et al., 2022).

Gossen et al. (2022) primarily focus on the availability, credibility, and communicative function of sustainability labels as nudges in the online retail context. However, the present study takes a different approach by analysing the economic impact of these labels, specifically how the different types of sustainability certifications influence the retail price of fashion products.

The division of certifications into main groups, called certification types, which are compared in the next sections of the study, was based on a dual dimension approach. The first dimension is based on numbers and is explained in the research section's description, while the second dimension is based on recent research by Ziyeh (2023). The goal of Ziyeh's (2023) paper was to categorise the sustainability labels into main categories, and the context of the study is the fashion industry, which is the same industry that the present study operates in.

Ziyeh (2023) provides a structured methodological classification of eco-labels, which first concludes in six methodological types. The second dimension is methodological, differentiating six distinct assessment types based on how criteria are weighted and aggregated. These range from simple mandatory lists (Type 1 and 2) to more complex systems like weighted averages (Type 4), minimum scores (Type 5), and worst-case score dependency (Type 6) (Ziyeh & Cinelli, 2023).

Those six methodological types lead to four main dimensions addressed by each sustainability label, these dimensions are: environmental, social, economic, and circularity (Ziyeh & Cinelli, 2023).

This approach is in line with the approach of categorisation that the present study follows, where the sustainability certifications are categorised into three main categories, Organic, Fairtrade, and Multidimensional. For example, labels like GOTS or OEKO-TEX 100, which focus on using organic materials and managing the environment, fit with what Ziyeh and Cinelli call labels with levels (Type 3), which are mostly focused on the environment. Fairtrade certifications, on the other hand, focus on labour

rights and ethical trade, which fits with the binary, socially-oriented Type 2 labels. Finally, certifications like Cradle to Cradle and Bluesign are examples of multi-criteria systems (Types 4–6), which look at environmental, social, and circular impacts all at once. So, this framework supports and justifies the categorisation strategy of the current study.

## Case Discussions

The goal of this section is to present real-world examples of companies using the sustainability certifications, as presented in the literature review, on their online listings to inform consumers about the materials that their products are made, about the working conditions of their employees, or even about the environmental initiatives that the organization is making for the planet.

To make this, a series of cases will be presented from a variety of companies, like Amazon, Patagonia, and also smaller, not well-known companies, like Pact.

Starting from Patagonia, Patagonia is known for being a leader in sustainable clothing and corporate responsibility. Its business model is all about putting the environment and society first, and it uses loads of third-party certifications to show this. They are working towards using 100% renewable energy for all our stores, offices, and distribution centres all over the world (*Environmental Responsibility Programs - Patagonia*, n.d.). This strategy is being reflected in their product listings, where sustainability certifications are visible

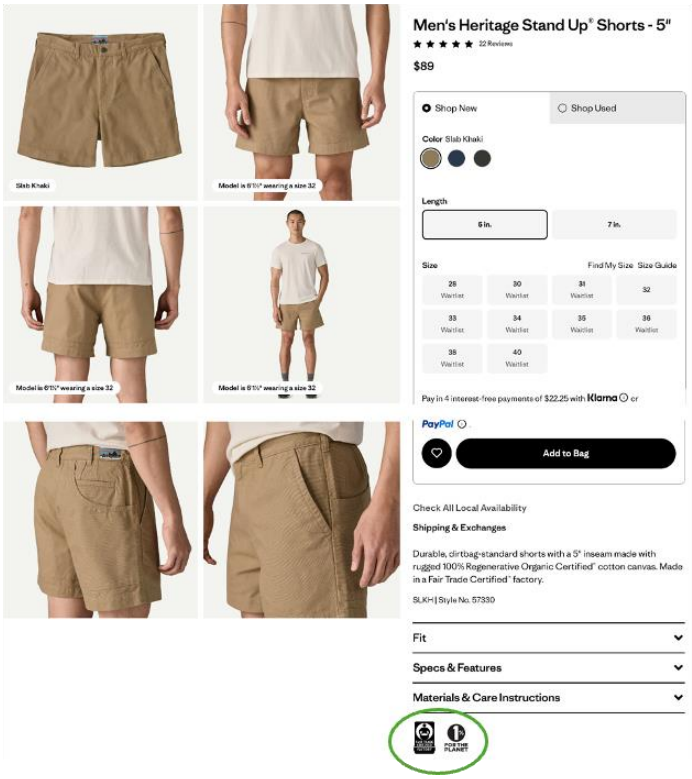


*Figure 1*

In the example above, 2 sustainability certifications are present, the first is the Fair Trade certified factory, which indicates that Patagonia provides workers in the factories with tangible benefits that can improve their lives, although they state that they don't own any factories themselves, and they have limited control over them (*Fair Trade Certified™ - Patagonia*, n.d.).

The second certification that is visible is the 1% for the planet. 1% for the Planet is a group of businesses that get how important it is to protect the natural environment. They get that profit and loss are directly linked to their health, and they're concerned about the social and environmental impacts of industry (*1% for the Planet - Patagonia*, n.d.).

This product can be considered premium, due to its price, 89 dollars, and we can see that it contains both Fairtrade certification and Organic certification, and this strategy is being analyzed in depth in the next sections.

The second real-world example of sustainability certifications comes from a giant of online retail, Amazon. Amazon represents a markedly different model from vertically integrated sustainable brands like Patagonia. As a global online marketplace, Amazon has taken steps to make sustainable fashion more discoverable and accessible through its *Climate Pledge Friendly* initiative and dedicated sustainability filters. One clear example is Amazon UK's curated collection of Cradle to Cradle Certified clothing items, which allows customers to look for products that are approved for being eco-friendly and sustainable.

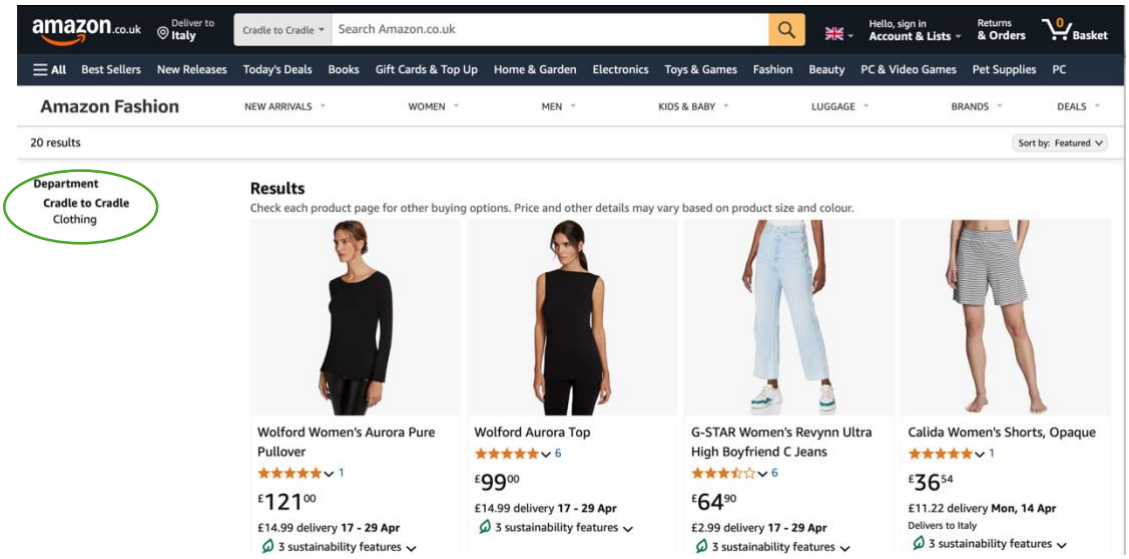


*Figure 2*

The “Cradle to Cradle” category displays garments from brands such as Wolford, G-STAR, and Calida, offering a diverse range of prices, from basic shorts at £36.54 to high-end pullovers priced above £120, clearly marked with sustainability feature icons (*Amazon.Co.Uk*, n.d.).

It's worth pointing out that the price range visible in this Cradle to Cradle category shows that certification alone doesn't automatically lead to a price premium. But it does allow for differentiation within the broader category. This will be evidence in the upcoming analysis, which found that not all certifications are seen as equal when it comes to pricing decisions.

Another example is Pact, a U.S. clothing brand that claims to prioritize ethical production and sustainability certification.

Pact isn't just talk about sustainability; they actually ensure it's done right. The brand says on its website that it's not just all talk about sustainability, it's got the certificates to prove it.

Pact's commitment is backed by three globally recognised partners: Fair Trade USA, the Global Organic Textile Standard (GOTS), and SimpliZero are all working together to create a strong sustainability framework (*Sustainability, Certified*, n.d.). Providing the company with a holistic sustainability strategy that captures all the different dimensions of sustainability certifications.

This strategy is an example of how a brand can make sustainability a part of both how they design their products and what they're offering. It shows that products with multiple certifications can be worth paying more for, not just in theory but in practice. Examples of their offerings are shown in Figure 3.

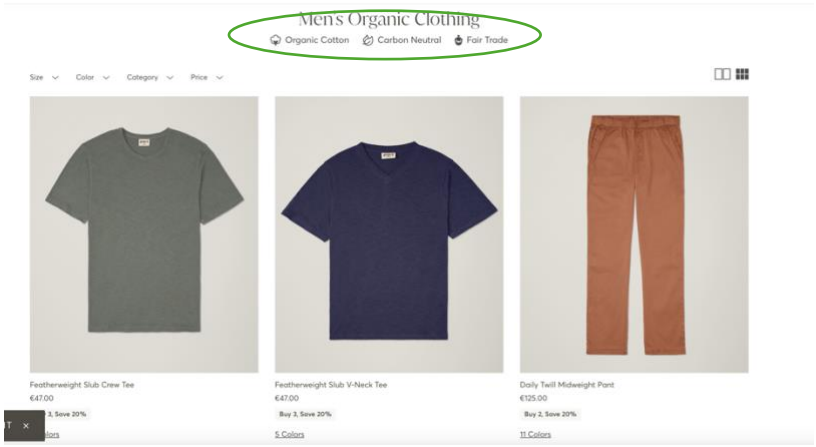


*Figure 3*

Examining Pact's product lineup reveals that their pricing strategy positions them above the average market rates for similar apparel items. For instance, while the average price of a t-shirt is 10 euros (Velthuijsen et al., 2023) while a fair price is 28 euros (Velthuijsen et al., 2023).

The premium pricing, from the retailers' point of view, is possibly due to a number of factors linked to sustainable and ethical production. Using organic cotton, following fair trade standards, and investing in carbon footprint reduction all mean that production costs go up.

These observations suggest that it should look more closely at how sustainability certifications and retail pricing work together. The next part of the analysis looks at this relationship. It uses information from real transactions to explain how certifications like Organic and Fair Trade affect how prices are set.

# Empirical Research

## Recap of Main Theoretical Elements

Building on the literature review, this study is grounded in the theory that sustainability certifications serve as market signals, reducing information asymmetry and potentially influencing consumer perceptions of value and willingness to pay (Crespi & Marette, 2005; Thøgersen et al., 2010). However, as previous research has shown, the effectiveness of these certifications is not uniform.

It may depend on factors such as the type of certification and price premiums. While prior studies have mostly focused on consumer attitudes or willingness to pay, often in the context of food products, with limited attention to actual retail pricing and the fashion industry (Bastounis et al., 2021; White, Habib, et al., 2019), and the literature highlights the risk of greenwashing and the need for credible, transparent certifications (European Commission, 2021), as well as the potential moderating roles of

product characteristics and consumer factors in shaping the economic impact of certifications(Kim et al., 2024; Nascimento & Loureiro, 2022).

## Development of Research Questions/Hypotheses

The main research question of the study is regarding sustainability certifications, more specifically: **How do the certifications' types affect the retail price of a product?**

This question can be studied in greater depth to determine which certification types have an impact on the retail price, and in which product segments this effect is observed.

The objective of this research is to improve understanding of the effectiveness of sustainability certifications by identifying specific certifications or types of certifications and in which context they can boost the retail price of a product.

This leads to a direct address of the gap identified in previous literature regarding the mixed success of sustainability certifications and their varying effectiveness across contexts. Despite the growing usage of sustainability certifications and customer demand for sustainable products, the specific relationship between the certifications and retail prices and the moderating effects of the different certification types remains unexplored. This research gap can be attributed to a lot of reasons:

First, it is not easy to access complete datasets linking product certifications to actual pricing data at scale, and this requires access to retailer databases, large-scale web scraping, or costly market research data.

Second, most of the previous studies have highlighted consumer attitudes and willingness to pay, but not actual pricing behavior in the marketplace. This is partly due to methodological difficulties in isolating the causal effect of certifications on price from other confounding factors.

Finally, even with access to pertinent data, analyzing the complex interaction of several moderators (different types of certifications) requires sophisticated statistical techniques and heavy computational power, which might have deterred previous researchers.

By addressing these questions, my research provides a new explanation of the relationship between product price and sustainability certification.

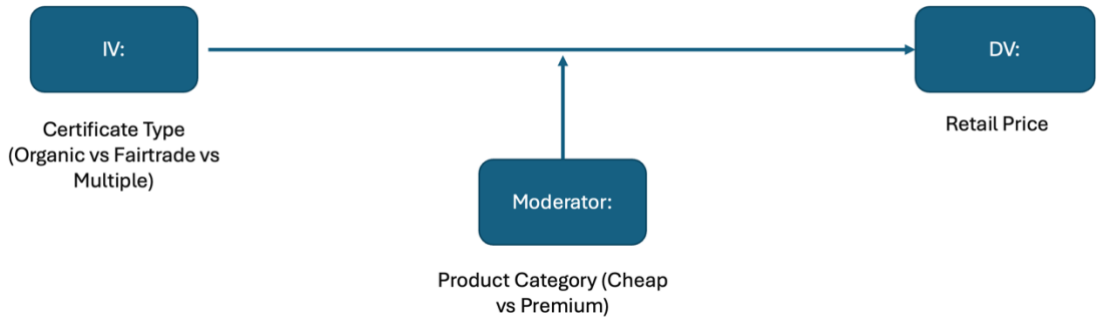


*Figure 4*

This research contributes to the literature by introducing a new element to the relationship between certification type and actual product prices for the fashion industry. Previous studies have looked at customer attitudes or willingness to pay for environmentally friendly products. This research uses actual pricing information to determine the economic impact of such certifications and their type.

This research also explains why the effect on final retail price is different across different certification types, providing firms with practical results to maximize their pricing policy and efficiently communicate customers' value regarding sustainability certification.

It is also valuable as it provides insight into the importance of the certification types, helping businesses to implement more effective and targeted pricing strategies. Moreover, this study is especially relevant in today's market, where consumers prioritize sustainability while also considering price, and where companies struggle to differentiate themselves from the crowded and potentially confusing realm of certifications.

By presenting definitive evidence of the financial worth of certifications and their connection to key product and consumer qualities, this study aims to assist businesses and consumers in making wiser and more sustainable decisions.

## Description of the Research

This study employs a mixed methods approach, combining secondary data analysis with primary experimental data. The primary focus is on a large-scale quantitative analysis, supplemented by experimental insights where relevant.

To start with the secondary data analysis, the main dataset is sourced from "GreenDB: Toward a Product-by-Product Sustainability Database" (Jäger et al., 2022), a comprehensive database that addresses

the lack of large-scale sustainability product data. Permission to use this dataset was obtained from the authors, and the data was accessed via Zenodo.

The initial dataset comprises approximately 2.5 million rows, each representing a transaction of a product purchased by a customer. Key variables include product category, gender of the customer, retail price, and the sustainability certifications associated with each product.

A secondary dataset provided by the authors contains detailed information on 319 different sustainability certifications, including their names, descriptions, and a range of sustainability aspect scores (e.g., credibility, environmental management, social responsibility), each measured on a 0–100 scale.

## Data Cleaning

The process of data cleaning and preparation was critical and challenging because the dataset contained real data, thus, the data cleaning part was crucial for the beginning of any analysis.

The initial dataset, sourced from the "GreenDB: Toward a Product-by-Product Sustainability Database", consisted of approximately 2.5 million rows, each representing a unique product transaction. This dataset included key variables such as product category, gender of the customer, retail price, and the sustainability certifications associated with each product. The first step in the cleaning process involved the removal of incomplete or irrelevant data. All rows with missing or unavailable certification information, or certifications not present in the secondary dataset, were excluded. This reduced the data to 676155 rows, thus transactions that included a product with at least one sustainable certification.

**DATA CLEANING**

```
In [7]: # One-shot cleaning to get plain comma-separated values
        df1['sustainability_labels'] = (
            df1['sustainability_labels']
            .str.strip("[]")  # remove square brackets
            .str.replace("'", "", regex=False)  # remove single quotes
            .str.split(", ")  # split into list
            .apply(lambda lst: ', '.join([item.replace("certificate:", "") for item in lst]))  # clean and re-join
        )

In [8]: # Filter out rows where sustainability_labels is 'OTHER'
        df1 = df1[df1["sustainability_labels"] != "OTHER"]

In [9]: # Filter out rows where sustainability_labels is 'UNAVAILABLE'
        df1 = df1[df1["sustainability_labels"] != "UNAVAILABLE"]

In [10]: # Filter out rows where sustainability_labels is 'UNKNOWN'
         df1 = df1[df1["sustainability_labels"] != "UNKNOWN"]
```

*Figure 5*

The next step is filtering the data to include only the following product categories: t-shirt, sweater, shoes, shirt, jacket, bag, underwear, dress, pants, and top. These categories were selected due to their high frequency in both fast fashion and sustainable fashion markets, alongside the high frequency in the existing dataset, specifically those are the top 9 categories frequently displayed in the dataset, and they

account for more than 70% of the transactions in the data, leading to a dataset with 489817 rows, eg., unique transactions of the top 9 product categories with products that contain valid sustainability certifications.

```
In [12]: valid_categories = {'TSHIRT', 'SWEATER', 'SHOES', 'SHIRT', 'JACKET', 'BAG', 'UNDERWEAR', 'DRESS', 'PANTS', 'TOP'}

In [13]: # Remove brackets and quotes
         df1['categories_clean'] = df1['categories'].str.strip("[]").str.replace("'", "", regex=False)

In [14]: # Filter rows
         df1 = df1[df1['categories_clean'].isin(valid_categories)]

         # Drop the helper column if not needed
         df1 = df1.drop(columns='categories_clean')
```

*Figure 6*

The next problem to solve in order to generate a clean dataset with real consumer transactions that will be easy to analyse and give us useful insights is to extract the product color of each transaction. The dataset already had a column named “colors” with the value of the product color displayed in the German language, but for most of the transactions, this value was missing. To handle that, the first step was to translate the German-named colors to English and then save the color name into a new column in the English language. Since most of the rows had an unknown value on the color column, the problem was still there, and to deal with it a color detection function was implemented using a comprehensive list of color names in both German and English (e.g., "schwarz", "weiß", "black", "white", etc.). The function searched for known color names within two columns of the existing dataset: name and description. The priority of detection was as follows: first from the column name, and then from the column description. Also, the re module was used for word-boundary matching to avoid partial or false positives.

Rows where a color could not be detected from any of the three sources were assigned the value "Unknown." These rows were later removed to ensure data consistency in subsequent analysis, leaving the dataset with 208412 clean and ready to use for further analysis transactions, with all the relevant information there.

**Extract Colors**

In [16]:
```python
import pandas as pd
import re

# Define color list
colors = [
    "schwarz", "weiß", "rot", "blau", "grün", "gelb", "orange", "rosa", "pink",
    "lila", "violett", "braun", "beige", "grau", "silber", "gold", "khaki",
    "türkis", "magenta", "indigo", "cyan", "oliv", "maroon", "lime", "teal",
    "navy", "coral", "lavender", "creme", "mint", "salmon", "tan", "plum",
    "black", "white", "red", "blue", "green", "yellow", "orange", "pink",
    "purple", "brown", "beige", "gray", "grey", "silver", "gold", "khaki",
    "turquoise", "magenta", "indigo", "cyan", "olive", "maroon", "lime", "teal",
    "navy", "coral", "lavender", "cream", "mint", "salmon", "tan", "plum"
]

# Function to extract color from text
def extract_color_from_text(text):
    if pd.isna(text):  # Handle missing values
        return "Unknown"

    # Convert text to lowercase for case-insensitive matching
    text = text.lower()

    # Search for color keywords
    for color in colors:
        if re.search(rf"\b{color}\b", text):  # Match whole words only
            return color

    # If no color is found
    return "Unknown"
```

*Figure 7*

In [17]:
```python
# Apply the function to the "name" and "description" columns
df1["color_from_name"] = df1["name"].apply(extract_color_from_text)
df1["color_from_description"] = df1["description"].apply(extract_color_from_text)

# Combine the results (prioritize "name" over "description")
df1["color"] = df1["color_from_name"].where(df1["color_from_name"] != "Unknown", df1["color_from_description"])
```

In [18]:
```python
german_to_english_colors = {
    "rot": "red",
    "blau": "blue",
    "grün": "green",
    "gelb": "yellow",
    "schwarz": "black",
    "weiß": "white",
    "grau": "gray",
    "rosa": "pink",
    "lila": "purple",
    "orange": "orange",
    "braun": "brown",
    "beige": "beige",
    "silber": "silver",
    "gold": "gold",
    "türkis": "turquoise",
    "marineblau": "navy blue",
}
```

In [19]:
```python
# Translate only German colors
df1["color"] = df1["color"].apply(
    lambda x: german_to_english_colors.get(x, x))
```

*Figure 8*

The next step is to extract the number of certifications that each product has. This part is essential since the IV of the conceptual model is based on this number; the information needed was embedded in the already existing column of the dataset, named sustainability_labels, where multiple certifications were listed as comma-separated strings. To quantify this information for each transaction, a new variable named Number_of_certificates was created. This variable represents the count of certifications per product, computed by counting the number of comma delimiters in the sustainability_labels string and adding one, under the assumption that each certification is separated by a comma. For example, in the product whose value under the sustainability_labels is LEATHER_WORKING_GROUP, OTHER, we can observe one comma; thus, the number of certifications for this product is 1+1=2. To make sure the data was as accurate as possible, any rows with missing or empty certification values had already been

removed during the previous step of the data cleaning process. So, this calculation was only used for entries where there was at least one valid certification.

**Count the nuber of sustainability certifications**

```
In [24]: # Strip whitespace and count the number of certificates per row
df1['Number_of_certificates'] = df1['sustainability_labels'].apply(
    lambda x: len(x.split(',')) if isinstance(x, str) else 0
)
```

*Figure 9*

To better understand the distribution of sustainability certifications among the product transactions, a frequency analysis was conducted on the newly created Number_of_certificates variable. This allowed identification of how many unique certification count values existed (e.g., 1, 2, 3, etc.) and how many transactions corresponded to each value. This step provides an overview of how widely sustainability certifications are applied per product in the dataset and supports further segmentation analysis.

- Transactions with one certificate: 205726
- Transactions with two certificates: 2433
- Transactions with three certificates: 210
- Transactions with four certificates: 36
- Transactions with five certificates: 7

As shown in the distribution of the Number_of_certificates variable, the overwhelming majority of product transactions in the dataset are associated with only one sustainability certification (295,726 transactions). A much smaller share includes two certifications (2,433 transactions), and only a marginal portion includes three (210), four (36), or five (7) certifications. This is probably happening due to the cost and complexity of obtaining a certificate.

To maintain the reliability and interpretability of the analysis, in the first analysis, as it is described later in this paper, the data were restricted to transactions with one, two, or three sustainability certifications. Products with four or five certifications were excluded due to their very small sample sizes (n=36 and n=7, respectively), which could make statistical analysis less reliable and lead to more confusion than useful information.

To prepare the dataset for statistical analysis, the variable gender, which in this case refers to the intended gender of the product rather than the consumer, was recoded into numerical values.

Specifically, products targeted at female consumers were assigned the value 1, those for males were coded as 0, and unisex products were assigned the value 2. This transformation facilitates easier use of the variable in regression models and other numerical analyses, allowing gender effects to be more systematically examined across different sustainability and pricing levels.

**Gender**

```
In [31]: # Recode gender values
df1['gender'] = df1['gender'].map({
    'FEMALE': 1,
    'MALE': 0,
    'UNISEX': 2
})
```

*Figure 10*

To get a better idea of product pricing on sustainable products, each item in the product dataset is categorised into one of three groups: cheap, premium, or neither. This was based on the price of the item in relation to other items in the same category. This approach made it easy to compare prices across categories (like shoes and t-shirts) because it took the price differences into account. I calculated the first (25th quartile) and third quartiles (75th quartile) of the price distribution for each category.

Products that cost less than the first quartile were labelled as cheap, while those that cost more than the third quartile were put in the premium category. Anything that didn't fit neatly into either category just didn't get assigned to either one.

**Price categorization**

```
In [57]: # Initialize the new columns with 0
df1['cheap'] = 0
df1['premium'] = 0
```

```
In [59]: # Group by each category and apply quantile logic
for category in df1['categories'].unique():
    # Filter the rows for this category
    cat_mask = df1['categories'] == category
    prices = df1.loc[cat_mask, 'price']

    # Calculate Q1 and Q3
    q1 = prices.quantile(0.25)
    q3 = prices.quantile(0.75)

    # Assign values based on quartiles
    df1.loc[cat_mask & (df1['price'] <= q1), 'cheap'] = 1
    df1.loc[cat_mask & (df1['price'] >= q3), 'premium'] = 1
```

```
In [62]: # Make sure 'cheap' and 'premium' are mutually exclusive
df1.loc[df1['cheap'] == 1, 'premium'] = 0
```

*Figure 11*

## Categorization

Parallel to the product dataset, we used a second dataset, as presented above, containing metadata on various sustainability certifications.

This dataset included a range of numeric attributes, scored from 0 to 100, across environmental and social dimensions, for example:

- **Environmental indicators**: eco chemicals, eco lifetime, eco water, eco inputs, eco quality, eco energy, eco waste air, eco environmental management

- **Social indicators**: social labour rights, social business practice, social rights, social company responsibility, social conflict minerals

Each row in the second dataset represents a unique certification label, with associated scores reflecting the extent to which it addresses each sustainability dimension. These numerical scores were interpreted as the degree of emphasis or performance within the respective domain. In addition to the scores, the dataset has a description column where each certification is described in the German language again.

For clarity and accessibility, especially considering an international academic context, all values in this column were translated into English using the Google Translate module from the deep_translator library.

```
In [38]: from deep_translator import GoogleTranslator

         # Translate each description from German to English
         df2['description_en'] = df2['description'].apply(
             lambda text: GoogleTranslator(source='de', target='en').translate(text) if pd.notnull(text) else text
         )
```

*Figure 12*

A new column, description_en, was created to store these translated descriptions. After confirming the integrity of the translation, the original German-language column was dropped. A critical part of the analysis involved classifying each certification into one of three distinct categories:

- Organic labels
- Fairtrade labels
- Multi-Criteria labels

To accomplish this, a rule-based classification function was applied based on the certification scores, as long as a manual check was performed based on the description column of each certification.

The initial thresholds and variables used were as follows:

- A label was categorized as an Organic label if it scored higher than 60 in at least one of these environmentally focused categories
- A label was categorized as a Fairtrade label if it scored above 60 in at least one of the socially focused categories.
- If a certification met the criteria for both Organic and Fairtrade, it was classified exclusively as a Multi-Criteria label, and not included in the other two groups to avoid overlap.
- Certifications that did not meet any of the thresholds remained unclassified.

Then I manually check the output to make adjustments based on the description of each certificate and not based on the scores of each element. The check was done only on the certifications that appeared in the first dataset, the real consumer transactions, and not in all 319 certifications that are available on the second dataset.

**CATEGORIZATION**

In [33]:
```
# Define the thresholds (you can adjust as needed)
def classify_label(row):
    organic_criteria = (
        row['eco_inputs'] > 60 or
        row['eco_chemicals'] > 60 or
        row['eco_lifetime'] > 60
    )
    fairtrade_criteria = (
        row['social_labour_rights'] > 60 or
        row['social_business_practice'] > 60 or
        row['social_social_rights'] > 60
    )

    if organic_criteria and fairtrade_criteria:
        return pd.Series([0, 0, 1], index=['Organic label', 'Fairtrade label', 'Multi-Criteria label'])
    elif organic_criteria:
        return pd.Series([1, 0, 0], index=['Organic label', 'Fairtrade label', 'Multi-Criteria label'])
    elif fairtrade_criteria:
        return pd.Series([0, 1, 0], index=['Organic label', 'Fairtrade label', 'Multi-Criteria label'])
    else:
        return pd.Series([0, 0, 0], index=['Organic label', 'Fairtrade label', 'Multi-Criteria label'])
```

In [34]:
```
# Apply classification
df2[['Organic label', 'Fairtrade label', 'Multi-Criteria label']] = df2.apply(classify_label, axis=1)
```

In [35]:
```
# Keep only desired columns
df2 = df2[['id', 'name', 'description', 'Organic label', 'Fairtrade label', 'Multi-Criteria label']]
```

*Figure 13*

The outcome was:

Out of the 48 different Sustainability Certifications

- 21 Certificates categorised as Organic
- 7 Certificates categorised as Fairtrade
- 9 Certificates categorised as Multi-Criteria label
- And 11 can’t be categorised into any of the categories due to missing information or because they don’t fit any of the two main categories (Organic and Fairtrade)

This transformation made it easier to understand the scope and focus of each certification. For example, well-known labels such as GOTS (Global Organic Textile Standard) did well on environmental metrics but didn't cover labour or business practice domains, sois categorised as Organic. On the other hand, the Fair Trade International certification scored well on the element associated with the Fairtrade category and has been categorised accordingly. While some certifications scored high on both thresholds, for example, Cradle to Cradle certification, and thus is categorised as a Multi-Criteria label.

After completing the categorization of certifications into the three groups, Organic, Fairtrade, and Multi-Criteria, based on the second dataset containing certification-level metadata, this classification was applied to the main product dataset.

Each row in the main dataset represents a unique product, with a column listing one or more associated sustainability certifications.

To link the certification classification to the product level, a transformation was performed: each unique certification name in the main dataset was matched to its corresponding category based on the earlier classification.

Three new binary columns were created: *Organic*, *Fairtrade*, and *Multi-Criteria*, giving a value of 1 if the product held at least one certification belonging to the respective category, and 0 otherwise.

```
In [53]: # Categorization dictionary from the list
         cert_category = {
             'CRADLE_TO_CRADLE':              {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'IVN_NATURTEXTIL':               {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'GOOD_CASHMERE_STANDARD':        {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'RECYCLED_CLAIM_STANDARD_BLENDED':{'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'NORDIC_SWAN_ECOLABEL':          {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'CRADLE_TO_CRADLE_SILVER':       {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'GLOBAL_RECYCLED_STANDARD':      {'Organic': 0, 'Fairtrade': 1, 'Multi_Criteria': 0},
             'RECYCLED_CLAIM_STANDARD_100':   {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'GOTS_ORGANIC':                  {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'FAIRTRADE_INTERNATIONAL':       {'Organic': 0, 'Fairtrade': 1, 'Multi_Criteria': 0},
             'CRADLE_TO_CRADLE_GOLD':         {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'RESPONSIBLE_DOWN_STANDARD':     {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'REGENERATIVE_ORGANIC':          {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'OEKO_TEX_100':                  {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'BLUE_ANGEL':                    {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'BLUESIGN_APPROVED':             {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'FOREST_STEWARDSHIP_COUNCIL':    {'Organic': 0, 'Fairtrade': 1, 'Multi_Criteria': 0},
             'GREEN_BUTTON':                  {'Organic': 0, 'Fairtrade': 1, 'Multi_Criteria': 0},
             'GOTS_MADE_WITH_ORGANIC_MATERIALS': {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'RESPONSIBLE_WOOL_STANDARD':     {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'BIORE':                         {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'FAIRTRADE_COTTON':              {'Organic': 0, 'Fairtrade': 1, 'Multi_Criteria': 0},
             'EU_ECOLABEL':                   {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'FAIRTRADE_TEXTILE_PRODUCTION':  {'Organic': 0, 'Fairtrade': 1, 'Multi_Criteria': 0},
             'EU_ENERGY_LABEL_G':             {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'EU_ENERGY_LABEL_F':             {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'HIGG_INDEX_MATERIALS':          {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'COTTON_MADE_IN_AFRICA':         {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'LEATHER_WORKING_GROUP':         {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'EU_ECOLABEL_TEXTILES':          {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'CRADLE_TO_CRADLE_PLATINUM':     {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'BLUESIGN_PRODUCT':              {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'NATRUE':                        {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'EU_ORGANIC':                    {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'ECOCERT':                       {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'CLIMATE_NEUTRAL_CLIMATE_PARTNER': {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'BETTER_COTTON_INITIATIVE':      {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'MADE_IN_GREEN_OEKO_TEX':        {'Organic': 0, 'Fairtrade': 1, 'Multi_Criteria': 0},
             'RAINFOREST_ALLIANCE':           {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'ORGANIC_CONTENT_STANDARD_100':  {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'CARBON_NATURAL_CERTIFIED_SCS':  {'Organic': 0, 'Fairtrade': 0, 'Multi_Criteria': 1},
             'CRADLE_TO_CRADLE_BRONZE':       {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'MM_CONSCIOUS':                  {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': 0},
             'ORGANIC_CONTENT_STANDARD_BLENDED': {'Organic': 1, 'Fairtrade': 0, 'Multi_Criteria': Zo
         }

In [54]: # Initialize the new columns
         df1['Organic'] = 0
         df1['Fairtrade'] = 0
         df1['Multi_Criteria'] = 0

         # For each row, check which certifications apply
         for cert in cert_category:
             if cert in df1.columns:
                 df1['Organic'] = df1['Organic'] | (df1[cert] & cert_category[cert]['Organic'])
                 df1['Fairtrade'] = df1['Fairtrade'] | (df1[cert] & cert_category[cert]['Fairtrade'])
                 df1['Multi_Criteria'] = df1['Multi_Criteria'] | (df1[cert] & cert_category[cert]['Multi_Criteria'])
```

*Figure 14*

This allowed each product to be evaluated in terms of its sustainability focus. As a result, the main dataset now includes:

- 129,678 Organic products
- 39,876 Fairtrade products
- 38,432 Multi-Criteria products

## Log price

Lastly, to deal with the issue of extreme price values, a natural logarithmic transformation to the price variable in the product dataset was applied. Log transformation is a common technique used to reduce right-skewness and normalise data distributions, especially when dealing with numerical values that are very spread out. Before the change, zero or negative price entries were treated as missing values to avoid math errors, since the logarithm of non-positive numbers is undefined.

**LOG PRICES**

```
In [68]: import numpy as np

In [72]: # Replace zero or negative prices with NaN to avoid log issues
         df1['price'] = df1['price'].replace(0, np.nan)
         df1['price'] = np.log(df1['price'])
```

*Figure 15*

## ANOVA

In the initial phase of the analysis, an ANOVA test was conducted between the three main categories of the sustainability certifications included in the dataset. The objective of the present analysis was to examine whether the presence of each specific certification type is associated with a statistically significant difference in product price compared to the other certification types.

The following hypothesis was tested:

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$ At least one pair of means is different from each other

Where:

- $\mu_1$ = mean retail log price of products containing only Organic certification (s)
- $\mu_2$ = mean retail log price of products containing only Fairtrade certification (s)
- $\mu_3$= mean retail log price of products containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Log Price* |
|---|---|---|
| Organic | 129678 | 3,79 |
| Fairtrade | 39398 | 3,80 |
| Multi-Criteria | 38192 | 4,69 |
| Total | 207268 | 3,95 |

*Figure 16*

*Table: ANOVA*

| *Sustainability Label* | *Sum of Squares* | *df* | *Mean Square* | *F* | *Significance* |
|---|---|---|---|---|---|
| Between Groups | 24989,48 | 2 | 12494,74 | 33496,75 | < 0,001 |
| Within Groups | 77312,66 | 207265 | ,373 | | |
| Total | 102302,15 | 207267 | | | |

*Figure 17*

The ANOVA results showed that the three segments had a statistically significant difference in price level (F = 33496,75 ; p < 0,005). This means that we can reject the null hypothesis and conclude that there is at least one pair of means is different from each other.

To find out in which of the three pairs the difference is evident and the direction of the effect, a post hoc analysis is being used. At this time, a Bonferroni post hoc analysis is being selected.

*Table: Bonferroni Post Hoc*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -0,085 | 0,046 |
| Organic | Multi-criteria | -0,897 | < 0,001 |
| Fair Trade | Multi - Criteria | -0,889 | < 0,001 |

*Figure 18*

The Bonferroni post hoc analysis conducted following the ANOVA reveals significant differences in retail pricing among products with different types of sustainability certification. The results indicate a hierarchical pricing structure across the three certification categories. Products with multi-criteria certifications have significantly higher retail prices compared to both organic-certified products (mean difference = 0.897, p < 0.001) and fair trade-certified products (mean difference = 0.889, , p < 0.001).

Furthermore, fair trade-certified products are priced significantly higher than organic-certified products (mean difference = -0.085, p = 0.046), although the difference is not that big.

These findings suggest that multi-dimensional sustainability certifications that address both environmental and social criteria at the same time are associated with the most price advantages.

The reason for selecting Bonferroni as the post hoc analysis is that this method can test complex pairs and is used to test differences among experimental groups as well as between experimental and control groups (McHugh, 2011). The disadvantage of this method is that it requires equal-sized groups (McHugh, 2011), and in this case, only 2 out of the 3 groups are equal. To support this argument, a Test of Homogeneity of Variances is being utilized with the following hypothesis:

$$H_0: \sigma_1^2 = \sigma_2^2 = \sigma_3^2$$

$$H_1: At\ least\ one\ of\ \sigma_i^2\ is\ different\ from\ the\ others, for\ i = (1,2,3)$$

Where:

- $\sigma_i^2$ represents the variance of population i.

*Table: Test of Homogeneity of Variances*

| *Price* | *Lavene statistic* | *Significance* |
|---|---|---|
| Based on Mean | 4971,95 | < 0,001 |
| Based on Median | 4522,21 | < 0,001 |
| Based on Median and with adjusted df | 452,22 | < 0,001 |
| Based on trimmed mean | 4839,83 | < 0,001 |

*Figure 19*

With the above outcome, we can reject the null hypothesis. Thus, we cannot conclude that all population variances are equal.

To deal with that, Games-Howell post hoc analysis is utilized, with the following outcome

*Table: Games-Howell Post Hoc*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -0,085 | 0,101 |
| Organic | Multi-criteria | -0,897 | < 0,001 |
| Fair Trade | Multi - Criteria | -0,889 | < 0,001 |

*Figure 20*

The difference from the Bonferroni test is that here the mean difference of Organic and Fairtrade is not statistically significant, and we can only conclude that products containing multiple criteria certifications are the only ones with the highest statistically significant retail prices.

In order to draw more in-depth conclusions about the mean retail price differences between the three groups, the statistical analysis of the T-test is being utilized in the next step of the analysis.

## T-Test

In the next phase of the analysis, individual independent-sample t-tests were conducted for each of the sustainability certifications included in the dataset. The objective of the present analysis was to examine whether the presence of each specific certification is associated with a statistically significant difference in product price. To this end, the log-transformed price variable was employed in order to control for skewness and ensure interpretability.

For each of the 48 different Sustainability Certifications, the following hypothesis was tested:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Where:

- $\mu_1$ represents the mean retail price of the products containing only the certification tested each time.
- $\mu_2$ represents the mean retail price of the products containing all the other certifications except the one that was tested at that time.

The results demonstrated a clear pattern: the majority of certifications were associated with statistically significant price differences, frequently at very high levels of significance ($p < 0.01$).

However, the direction of the effect was not the same for all the certifications. For example, products certified with the Responsible Down Standard, Cradle to Cradle Gold, or Bluesign Approved were found to be associated with substantially higher log prices compared to the products without those certifications, indicating a premium effect.

In contrast, certifications such as the Better Cotton Initiative and Rainforest Alliance were linked to significantly lower prices, suggesting a possible value perception gap or perhaps a broader difference in the product categories to which these certifications are present.

These findings show how complicated it is to link sustainability certifications with market value. Some certifications might be seen as a sign of quality or that a company is sustainable, which could mean they can charge more. But some labels, especially the ones that are more popular or have less strict rules about who can use them, might not be worth more money. These labels could be more common for items that are made to be sold to everyone and not just a few people.

The individual t-test approach gives us some useful initial insights, showing where certification presence is linked to pricing outcomes. But this method treats each label separately, without thinking about how many certifications are linked in ideas or how they work. For example, some certifications focus on organic content (like GOTS Organic, EU Organic, and OCS 100), some are all about fair labour conditions (Fairtrade Cotton, Fairtrade Textile Production), and others aim to cover a lot of different sustainability aspects, including the ecological, social, and safety aspects (like Bluesign, Cradle to Cradle, and OEKO-TEX).

To solve this problem, the analysis looks at the bigger picture by putting certifications into three main groups: organic, fair, and multi-dimensional. This way of classifying them means we can get a better overall picture of how different types of sustainability stories affect pricing.

The idea is that while the market may react differently to individual certifications, it may show more consistent behaviour when certifications are grouped according to the type of sustainability value they promote. The upcoming T-test analysis uses these three categories as grouping variables to see if products with organic, fair, or multi-dimensional certifications are priced differently compared to products without such certifications. Thus, the Dependent Variables are the three main categories (organic, fairtrade, and multicriteria certifications), while the Independent Variable is the retail price of the product, and this leads to three different T-Test analyses.

*Organic Products*

The two hypotheses that are studied in the first analysis are the following:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Where:

- $\mu_1$ represents the mean retail price of the products containing only Organic certification(s).
- $\mu_2$ represents the mean retail price of the products containing only Fairtrade certification(s) or only Multi-criteria certification(s).

*Table: Descriptives*

| *Organic* | *N* | *Mean Log Price* |
|---|---|---|
| 0 | 78734 | 4,25 |
| 1 | 129678 | 3,79 |

*Figure 21*

From the descriptive statistics, we can see a clear difference between the means of the two versions. Specifically, products which contain only Fairtrade certification(s) or only Multi-criteria certifications have a higher retail log price of 0,46, which means that products, on average, have a retail price of 12% more when they only contain Fairtrade certification(s) or only Multi-criteria certifications compared to when they contain only organic certification(s). However, this does not guarantee any significant statistical difference. Thus, we are moving on to the T-Test.

*Table: T-Test*

| | *F* | *Significance* | *Significance Two-Sided p* |
|---|---|---|---|
| Equal values assumed | 27623,15 | <0,001 | <0,001 |
| Equal values not assumed | | <0,001 | <0,001 |

*Figure 22*

The first step to interpret is the Levene's Test for Equality of Variances, since the significance level on this test is less than 0,001 and is lower than the significance level of 0,05, we can conclude that there's a significant difference between the variances. That's why we will look at and interpret the first row (Equal variances assumed) to test our hypotheses. With equal variances assumed, the two-sided p-value (0.001) is smaller than the significance level (0.05).

Indicating that there is a statistically significant difference in the mean retail price of the products containing only Organic certification(s) and the products containing only Fairtrade certification(s) or only Multi-criteria certifications.

Thus, we can reject the null hypothesis H0 and conclude that the mean retail price of the products containing only Fairtrade certification(s) or only Multi-criteria certifications is on average 12,1% higher than the mean retail price of the products containing only Organic certification(s).

*Fairtrade Products*

The two hypotheses that are studied in the first analysis are the following:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Where:

- $\mu_1$ represents the mean retail price of the products containing only Fairtrade certification(s).
- $\mu_2$ represents the mean retail price of the products containing only Organic certification(s) or only Multi-criteria certification(s).

*Table: Descriptives*

| *Fairtrade* | *N* | *Mean Log Price* |
|---|---|---|
| 0 | 168536 | 4,00 |
| 1 | 39876 | 3,79 |

*Figure 23*

From the descriptive statistics, we can see a difference between the means of the two versions. Specifically, products which contain only Organic certification(s) or only Multi-criteria certifications have a higher retail log price of 0,21, which means that products, on average, have a retail price of 5,5% more when they only contain Organic certification(s) or only Multi-criteria certifications compared to when

they contain only Fairtrade certification(s). However, this does not guarantee any significant statistical difference. Thus, we are moving on to the T-Test.

*Table: T-Test*

| | *F* | *Significance* | *Significance Two-Sided p* |
|---|---|---|---|
| Equal values assumed | 1323,29 | <0,001 | <0,001 |
| Equal values not assumed | | <0,001 | <0,001 |

*Figure 24*

Also here, the first step to interpret is the Levene's Test for Equality of Variances, since the significance level on this test is less than 0,001 and is lower than the significance level of 0,05, we can conclude that there's a significant difference between the variances. That's why we will look at and interpret the first row (Equal variances assumed) to test our hypotheses. With equal variances assumed, the two-sided p-value (0.001) is smaller than the significance level (0.05).

Indicating, also in that case, that there is a statistically significant difference in the mean retail price of the products containing only Fairtrade certification(s) and the products containing only Organic certification(s) or only Multi-criteria certifications.

Thus, we can reject the null hypothesis H0 and conclude that the mean retail price of the products containing only Organic certification(s) or only Multi-criteria certifications is on average 5,5% higher than the mean retail price of the products containing only Fairtrade certification(s).

*Multi-criteria Products*

The two hypotheses that are studied in the first analysis are the following:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 \neq \mu_2$$

Where:

- $\mu_1$ represents the mean retail price of the products containing only Multi-criteria certification(s).
- $\mu_2$ represents the mean retail price of the products containing only Organic certification(s) or only Fairtrade certification(s).

*Table: Descriptives*

| *Multi-criteria* | *N* | *Mean Log Price* |
|---|---|---|
| 0 | 169980 | 3,80 |
| 1 | 38432 | 4,68 |

*Figure 25*

Here, the output is changing direction because, from the descriptive statistics, we can see a difference between the means of the two versions. Specifically, products which contain only Multi-criteria certifications have a higher retail log price of 0,88, which means that products, on average, have a retail price of 23,1% more when they only only Multi-criteria certifications compared to when they contain only Fairtrade certification(s) or only Organic certification(s). However, this does not guarantee any significant statistical difference. Thus, we are moving on to the T-Test.

*Table: T-Test*

| | *F* | *Significance* | *Significance Two-Sided p* |
|---|---|---|---|
| Equal values assumed | 208410 | <0,001 | <0,001 |
| Equal values not assumed | | <0,001 | <0,001 |

*Figure 26*

Also here, the first step to interpret is the Levene's Test for Equality of Variances, since the significance level on this test is less than 0,001 and is lower than the significance level of 0,05, we can conclude that there's a significant difference between the variances. That's why we will look at and interpret the first row (Equal variances assumed) to test our hypotheses. With equal variances assumed, the two-sided p-value (0.001) is smaller than the significance level (0.05).

Indicating, also in that case, that there is a statistically significant difference in the mean retail price of the products containing only Multi-criteria certification(s) and the products containing only Organic certification(s) or only Fairtrade certification(s).

Thus, we can reject the null hypothesis H0 and conclude that the mean retail price of the products containing only Multi-criteria certification(s) is on average 23,1% higher than the mean retail price of the products containing only Fairtrade certification(s) or only Organic certification(s).

## Interaction Analysis

In the next phase of the analysis, a moderation model was applied to explore whether the presence of Fairtrade certifications influences the effect that Organic certifications have on product price. Specifically, using the PROCESS macro Model 1 developed by Hayes (2013), an interaction analysis was conducted with Organic as the independent variable (X), Fairtrade as the moderator (Mod), and the log-transformed retail price of the product as the dependent variable (Y) (Hayes, 2013).

This statistical approach allows for the testing of conditional effects, meaning it studies whether the relationship between Organic certifications and retail Price is dependent on the presence or absence of Fairtrade certifications. In practice, this analysis allows us to answer whether having both types of certifications together results in a different pricing pattern than having only Organic or only Fairtrade certifications. This doesn't mean having tw certifications (one for Organic and one for Fairtrade), there are multiple examples of one single certification that combines Organic and Fairtrade characteristics into only one certificate.

In order to perform Moderation Analysis, the PROCESS macro is utilized, and Model 1 is selected.

The outcome of the analysis is the following:

*Table: Interaction*

| *Predictor* | *B* | *SE* | *t* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|---|
| Constant | 4,7061 | 0,031 | 1521,93 | <0,01 | 4,700 | 4,712 |
| Organic | 0,9126 | 0,035 | -268,40 | <0,01 | -0,9195 | -0,9057 |
| Fairtrade | -0,905 | 0,044 | -207,03 | <0,01 | -0,9139 | -0,8956 |
| Organic X Fairtrade | 0,6514 | 0,284 | 22,90 | <0,01 | 0,5957 | 0,7072 |

*Figure 27*

In order to understand if the moderator "Fair" has an effect on the Log retail price, the significance level of the Fair variable is examined.

The figure above demonstrates that the moderator "Fair" has a statistically significant impact on the dependent variable (Log retail price) since its p-value (0.000) is smaller than the significance level (0.05).

Once the moderator is significant, the Interaction Effects (Organic * Fair → Price) need to be interpreted to understand the conditions under which the effect of Organic certification (IV) on Log Retail Price (DV) changes intensity and/or sign.

Firstly, from the Figure above, it is observed that the significance of the Interaction effect (Int_1), where the p-value (0.000) is smaller than the significance level (0.05), indicating that the Interaction effect is significant.

Therefore, it is concluded that the effect of the Organic certification on Log Retail Price (DV) depends and changes according to the existence of Fairtrade certification.

To easily interpret the intensity and sign of the effect, the beta coefficient values are written in the equation.

$$Log\ Price = \beta_0 + \beta_1 Organic + \beta_2 Fairtrade + \beta_3 Organic\ Fairtrade + \varepsilon$$

$$Log\ Price = 4{,}7061 - 0{,}9126 * Organic - 0{,}905 * Fairtrade + 0{,}6514 * Organic * Fairtrade$$

*Table: Moderator*

| *Fairtrade* | *Effect* | *SE* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|
| 0 | -0,9626 | 0,035 | <0,001 | -0,9195 | -0,9057 |
| 1 | -0,2612 | 0,0282 | <0,001 | -0,3165 | -0,2058 |

*Figure 28*

As for the levels of moderation, from Figure 28, it is observed that Since the confidence interval [–0.9195, –0.9057] for the moderator Fairtrade with value 0 (i.e., products not certified as Fairtrade) does not include 0 and the effect is strongly negative (–0.9126), this effect is considered to be statistically significant. This indicates that when a product is only Organic-certified, it tends to be associated with a lower log price.

Similarly, for Fairtrade with value 1 (i.e., products that do carry the Fairtrade certification), the confidence interval [–0.3165, –0.2059] also excludes 0, and the effect (–0.2612) remains statistically significant, though notably weaker.

Therefore, it is concluded that while Organic certification alone is associated with a price decrease, this negative effect is significantly reduced when a product also carries a Fairtrade label.

This implies that consumers or retailers may perceive the combination of Organic and Fairtrade certifications as delivering more value than Organic alone.

## Additional Interaction Analysis

To further explore how sustainability certifications interact with perceived product value in influencing price outcomes, a second series of moderation analyses was conducted.

In these models, the three main certification categories, Organic, Fairtrade, and Multi-Criteria, were each used as independent variables (IVs) in turn, while product value (operationalized as a dummy variable between premium and cheap products) served as the moderator. The dependent variable remained the log-transformed retail price.

So, the idea here is to see if sustainability certifications affect product pricing differently depending on whether a product is positioned as high-end or budget-friendly.

This approach helps to understand how certifications work in different price ranges, and whether sustainability certifications are more valuable in premium products or lower-priced ones.

### Organic – Cheap

The first combination studied is the products containing only organic-related certification(s) categorized as cheap. Again, the PROCESS macro is utilized, and Model 1 is selected (Hayes, 2013).

The outcome of the analysis is the following:

*Table: Interaction*

| *Predictor* | *B* | *SE* | *t* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|---|
| Constant | 4,6159 | 0,0082 | 564,02 | <0,01 | 4,6008 | 4,6311 |
| Organic | -0,6636 | 0,0084 | -78,82 | <0,01 | -0,6801 | -0,6472 |
| Cheap | -1,3039 | 0,0084 | -154,42 | <0,01 | -1,3203 | -1,2875 |
| Organic X Cheap | 0,6485 | 0,0115 | 56,37 | <0,01 | 0,6259 | 0,6711 |

*Figure 29*

In order to understand if the moderator “Cheap” has an effect on the Log retail price, the significance level of the Cheap variable is examined.

The figure above demonstrates that the moderator "Cheap" has a statistically significant impact on the dependent variable (Log retail price) since its p-value (0.000) is smaller than the significance level (0.05).

Once the moderator is significant, the Interaction Effects (Organic * Cheap → Price) need to be interpreted to understand the conditions under which the effect of Organic certification (IV) on Log Retail Price (DV) changes intensity and/or sign.

Firstly, from Figure 29, it is observed that the significance of the Interaction effect (Int_1), where the p-value (0.000) is smaller than the significance level (0.05), indicating that the Interaction effect is significant.

Therefore, it is concluded that the effect of the Organic certification on Log Retail Price (DV) depends and changes according to the type of the product, cheap or not cheap.

To easily interpret the intensity and sign of the effect, the beta coefficient values are written in the equation.

$$Log\ Price = \beta_0 + \beta_1 Organic + \beta_2 Cheap + \beta_3 Organic\ Cheap + \varepsilon$$

$$Log\ Price = 4{,}6159 - 0{,}6636 * Organic - 1{,}3039 * Cheap + 0{,}6485 * Organic * Cheap$$

*Table: Moderator*

| *Cheap* | *Effect* | *SE* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|
| 0 | -0,6639 | 0,0028 | <0,001 | -0,6690 | -0,6582 |
| 1 | -0,0151 | 0,0046 | <0,001 | -0,0242 | -0,0061 |

*Figure 30*

As for the levels of moderation, from Figure 30, it is observed that Since the confidence interval [–0.669, –0.6582] for the moderator Cheap with value 0 (i.e., products not categorised as cheap) does not include 0 and the effect is strongly negative (–0.6639), this effect is considered to be statistically significant. This indicates that when a product is only Organic-certified and is not cheap, it tends to be associated with a significant decrease in the log price, all other variables constant.

Similarly, for Cheap with value 1 (i.e., products that are categorised as cheap), the confidence interval [–0,0242, –0.0061] also excludes 0, and the effect (–0.0151) remains statistically significant.

However, the negative effect (–0.2030) is substantially smaller in magnitude compared to the effect when Cheap equals 0.

This suggests that for lower-priced products, organic certification still results in a decrease in price, but the effect is less strong.

It is evident that the impact of organic labelling on price appears to be moderated by product value. Stronger price reductions are evident among non-cheap products, while a weaker effect is observed among cheap products.

## Organic – Premium

The second combination studied is the products containing only organic-related certification(s) categorized as premium. Again, the PROCESS macro is utilized, and Model 1 is selected (Hayes, 2013).

The outcome of the analysis is the following:

*Table: Interaction*

| *Predictor* | *B* | *SE* | *t* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|---|
| Constant | 3,9247 | 0,0023 | 1699,47 | <0,01 | 3,9202 | 3,9293 |
| Organic | -0,3916 | 0,0030 | -101.44 | <0,01 | -0,3874 | -0,2957 |
| Premium | 1,1916 | 0,0044 | 269.58 | <0,01 | 1,1830 | 1,2002 |
| Organic X Premium | -0,6479 | 0,0055 | -117.18 | <0,01 | -0,6587 | -0,6370 |

*Figure 31*

In order to understand if the moderator “Premium” has an effect on the Log retail price, the significance level of the Premium variable is examined.

The figure above demonstrates that the moderator “Premium” has a statistically significant impact on the dependent variable (Log retail price) since its p-value (0.000) is smaller than the significance level (0.05).

Once the moderator is significant, the Interaction Effects (Organic * Premium → Price) need to be interpreted to understand the conditions under which the effect of Organic certification (IV) on Log Retail Price (DV) changes intensity and/or sign.

Firstly, from Figure 31, it is observed that the significance of the Interaction effect (Int_1), where the p-value (0.000) is smaller than the significance level (0.05), indicating that the Interaction effect is significant.

Therefore, it is concluded that the effect of the Organic certification on Log Retail Price (DV) depends and changes according to the type of the product, premium or no premium.

To easily interpret the intensity and sign of the effect, the beta coefficient values are written in the equation.

$$Log\ Price = \beta_0 + \beta_1 Organic + \beta_2 Premium + \beta_3 Organic\ Premium + \varepsilon$$

$$Log\ Price = 3{,}947 - 0{,}3016 * Organic + 1{,}1906 * Premium - 0{,}6479 * Organic * Premium$$

*Table: Moderator*

| *Premium* | *Effect* | *SE* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|
| 0 | -0,3916 | 0,0030 | <0,001 | -0,3874 | -0,2957 |
| 1 | -0,9494 | 0,0047 | <0,001 | -0,9586 | -0,9403 |

*Figure 32*

As for the levels of moderation, from Figure 32, it is observed that Since the confidence interval [–0.3074, –0.2957] for the moderator Premium with value 0 (i.e., products not categorised as premium) does not include 0 and the effect is negative (–0.3016), this effect is considered to be statistically significant.

Similarly, for Premium with value 1 (i.e., products that are categorised as Premium), the confidence interval [–0,9586, –0.9403] also excludes 0, and the effect (–0.9494) remains statistically significant. Moreover, the negative effect (–0. 9494) is much higher in magnitude compared to the effect when Premium equals 0.

Thus, it can be concluded that Organic labeling lowers price significantly more when the product is premium.

## Fairtrade – Cheap

The next combination studied is the products containing only fairtrade-related certification(s) categorized as cheap. Again, the PROCESS macro is utilized, and Model 1 is selected (Hayes, 2013).

The outcome of the analysis is the following:

*Table: Interaction*

| *Predictor* | *B* | *SE* | *t* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|---|
| Constant | 4,1858 | 0,0016 | 2573,89 | <0,01 | 4,1834 | 4,1913 |
| Fairtrade | -0,8254 | 0,0043 | -192,06 | <0,01 | -0,8338 | -0,8169 |
| Cheap | -0,8451 | 0,0035 | -240,79 | <0,01 | -0,8528 | -0,8382 |
| Fairtrade X Cheap | -0,1762 | 0,0069 | -25,4 | <0,01 | -0,1898 | -0,1626 |

*Figure 33*

In order to understand if the moderator "Cheap" has an effect on the Log retail price, the significance level of the Cheap variable is examined.

The figure above demonstrates that the moderator "Cheap" has a statistically significant impact on the dependent variable (Log retail price) since its p-value (0.000) is smaller than the significance level (0.05).

Once the moderator is significant, the Interaction Effects (Fairtrade * Cheap → Price) need to be interpreted to understand the conditions under which the effect of Fairtrade certification (IV) on Log Retail Price (DV) changes intensity and/or sign.

Firstly, from Figure 33, it is observed that the significance of the Interaction effect (Int_1), where the p-value (0.000) is smaller than the significance level (0.05), indicating that the Interaction effect is significant.

Therefore, it is concluded that the effect of the Fairtrade certification on Log Retail Price (DV) depends and changes according to the type of the product, cheap or non-cheap product.

To easily interpret the intensity and sign of the effect, the beta coefficient values are written in the equation.

$$Log\ Price = \beta_0 + \beta_1 Fairtrade + \beta_2 Cheap + \beta_3 Fairtrade\ Cheap + \varepsilon$$

$$Log\ Price = 4{,}1882 + 0{,}0524 * Fairtrade - 0{,}8451 * Cheap - 0{,}1762 * Fairtrade * Cheap$$

| *Cheap* | *Effect* | *SE* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|
| 0 | -0,524 | 0,0043 | <0,001 | 0,441 | 0,608 |
| 1 | -0,1237 | 0,0055 | <0,001 | -0,1345 | -0,1130 |

*Figure 34*

As for the levels of moderation, from Figure 34, it is observed that Since the confidence interval [0.0411, 0.0608] for the moderator Cheap with value 0 (i.e., products not categorised as cheap) does not include 0 and the effect is positive (0.0524), this effect is considered to be statistically significant.

However, for Cheap with value 1 (i.e., products that are categorised as Cheap), the confidence interval [–0,1345, –0.1130] also excludes 0, and the effect (–0.1237) here is negative and remains statistically significant. This indicates that among low-priced products, Fairtrade certification is associated with a statistically significant decrease in price.

## Fairtrade – Premium

The next combination studied is the products containing only fairtrade-related certification(s) categorized as Premium. Again, the PROCESS macro is utilized, and Model 1 is selected (Hayes, 2013).

The outcome of the analysis is the following:

*Table: Interaction*

| *Predictor* | *B* | *SE* | *t* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|---|
| Constant | 3,7758 | 0,0018 | 2068,36 | <0,01 | 3,7738 | 3,783 |
| Fairtrade | -0,1725 | 0,0039 | -44,70 | <0,01 | -0,1801 | -0,1649 |
| Premium | 0,6943 | 0,0032 | 217,30 | <0,01 | 0,6881 | 0,7006 |
| Fairtrade X Premium | 0,3802 | 0,0087 | 43,85 | <0,01 | 0,3633 | 0,3972 |

*Figure 35*

In order to understand if the moderator “Premium” has an effect on the Log retail price, the significance level of the Premium variable is examined.

The figure above demonstrates that the moderator “Premium” has a statistically significant impact on the dependent variable (Log retail price) since its p-value (0.000) is smaller than the significance level (0.05).

Once the moderator is significant, the Interaction Effects (Fairtrade * Premium → Price) need to be interpreted to understand the conditions under which the effect of Fairtrade certification (IV) on Log Retail Price (DV) changes intensity and/or sign.

Firstly, from Figure 35, it is observed that the significance of the Interaction effect (Int_1), where the p-value (0.000) is smaller than the significance level (0.05), indicating that the Interaction effect is significant.

Therefore, it is concluded that the effect of the Fairtrade certification on Log Retail Price (DV) depends and changes according to the type of the product, premium or non-premium product.

To easily interpret the intensity and sign of the effect, the beta coefficient values are written in the equation.

$$Log\ Price = \beta_0 + \beta_1 Fairtrade + \beta_2 Premium + \beta_3 Fairtrade\ Premium + \varepsilon$$

$$Log\ Price = 3{,}7794 - 0{,}1725 * Fairtrade + 0{,}6943 * Premium + 0{,}3802 * Fairtrade * Premium$$

| *Premium* | *Effect* | *SE* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|
| 0 | -0,1725 | 0,0039 | <0,001 | -0,1801 | -0,1649 |
| 1 | 0,2077 | 0,0078 | <0,001 | 0,1925 | 0,2230 |

*Figure 36*

As for the levels of moderation, from Figure 36, it is observed that Since the confidence interval [-0.1801, -0.1649] for the moderator Premium with value 0 (i.e., products not categorised as Premium) does not include 0 and the effect is negative (-0.1725), this effect is considered to be statistically significant.

However, for Premium with value 1 (i.e., products that are categorised as Premium), the confidence interval [0,1925, 0.2230] also excludes 0, and the effect (0.2007) here is positive and remains statistically significant. This indicates that among high-priced products, Fairtrade certification is associated with a statistically significant increase in price.

Together, these results show a meaningful interaction: Fairtrade labeling adds value among higher-priced products, but appears to lower perceived value in the cheap segment, potentially because consumers associate Fairtrade claims with ethical sourcing only when aligned with other premium signals, or because low-end products struggle to command higher prices despite ethical labels.

## Multiple – Cheap

The next combination studied is the products containing both Organic and Fairtrade-related certification(s) categorized as cheap. Again, the PROCESS macro is utilized, and Model 1 is selected (Hayes, 2013).

The outcome of the analysis is the following:

*Table: Interaction*

| *Predictor* | *B* | *SE* | *t* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|---|
| Constant | 4,018 | 0,0015 | 2725,53 | <0,01 | 4,0151 | 4,0209 |
| Multiple | 0,8202 | 0,0032 | 259,05 | <0,01 | 0,814 | 0,826 |
| Cheap | -0,7483 | 0,0028 | -217,57 | <0,01 | -0,7537 | -0,7429 |
| Multiple X Cheap | -0,4519 | 0,0084 | 54,07 | <0,01 | -0,4683 | -0,4355 |

*Figure 37*

In order to understand if the moderator "Cheap" has an effect on the Log retail price, the significance level of the Cheap variable is examined.

The figure above demonstrates that the moderator "Cheap" has a statistically significant impact on the dependent variable (Log retail price) since its p-value (0.000) is smaller than the significance level (0.05).

Once the moderator is significant, the Interaction Effects (Multiple * Cheap → Price) need to be interpreted to understand the conditions under which the effect of Fairtrade certification (IV) on Log Retail Price (DV) changes intensity and/or sign.

Firstly, from Figure 37, it is observed that the significance of the Interaction effect (Int_1), where the p-value (0.000) is smaller than the significance level (0.05), indicating that the Interaction effect is significant.

Therefore, it is concluded that the effect of the Multiple certification on Log Retail Price (DV) depends and changes according to the type of the product, cheap or non-cheap product.

To easily interpret the intensity and sign of the effect, the beta coefficient values are written in the equation.

$$Log\ Price = \beta_0 + \beta_1 Multiple + \beta_2 Cheap + \beta_3 Multiple * Cheap + \varepsilon$$

$$Log\ Price = 4{,}018 + 0{,}8202 * Multiple - 0{,}7483 * Cheap - 0{,}4519 * Multiple * Cheap$$

| *Cheap* | *Effect* | *SE* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|
| 0 | 0,8202 | 0,0032 | <0,001 | 0,8140 | 0,8264 |
| 1 | 0,3683 | 0,0077 | <0,001 | 0,3531 | 0,3835 |

*Figure 38*

As for the levels of moderation, from Figure 38, it is observed that Since the confidence interval [0.814, 0.8264] for the moderator Cheap with value 0 (i.e., products not categorised as cheap) does not include 0 and the effect is highly positive (0.8202), this effect is considered to be statistically significant.

Moreover, for Cheap with value 1 (i.e., products that are categorised as Cheap), the confidence interval [0,3531, 0.3835] also excludes 0, and the effect (0.3683) is also positive, but less strong, and remains statistically significant.

These findings suggest that while multiple certifications consistently increase product price across segments, the pricing benefit is much stronger among higher-tier market products.

## Multiple – Premium

The last combination studied is the products containing both Organic and Fairtrade-related certification(s) categorized as Premium. Again, the PROCESS macro is utilized, and Model 1 is selected (Hayes, 2013).

The outcome of the analysis is the following:

*Table: Interaction*

| *Predictor* | *B* | *SE* | *t* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|---|
| Constant | 3,622 | 0,0015 | 2397,45 | <0,01 | 3,619 | 3,624 |
| Multiple | 0,7112 | 0,0037 | 192,3618 | <0,01 | 0,704 | 0,7184 |
| Premium | 0,6412 | 0,0028 | 225,98 | <0,01 | 0,6357 | 0,6468 |
| Multiple X Premium | 0,328 | 0,0063 | 52,34 | <0,01 | 0,3157 | 0,3403 |

*Figure 39*

In order to understand if the moderator "Premium" has an effect on the Log retail price, the significance level of the Premium variable is examined.

The figure above demonstrates that the moderator "Premium" has a statistically significant impact on the dependent variable (Log retail price) since its p-value (0.000) is smaller than the significance level (0.05).

Once the moderator is significant, the Interaction Effects (Multiple * Premium → Price) need to be interpreted to understand the conditions under which the effect of Fairtrade certification (IV) on Log Retail Price (DV) changes intensity and/or sign.

Firstly, from Figure 39, it is observed that the significance of the Interaction effect (Int_1), where the p-value (0.000) is smaller than the significance level (0.05), indicating that the Interaction effect is significant.

Therefore, it is concluded that the effect of the Multiple certification on Log Retail Price (DV) depends and changes according to the type of the product, premium or non-premium product.

To easily interpret the intensity and sign of the effect, the beta coefficient values are written in the equation.

$$Log\ Price = \beta_0 + \beta_1 Multiple + \beta_2 Premium + \beta_3 MultiplePremium + \varepsilon$$

$$Log\ Price = 3{,}622 + 0{,}7112 * Multiple + 0{,}6412 * Premium + 0{,}328 * Multiple * Premium$$

| *Premium* | *Effect* | *SE* | *p* | *95% CI Lower* | *95% CI Upper* |
|---|---|---|---|---|---|
| 0 | 0,7112 | 0,0037 | <0,001 | 0,704 | 0,7184 |
| 1 | 1,0392 | 0,0051 | <0,001 | 1,0293 | 1,0491 |

*Figure 40*

As for the levels of moderation, from Figure 40, it is observed that Since the confidence interval [0.704, 0.7184] for the moderator Premium with value 0 (i.e., products not categorised as premium) does not include 0 and the effect is positive (0.7112), this effect is considered to be statistically significant.

Moreover, for Premium with value 1 (i.e., products that are categorised as Premium), the confidence interval [1,0293, 1.0491] also excludes 0, and the effect (1.0392) is also positive, and even higher, while it remains statistically significant.

These results show that having multiple certifications is a strong signal of added value across all product tiers, especially in the premium market. In this segment, consumers might be more likely to respond to comprehensive sustainability credentials, seeing them as being the same as quality, exclusivity, and ethical production.

## Experiment

In order to validate the insights obtained from the secondary data analysis, an experimental study was conducted. This study tested the hypothesis that the pricing effects of different sustainability certifications can be observed in a controlled environment. The goal of this experiment is to study the causality by isolating the specific impact of different certification types and product tiers on how consumers perceive prices and how much they're willing to pay, trying to validate or to reject the results of the secondary data analysis part where the multi-criteria certifications outperformed both the organic and the fairtrade ones.

The experiment used a 3 (certification type: Organic vs Fairtrade vs Multi-Criteria) × 2 (product tier: Cheap vs Premium) design that was fully within-subjects.

The choice of a within-subjects experimental design had a few key advantages for this research. Firstly, this design allowed each participant to experience all six experimental conditions (covering every combination of certification type and product value), which made it possible to collect comparable data from every respondent. This was especially efficient given the challenge of recruiting a sufficiently large sample; by maximising the data obtained from each participant, the study achieved a statistical power without requiring an impossibly large sample size. Secondly, the design minimised the influence of individual differences by having each participant be their own control across all conditions. This ensured that observed effects could be more reliably attributed to the experimental manipulations rather than to pre-existing differences between groups. This increased the comparability of results across conditions and helped isolate the true impact of certification type and product value on the dependent variables. Thirdly, using the within-subjects approach reduced error variance associated with random differences between subjects, which made the statistical tests more sensitive and increased the likelihood of detecting real effects (Mendoza, 2006).

On the other hand, one disadvantage is the possibility of carryover effects, where a participant’s experience with one condition may influence their responses in the other conditions. For example, after seeing a premium product with multiple certifications, a participant might evaluate a cheap product differently than if they had seen it first. To partially deal with that problem, a randomizer has been utilized where the order of the presented conditions to each participant is random. Finally, within-subjects designs

can sometimes increase participants' awareness of the experimental manipulations, which may lead to more deliberate or strategic responses.

Moreover, the experiment builds on the SHIFT framework (White, Habib, et al., 2019), which suggests that sustainable consumption is driven by social influence, habit formation, individual identity, feelings/cognition, and tangibility. The study tests how tangibility (via certifications) and individual identity (via premium/cheap positioning) interact to influence WTP by manipulating certification type and product pricing.

As for the methods of the study, 92 participants were recruited on the university campus (n = 92, 42.4% males, 55.4% females, and 2.2% other). Since the data collection was held on the university campus, the mean age of the participants is 23,65, and as for the education level (13% had a high school degree, 43,5% a bachelor's degree, 42,4% a master's, and one participant a PhD degree).

Then the participants were asked to engage in a hypothetical online shopping task. Each participant was presented with six stimuli, each corresponding to one unique combination of certification type and product tier. The product in question was a t-shirt, and its attributes were carefully manipulated across conditions to vary in terms of both sustainability certification and brand positioning (i.e., cheap vs premium).

Each stimulus was prefaced with the following standardized prompt:

- "Imagine you are browsing an online store and come across the following t-shirt."

The descriptions varied only in the brand framing and certification information. For example:

In the cheap/organic condition:
*"Brand: DropTee, affordable, everyday t-shirts. Perfect for anyone who wants to look good without spending a fortune.*
*Organic Cotton Certification: 100% organic-certified cotton, free from harmful pesticides and chemicals."*
In the premium/multi-criteria condition:
*"Brand: Ferne, premium t-shirts with attention to every detail. Perfect for those who value excellence and timeless comfort.*
*Organic Cotton Certification: 100% organic-certified cotton, free from harmful pesticides and chemicals.*
*Fairtrade Certification: 100% Fairtrade International-certified, the product is manufactured in accordance with all ethical standards supporting the workers and their social rights."*

Each participant evaluated the same six combinations in randomized order to avoid sequence effects.

After viewing each stimulus, participants were asked to report three key dependent variables:

1. Perceived Value:
   Measured on a 0–7 Likert scale with the item:
   "A purchase like this would be"
   Poor value ……. Excellent value
2. Perceived Worth:
   Measured on a 0–7 Likert scale with the item:
   "A purchase like this would be"
   Not worth it ……. Totally worth it
3. Willingness to Pay (WTP):
   Participants were prompted to enter the amount they would be willing to pay for the product in euros.

## Results

A repeated measures ANOVA was performed to compare the interaction effect of product type (cheap vs premium) and certification type (organic vs fairtrade vs multi-criteria) on the willingness to pay.

The effect of product type (cheap vs premium) on the willingness to pay was not tested because the outcome would have been obvious, as we expect the relationship between product type (cheap vs premium) and willingness to pay to be linear.

However, the effect of certification type (organic vs fairtrade vs multi-criteria) on the willingness to pay is also tested in this analysis, providing interesting results, aligned with the secondary data analysis results.

Starting from the certification type, the following hypothesis was tested:

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$$H_1: \text{At least one pair of means is different from each other}$$

Where:

- $\mu_1$ = mean willingness to pay for products containing only Organic certification (s)
- $\mu_2$ = mean willingness to pay for products containing only Fairtrade certification (s)
- $\mu_3$= mean willingness to pay for containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis is:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Price* |
|---|---|---|
| Organic | 92 | 28,71 |
| Fairtrade | 92 | 29,86 |
| Multi-Criteria | 92 | 35,45 |

*Figure 41*

*Table: Repeated Measures*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -1,141 | 0,359 |
| Organic | Multi-criteria | -6,717 | < 0,001 |
| Fair Trade | Multi - Criteria | -5,576 | < 0,001 |

*Figure 42*

The results of this analysis are in line with the results of the ANOVA test in the secondary data analysis part. Specifically, participants have significantly higher willingness to pay for products with multi-criteria certifications compared to both organic-certified products (mean difference = -6.717, $p < 0.001$) and fair trade-certified products (mean difference = -5.576, $p < 0.001$). Additionally, the difference between the willingness to pay for products containing only Organic certification and products containing only Fairtrade certification is not statistically significant.

This finding not only confirms that the pricing effects of different sustainability certifications can be observed in a controlled environment, but also confirms the retailers' strategy of setting higher prices for multi-criteria products to be in line with customers' willingness to pay for those products, which is significantly higher compared to other certifications.

*Willingness to Pay*

Moving to the interaction effect of product type and certification type on willingness to pay, the following hypothesis was tested

For Product type = Cheap

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$: At least one pair of means is different from each other

Where:

- $\mu_1$ = mean willingness to pay for Cheap products containing only Organic certification (s)
- $\mu_2$ = mean willingness to pay for Cheap products containing only Fairtrade certification (s)
- $\mu_3$= mean willingness to pay for Cheap containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis is:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Price* |
|---|---|---|
| Organic | 92 | 25,21 |
| Fairtrade | 92 | 24,31 |
| Multi-Criteria | 92 | 31,09 |

*Figure 43*

*Table: Repeated Measures*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | 0,902 | 0,573 |
| Organic | Multi-criteria | -5,88 | < 0,001 |
| Fair Trade | Multi - Criteria | -6,78 | < 0,001 |

*Figure 44*

Here, once again, the results clearly indicate that Multi - Criteria certifications outperform both Organic and Fairtrade ones and the difference is significant, thus the null hypothesis is rejected and it is concluded that consumers are willing to pay a higher price for cheap products that contain Multi-criteria certifications compare to products that contain only Organic or only Fairtrade certifications.

An interesting finding is observed in this analysis, which is the only one so far in which the Organic products outperform the Fairtrade ones, however this mean difference is not statistically significant so no further explanations can be made.

Moving to the interaction effect of product type and certification type on willingness to pay for premium products, the following hypothesis was tested

For Product type = Premium

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$: At least one pair of means is different from each other

Where:

- $\mu_1$ = mean willingness to pay for Premium products containing only Organic certification (s)
- $\mu_2$ = mean willingness to pay for Premium products containing only Fairtrade certification (s)
- $\mu_3$= mean willingness to pay for Premium containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis is:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Price* |
|---|---|---|
| Organic | 92 | 32,21 |
| Fairtrade | 92 | 35,4 |
| Multi-Criteria | 92 | 39,77 |

*Figure 45*

*Table: Repeated Measures*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -3,18 | 0,089 |
| Organic | Multi-Criteria | -7,55 | < 0,001 |
| Fair Trade | Multi - Criteria | -4,37 | 0,049 |

*Figure 46*

The null hypothesis, also in this part of the analysis, is rejected.

Firstly, the Multi-Criteria outperforms again the other two certification types and the difference is statistically significant. Thus it is concluded that consumers have a higher willingness to pay for premium products that contain Multi-Criteria sustainability certifications compared to premium products containing only Organic or Fairtrade ones.

Secondly, there is a difference in the mean willingness to pay for premium products which contain only Fairtrade certification compared to the products containing only Organic certification. Specifically, the Fairtrade scored higher on average ( $M_{fairtrade}$ = 35.4 , SD = 2.67 vs $M_{Organic}$ = 31.17 , SD = 1.87; p = .089 ), with an a = 0.05 this difference is not considered significant, but with an α = 0.1 the difference is significant and it can be concluded that consumers have a higher willingness to pay for premium products that contain Fairtrade sustainability certifications compared to premium products containing Organic certifications.

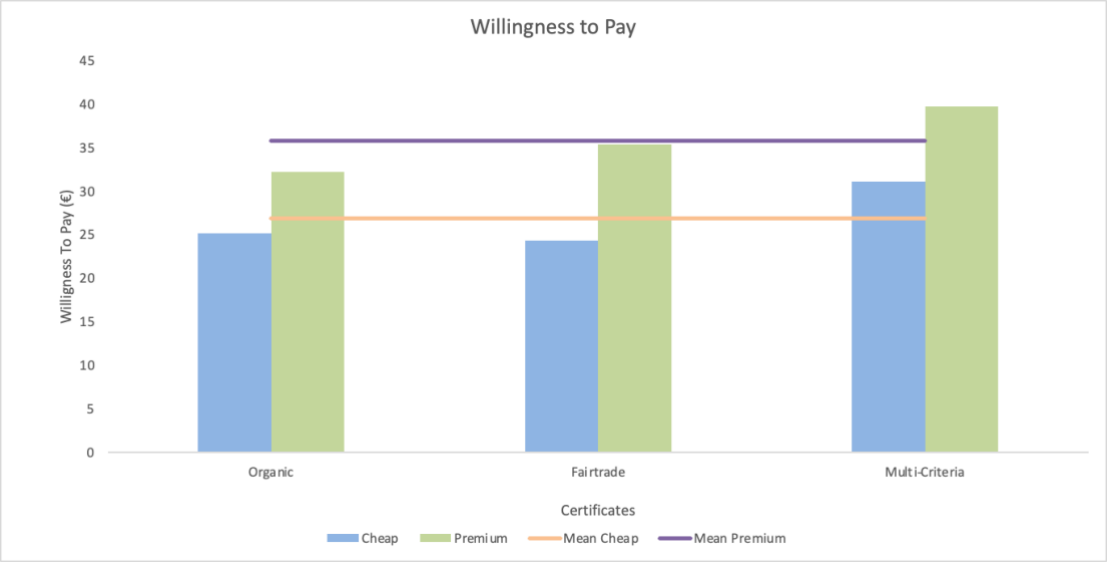


*Figure 47*

*Value*

Except for the willingness to pay, the current study had two more dependent variables as mentioned before. Starting from the value, defined as the perceived value that the customers associate to each of the six products they were exposed to, the goal is to test the interaction effect of product type and certification type on the perceived value, the following hypothesis was tested.

For Product type = Cheap

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$: At least one pair of means is different from each other

Where:

- $\mu_1$ = mean Perceived Value for Cheap products containing only Organic certification (s)
- $\mu_2$ = mean Perceived Value for Cheap products containing only Fairtrade certification (s)
- $\mu_3$= mean Perceived Value for Cheap containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis is:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Perceived Value (1-7)* |
|---|---|---|
| Organic | 92 | 5,35 |
| Fairtrade | 92 | 5,58 |
| Multi-Criteria | 92 | 6,06 |

*Figure 48*

*Table: Repeated Measures*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -0,228 | 0,131 |
| Organic | Multi-criteria | -0,707 | < 0,001 |
| Fair Trade | Multi - Criteria | -0,478 | < 0,001 |

*Figure 49*

The null hypothesis is rejected. Firstly, the Multi-Criteria outperforms, also in the Perceived Value the other two certification types and the difference is statistically significant. Thus it is concluded that consumers perceive cheap products that contain Multi-Criteria sustainability certifications as more valuable than the premium products containing only Organic or Fairtrade ones.

For the Product type = Premium, the following hypothesis is tested

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$: At least one pair of means is different from each other

Where:

- $\mu_1$ = mean Perceived Value for Premium products containing only Organic certification (s)
- $\mu_2$ = mean Perceived Value for Premium products containing only Fairtrade certification (s)
- $\mu_3$= mean Perceived Value for Premium containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis is:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Perceived Value (1-7)* |
|---|---|---|
| Organic | 92 | 5,5 |
| Fairtrade | 92 | 5,68 |
| Multi-Criteria | 92 | 6,1 |

*Figure 50*

*Table: Repeated Measures*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -0,185 | 0,162 |
| Organic | Multi-criteria | -0,609 | < 0,001 |
| Fair Trade | Multi - Criteria | -0,424 | < 0,001 |

*Figure 51*

The null hypothesis is also rejected in the premium context. Firstly, the Multi-Criteria again outperforms the other two certification types and the difference is statistically significant. Thus it is concluded that consumers perceive premium products that contain Multi-Criteria sustainability certifications as more valuable than the premium products containing only Organic or Fairtrade ones.

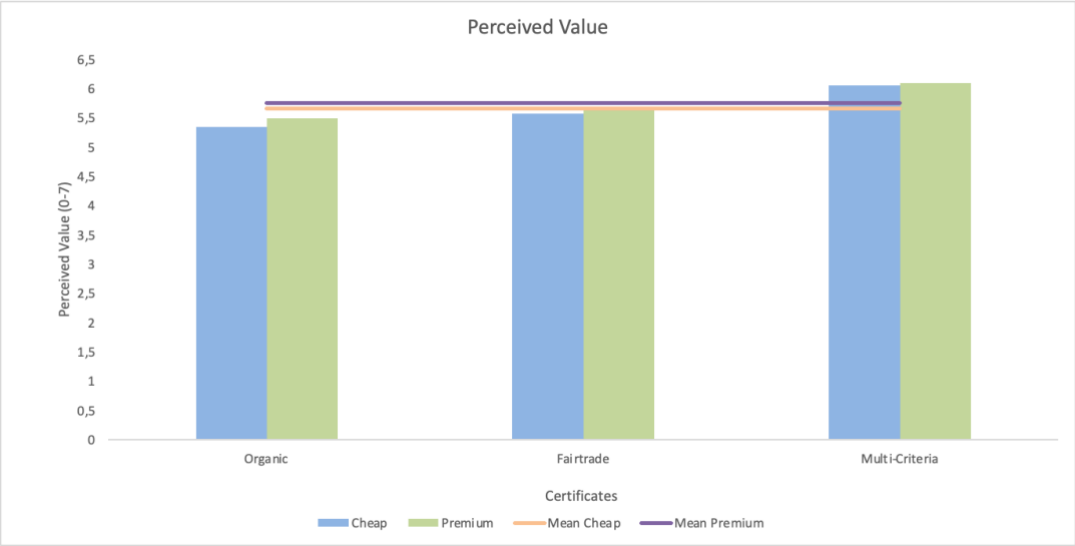


*Figure 52*

*Worth*

Moving to the last dependent variable worth, defined as the perceived worth that the customers associate to each of the six products they were exposed to, the goal is to test the interaction effect of product type and certification type on the perceived worth, the following hypothesis was tested.

For Product type = Cheap

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$: At least one pair of means is different from each other

Where:

- $\mu_1$ = mean Perceived Worth for Cheap products containing only Organic certification (s)
- $\mu_2$ = mean Perceived Worth for Cheap products containing only Fairtrade certification (s)
- $\mu_3$= mean Perceived Worth for Cheap containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis is:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Perceived Worth (1-7)* |
|---|---|---|
| Organic | 92 | 5,44 |
| Fairtrade | 92 | 5,58 |
| Multi-Criteria | 92 | 6,00 |

*Figure 53*

*Table: Repeated Measures*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -0,141 | 0,321 |
| Organic | Multi-criteria | -0,554 | < 0,001 |
| Fair Trade | Multi - Criteria | -0,413 | 0,007 |

*Figure 54*

The null hypothesis is rejected. Firstly, the Multi-Criteria outperforms, also in the Perceived Worth the other two certification types and the difference is statistically significant. Thus it is concluded that consumers perceive cheap products that contain Multi-Criteria sustainability certifications as more Worth it than the premium products containing only Organic or Fairtrade ones.

For the Product type = Premium, the following hypothesis is tested

$$H_0: \mu_1 = \mu_2 = \mu_3$$

$H_1$: At least one pair of means is different from each other

Where:

- $\mu_1$ = mean Perceived Worth for Premium products containing only Organic certification (s)
- $\mu_2$ = mean Perceived Worth for Premium products containing only Fairtrade certification (s)
- $\mu_3$= mean Perceived Worth for Premium containing a combination of Organic and Fairtrade certification (s)

The outcome of the analysis is:

*Table: Descriptives*

| *Sustainability Label* | *N* | *Mean Perceived Worth (1-7)* |
|---|---|---|
| Organic | 92 | 5,27 |
| Fairtrade | 92 | 5,55 |
| Multi-Criteria | 92 | 6,07 |

*Figure 55*

*Table: Repeated Measures*

| *Sustainable Certification* | *Sustainable Certification* | *Mean Difference* | *Significance* |
|---|---|---|---|
| Organic | Fair Trade | -0,283 | 0,068 |
| Organic | Multi-criteria | -0,804 | < 0,001 |
| Fair Trade | Multi - Criteria | -0,522 | < 0,001 |

*Figure 56*

The null hypothesis, also in this part of the analysis, is rejected.

Firstly, the Multi-Criteria outperforms again the other two certification types and the difference is statistically significant. Thus, it is concluded that consumers perceive the premium products that contain Multi-Criteria sustainability certifications as more Worth it than the premium products containing only Organic or Fairtrade ones.

Secondly, there is a difference in the mean Perceived Worth for premium products which contain only Fairtrade certification compared to the products containing only Organic certification. Specifically, the Fairtrade scored higher on average ( $M_{fairtrade}$ = 5.55 , SD = 0.123 vs $M_{Organic}$ = 5.27 , SD = 0.128; p = .068 ), with an a = 0.05 this difference is not considered significant, but with an α = 0.1 the difference is significant and it can be concluded that consumers perceive the premium products that contain Fairtrade sustainability certifications as more Worth it than the premium products containing Organic certifications.

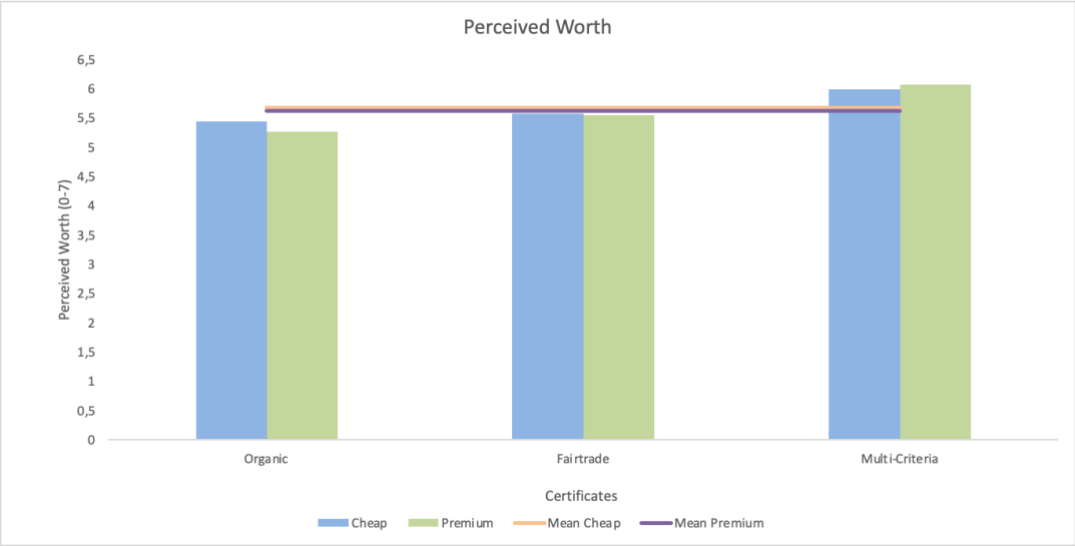


*Figure 57*

## General Discussion

The aim of this thesis was to investigate how sustainability certifications influence retail product pricing and consumer perceptions in the fashion industry. Specifically, it explored how different types of certifications Organic, Fairtrade, and Multi-Criteria (combining Organic and Fairtrade) influence product value across different price tiers (cheap vs. premium). The study combined a large-scale secondary data analysis with a controlled experiment to assess both real-world pricing behaviour and how consumers perceive products with the above certifications.

The results across both methods consistently support two key findings. First, multi-criteria certifications significantly outperform single-dimension certifications, both in actual retail prices and in consumers' willingness to pay (WTP), perceived value, and perceived worth. Second, the analysis reveals that Fairtrade certifications outperform Organic certifications specifically in premium product contexts. In both the market data and the experiment, Fairtrade-labeled premium products showed higher price levels and greater consumer value assessments than their organic-certified counterparts. This interaction effect suggests that the effectiveness of a certification depends not only on its type but also on the product's strategic positioning.

The findings closely align with real-world practices among brands that prioritise sustainability. Leading companies such as Patagonia and Pact effectively implement a multi-criteria strategy by integrating environmental and social certifications in their premium offerings. This finding aligns with the study's core conclusion that multi-dimensional sustainability signals elicit the most robust consumer responses.

What's more interesting is that Fairtrade actually has an advantage over Organic in premium products, which is also evident in the real market. For example, Patagonia not only boasts about its environmental credentials, but also actively promotes fair labour practices and social justice – elements more closely aligned with Fairtrade standards. This suggests that when it comes to high-end offerings, consumers might see ethical labour conditions as more believable and relevant to their identity than environmental claims on their own. Furthermore, the Fairtrade–premium combination did not significantly outperform Organic in terms of perceived value, but it did produce a significantly higher perceived worth. This suggests that Fairtrade certification in premium products may have a bigger impact on the moral or identity-related parts of the evaluation (worth), rather than on the economic value.

## Empirical Contributions

This research is among the first to combine real-market pricing data with experimental testing to assess the impact of certification types and product positioning on consumer valuation in fashion. The data show a consistent and significant premium for multi-criteria certifications, while also uncovering a meaningful interaction between Fairtrade certification and premium product positioning. These insights offer a data-driven basis for understanding the complex dynamics of ethical consumption.

## Theoretical Contributions

The thesis extends signaling theory by demonstrating that the effectiveness of sustainability signals varies based on the context in which they are deployed. The observed synergy between Fairtrade certification and premium positioning suggests that consumers interpret certifications differently depending on the product's market segment. It also contributes to the SHIFT framework by empirically validating the interaction between Tangibility (clear certification labels) and the Individual Self (product identity and prestige).

## Managerial Contributions

For managers in the fashion industry, the findings offer several actionable insights, firstly investing in multi-criteria certifications (e.g., Organic + Fairtrade) can justify price premiums in both mass and premium markets, reducing the risk of investment. Moreover, Fairtrade certifications should be used strategically because they receive greater impact when paired with premium positioning, where ethical sourcing becomes part of the product's identity, while for cheaper product lines, organic or single-focus labels may not provide sufficient differentiation or value. These findings help refine sustainability strategies to avoid over-labeling in low-margin segments and to maximize ethical signaling where it matters most.

## Limitations

Even though the methods used were strong and the findings were reliable, there are a few things to be aware of when it comes to understanding the results. First, the experimental sample was made up of university students, which is convenient and relevant for online fashion consumption, but may not fully represent the wider consumer population. This age group might have different attitudes towards sustainability, be more sensitive to price, and shop digitally in different ways compared to older or less digitally native groups.

Second, the experiment used a hypothetical willingness-to-pay (WTP) measure, which is pretty common in experimental economics and consumer behaviour research, but it might not always be an exact reflection of real purchasing decisions. There are lots of things in the real world that can affect how people behave, like money, how urgent the situation is, things like advertising, or what their friends are doing (White, Habib, et al., 2019).

Third, the study's design also needed to use a level of generalization when it came to how sustainability certifications were sorted into groups. The certifications were put into three groups, Organic, Fairtrade and Multi-Criteria, based on previous research and mathematical verification as presented on the analysis part. While this categorisation was necessary for analytical clarity, it may oversimplify meaningful differences within each category, such as distinctions between GOTS and OEKO-TEX in organic certification, or regional variation in fair labour standards.

## Suggestions for Future Research

To develop the insights from this study further, future research could look into a few promising areas. One important step would be to conduct experiments that simulate real purchasing decisions and offer rewards. By using real or pretend money, researchers could see how consumers behave in situations that are more like what happens in the real world, which would make the results more relevant.

Another thing that can be looked at is cross-category analysis. While this thesis focused on fashion, the interaction between certification type and product positioning, particularly the effectiveness of Fairtrade in premium segments, may also be relevant to other categories, such as cosmetics, electronics, or food and beverages. If we could see if these patterns were the same across different industries, it would help us understand certification-based signaling better.

It's also a good idea to do some cross-cultural research. The way people understand ethical labels is affected by cultural norms and values, so what's seen as credible or aspirational in one place might not

have the same meaning in another. So, future studies could look at how national culture affects the impact of sustainability certifications on willingness to pay and perceived value.

Most notably, future research should delve deeper into the psychological distinction between perceived value and perceived worth. The current study found that in premium product contexts, Fairtrade certifications significantly increased perceived worth but not perceived value, suggesting that consumers may interpret these certifications as ethical or identity-relevant rather than economically advantageous. This can potentially start an interesting research project that could look at whether sustainability labels change how consumers think about whether something is useful or moral, and when that happens.

To explore this further, some more qualitative research is needed to get to the bottom of the psychological mechanisms behind the Fairtrade–premium interaction that is found in this thesis. Methods such as interviews and focus groups to find out if consumers think Fairtrade certifications on premium products show quality, ethics, or that the product is a way of showing off, and if that leads to actual purchase behavior.

Lastly, future studies could provide valuable insight into the long-term effects of certification strategies. By measuring if multi-criteria certifications influence customer retention, brand loyalty, or lifetime value over time, future research could show if the short-term valuation effects seen here lead to long-term competitive advantages.

## Conclusion

This thesis investigates whether and how different sustainability certifications influence product pricing and consumer valuation in the fashion industry. By combining large-scale market data with a controlled experimental study, the research shows that multi-criteria certifications consistently result in higher retail prices and consumer willingness to pay compared to single-dimension certifications. What's interesting is that Fairtrade certifications do better than Organic ones, when it comes to premium products.

These insights add to what we already know about signalling theory and the SHIFT framework by showing that the value of sustainability certifications depends on the type of signal, but also on its alignment with brand positioning and consumer expectations. The findings offer both theoretical detail and practical relevance, helping to create a more evidence-based understanding of how ethical product cues work in real and perceived economic value creation.

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