

The Higg Index: A way to increase sustainable consumer behavior?

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Abstract

This honors thesis will examine the potential role and influence of the Higg Index scores, introduced by the Sustainable Apparel Coalition (SAC) on sustainable consumption habits. The SAC continue to work on the Higg modules, from which the scores are generated, but it hasn't done any substantial consumer related studies. This thesis makes first steps towards evaluation of the Higg Index scores in the development of sustainable consumption habits. As a preliminary study, I wrote a survey to see if apparel consumers from the state of Colorado would express an interest in the scores on the apparel hangtags and if they were willing to pay more for an increase in the value of the scores. The survey results, model runs, and other similar studies indicate that the majority of consumers support the concept of sustainable apparel and have already developed sustainable habits, thus the scores can influence them to buy and spend more on sustainable apparel that have higher scores. When the scores are released to the public, it's important for the marketing teams to educate consumers who haven't developed yet their sustainable habits on the purpose of the scores.

Keywords: sustainable consumption, Higg Index, Sustainable Apparel Coalition, sustainability reporting, sustainable assessments, consumer behavior, sustainable apparel, apparel, fashion, Wal-Mart, Patagonia

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Introduction

In 2012, H&M Hennes & Mauritz AB (more commonly known as H&M) launched its first “Conscious” collection. H&M is a clothing-retail company that creates fast fashion for youth, men, and women. Fast fashion is a way of capturing what is on trend and making it immediately available to the general public (Wicker 2016). This concept has been criticized for using techniques that damage the local environment. Hence, H&M’s take on a collection that claims to use eco-friendly techniques was a major step towards apparel that is made sustainably.

According to Catarina Midby, who was the head of fashion and sustainability for H&M, they wanted “great fashion with the added bonus of sustainable materials” (Midby and Murray 2013). H&M isn’t the only apparel company that has been making an effort of incorporating environmentally friendly techniques into their supply chains. North Face, an outdoor apparel company, has pledged to having “at least 65 percent of the fabric it uses to conform to the bluesign sustainability standard for textile production by 2015” (Guevarra 2011). Nike announced, in 2012, that it would be implementing a waterless system for dyeing apparel, as a way to reduce their water consumption footprint (Makower 2012).

Some apparel companies have taken steps to engage their customers in the conversation about consuming sustainable apparel. Marks & Spencer (M&S), an English clothing brand, launched a recycling program in their stores. If a customer brings their M&S apparel to be recycled, then they receive a money voucher that can be used for their next purchase (Gunther 2011). Patagonia ran an advertisement in the New York Times, on November 25th in 2011, urging consumers to not buy the pictured jacket. The purpose of this advertisement was to educate consumers on the environmental burdens that go into making apparel and to think twice when buying apparel (“Don't Buy This Jacket, Black Friday and the New York Times.” 2016).

These examples cover only a fraction of the larger movement that the majority of the apparel industry is in towards the production and consumption of sustainable apparel. Brands have been measuring their progress on these initiatives through various tools, standards, and reports. The previously mentioned bluesign, a standard for the manufacturing of textiles, provides an online system that measures the environmental impacts that occur in the production and manufacturing phases. If an apparel item passes the prior-set standards, then it receives a bluesign verified mark on the apparel hangtag (What Is the 'Bluesign' Standard for Textiles 2012). Another well-known tool, similar to bluesign, is Nike's Material Sustainability Index (MSI). The Nike production teams can take manufacturing and production data from their apparel and footwear products and see their progress through the reports that are generated by the MSI ("The Nike Materials Sustainability Index." n.d).

Even though there are plenty of tools and environmental standards to measure sustainable practices, the apparel industry didn't have a unified standard or metric to follow. This all changed when Wal-Mart and Patagonia partnered and formed the Sustainable Apparel Coalition (SAC). This coalition, consisting of 40+ apparel, footwear, and textile brands, is working on a tool called the Higg Index that measures environmental progress of the SAC members. The progress is given out as scores, and in 2020 these scores will become available to the public, as a way to increase environmental awareness (Kibbey n.d and Moreau n.d). A more detailed account of this information can be found in the *Overview of the Sustainable Apparel Coalition and the Higg Index* section of this thesis.

Currently, there have been no studies done on consumer behavior and the Higg Index scores. However, there have been many studies that examine the level of consumer's environmental

awareness and their willingness to purchase sustainably made apparel. Based on this background research, I decided to pose the question of:

Will the Higg Index scores influence sustainable consumption habits in an everyday consumer of apparel?

To answer this question, I created a survey, using Laroche et al.'s model on willingness to pay more for environmentally friendly products, and collected responses from the Denver and Boulder areas. Afterwards, I ran a logistic regression binomial model to see what items on an apparel hangtag, found in the Methods section and Appendix A, can predict interest in the Higg Index scores. In the *Results and Discussion* section, I compare my findings with three other studies of a similar nature. Ultimately, my research demonstrates the fact that people are interested in sustainable apparel, but it's important to provide information on environmental and social issues that are associated with the apparel industry. Without prior-knowledge, consumers will see the Higg Index scores as meaningless numbers on an apparel hangtag.

Background Information

Before addressing the research question, one must gain an understanding of how apparel is made, what are the environmental concerns, and how to make this process more sustainable. Then, there needs to be an understanding of how these sustainability habits are recorded and how they are rewarded. The answer to these two questions is by using sustainability reports/assessments and having consumers reward companies with their preferences and spending habits.

How is apparel made?

In the apparel industry, an item goes through five different stages: generation of material, production, manufacturing, distribution, and consumption (Wallander 2011). When the item

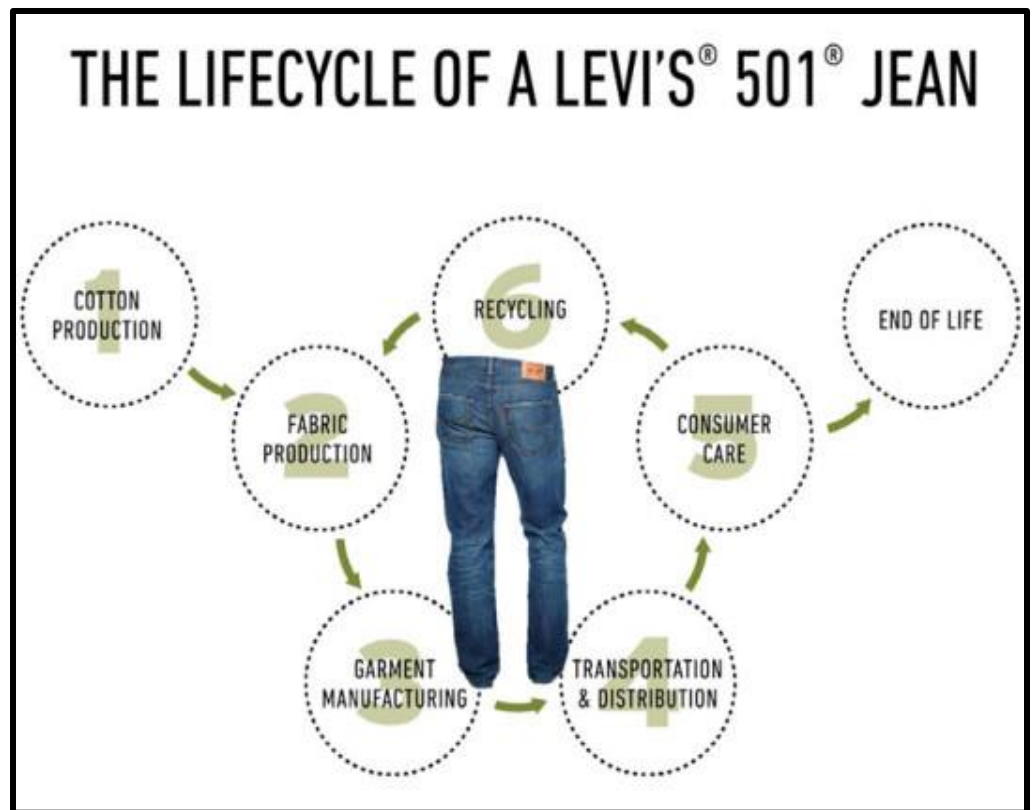


Fig.1: A visual representation of the LEVI's 501 Jean lifecycle. This is a representation of a standard lifecycle for apparel. Some companies will not have the recycling phase (LEVI STRAUSS & CO 2015).

reaches the end of its lifetime, it can be recycled and the process, for that particular item, is restarted. Otherwise, the item will be disposed ("THE LIFE CYCLE OF A JEAN" 2015 and Wallander 2011). Generation of material encompasses the farming process (fertilization, irrigation, and harvesting) for non-human made materials. Cotton is the primary material source that follows this process, while other materials, such as nylon and polyester, are manmade

(Wallander 2011). After the raw cotton has been harvested, it's cleaned and turned into yarn. This process is commonly done in China, India, and Pakistan. The yarn gets distributed to apparel companies that are often located overseas (EWContributor 2015). Once the material reaches the site, where the next three stages (production, manufacturing, and distribution) occur, it becomes the desired garment. The process of production and manufacturing can solely rely on using machines, human labor, or a mixture of both to move to the distribution and consumption stages (Muthu 2015 and Wallander 2011).

What are the environmental concerns in the apparel industry?

Continuing with the example of cotton, the common approach of farming and transforming it to yarn makes use of pesticides, fertilizer, and large amounts of energy and water consumption (Jackson 2014 and Lambert 2016). The production of cotton makes up 2.6 percent of the global water usage (Ndachengedzwa and Stecca 2016 and Jackson 2014). The water consumption becomes a more noticeable environmental and economical concern, when a drought occurs. In the year of 2010, H&M reported that because of the drought that occurred in China (one of their cotton suppliers), their total amount of profits dropped by 30 percent (Jackson 2014). Pesticides and fertilizers can pollute the land and local and underground water sources. If a community makes use of these water sources and doesn't have a filtration system, then they are at a higher risk of contracting these chemicals in personal health and/or growth of other crops ("Eleven Hazardous Chemicals Which Should Be Eliminated." n.d). Pollution of fresh water sources will lead to eutrophication and oxygen depletion for freshwater plants and animals. Marine eutrophication and ocean acidification rates increases as well ("The Life Cycle of a Jean" 2015).

Greenhouse gas emissions are another major concern that affects all of the stages in apparel production. For synthetic or manmade fibers, there is a higher amount of greenhouse gas

emissions than to wool and cotton. Wool is made from sheep that naturally produce methane gas. Cotton, on the other hand, is derived from a plant, thus requiring fewer emissions for cultivation, but it can be offset by the processing plant (Koerner 2008). The depletion of the ozone gas simultaneously occurs when there is an increase in emissions. Ozone serves as a protective layer from ultraviolet (UV) rays that come from the sun (Yip 2000).

During the production and manufacturing phases, apparel companies will make use of dyes, bleach, and other chemicals to alter the raw material. These chemicals, if not disposed properly, are potential pollutants to the local environment and can cause various illnesses. Azo dyes, as an example, are used in textiles. Their natural breakdown releases chemicals called aromatic amines, which can cause cancer upon human contact (“Eleven Hazardous Chemicals Which Should Be Eliminated.” n.d). The process of cutting, knitting, or sewing will require energy. If the energy source isn’t a renewable one or there is no monitoring, then the processes that occur during these two stages and the obtainment of the fuel will increase emissions (Muthu 2015).

Adding sustainable practices to the five stages of apparel making.

For the generation of material, Dr. Linda Greer (senior scientist at the Natural Resources Defense Council) suggests that apparel companies should rely on producers who grow cotton or other types of fibers sustainably. If the fibers are synthetic, then they should reuse old ones. The production phase can use fabric that has been certified by the Global Organic Textile Standard (GOTS), Blue Sign, or Cradle-to-Cradle. These organizations also verify the chemicals, for generation of material and fabric production (Greer 2015). The cotton mills, factories, and other manufacturing locations should monitor and release records on their pollution footprints to apparel brands and the public. Pollution footprint includes air emission limits, wastewater

discharge, energy use, and the types of chemicals that these entities use to produce the fabric (Wallander 2011).

In the production and manufacturing phases, designers are capable of practicing sustainability in their designs of apparel. When a garment is being developed, one can try designs or patterns that require less fabric; this will reduce the amount of fabric waste. Designs that allow for consumers to use the item in multiple ways, instead of buying additional ones to fulfill various needs, are another example of sustainable practices (Lambert 2016).

Transportation of garments and materials by ships and/or trains is more sustainable, because air and motor transportation releases larger amounts of emissions (EWContributor 2015).

When the item reaches consumers, brands can provide certifications for environmental management and ethical practices and suggestions for sustainable care of the garment (Lambert 2016). By promoting hand washing or gentler washing machine cycles, instead of dry cleaning that utilizes large amounts of toxic chemicals and energy, one can avoid water pollution and reduce energy and chemical consumption. Marketing teams can educate consumers on the construction of apparel and what sustainable practices were used. Labels of environmental certifications on the apparel item's hangtag will help to increase awareness for the previously mentioned environmental problems (Lambert 2016 and Greer 2015). A hangtag often includes designer and manufacturing information, type of fabric or material, care instructions, and price ("Hangtag" n.d). Lastly, apparel brands can implement recycling programs that will make the process of designing apparel into a closed loop (Hable 2017).

Can consumer behavior be a possible reward for sustainable practices?

From a historical perspective, the notion of consumption was centered on satisfying materialistic and idealistic goals. Prior and during World War II, consumers were primarily

concerned with satisfying their private material desires and the government wasn't concerned about protecting them. The shift from this view point, stemmed from middle-class women, who were part of organizations that focused on consumer safety, corporation liability, and improving working conditions. They encouraged other women to consume products more selectively and choose companies that would improve their conditions for the working class. This attitude spread, and in the fall of 1929, democratic and educational theorist John Dewey and progressive economist Paul Douglas founded a new third political party, the League for Independent Political Action. This party focused on the interests and rights of consumers and how these factors influence consumption and the economy (Cohen 2003).

Corporations responded to this movement, by making customer satisfaction as one of their top priorities. Customer satisfaction guarantees long term financial security for the company and creates customer loyalty. This led to the creation of consumer behavior studies, which can be defined as “a study of how consumers think, feel (emotions), and behave” (Schiffman et al. 2013). Marketing teams can collect quantitative and qualitative data that can help companies predict and satisfy consumer needs. They can also determine the target group, consumers who consistently choose a company/brand over others. With the advancement of technology, brands have the ability to tailor advertisements (paper and digital) to their clientele. Consumers can leave online reviews and express their opinions to other potential customers (Khan 2017 and Schiffman et al. 2013). The cultural norm, beliefs, and values of the target group can also influence the company's internal policies on which products to make and sell (Jones and Sasser Jr 2014). Thus, if the cultural norm encompasses sustainable consumption, then target groups will make some effort in practicing this concept. Sustainable consumption is the “the use of goods and services that respond to basic needs and bring a better quality of life, while

minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardize the needs of future generations” (Ministry of the Environment Norway 1994). Consumer behavior studies will capture these habits, and companies will attempt to also practice sustainable habits, in order to appeal to their desired target groups.

How does one measure sustainable practices?

Through the use of sustainability reports and assessments, companies can keep track of their progress towards the environmental goals that they have set. According to the Global Reporting Initiative, a sustainability report is “published by a company or organization, about the economic, environmental, and social impacts caused by its everyday activities” (“About Sustainability Reporting.”). The benefits of implementing a sustainability report include reputation and image amongst clients and employees, natural competition amongst companies from the same industry, increased knowledge and awareness on the environmental issues and sustainably related projects, and engagement of the company’s investors (“The Value of Sustainability Reporting”). The cons are often associated with the creation and usage of the sustainability report. Some companies set goals that can’t be achieved or aren’t challenging enough. Another issues focuses on the process of collecting data for the report. There are cases when a corporation doesn’t record all of the data and/or takes an extensive amount of time to collect it (Millar n.d). Often, there is a third party that verifies the credibility of the report, but it’s not a requirement. This allows for the possibility of companies not following the rules, if they don’t make use of a verification system (Kolk 58). The three most commonly used sustainability reports and assessments are the Global Reporting Initiative (GRI), the Carbon Disclosure Project, and Dow Jones Sustainability Indices (Kolk 58 and “The Value of

Sustainability Reporting” n.d). Apparel companies can use these reports to convey their progress on environmental initiatives, but these reports are not specifically designed to capture the environmental problems and solutions that are encountered in the lifecycle of apparel.

Overview of the Sustainable Apparel Coalition and the Higg Index

This section will go over the formation of the Sustainable Apparel Coalition (SAC) and its foundational beliefs. Afterwards, the Higg Index, the SAC's tool for measuring sustainable practices in the apparel industry, will be discussed and where the SAC plans to take this tool in the future.

How and why was the Sustainable Apparel Coalition (SAC) formed?

The Sustainable Apparel Coalition was founded by an unlikely partnership of Wal-Mart and Patagonia. In 2005, the Chief Executive Officer (CEO) of Wal-Mart, Lee Scott, made an effort to increase his company's sustainability initiatives by "reducing energy use, doubling truck fuel efficiency, minimizing the use of packaging, and pressuring thousands of companies to do the same" (Barbaro and Barringer 2005). Within those initiatives was the idea of increasing the amount of organic cotton in apparel. Even though there were many concerns about commitment to these goals, the majority of the environmental community agreed that if Wal-Mart changed its practices, then others would follow and change in the supply chain could be possible (Featherstone 2005). To further his commitment to sustainability, Scott reached out to Jib Ellison, founder of BlueSkye and Scott's former advisor, who had a connection with the Vice President of Sustainability for Patagonia, Rick Ridgeway. At that time Patagonia was one of the leaders in implementing sustainability initiatives into their supply chains and assisting other companies in achieving their environmental goals (Burke 2010 and Gunther 2012).

In 2009, Patagonia agreed to assist Wal-Mart in the development of a tool, similar to the Eco Index that would assess their supply chain (Schwartz 2011). There was also an effort to educate Wal-Mart's consumers on water and energy usage, pesticides, and climate change. The next goal for Wal-Mart consisted of placing scorecards that would display sustainability index scores, on

the products. These scores would cover environmental and social impacts (Burke 2010). Scott also kept his promise on encouraging other companies to follow in Wal-Mart's footsteps. During fall of 2009, Mary Fox, Wal-Mart's Senior Vice President for Apparel Sourcing, and Rick Ridgeway formed a committee with twelve apparel companies whose mission was to "reduce the environmental and social impacts of clothing and footwear, and to that end it will also promote promising innovations and spotlight ways to improve practices at any point in supply chains" (Gunther, "The Great Patagonia Adventure: Yvon Chouinard's Stubborn Desire to Redefine Business" 2016 and Bardelline 2011). This committee would later be known as the Sustainable Apparel Coalition (SAC).

For the innovation aspect of their mission statement, the committee decided to expand the Outdoor Industry Association's Eco Index, on which Patagonia was a helping force, and the Nike Considered Index (now known as the Materials Sustainability Index). At first, Nike and other companies were hesitant to work with Wal-Mart. The first official meeting was held in April of 2010, in Chicago. The apparel companies included Nike, Target, Gap, Kohl's, Levi's, Nike, J.C. Penny, Esquel, H&M, Hanes, Li & Fung, Marks & Spencer, Timberland, Wal-Mart, and Patagonia. The Otto Group, Duke University, and the EPA, and the Environmental Defense Fund were the non-apparel companies (Gunther 2012). In addition to the development of common framework that would capture environmental progress, companies wanted information and tools on how to work through worker's rights and give accurate information about their sustainability initiatives to their target-groups (Gunther, "The Great Patagonia Adventure: Yvon Chouinard's Stubborn Desire to Redefine Business" 2016 and Gunter 2012).

As of 2016, the SAC has over 180 global members ranging from apparel, footwear, textile, non-profits, and academic institutions. They have been working on the Higg Index, which is the

expanded product of the Eco Index, the Nike Considered Index, and other tools (Kibbey n.d). In January 2017, the brand Helly Hansen, a Norwegian active-wear designer, announced that they were joining the SAC (“Helly Hansen Joins Sustainable Apparel Coalition” 2017).

What are the benefits when one joins the Sustainable Apparel Coalition (SAC)?

The primary benefit of the Sustainable Apparel Coalition is collaborating with other members on sustainable initiatives and using the same tools for measurements. Brands can learn from past experiences of others and avoid or implement certain ideas or methods (“10 Ways the Higg Index Creates Business Value.” nd). By using the Higg Index, brands and manufacturers can complete assessments on a variety of sustainability topics, and they don’t need to have the proper educational background to answer the questions and understand the results. Since, they only have to complete the self-assessments a few times per year, then the overall number of internal and external assessments goes down. This saves the SAC members time and reduces their overall costs. The problems of duplicated data or missing/incomplete data are generally taken care of when using a singular tool. There is no need to use or develop other tools that may not even be used by similar brands or manufacturers. The Higg Index can assist in developing and maintaining goals. Members can use the index to determine what areas of the supply chain are running efficiently, in terms of energy and water usage (“10 Ways the Higg Index Creates Business Value.” nd).

Another benefit consists of the fact that members can compare their progress with each other, seen in Fig. When a brand compares their progress against someone else, they want to be on the same level or higher. The comparison creates an environment for natural competition and motivation for progressing on the environmental goals. Apparel brands can find manufacturers and/or textile producers that have low environmental risk scores by checking their assessment

reports and vice versa. In the future, the SAC will have a verification system for the accuracy of the data. Companies can demonstrate their accurate progress, to their current or potential investors and their customers ("10 Ways the Higg Index Creates Business Value." nd).

What is the Higg Index?

According to the SAC, the Higg Index is a “suite of self-assessment tools that empowers brands, retailers, and facilities of all sizes, at every stage in their sustainability journey, to measure their environmental and social labor impacts and identify areas for improvement” (“The Higg Index – Sustainable Apparel Coalition” n.d). The foundational basis consisted of the strongest

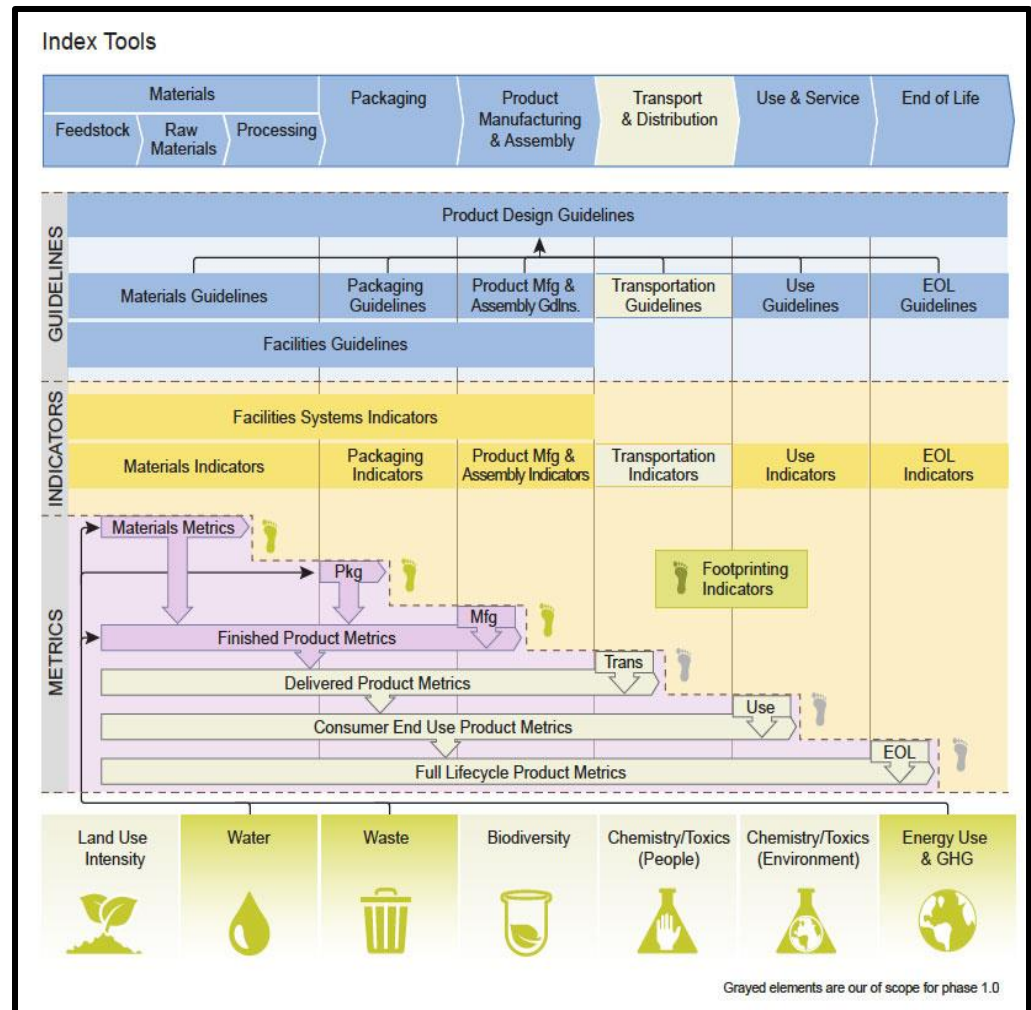


Fig 2: Breakdown of the Eco Index (Maiers and The Outdoor Industry Association 2011).

aspects from the Eco Index, Nike Materials Sustainability Index (MSI), and the Global Social Compliance Program’s Environmental Reference tools formation (Maiers 2011). The Eco Index developed by the Outdoor Industry Association (OIA) and the European Outdoor Group, assisted companies in benchmarking and measuring their environmental footprint, while identifying areas for improvement (Bauser Yaghoubi 2010). Figure 2 demonstrates how the Eco Index took the

standard lifecycle of apparel, broke it down into smaller separate tools, and implemented environmental guidelines, metrics, and indicators for each stage/phase (Maiers 2011). Every module of the Higg Index consists of questions that were developed by members, stakeholders, and experts. The questions are constantly being updated based on changes in corporate policies or practices ("The Higg Index – Sustainable Apparel Coalition" n.d). The SAC members enter data about their business impact areas, and they receive a generated standard performance score, which can be shared with present or future suppliers, on a local or global scale. The scores are made anonymous and are aggregated, “which allows businesses to benchmark their results against the industry and serves as a powerful incentive to strive for greater improvements and raise the sustainability bar “ ("The Higg Index – Sustainable Apparel Coalition" n.d). The first version of the Higg Index was released in July 2012, and an updated version, Higg 2.0, was released in December 2013 ("HIGG INDEX FAQ." 2015).

What does the current version of the Higg Index (2.0) consist of?

As of now, there are three modules that make up the Higg Index (2.0), as shown in Figure 3. The

facility module measures the environmental and social performance of individual facilities of an apparel company. This can include the assessment of materials, packaging, and manufacturing supplier facilities ("HIGG INDEX FAQ." 2015). The brand module allows brands to enter information about their

practices, at the company level, for apparel and footwear. The

product module consists of two tools, the Rapid Design Module (currently in beta testing) and the Materials Sustainability (MSI) Data Explorer. Originally, Nike created the MSI Data Explorer, but the SAC adopted it into the Higg Index in 2012 ("Sustainable Apparel Coalition Releases New Version of the Materials Sustainability Index – Sustainable Apparel Coalition" 2016). This tool serves as a materials library, where brands can access, enter, and compare different types of materials and methodologies. Each material has an MSI score (a low score means less damage to the environment), and the material can be broken down by the production phase. The current list of materials includes textiles, leather, synthetic leather,

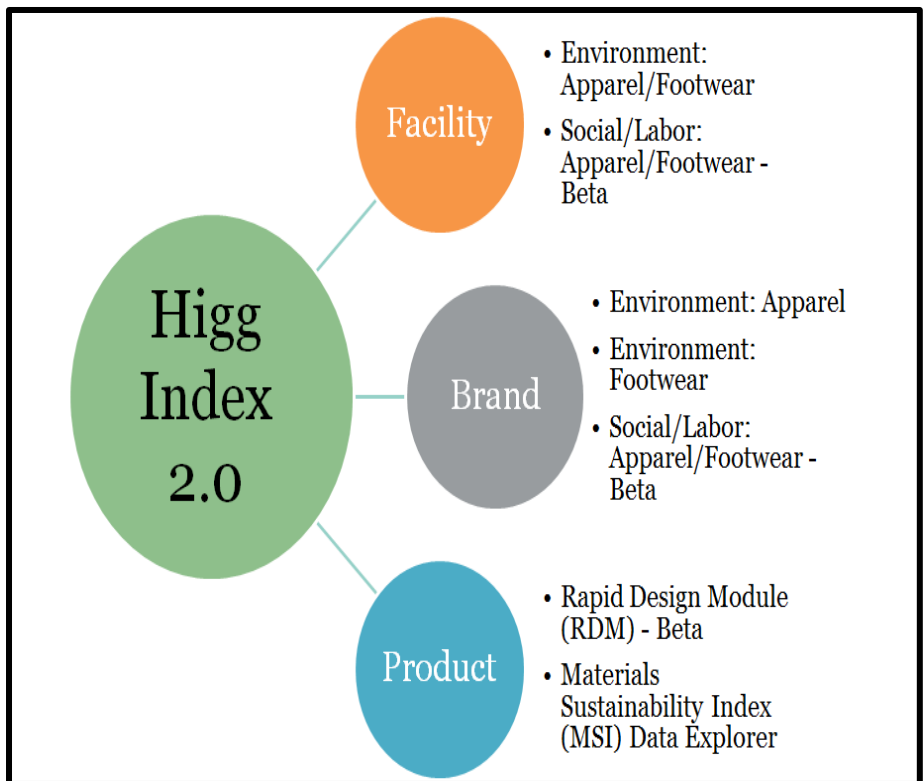


Fig 3: The three modules (facility, brand, and product) that make up the Higg Index 2.0 (Outdoor Industry Association 2015).

plastics, rubber/elastomers, foam, metals, wood-based materials (non-textile), and insulation. At each production phase (raw material scores, yarn formation, textile formation, preparation,

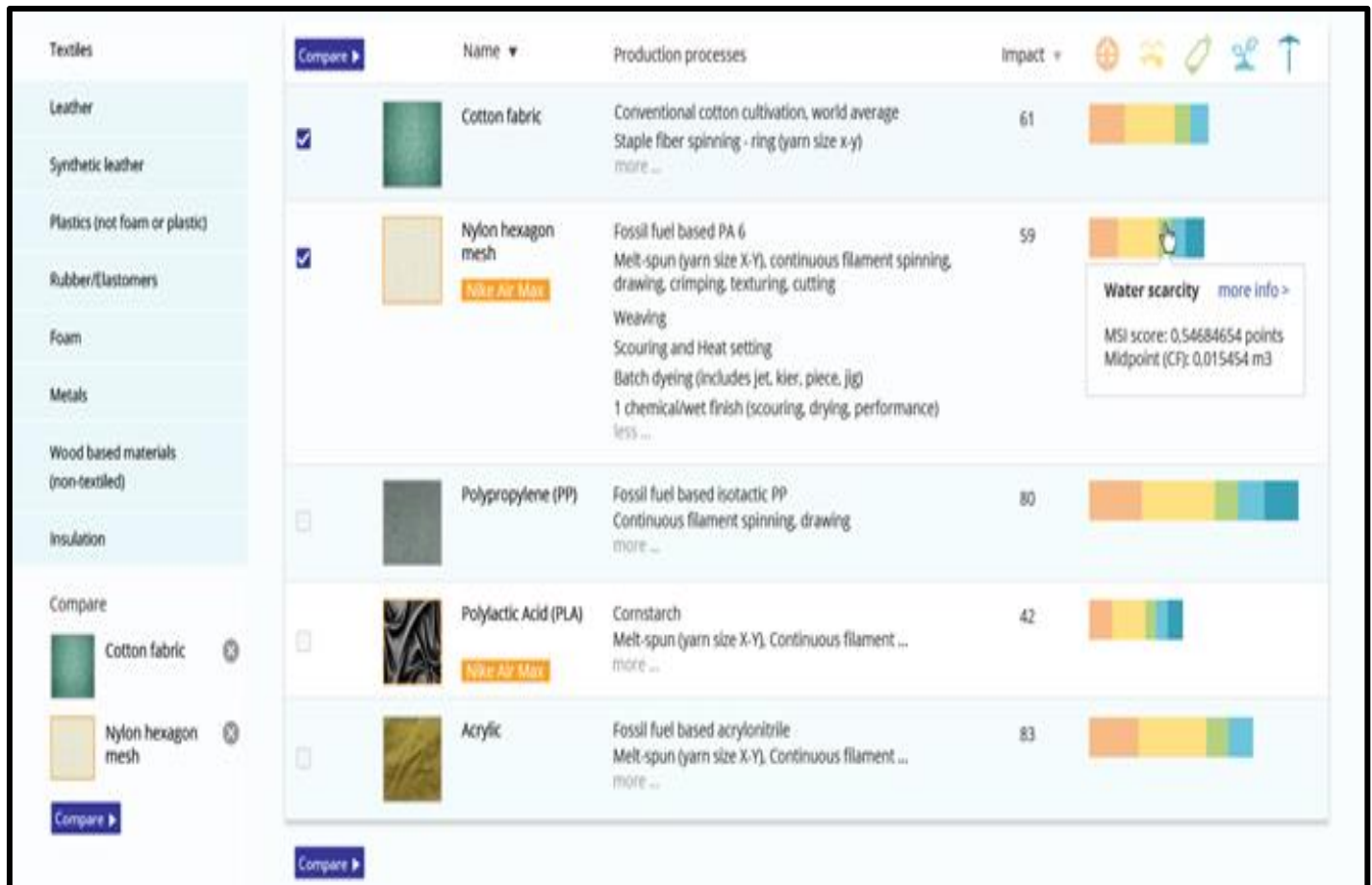


Fig 4: The selection and comparison of materials from the MSI Data Explorer ("Higg Materials Sustainability Index (MSI) – Sustainable Apparel Coalition").

warming, water scarcity, agriculture land occupation, eutrophication and abiotic depletion) contributed to the overall score. If a brand wants to enter a new material or methodology into the MSI Data Explorer library, then they will have to go through a verification process ("Higg Materials Sustainability Index (MSI) – Sustainable Apparel Coalition" n.d). The Rapid Design Module allows members to provide feedback on educational guidelines for apparel ("HIGG INDEX FAQ." 2015).

What are the weaknesses, and challenges of the Higg Index?

The main weakness, one could argue that since most of the data is not available to the public, then the data becomes meaningless in the grand scheme. The SAC doesn't allow its members to disclose anything related to the Higg Index data or the calculated scores, which results in the use of other tools that accomplish the same task. By not releasing the data to the public, consumers often times don't understand the full impact that apparel has on the environment. They will encounter labels that say 50 percent organic cotton on a shirt, but there is no information on the social and factory conditions. This missing information is crucial for consumer awareness and education (Gunther 2016). As the Higg Index undergoes a process of constant revision, apparel companies complain for the lack of flexibility and usability. Some may hesitate in asking their suppliers (farmers, mills, factories, etc.) for data and/or lack the motivation to collect the data in the first place (Gunther 2016).

Future Development Plans for the Higg Index

In response to the concern about data being inaccessible by stakeholders and consumers, the Sustainable Apparel Coalition (SAC) released a transparency plan that outlines when and what type of information will

be given out. By mid-2018,

the environmental and social data from the facilities module will be released. The next phase entails releasing the brand module data in 2019, and the full release of the Higg Index scores and data would occur in 2020 (Mowbray 2016). The SAC is currently working on revising the Higg modules (facilities, brand, and product) and the verification of data. The target audience for the transparency plan includes consumers, governments, employees, media, industry initiatives, and non-governmental organizations. There has been some discussion about a communication tool kit that will provide an accurate representation on the supply chains and their sustainability practices. With this toolkit, the target audience can make educated decision on which apparel items they should buy (Moreau 18-21).

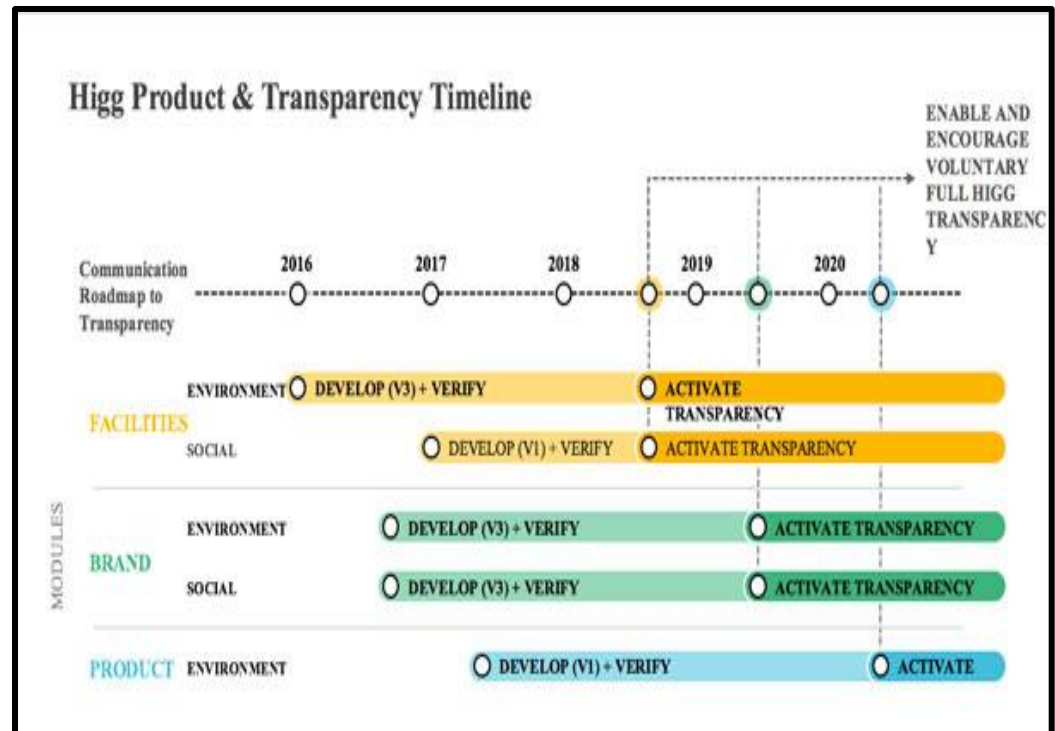


Fig 5: The transparency plan of the Higg Index (Moreau and the Sustainable Apparel Coalition).

Methods

During my research process, there haven't been any preliminary consumer studies done with the Higg Index scores in mind. Hence, I came up with the research question of *will the Higg Index scores influence sustainable consumption habits in an everyday consumer of apparel?* To answer this question, I decided to implement a survey that would see if people expressed interest in the Higg Index scores and if they already practice sustainable consumption of apparel. This section will go over the composition of the survey, collection of responses, creating the appropriate training and test sets, and the usage of the logistical binomial regression model with the ANOVA Chi Square test.

Composing the Survey Questionnaire

Overview of the survey method

There are three components that need to be taken into account when designing a survey questionnaire: types of questions, administration of the survey, and population sampling. This method can ask two different types of questions, open-ended or close-ended. For open-ended questions, the respondents have to write down their answers to the survey questions. Close-ended question surveys, on the other hand, already pre-defined answer options that respondents can pick (Crawford 1990 and Sudman and Bradburn 1973). In this case, it's important to have all of the possible answer options that someone might come up with when reading the question. The wording of the questions needs to be precise and clear. The survey that will be conducted for this thesis will make use of close-ended questions.

A survey can be administrated through various ways ranging from in-person to emails. Every way has its advantages and disadvantages. If the administrator were to hand out his or her surveys in person, then they would receive a higher response rate. The respondents can ask the

administrator what is the survey's purpose, how the results will be used, and if they fill out the questionnaire, if their identity will be protected. If they are confused on a question or the answer options, then they can ask for clarification from the administrator. Even though more people will be inclined to complete the questionnaire, if it's done in-person, the process itself is very expensive both monetarily and time wise for the administrator. For an in-person survey administration, there needs to be a location that has a good number of people passing through (Crawford 1990). An example of such location would be a public mall or a public park, where the respondents feel safe to express their personal views and opinions. If there is a specific targeted population, then their location might be in a different part of the world to which the administrator may have to travel to. Depending on the length and complexity of the survey, the time for completion of the questionnaire will vary. It's still a time-consuming process for the administrator, who has to be stationed at the survey questionnaire location and interact with the respondents. If the surveys were to be administrated by phone, mail, or online, then there would be a significantly lower-response rate compared to the in-person method. The respondents can easily ignore the survey, as they don't have that in-person connection with the administrator (Bradbum 1973).

When it comes to sampling the general population, the best method is simple random sampling, which can be defined as "a subset of a statistical population in which each member of the subset has an equal probability of being chosen" ("Simple Random Sampling" 2015). This prevents any bias towards a group of people that may hold the same values as the administrator. For this specific survey questionnaire, the sampling method will not be simple random sampling. Instead, it will be cluster sampling. This sampling method focuses on different geographical

areas where the general population lives. Once the areas are selected then the simple random sampling method is used ("Simple Random Sampling" 2015).

The last component for a survey questionnaire is the anonymity and confidentiality of the respondents. When an administrator is giving out the survey to the respondents, they should have some sort of agreement, verbal or non-verbal, about what type of personal information can be disclosed, if any. Ideally, the administrator should have some sort of third-party certification that allows them to conduct their survey in the first place.

These three components that define a survey questionnaire were taken into account when this particular survey questionnaire was designed. The survey questionnaire form that was used for this thesis project can be found in Appendix A. The questions, as previously mentioned, are close-ended rather than being open-ended. The surveying method is in-person and the population sampling is clustered. I was the administrator of the survey and had certification from the Institutional Review Board (IRB), a third-party organization that verified that my questionnaire respected and protected the respondent's personal information.

Determining the survey questions

After researching an extensive number of frameworks that describe consumers' willingness to pay for environmental goods, I decided to use the framework presented by Michel Laroche, Jasmin Bergeron, and Guido Barbaro-Forelo that was published in 2001. There are five parts of this framework that influence a consumer's willingness to pay more for environmentally friendly products: demographics, knowledge, values, behaviors, and attitudes (Laroche, Bergeron, and Barbaro Forelo 504). Figure 6 presents the conceptual framework that is presented in their paper.

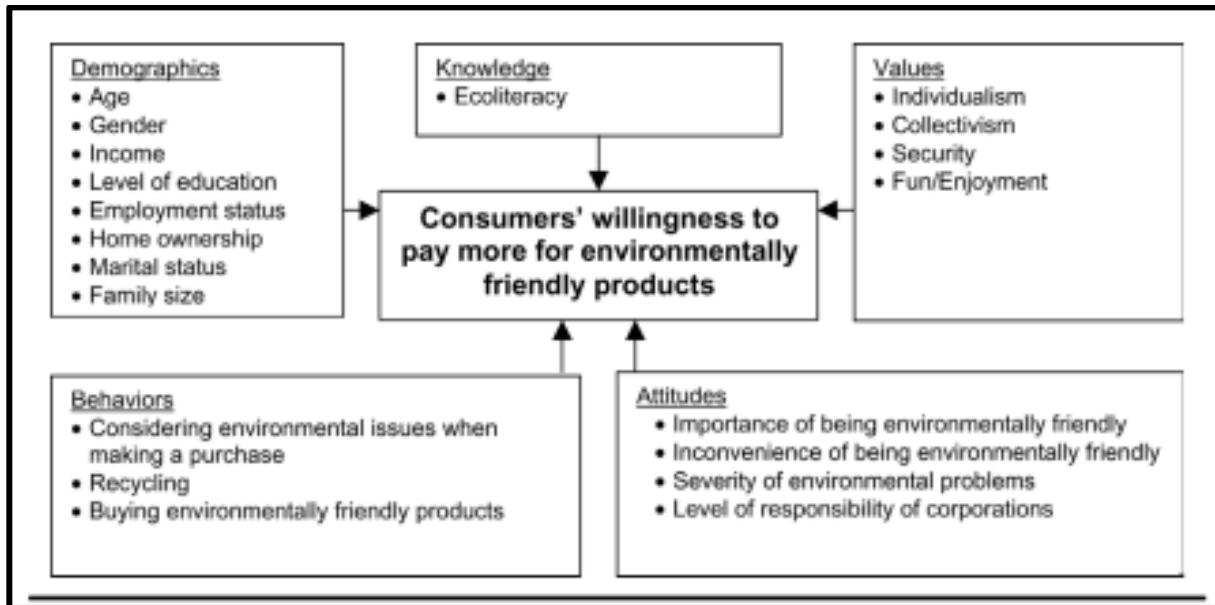


Fig 6: Laroche et al.'s framework for consumer's willingness to pay.

The first three questions of my survey are used to determine the respondents' knowledge, behaviors, and attitudes towards environmental issues that can be attributed to the apparel industry and if they already practice any sustainable behaviors. In the first question, I ask participants to check all of the following items that they look for on the apparel hangtag. When developing the options, I kept in mind the participant's level of education and their knowledge of environmental issues. Since I decided to use the random sampling technique, I had to use simple language and broad enough terms. This way no one would be overwhelmed by specific details. After conducting background research on environmental impacts, consumer behavior, and what the Higg Index currently measures, I came up with four categories that directly relate to knowledge and behavior. The categories that I chose were fiber composition, manufactory location, handmade, and fair trade. The last category that I added in was price, which can be associated with demographic, behaviors, knowledge, attitude and values. The second question focuses on how often do consumers check where and how their apparel was made, which measures their behavioral habits. Participants can select from the options of never, rarely,

sometimes, frequently, or always. Once the first two questions are completed, I provide a short paragraph on the Higg Index score that gives a basic overview of what it represents, in terms of sustainable practices for the supply chain of apparel. After the paragraph has been read, I asked if they will pay attention to the score or express some sort of interest in it. Depending on their values, attitudes, and/or behaviors they will answer yes or no. The last two questions directly focus on the concept of willingness to pay. If people answered ‘yes’ to the third question, then they are more likely to answer ‘yes’ to the fourth question, which asks if they are willing to pay more for the increase of the Higg Index score on a particular item. A higher score means that the item had more sustainable practices implemented during production, manufacturing, or transportation. Participants who answered ‘no’ to the third question would most likely answer ‘no’ to the fourth one. The last question asks for a percentage on how much more are consumers willing to spend. Those who answered ‘no’ for the fourth question were asked to put a zero.

Collecting the Responses

I collected responses in two locations on two different days. The first time, I went out and surveyed people was on November 12, 2016 at the second night of Denver Fall Fashion Week. My original plan was to survey people from Boulder and Denver, this way I would have two different demographics. Boulder, for the most part, is an environmentally conscious city. If I only collected survey responses from people that live in Boulder, then there is a high chance that the results would have a bias. However, the Denver and Boulder populations are similar because there is constant movement of people between these two cities. It wouldn’t make sense to separate these results between the two populations. This was further confirmed at the Denver Fall Fashion event. There were people who lived in Denver, but studied at CU Boulder. There were a few environmental studies students from Colorado State University, who were educated

on some of the issues that my survey was covering. In short, this event was held for the public. This type of event wasn't for Denver locals only; hence it wouldn't be fair to say that the obtained responses represent the Denver population.

For the most part the people that were self-selected were interested in sustainability Indexes. One of my concerns for the survey was that people would put down responses, that weren't 100% truthful. When I asked people if they wanted to fill out my survey, I had to explain the purpose of this survey and that I'm a CU Boulder student doing an honors thesis project. This explanation might make the individual who is about to complete this questionnaire feel that they have to answer in a certain way, in order to support my study. Another concern was that some individuals didn't read the short description of my project, which describes the Higg Index. When they didn't read the paragraph of information, they would always ask me to give a brief definition of this Index. Others forgot to check anything that can apply to them for the first question. At this event I collected 35 responses. The remaining 15 responses were collected on the Pearl Street Mall, which is an outdoor shopping center that runs for a few blocks. I walked around and asked people if they would be willing to fill out my survey.

Creating the Logistic Binomial Regression Model

A logistic binomial regression, simply known as logistic regression is a predictive analysis. It can predict whether a result, which must be coded as 0 or 1 ('no' and 'yes'), will fall into one or the other category ("What Is Logistic Regression?" n.d.). The main uses of a logistic regression are to assess the model and assess the predictors ("Logistic Regression" 2017). The input data can be either categorical or continuous ("What Is Logistic Regression?" n.d.).

My research will be assessing the predictors taken from the first question of my survey and using the logistic binomial regression model to predict which variables (criteria) can increase interest in the Higg Index scores. The predicted variable (Y) is the attention of consumers to the Higg Index scores. The outcome is depicted as a 0 or 1 ('no' and 'yes'). The dependent variables (predictors) are categorical variables (X1,X2,X3,X4,X5):

- Fiber Composition
- Price of the Apparel
- Manufacturing Location
- Handmade Apparel or Product
- Fair Trade Apparel or Product

This model was based on the 50 consumer responses from the survey.

(Y_i, x_i) , $x_i = (x_{i1}, \dots, x_{ik})$ k potentially important predictors, where $k = 5$, $i = 50$, in this case.

I suggested that Y has a binomial distribution and logistic regression is linear regression on the logit transform of Y, where Y is the proportion (or probability) of success ('yes' or 1) at each value of $X = (X1, X2, X3, X4, X5)$

The mathematical equation that I used to conduct my analysis is:

$$\text{Log} (p(X) / (1 - p(X))) = \beta_0 + X \cdot \beta$$

I wrote a code in the R programming language to run this logistic binomial regression model.

The results of survey (categorical variables) were coded, and divided into a subsequent training and test sets.

Results and Discussion

This section will begin with an overview of the responses that were acquired from the survey, analysis of the logistic regression model results, and end with a discussion that incorporates my results (survey and model) and the results of other sustainable apparel consumer studies.

Survey Results

For the first question, participants were asked to check off criteria that they paid attention to when they were buying apparel or footwear. My prediction was that people would pay attention to price, which proved correct. Close to 40% of the respondents were looking for price. This percentage could have been higher, because there is a chance that people missed the line that says to check all that apply. Another possibility is that some people may not want to admit that price serves as a factor, when it comes to the decision of buying an apparel item. Some individuals may genuinely not care about the price, which may depend on their economic status.

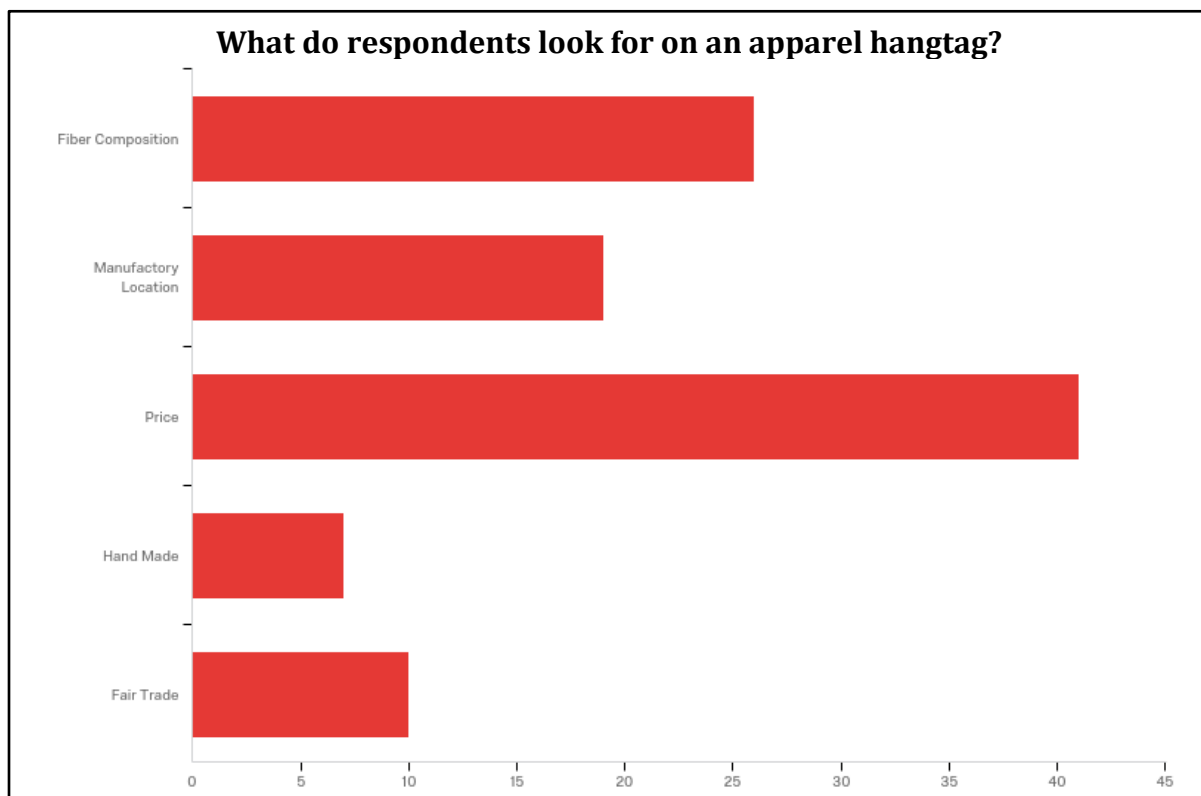


Fig 7: Breakdown of what people look for on an apparel hangtag.

Fiber composition and manufacturing location, when combined, account for 43%. These two categories receive attention from media outlets, thus people are aware of the social, medical, and environmental issues that each category captures. Handmade and fair trade criteria were the least relevant to the majority of participants. One can make an assumption that those who checked off handmade, fair trade, or both has a deeper understanding of sustainability in the apparel industry. Although some respondents expressed their awareness on sustainable fashion, after they finished taking the survey, there is a chance that they were influenced by the fact that this survey is for an environmental studies honors thesis. They might have been compelled to check off these two categories, as a way to help me with my research.

When it came to frequency of checking where and how their apparel was made, the distribution of responses followed a normal one. Every answer choice was chosen with the mode being 18 respondents for 'sometimes'. The options 'rarely' and 'frequently' each received 11 responses, while the remaining options of 'never' and 'always' got 3 and 6 responses.

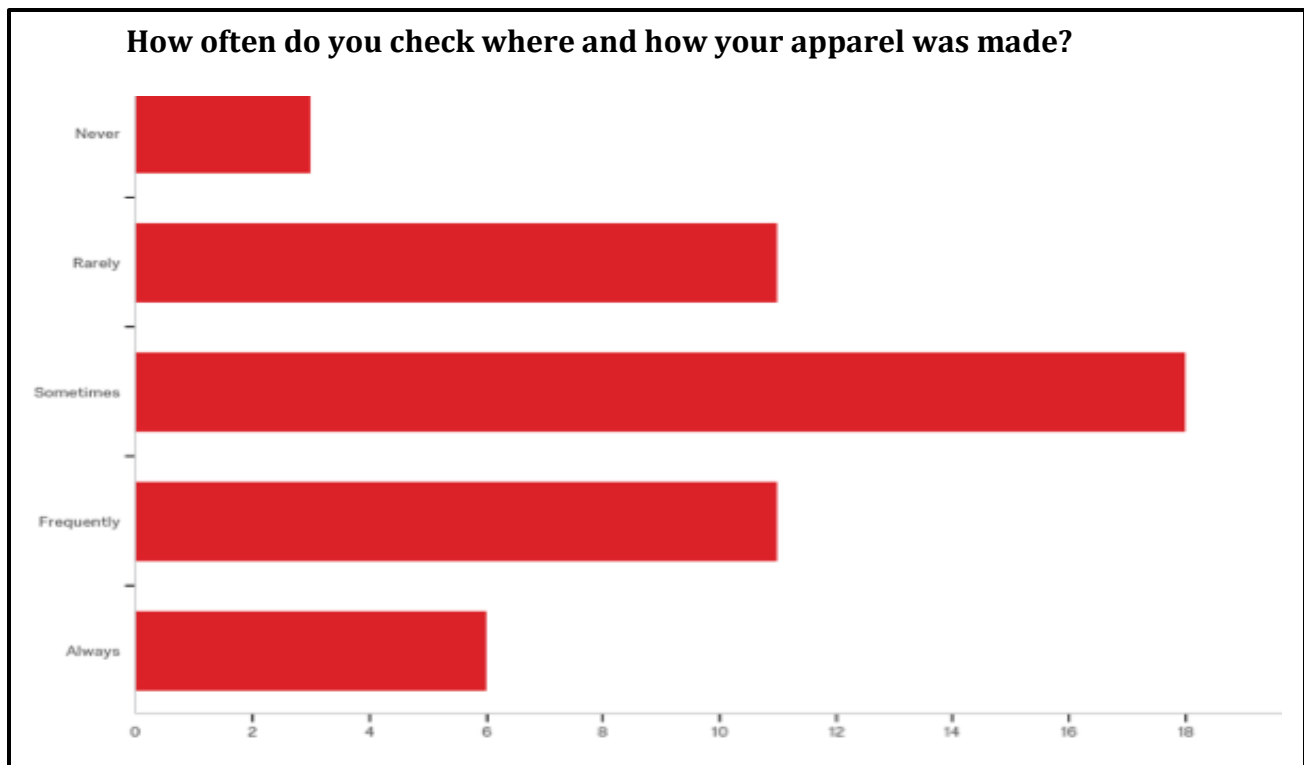


Fig 8: Frequency responses to the question of how often do you check where and how your apparel was made.

With regards to the Higg Index questions, people expressed a genuine interest in its purpose of measuring sustainable initiatives in the supply chains. Only 12 respondents claimed that they wouldn't pay attention to the Higg Index scores on apparel hang tags. The remaining 38 said that they would. I expected that the same proportion would carry over to the next question, covering willingness to pay more if the score were to be increased, however, the number of people who said 'yes' increased to 42 and 'no' decreased to 8. For the last question, which asked how much more are you willing to pay if the Higg Index score were to be increased, I estimated that most people would say 5 or 10 percent. In Figure 9, one can see that only 18 percent responded with 0 percent, but the majority of responses fell into the estimate range. In terms of potential outliers, this survey received two (45 and 50 percent). They have been grouped into the 25+ percentage category. There is a possibility that these respondents would pay the claimed

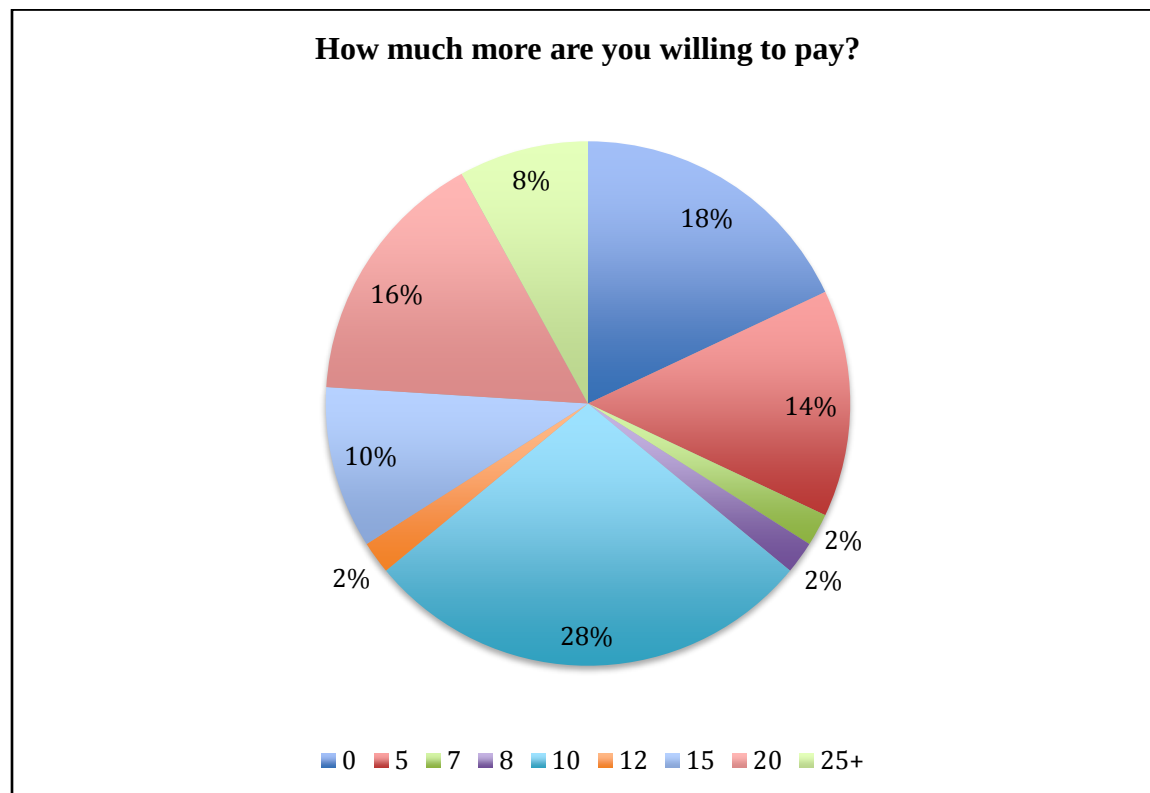


Fig 9: Break down of 50 responses to the question how much more are you willing to pay if the Higg Index score were to increase. This would mean that the item has been made more sustainably. Participants were asked to enter a percentage.

amount, but there is also a chance that they might have mistyped the percentage and didn't pay attention to the fact that they were missing a decimal place.

Overall, the group of 50 respondents would be willing to pay more and express support for an increase in sustainable practices. Those who responded with a 'yes' to the third question, concerning the Higg Index, would typically check off more categories, besides price, in the first question. They were also the ones who would pay more and enter a higher percentage than others. One of the potential outliers (50 percent more) followed this trend as well. This observation led me to create a logistic regression model that tests if the Higg Index score is an indicator of sustainable consumption of apparel.

Results of the Logistic Binomial Regression Model

Once I coded the data from the first question and split it into the appropriate training and test data sets, I ran the logistic binomial regression model twice and for each run I conducted the ANOVA Chi Square Test. To reiterate, the null hypothesis is that attention to fiber composition, price, manufacturing location, hand made, and fair trade cannot determine if there will be an interest in the Higg Index. The first

Analysis of Deviance Table						
Model: binomial, link: logit						
Response: Higg.Index						
Terms added sequentially (first to last)						
	Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)	
NULL			32	28.072		
Fiber 1	10.7484	31	17.323	0.001044	**	
Price 1	1.0226	30	16.301	0.311903		
Location 1	1.7359	29	14.565	0.187659		
Hmade 1	0.1535	28	14.411	0.695180		
Trade 1	0.1064	27	14.305	0.744247		

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1						

Fig 10: Output of the ANOVA Chi Square test for data in Appendix B

run's ANOVA Chi Square Test of significance produced the following result, which is displayed in Figure 10. In this scenario, one can see that those who were interested in the Higg Index checked off fiber composition (coded as Fiber in Figure 10) as one of the components that they

look for on an apparel hangtag, with a p value of 0.001044, indicated by the two asterisks. In other words, whenever someone expresses interest in fiber composition, there is a 99.999 percent chance that they will also be interested in the Higg Index. The accuracy of the model was around 63%. To summarize this model run, one can say that the null hypothesis can be rejected only for fiber composition. The other categorical variables proved to be insignificant, hence the null hypothesis holds true for them. However, I noticed that manufacturing location (Location) had a fairly low p value, and if it were lower then it could be significant predictor in determining the interest of the Higg Index score. I decided to re-divide the data into a new training and test set and rerun the model.

The second model run with the selected training and test set, found in Appendix C, demonstrated that people who chose fiber composition, manufacturing location, and fair trade showed interest in the Higg Index. For this run, the significance level of fiber composition increased from 0.01 to 0.001, and the p value decreased to 0.0002133. Manufacturing location and fair trade both acquired significance levels of 0.05 and 0.1,

		Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)
NULL				30	33.118	
Fiber	1	13.7098		29	19.408	0.0002133 ***
Price	1	0.0000		28	19.408	1.0000000
Location	1	5.0290		27	14.379	0.0249269 *
Hmade	1	1.1111		26	13.268	0.2918470
Trade	1	3.7654		25	9.503	0.0523241 .

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1						

Fig 11: Output of the ANOVA Chi Square test for data in Appendix C

respectively, by having lower p values than the original run. Hence, the null hypothesis can be rejected for these three categorical variables. The accuracy level still remained at 63%. Even though handmade didn't obtain a low enough p value for a significance level, its p value decreased from 0.695180 to 0.2918470. The p value for price, on the other hand, increased from

0.311903 to a 1, indicating that the variable of price doesn't correlate with interest to the Higg Index score.

Results from other studies on sustainable consumption of apparel

The first study that I examined focused on consumer attitudes towards organic cotton apparel. Professors Gwendolyn Hustvedt (Family and Consumer Sciences from Texas State University) and Marsha A. Dickson (Fashion and Apparel Studies from the University of Delaware) conducted a survey with 2,905 (over 18 years old) natural health and food consumers from the United States. The first part of the survey asked respondents to rate eight t-shirts based on price, organic cotton percentage, social responsibility labeling, and process labeling. Social responsibility labeling includes fairly traded materials, and process labeling consists of organic or sustainable practices in the production of the apparel. The second part examined how the participants would respond to hypothetical situations around organic cotton, environmental issues, and socially responsible consumption. Participants were also asked to identify what type of consumer they are. To measure the response, Hustvedt and Dickson used a numerical scale of 1 (strongly disagree) to 7 (strongly agree). Their results were based off the 377 fully completed survey responses. Consumers who exhibited behaviors that favorite the production and consumption of organic cotton were classified as Content User, and the ones that showed little to no interest were grouped as Non-Users.

Respondents from both categories viewed organic cotton apparel as a health benefit for them and their families. They associate the positive aspects of organic cotton with the ones that are given by organic food. The majority identified themselves as socially responsible consumers that were interested in satisfying their personal materialistic desires. Another overall trend consisted of the fact that the two groups support the concept of organic farming, but they don't necessarily

express any interest in a particular brand that promotes sustainable products. Respondents would go out of their way to purchase apparel that had a fair label trade or other environmental based labels, in support of organic farming. The members of the Content User group were mainly interested in the lowest price, but their numbers grew as the organic cotton percentage increased. On the other hand, the Non-Users didn't express any interest in organic cotton and preferred the 5 percent level (Hustvedt and Dickson 2009).

The second study focused on college students from Kansas State University and their knowledge of social and environmental issues that are associated with the production of apparel and whether their awareness influences their purchasing behavior. Professors Kim Y. Hiller Connell and Joy M. Kozar, who conducted an online questionnaire, had to keep in mind the contextual and habitual factors when it comes to choosing apparel, in addition to their knowledge, attitude, and beliefs. They found that students had greater awareness of the environmental issues rather than the social ones, such as labor laws. Some students noted that "popular designs of sustainable apparel are not stylish, often misshapen, and can't be worn to work events" (Hiller Connell and Kozar 2013). Hiller Connell and Kozar make a claim that students share this perception only for certain items of apparel, because the majority of mainstream brands that offer women's V-necks and denim jeans follow sustainable practices. The study also found that participants are interested in sustainable consumption, but they don't have the adequate reliable information about the environmental impacts to educate themselves on. In order to encourage sustainable consumption of apparel, there needs to be more education and information about the environmental and social impacts, which can be provided by educators and marketing teams of the apparel brands (Kozar and Hiller Connell 2013).

The third study focused on consumers' environmental knowledge and willingness to pay more for sustainable apparel. Seah Lee developed six hypotheses that can explain why certain types of apparel consumers have different levels of environmental awareness and their financial choices, which are listed out below

1. "Consumers who have higher fashion involvement value will have less environmental knowledge than those who have lower fashion involvement value" (Lee 2011).
2. "Consumers who have higher fashion involvement value will have lower environmental concern than those who have lower fashion involvement value" (Lee 2011).
3. "Consumers who have higher fashion involvement value will demonstrate fewer environmentally sensitive behaviors than consumers who have lower fashion involvement value" (Lee 2011).
4. "Consumers who have more environmental knowledge will demonstrate a greater willingness to pay more for environmentally friendly apparel products than customers who have less environmental knowledge" (Lee 2011).
5. "Consumers who have higher environmental concerns will show higher willingness to pay more for environmentally friendly apparel products than consumers who have lower environmental concerns" (Lee 2011).
6. "Consumers are more involved in environmentally sensitive behaviors will have higher willingness to pay more for environmentally friendly apparel products than consumers who are less engaged in general environmental behaviors" (Lee 2011).

Lee tested his hypotheses on 150 college-aged students through a questionnaire and to analyze the responses with the original hypotheses he created a model that used linear structural equation modeling. For the most part, the results followed the six proposed hypotheses. Students who

expressed a higher interest in fashion were not aware of the environmental issues and didn't practice any sustainable habits. In terms of willingness to pay, the model demonstrated that there is no linear relationship with environmental knowledge, thus disproving the fourth hypothesis. However, those who adopted sustainable habits into their lifestyles claimed that they would pay more for sustainably made apparel. Lee's research places an emphasis on developing a sustainable lifestyle and not solely relying on consumer's knowledge about environmental impacts. Marketing teams need to consider this fact when developing sustainability campaigns for apparel (Lee 2011).

Will Higg Index scores influence consumers towards consumption of sustainable apparel?

The first part in answering this question, using the results from my survey and model, is to determine the environmental awareness and any signs of sustainable habits from the 50 individuals that completed this survey. Not a single person from this specific group expressed any awareness or prior knowledge of the Higg Index scores or the SAC. At the Denver Fall Fashion Week show, I can assume that the majority of the 35 respondents had a higher interest and involvement in fashion, than other members of the general public in the Boulder/Denver area. If one were to use Lee's first three hypotheses that present a negative trend about fashion involvement value and environmental consciousness, then they would expect these 35 respondents to be primarily concerned about the price when they check the apparel hangtag, and that they 'rarely' or 'never' check where and how their items were made. Furthermore, if these expectations were correct, then these individuals would have no interest in the Higg Index scores and no motivation to pay more for an increase in the scores. Some of the remaining 15 respondents, who I surveyed at the Pearl Street mall, could be classified as having a higher interest/involvement in fashion based on the apparel shopping bags that they were carrying. For

this specific study, it's important to remember that residents of Colorado, especially of the Boulder and Denver areas. While my survey didn't explicitly ask for any information regarding prior knowledge, income, or educational levels, I could assume that almost all of the respondents would fall into this category. The fashion show required an entrance fee and the apparel bags indicated a substantial income. The educational level and environmental awareness appeared in the responses to the first two questions.

Participants were primarily interested in the price, when it came to checking off items on the apparel hangtag, but price didn't come up as an indicator, during the two model runs, for interest in the Higg Index scores. Instead, the model runs demonstrated that those who checked off fiber composition were more likely to acknowledge the Higg Index scores. During the second model run, manufacturing location, handmade, and fair trade came up as significant factors for interest in the Higg Index scores. From the survey, only ten and seven respondents indicated that they look for fair trade and handmade labels, respectively. Fair trade and handmade imply social rights for workers. My study supports the findings of Hiller Connell and Kozar, in that the public has greater awareness for the environmental issues (fiber composition and manufacturing location), rather than the social ones. With the communication-tool kit, in the works, it would be important to include information about the social issues regarding workers' rights and health along with the environmental ones.

When it comes to the last three hypotheses that Lee proposes about environmental habits and awareness and their relationship to willingness to pay, the results of this study partially follow them. There were two respondents who said that they look for fair trade labels and frequently check where and how their apparel was made, but both were not willing to pay more for an

increase in sustainable practices. The rest of the responses follow accordingly with the proposed hypotheses.

By saying that they will pay more for higher Higg Index scores and putting down percentages, participants are acknowledging the existence of the scores and what they stand for. Those who claimed that they already practice sustainable habits by looking for certain marks of sustainability were further compelled to continue on. Others, who put down price only, were intrigued by the idea of the Higg Index scores and would be willing to pay more for sustainably made apparel. The scores themselves represent the concept of sustainable apparel and this can be the only reason why participants are willing to invest more, just like in Hustvedt's and Dickson's study on organic cotton. If a different tool or marketing campaign were to be created that conveys the same information as the Higg Index scores, then consumers might not express any interest in them. Overall, for this study I obtained participants who chose to self-identify as environmentally conscious consumers, who wanted to support the cause for sustainable apparel. The Higg Index scores will serve as a reminder, thus encouraging consumers to develop and/or keep practicing their sustainable consumption habits. For this scenario and specific group, the answer would be yes.

Limitations of this Study and Further Research

Although this study achieved a favorable result, one has to remember that only a narrow range of educational levels, beliefs, values, race, age, and incomes were represented in this study. Even though this survey didn't record any information on these characteristics, it would be best to obtain more responses from different areas of the United States. This would provide an accurate representation of the public's opinion towards the Higg Index scores. Another limitation is that I had to explain the purpose of the survey and who I am. Participants could have felt some pressure to self-identify as an environmental conscious consumer, who would be interested in the Higg Index scores, and pay more for the increase of sustainable practices. My attempt to mitigate this scenario was to have the surveys be anonymous. If the surveys were administered by mail or email with a brief description about the research, then this problem could be avoided. However, the in-person method received higher response rates.

In terms of further research, it would be interesting to capture personal information about consumers. A question on previous knowledge or awareness about environmental problems would help marketing teams for apparel brands if they want to conduct a similar study and develop education campaigns on the social and environmental issues that are associated with the apparel industry's supply chain. This survey didn't present any specific scenarios regarding different prices and apparel items, so if I had more time on this project I would create situations where there are two identical apparel items, in terms of functionality, but they have different Higg Index scores. The respondent can only select one of these items, and to get a better understanding of their beliefs and desires I could alter the prices or change the scores.

Conclusion

The main takeaway from this research project is that almost all of my 50 respondents would express interest in the Higg Index scores, and they would be willing to pay more for apparel items that have higher scores. My survey demonstrated that my sample group had prior awareness and knowledge on environmental-based issues and only some were aware about the social issues that surround the apparel industry. None of them expressed any knowledge or signs of familiarity with the Higg Index scores. The model results and Kozar's and Hiller Connell's study further confirm this. If a respondent were to check off fiber composition, then they would most likely express interest in the Higg Index scores. One thing to note about my sample group is that they had disposable incomes meaning that they could afford to pay more for sustainably-made apparel and don't have any economic burdens or restrictions. Another trait that needs to be kept in mind is that all of my respondents chose to self-identify as environmentally conscious and had some sustainable consumption habits. Going along this scenario, the Higg Index scores would serve as reminders about sustainable-made apparel, thus these scores would increase sustainable consumption.

Whether they will be willing to pay more or even notice the scores, when they encounter them in real life, is another question that needs to be further researched. Perhaps these 50 respondents are interested in the concept of sustainable apparel and may want to support it. Furthermore, the Higg Index scores could encourage consumers to buy more apparel or footwear than necessary, under the fact that sustainable practices were used in this apparel's life cycle. Consumers would not feel any guilt when they are buying, and they might reason that their money is supporting sustainable apparel. If the goal of the Sustainable Apparel Coalition is to decrease levels of consumption, then they should create a marketing campaign or a section in the

communication toolkit about consuming less apparel, in general. Otherwise, the Higg Index scores will not increase sustainable consumption habits, but they will increase awareness towards environmental and social problems that occur in the apparel and footwear industries.

Consumers who aren't aware about neither the social nor the environmental problems need to be educated on them, whether it's through marketing campaigns, the communication toolkit, or academic courses. Without education and/or awareness, the Higg Index scores for these types of consumers become meaningless numbers on an apparel hangtag. When I was conducting my background research on the Higg Index and the Sustainable Apparel Coalition, I came across a diagram provided by the Anthesis group (member of the SAC), which is shown below. This is



Fig 12: Anthesis's 2013 representation of the Higg Index scores to their clients ("How Sustainable Is Your Outfit?", 2014)

a type of advertisement that needs to be included in stores, catalogues, etc. Even though it's from 2014, hence not up-to-date with the current vision for the Higg Index scores, it provides a breakdown of each item that composes the overall outfit for each model. The items mention the sustainable practices or concepts that were used during the manufacturing and production phases. The center panel briefly covers other environmental issues, such as greenhouse gases that are associated with the transportation phase. The one improvement that I would suggest is to mention something about the social issues. Overall, this diagram quickly and effectively educates or at least captures the attention of a consumer, regardless of prior knowledge.

Before any general conclusions can be made, it would be best to gather more data from different parts of the United States and conduct additional studies with consumers directly interacting with the Higg Index scores. Only then, one can say if the scores will increase sustainable consumption habits. However, this study showed that people would express some interest in the Higg Index scores, if they already practiced certain aspects of sustainable consumption. The scores would bring awareness to the issues, and they might spark an interest towards the issues and sustainable apparel in the consumers who don't identify as environmentally conscious.

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Appendix A

Survey

What do you look for on an apparel hangtag?

Please check all that apply:

- ☐ Fiber Composition
- ☐ Manufactory Location
- ☐ Price
- ☐ Hand made
- ☐ Fair Trade

How often do you check where and how your clothes were made?

Please circle your answer:

- A. Never B. Rarely C. Sometimes D. Frequently E. Always

The Higg Index is a self-assessment tool being used by apparel and footwear companies to keep track of how clean their supply chains are, when producing their products.

In the future, they are planning to have an overall numerical score or a series of scores for various items, which is/are determined by the Higg Index modules, on each clothing item. The score/scores would symbolize how sustainably the specific clothing item was made.

Please circle your answers:

1. If the apparel hangtag had a numerical score/scores, would you notice it?

- A. Yes B. No C. Sometimes

2. Would you be willing to pay more for apparel and footwear, if the Index score/scores was/were higher? (This means the item was more sustainably made.)

- A. Yes B. No

3. How much more are you willing to pay? Please write down a percentage (i.e. 10% or 20% or 30%).

If you answered “No” to question 2 then you can write down 0%.

Answer:

Thank you for your time!

Appendix B

Train Data for First Model Run

Higg Index	Fiber	Price	Location	Hmade	Trade
1	1	1	1	0	0
1	0	1	0	0	0
1	1	1	0	0	0
1	0	1	0	0	0
1	1	0	1	0	1
1	0	1	0	0	0
1	1	1	0	0	0
1	1	1	1	1	0
0	0	1	1	0	0
0	0	1	0	0	0
1	1	0	0	0	0
1	0	0	1	0	0
0	0	1	0	0	0
1	0	1	1	1	0
0	0	1	0	1	1
1	1	1	0	0	1
1	1	1	1	0	0
1	1	1	1	0	0
1	1	0	0	0	0
1	1	1	0	0	0
1	1	1	1	0	0
1	0	1	1	0	0
1	0	1	1	0	0
1	1	1	1	0	0
1	0	1	1	0	0
1	1	1	1	1	1
1	1	1	0	0	0
1	1	1	0	0	1
1	1	1	0	1	1
0	0	1	0	0	1
1	1	1	0	0	0
1	1	1	0	0	0
1	1	1	0	0	1

Test Data for First Model Run

Higg Index	Fiber	Price	Location	Hmade	Trade
1	0	1	0	0	0
1	1	0	0	0	0
0	1	1	1	0	0
0	0	1	0	0	0
1	0	1	1	0	1
0	0	1	0	0	0
0	1	0	0	0	0
1	0	1	0	0	0
1	0	1	0	0	0
1	1	0	1	0	1
1	0	1	0	0	0
1	1	1	1	1	1
1	1	1	0	0	0
1	1	1	0	0	1
1	1	1	0	1	0
0	1	1	0	0	1
1	1	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	0
1	1	0	0	0	0
1	1	1	0	0	0
1	1	1	1	0	0
1	0	1	1	0	0

Training Data Set for the second model run

Higg Index	Fiber	Price	Location	Hmade	Trade
1	0	1	0	0	0
1	0	1	0	0	0
1	1	0	1	0	1
1	0	1	0	0	0
1	1	1	0	0	0
1	1	1	1	1	0
0	0	1	1	0	0
0	0	1	0	0	0
1	1	0	0	0	0
1	0	0	1	0	0
0	0	1	0	0	0
1	0	1	1	1	0
0	0	1	0	1	1
1	1	1	0	0	1
1	1	1	1	0	0
1	1	1	1	0	0
1	1	0	0	0	0
1	1	1	0	0	0
1	1	1	1	0	0
1	0	1	1	0	0
1	0	1	1	0	0
1	1	1	1	0	0
1	0	1	1	0	0
1	1	1	1	0	0
1	0	1	1	0	0
1	1	1	1	1	1
1	1	1	0	0	0
1	1	1	0	0	1
1	1	1	0	1	0

Testing Data Set for the Second Model Run

Higg Index	Fiber	Price	Location	Hmade	Trade
1	0	1	0	0	0
1	1	0	0	0	0
0	1	1	1	0	0
0	0	1	0	0	0
1	0	1	1	0	1
0	0	1	0	0	0
1	1	0	0	0	0
1	0	1	0	0	0
1	0	1	0	0	0
1	1	0	1	0	1
1	0	1	0	0	0
1	1	1	1	1	1
1	1	1	0	0	0
1	1	1	0	0	1
1	1	1	0	1	0
1	1	1	0	0	1
1	1	1	0	0	0
1	0	1	0	0	0
1	1	1	0	0	0

R Code for Logistic Binomial Regression Model:

```
training.data <- read.csv('higgtrain2.csv', header = T, na.strings = c(""))
test.data <- read.csv('higgtest2.csv', header = T, na.strings = c(""))
model <- glm(Higg.Index~.,family = binomial(link = 'logit'), data = training.data)
anova(model,test = "Chisq")
fitted.results <- predict(model,newdata = test.data, type = 'response')
fitted.results <- ifelse(fitted.results > 0.5,1,0)
misClasificError <- mean(fitted.results != test.data$Higg.Index)
print(paste('Accuracy', 1-misClasificError))
```