The Market for Coffee:

An Analysis of the Effects of Sustainability Labels on Consumers' Choice

and U.S. Import Demand

by

Katherine Fuller

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved April 2022 by the
Graduate Supervisory Committee:

Carola Grebitus, Chair
Troy Schmitz
Renee Hughner

ARIZONA STATE UNIVERSITY

May 2022

ABSTRACT

Demand for specialty coffee worldwide is increasing, yet producers primarily located in developing countries struggle to cover their production costs and sustain their livelihood. Coffee producers are globally seeking higher profits by adapting their conventional production practices to be more socially and environmentally responsible. This dissertation aims to analyze the U.S. import demand for coffee and investigate consumer preferences and willingness to pay for coffee labels representing sustainability efforts.

Chapter one introduces the coffee industry and the three chapters of this research. In the second chapter, I analyze the influence of consumers' values and the warm glow effect of giving on their willingness to pay for sustainable coffee using a non-hypothetical auction mechanism. I use an information treatment to test the effect of information on consumers' willingness to pay. Providing information increases the premium consumers are willing to pay for sustainable coffee. Regarding values, consumers that like coffee and experience the warm glow of giving are willing to pay a premium for coffee with a sustainability label. Using a hypothetical online choice experiment, in the third chapter, I investigate coffee consumers' preferences and willingness to pay for Fair Trade, Direct Trade, Rainforest Alliance and USDA Organic coffee. I find that consumers value sustainability labels that aim to solve social issues more than those whose primary goal is to solve environmental problems. I find that when two labels are together on a coffee bag, there is no effect on consumers’ utility. However, there is a positive effect on consumers' willingness to pay for coffee labeled simultaneously for Fair Trade and Organic, and simultaneously for Direct Trade and Organic. In the fourth chapter, I estimate coffee price elasticities between major coffee exporters to the U.S. and calculate pass-through import cost using a system-wide

differential demand system. I compare imports of arabica and robusta green coffee and estimate the degree to which they complement each other or substitute one another. I find that arabica and robusta from Brazil, Colombia, and Mexico are substitutes but some exceptions show a complementary relationship. The inclusion of the exchange rate into the demand system has a significant effect on U.S. coffee demand. I find an incomplete pass-through cost of the exchange rate to U.S. import prices.

Chapter six concludes by summarizing the results of this dissertation and discussing the future challenges for the coffee industry.

I would like to thank God, for guiding me and leading me every step during this journey.

To my husband, Zach. I love you. One of the major blessings of my life is having you as my husband, sharing our dreams, and supporting each other. The sweetness of your love leads me to give the best version of myself in all aspects of my life. Your sharp mind and selfless love helped me to walk this journey.

To my precious son, Joshua. You brighten my life and help me see the beauty of every day. I love you sweet one.

To my parents, Alirio and Martha. Thank you. Your unconditional love, your persistence, and your dedication inspired me to work hard for the dreams that I aspire to achieve. Love you both.

To my sister, Camila. Thank you for all the long conversations and laughs. I feel blessed having you as my sister and best friend. I admire you and love you.

To my little sisters, Gaby and Dani. Thank you. Your love and constant words of encouragement inspired me during many challenges of graduate school and life. Love you.

ACKNOWLEDGMENTS

First, I would like to express my sincere gratitude to my committee chair, Dr. Carola Grebitus. I am achieving this critical milestone in my career thanks to her support and the multiple opportunities she gave me during my Ph.D. I am grateful to ASU for bringing me to a unique mentor like her. As my professor and mentor, she taught me more than I could ever give her credit for here. She has shown me, by her example, what a good scientist and person should be. I hope that I can inspire my students and colleagues in the way she inspired me one day. I am also very thankful to Dr. Troy Schmitz for his guidance and support since I started my journey at ASU. His lessons, brightness, and generosity facilitated the completeness of this research. I am also very grateful to Dr. Ashok Mishra, who encouraged me to continue with my PhD studies and facilitated the opportunity for me to be here today. I would also like to thank Dr. Mark Manfredo for his encouragement and providing me with avenues for professional growth. In addition, I want to extend my special thank you to Dr. Renee Hughner, Dr. Jeffrey Englin, Dr. Tim Richards, and Dr. Lauren Chenarides.

I want to thank my fellow PhD students, Alwin, Malu and Shijun for the stimulating discussions, sleepless nights before deadlines, and for all the fun we had in the last 6 years. In particular, I am grateful to Shijun for his help during the preparation of Chapter 4 of this dissertation.

Next, I would like to recognize the generous financial support I received from The Graduate and Professional Student Association, Marley Foundation, James Sweitzer Memorial, and Richard S. Gordon Scholarships that made this research possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Sustainability incorporates three factors: improving livelihoods, promoting economic development, and encouraging environmental protection (United Nations, 2012). Typical signals of unsustainable systems include lack of biodiversity, unregulated use of natural resources, inequality, and poverty. These compromise the trade-off of meeting present needs and the ability of future generations to meet theirs. Agriculture is at the core of sustainability efforts as most of the poorest people depend on agriculture for their livelihood (World Bank, 2017). Additionally, there is a pressing need to make agricultural practices more sustainable as demand for food in 2050 should be 60% higher than that of 2005 / 2007 (Alexandratos and Bruinsma, 2012). Current conventional techniques put farmers at risk as no significant value is added to their final product, trapping them in systematic poverty. Another consequence is exploiting natural resources to meet global demand for food, affecting natural biodiversity and the environment (Kremer and Miles, 2012).

Coffee is a pioneer in developing sustainability programs that benefit farmers and the environment. Coffee is the main economic activity of approximately 25 million smallholders in developing countries, and it is estimated that over 125 million people globally are dependent on coffee for their livelihoods (ICO 2002). Coffee is a globally preferred beverage, with approximately 400 billion cups consumed every year (Sachs et al. 2019). Demand for specialty coffee is projected to increase, driven by trends of new generations, preferences, and consumption patterns in developing countries (Nunes Torga and Spers 2020). The latest movement is called the "third wave," characterized by considering coffee an artisanal product differentiated by numerous attributes. The differentiation focuses on a superior quality coffee bean, whose availability is limited due to particular production methods that include social and environmental concerns (Borrella et al. 2015).

The coffee sector has been at the center of sustainability initiatives through certification and labeling programs. These initiatives originated from coffee stakeholders, NGOs, and private roasters. The three primary sustainability standards are Fair Trade, Rainforest Alliance, and Organic. These labels require a certification that farmers must follow closely to obtain the label. Other initiatives, such as, the Direct Trade initiative, do not have to comply with a certifying organization formally but agree with particular standards of the roasters.

Against this background, this dissertation analyzes coffee demand, consumers' preferences, motivations, and willingness to pay for sustainable coffee. The first chapter estimates consumers' willingness to pay (WTP) for coffee labeled for sustainability credence attributes using non-hypothetical experimental auctions. I examine consumers' WTP for Fair Trade, USDA Organic, Rainforest Alliance, Direct Trade, and a combination of Fair Trade and USDA Organic labels on coffee. Additionally, I investigate the underlying motivations of WTP for sustainable coffee. Specifically, I focus on altruistic, egoistic, and biospheric value orientation, and the warm glow effect. I find that consumers are willing to pay a premium of $2.57 for a 12oz coffee bag labeled for both, Fair Trade and USDA Organic, $2.04 for USDA Organic, $1.79 for Fair Trade, $1.96 for Rainforest Alliance, and $1.71 for Direct Trade. I also find that consumers react positively to information about the labels' claims, increasing the premium by approximately 55% for Rainforest

Alliance coffee and 72% for Fair Trade coffee. Although some consumers exclusively pursue their self-interest and do not care about social goals "per se", this does not hold for everyone. This study demonstrates that the warm glow effect on consumers who like coffee influences bids for coffee that carries sustainability labels. This indicates that sustainable coffee market outcomes may be influenced when attempting to increase sustainable purchase behavior. This study also shows that socio-demographic characteristics and knowledge of sustainability labels on coffee impact WTP for sustainable coffee. Stakeholders can use this to create promotional activities for consumers who value sustainable coffee, benefiting consumers and producers.

The second chapter analyzes consumers' preferences and willingness to pay for voluntary and private sustainability standards using online choice experiments. In this study, I examine the Direct Trade initiative, the newest private sustainability standard that emphasizes quality and sustainability efforts in coffee production. In the analysis, I test the multinomial model (MNL), the random parameter logit model (RPL), and the random parameter logit model with error component (RPL-EC) to determine the best fit for the data. I find that the RPL-EC fits the data best as it accounts for consumers' heterogeneity. I find that consumers are willing to pay a significant premium for double labeling: Fair Trade and Organic coffee, and Direct Trade and Organic coffee. This study demonstrates that consumers value social efforts embedded in sustainability labels more than environmental efforts.

Finally, I consider the crucial role of the U.S. in the sustainability path of the coffee industry, as the U.S. is the largest importer of coffee worldwide. I evaluate the quantity imported of arabica and robusta as they grow in distinctive ecosystems that encourage sustainable farming practices or, therefore, their lack. I analyze U.S. coffee import demand by country of origin using a system-wide differential demand system. In that system, I incorporate exchange rate parameters and estimate the degree of exchange pass-through to imported prices. Results indicate significant exchange rate pass-through elasticities into coffee import prices for the U.S. with respect to Colombia, Brazil, and Mexico. An appreciation of the U.S. Dollar against the Colombian Peso and the Brazilian Real increases U.S. imports of arabica from Colombia and the Rest of the World. An appreciation of the U.S. Dollar against the Mexican peso increases U.S. imports of arabica from Brazil and Mexico but decreases imports of robusta from the same countries.

My final chapter summarizes my empirical findings and outlines the implications of my research. My findings help identify the type of customer that purchases and pays a premium for sustainable production practices. It also displays the importance of providing information regarding the main goals of the labels, as it positively affects preferences and willingness to pay for sustainable coffee. My results provide an overview of consumers' characteristics and value orientations that lead to the purchase of sustainable coffee. Findings of the trade research provide insights into the effect of coffee price changes to the U.S. import demand for arabica and robusta coffee. Finally, I suggest future work to focus on sociological aspects that promote credence attributes' credibility, and explain how my research results generalize to other food sectors.

CHAPTER 2

THE EFFECTS OF VALUES AND INFORMATION ON THE WILLINGNESS TO PAY FOR SUSTAINABILITY CREDENCE ATTRIBUTES FOR COFFEE

2.1 Introduction

Rational economic theory states that people mostly behave according to what gives them the highest utility. However, there is evidence that shows that there are other motivations that drive people's decisions (Fehr and Schmidt 1999). Consumers support social and environmental causes that don't necessarily give them any rewards. The motivation that drives people to support a selfless cause comes from different sources such as their values, beliefs, or the society around them. Pure altruism moves consumers to donate and support social or environmental initiatives without expecting any personal benefit. However, there is another kind of altruism related to the warm glow feeling when people give back to society (Andreoni 1989). Prestige, societal recognition, and positive feelings drive people to make donations or support social and environmental efforts; but there is little research regarding the effect of human value orientations on consumers' WTP for products labeled for sustainability characteristics. Hence, we test the effect of human value orientations on WTP for sustainable product characteristics focusing on coffee.

We focus on coffee, as coffee is becoming the first fully sustainably produced agricultural product as a result of collaborative initiatives along the supply chain (Conservation International 2020). This initiative is supported by the premise that coffee consumers are willing to pay more for certain characteristics of coffee related to sustainability. Additionally, coffee consumption has notably increased due to several factors including trends and preferences of new generations and the increasing supply of specialty coffees. Daily demand for specialty coffee in the U.S. increased by 27% from 2001 to 2017 (NCDT 2017). To differentiate their coffee and obtain larger revenues, coffee farmers obtain production certifications. In addition to differentiation, these certifications aim to improve farmers' communities and the environment. Producers use certifications to guarantee social and environmental efforts to consumers. Those characteristics are mainly credence attributes, such as Fair Trade, Organic, or shade-grown labels (Loureiro and Lotade 2005). While consumers certainly derive positive utility from coffee's search quality attributes, e.g., packaging, one can argue that their utility derived from *credence* and *experience* quality attributes associated with coffee production practices and related quality traits is even more important to them (DePelsmacker et al. 2006). This importance—expressed by higher WTP—can be motivated by altruistic, egoistic or biospheric values, or by a warm glow effect. This raises the question of how much consumers are interested in sustainable coffee; and what the underlying motivations for consumers' valuation of coffee credence attributes are. This paper focuses on answering these questions by analyzing consumers' WTP and investigating underlying motivations. In addition, we estimate the effect of information on WTP. We include a treatment where we provide background information on the sustainability labels regarding related sustainability efforts. This, in turn, can be used to provide recommendations to stakeholders regarding the promotion of sustainable coffee.

Previous literature informs on preferences and WTP for Fair Trade coffee (DePelsmacker et al. 2006; Basu and Hicks 2008; Rotaris and Danielis 2011; Yang et al. 2012), and "eco-friendly" coffee – not covering sustainability labeling (Sorqvist et al. 2013). A study by Loureiro and Lotade

(2005) compared estimates from different certifications, including Fair Trade, Organic, and shade-grown coffee. Previous research has reported mixed results regarding the premium consumers are willing to pay for the labels. For instance, studies showed that consumers are willing to pay between $0.16 to $0.68 for a 12oz package of Fair Trade coffee, and approximately $0.12 to $1.16 for a 12oz package of Organic coffee (Loureiro and Lotade 2005; Van Loo et al. 2015).

Some studies have found that low WTP for sustainability labels are due to participants not being familiar with the labels (Sirieix et al. 2013; Hoogland et al. 2007), or being confused due to the overload of them in the market (Grunert 2011). This overload in the market coupled with consumer confusion and lack of trust limit the use of such labels (Horne 2009; Teisl et al. 2002). This hinders the goals of labeling organizations to improve farmers' livelihoods and/or reduce the negative impact on the environment, and begs the question of whether providing information could solve this problem. Previous studies found that providing information on nutritional benefits in experimental auctions increased participants' bids (Helleyer et al. 2012) but reduced them if the information included unpopular ingredients, such as, GMOs (Lusk et al. 2004). Vecchio and Annunziata (2015) estimated WTP for chocolate carrying sustainability labels using auction techniques and included the importance of information on the bids. Following this literature, we include a treatment in our study that enables us to calculate the effect of information on the bids for each bag of sustainable coffee tested in our experiment.

Previous research has focused on the effect of altruism on the valuation of different products. For instance, Bougherara and Combris (2009) tested the effect of altruism on the valuation of orange juice, and Yada (2016) analyzed the effect of altruism and egoism in consumers' decision to purchase organic products. Findings have been mixed depending on the product studied, demographics, and labeling scheme. Our study builds on previous research by including different sustainable coffee labels. In addition, we highlight the effect of underlying motivations for consumers to pay a premium for coffee grown under sustainability standards. Our main objective is to estimate the impact of value orientations and socio-economic factors affecting the WTP for coffee carrying labels of Fair Trade, Rainforest Alliance, Direct Trade, USDA Organic, and a combination of Fair Trade and USDA Organic. Specifically, we analyze the magnitude of altruistic, egoistic and biospheric values, and the warm glow effect on consumers' WTP for sustainable coffee using Tobit and Cragg models to account for the censored data collected with non-hypothetical experimental auctions.

2.2 Background

Sustainability Labeling

According to United Nations, "sustainability" is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations 2019). This definition involves the interaction between people and the environment. Access to clean water and education, reducing poverty, and zero hunger are some of the initiatives to improve people's quality of life. In terms of the environment, the goal is to have responsible production, reduce climate change, and protect ecosystems. These goals are aligned with the sustainability labeling scheme in which coffee has been a pioneer (Reinecke et al. 2012).

Several initiatives target coffee consumers' awareness regarding eminent environmental and social issues. For example, environmental issues focusing on coffee growing practices are related to soil erosion, loss of biodiversity, and deforestation. The intensification of coffee production systems driven by increasing demand encourages farmers to increase their yields by deforesting, overusing fertilizers and pesticides, and affecting the natural biodiversity (Gobbi, 2000; Rahn et al. 2014). Social issues are mostly focused on gender equality, child labor, and fair treatment and payment to producers (Doherty et al. 2013). To be relatable to consumers and appeal to their purchase decision, sustainability labeling programs align their mission so that the needs of producers in developing countries are connected to consumers in developed countries. In this regard, the intrinsic value that consumers assign to social and environmental activities is essentially the core of labeling programs. Since credibility is the essence of credence quality attributes of a product, labeling communicates those unseen characteristics.

The most recognizable labels for coffee are Fair Trade, led by Fair Trade USA, and Organic (Van Loo et al. 2015). The Fair Trade certification includes social and environmental standards that coffee farmers must follow in their production practices. The main goal of Fair Trade is to assure consumers that farmers are working in safe conditions, protect the environment, build sustainable livelihoods and earn additional money to empower their communities (Fair Trade certified 2019). The USDA Organic label assures that coffee is grown and processed relying on natural substances or biological based farming to the fullest extent possible. This process includes soil quality, pest and weed control, and the use of additives (USDA 2019).

Most studies regarding coffee sustainability labels use hypothetical settings to estimate consumers' WTP. For instance, DePelsmacker et al. (2006), using conjoint measurements, found that the label was the second most important attribute consumers pay attention to when buying coffee; and that the average WTP was 10% more than their reference profile. Their study included eight types of coffee with specific attributes including label, blending, and flavor. Basu and Hicks (2008) used stated preference conjoint methods to measure consumers' WTP. They found that consumers are willing to pay a premium per cup of coffee with the Fair Trade label only if the income increase to farmers does not exceed more than 75% (for U.S. respondents) and 55% (for German respondents). Analyzing different kinds of labeling, Loureiro and Lotade (2005) used contingent valuation methods providing evidence that the WTP for Fair Trade coffee is higher ($0.22/pound) than for shade-grown ($0.20/pound) and Organic coffee ($0.16/pound).

Arnot et al. (2006) used a non-hypothetical setting to elicit consumers' WTP. They estimated the price sensitivity of Fair Trade coffee by "ethical consumers" using choice experiments in a coffee shop. Their study found that "ethical consumers" are unresponsive to own price changes of Fair Trade coffee, while conventional consumers were likely to switch to Fair Trade coffee when facing own price changes.

Other coffee labels are UTZ, Bird Friendly, and Rainforest Alliance. The main goal of the Rainforest Alliance label is to certify that a coffee farm meets standards that conserve biodiversity and ensure sustainable livelihoods by transforming land-use practices, business practices, and consumer behavior (Rainforest Alliance 2019). They have a wide range of standards from soil and water conservation, energy and greenhouse emissions, to employment conditions and community relations (Rainforest Alliance 2017). The UTZ label merged in 2018 with the Rainforest Alliance offering mutual recognition and providing companies with an alternative to use the best mix of labels that benefit them the most (UTZ 2017). These labels have received less attention in the literature. Most studies focus on the networking effect of the certification scheme (Guedes Pinto et al. 2014), as well as, the governance structures, market positions, and certification requirements (Raynolds et al. 2007). An exception is Van Loo et al. (2015) who explore visual attention to sustainability labels, specifically Fair Trade, Rainforest Alliance, USDA Organic, and Carbon Footprint. They used hypothetical choice experiments and eye-tracking measures to find that consumers have a higher WTP for Organic coffee (premium of $1.16/12oz) over the other options. A recently introduced sustainability voluntary scheme is Direct Trade. The relatively new concept aims to reduce middlemen buyers and sellers promoting a direct relationship between roasters and coffee farmers. It was initially planned to become a "Direct Trade" certification through a third-party certification scheme but currently is only a voluntary practice. Producers and roasters agree on particular, but non-standard conditions in which roasters decide whether or not to use a label for marketing strategies (MacGregor et al. 2017). To our knowledge, this is the first study investigating consumer preferences and WTP for Direct Trade coffee.

Based on these labels, we test five different types of sustainability labeling using non-hypothetical second price auctions for coffee. The sustainability labels are Fair Trade, USDA Organic, the combination of Fair Trade and USDA Organic, Rainforest Alliance, and Direct Trade.

Altruistic, Biospheric and Egoistic Values and the Warm Glow Effect

Several studies found that when analyzing pro-environmental and ethical behavior it is important to consider the relevance of human values (Steg 2008; Fransson and Garling 1999). People usually refer to their values when evaluating the possible outcome of their behavior, for example when they decide which items to purchase (Iweala et al. 2019). Literature on ethical consumption shows that egoistic, altruistic, and biospheric values are important drivers in the decision making of a human for behaving ethically (Yadav 2016). According to Steg et al. (2005), egoistic values reflect an individual's self-interest, altruistic values emphasize the welfare of other human beings, while biospheric values relate to consideration for the environment.

Fehr and Schmidt (1999) stated that although most of the economic models assumed that people are egoistic and look after their own benefit, there is evidence that suggests that there are fewer self-interest motivations that drive people's behavior. Thus, among other motivations explaining human behavior, there is some sort of altruism. Rushton (1981, 1982) defined altruism as "a social behavior carried out to achieve positive outcomes for another rather than for the self". The theory of altruism considers that the only motivation for charitable giving is the utility derived from the charity's output (Becker 1974). Furthermore, Andreoni (1989) explained that people also get a warm glow effect from the act of giving, which he identifies as impure altruism. The warm glow concept is a prosocial behavior that causes the person to experience positive feelings associated with the act of giving (Andreoni 1990). The difference between these concepts is based on the ultimate utility they receive when giving to a certain cause. For the altruistic consumers, the assurance that their contribution is reaching the cause of their ethical concern is what maximizes their utility, while the impure altruistic consumers maximize their utility with respect to other causes, such as feeling good or the warm glow effect.

We test the effect of the above-described values on the WTP for sustainability. To do so, we follow the World Commission on Environmental Development's view (WCED 1987) and separate the concept of sustainability into two dimensions: the temporal dimension and the social dimension.

As explained by Grunert (2014), the temporal dimension is related to the trade-offs between present and future, which are closely related to environmental issues; while the social dimension refers to the trade-offs between consumers and others, appealing mostly to ethical issues. We argue that the social dimension is mostly motivated by altruistic values, while the temporal dimension can be driven by altruistic, egoistic or biospheric values or the warm glow effect of giving. Consumers decide which social and environmental initiative to support, motivated by their ethical concerns, and the most appealing message to them.

There is evidence of the effect of human values and the warm glow effect of giving on the temporal and social dimension in the food market (Umberger et al. 2009; Kareklas et al. 2014). The focus of most studies is on the motivation to purchase organic products, showing mixed results depending on the product, country, and methodology used. For instance, Monier-Dilhan and Berges (2016), using a conditional logit model of French household shopping baskets, found that consumers who purchase organic products are mostly motivated by social and environmental conditions of the farming practices rather than by possible personal benefits. Different results were obtained by Yadav (2016) using two-step structural equation modeling (SEM) applied to young Indian consumers. The author found that the main motivation to buy organic food was egoistic, associated with the health benefits perceived by organic farming practices.

Studies focused on the temporal dimension, specifically on eco-labeling, found that consumers' motivations are important to explain their WTP, e.g., Bougherara and Combris (2009). They used non-hypothetical choice experiments and found that consumers' WTP for eco-labeled orange juice relied more on their altruistic motives than on the perceived taste or safety attributes. Similar results were obtained by Grolleau et al. (2009) using a simple theoretical framework to explain the overall performance of eco-labeling schemes. This study indicated that altruistic consumers have a higher WTP for eco-label products, but argued that it may inadvertently prevent more self-interested consumers from purchasing these kinds of products.

In terms of the social dimension, studies have concentrated on the labeling that supports social causes such as the goals promoted by the Fair Trade Organization. Several studies have shown that altruism toward other humans is important when evaluating Fair Trade practices (Loureiro and Lotade 2005). Andorfer and Liebe (2015) addressed the role of morals, information, and price in the decision to purchase sustainable Fair Trade coffee using field experiments. They found that German consumers exhibited a positive reaction to a reduction in the price of Fair Trade coffee, but exhibited little to no effect when appealing to their moral obligation (warm glow effect) to purchase Fair Trade coffee. Kimura et al. (2012) obtained different results regarding the warm glow effect in their study of Japanese adults. They analyzed the effect of reputation on purchase behavior of Fair Trade goods using conjoint analysis and showed that under observable conditions, consumers valued Fair Trade products higher than under anonymous conditions.

In summary, previous studies suggest that warm glow, altruistic, egoistic and biospheric values have influenced consumers' purchase decision related to sustainable food products. For the case of coffee, there are no studies that have analyzed WTP using non-hypothetical experiments which include the most commonly used sustainability labels. Hence, we close a gap in the literature by providing insight into the motivations behind consumers' WTP for certified sustainable coffee.

2.3 Methods

To test WTP and underlying motivations for the respective WTP of consumers for sustainable coffee, we conducted non-hypothetical experimental auctions. Non-hypothetical auctions use real money and real goods that resemble a market environment in which bidders are focused on the valuation task (Lusk and Shogren 2007). This means that participants bid for the products in question and, if they win the auction, have to buy the product and pay for it. This allows for a more realistic evaluation of the value the respective labels (product characteristics) have for consumers. The auctions in our experiment reveal the WTP towards green and socially-friendly production of coffee. The advantage of this approach is that it incentivizes participants to truthfully reveal their value for the auctioned product by presenting them within a market setting where they are accountable for their choices. Since it is a non-hypothetical setting it eliminates problems associated with hypothetical and non-response bias (Fox 1995). In particular, we use second price Vickrey auctions to induce participants to reveal their true WTP for a good or service.

Participants were recruited via email lists and flyers to partake in the experiment in the consumer laboratory on campus of a large, public university in the U.S. southwest. Participants received a show-up fee of $20 for participating in the study. Participants were invited over the course of a week. Data were collected in a laboratory setting and participation was anonymous. Communication between participants was prohibited. In total, we conducted 15 sessions with approximately 9 participants per session (groups ranged from 4 to 14). Overall, 114 subjects participated in the experiments. In this study, we utilized a sample that includes participants that differ in both, their liking of coffee and their shopping behavior of coffee. For instance, about 16% of the sample do not like coffee and 31% are not responsible for shopping for coffee in their households. Rather than excluding these individuals from the main analysis, we believe that this is reflective of the market where some buy products they don't like for their households, and others consume products they like but don't buy themselves. For instance, the household head shops for the whole family. Also, one might not like a product but receiving information can change that preference. That said, we do include additional modeling to account for differences in findings that might be a result of preferences and buying behavior.

Measurements

In addition to the auctions, participants answered two series of survey questions measuring their values, preferences for coffee, coffee shopping behavior, and socio-demographics. The first set of questions measured altruistic, egoistic, and biospheric values, and warm glow derived from helping other people or the environment.

Warm Glow, and Altruistic, Egoistic, Biospheric Values

We measured participants' motivations towards protecting the environment and the act of giving, particularly when the embedded motivation is the warm glow effect. Following Hartmann (2017) we included six attitudinal questions about the pleasant feeling of giving, testing if acts such as doing something for social justice or participating in programs that give back to society make them happy or satisfied. Participants were asked if they agree or disagree with six statements on a five-point Likert-scale, with values ranging from 1 ("strongly disagree") to 5 ("strongly agree").

We identify altruistic values using measurement instruments developed by Stern et al. (1995), adapted by DeGroot and Steg (2008), based on the work of Rokeach (1973) and more recently, Schwartz (1994, 1996) on the motivational types of values. It has been validated that values play an important role in explaining beliefs and behavior and are, therefore, relevant to use as a predictor of attitude and behavioral intentions (DeGroot and Steg 2008; Grebitus et al. 2013b). The first part of the questionnaire included 13 value items regarding universal human values (equality, a world at peace, social justice, and helpful), biospheric values (respecting the earth, unity with nature, protecting the environment, and preventing pollution), and egoistic values (social power, wealth, authority, influential, and ambitious). Participants expressed the importance they assign to these values as guiding principles in their life on a scale from -1 (opposed to my values) to 7 (extremely important).

We created indexes for all values normalizing each value to have a mean of zero (Grebitus et al. 2013a) and a standard deviation of one to make coefficients more directly comparable.

Previous Knowledge of Coffee Labels

One of the objectives of this study is to identify the effect of information. Thus, we added a question regarding their knowledge about the sustainability labels included in this study. We used a 4-point scale ranging from “Not knowledgeable” (0) to “Very Knowledgeable” (3) (Peschel et al. 2016). “Knowledge” is a construct based on subjective knowledge of the labels (Cronbach’s α = 0.75).

Experimental Design

For our experiment, we selected six different types of coffee that differ only in the sustainability label they carry. The labels are Fair Trade, USDA Organic, Fair Trade + Organic (a combination of Fair Trade and USDA Organic), Rainforest Alliance, and Direct Trade. All labels guarantee a quality that relates to ethical values, social justice, solidarity, and empathy (Renard 2005). We also included an unlabeled coffee option which serves as the reference (base) profile in the auction.

We have two consecutive treatments to estimate the impact of information provided on coffee labels. During the first treatment, participants were shown five coffee bags labeled with different sustainability claims, and the sixth bag without any labeling. Since this was a non-hypothetical auction where the coffee alternatives were auctioned off, we presented the coffee bags in brown paper bags. This helped avoid issues related to participants being distracted by actual brand names, packaging colors, etc. In this treatment, participants were provided with no information. Before the second treatment, we provided participants with written information on the meaning of each of the coffee labels (see appendix A, Table A for details on the information). The order in which participants bid on the products was randomly changed for each of the groups according to a design generated using Ngene.

We started by explaining the procedures of the auction to participants and included a "practice round" to illustrate the mechanism and rules. During the "practice round" participants bid on two chocolate bars and were told why the best strategy was to bid truthfully. The non-hypothetical experimental auction proceeded as follows: *Step 1.* Participants looked at the coffee bags up for auction. The coffee bags were presented on a shelf in the experimental lab. The only label besides the bag's weight was the sustainability label: (1) Fair Trade, (2) USDA Organic, (3) Fair Trade + USDA Organic, (4) Rainforest Alliance, (5) Direct Trade, (6) unlabeled bag. *Step 2.* We explained the rules of the auction and emphasized why the best strategy was to bid their maximum WTP for each coffee bag. *Step 3.* Participants submitted six bids, one for each of the five labeled coffees and one for the reference coffee bag. *Step 4.* Each participant received a sheet of paper with a short explanation of the meaning of each of the labels. Each label was associated with its meaning. Participants kept the information sheet. *Step 5.* Participants submitted again six bids after reading the label's main objectives. They submitted one bid for each of the five labeled coffees, and one for the unlabeled coffee. *Step 6.* The highest bidder for one randomly selected coffee bag in each session paid an amount equal to the 2nd highest bid and received the corresponding coffee bag. *Step 7.* All other bidders paid nothing and received nothing (besides the aforementioned show-up fee of $20).

Econometric Analysis

We are interested in estimating the impact of information, human value orientations, and consumer characteristics on WTP. The dependent variable in this analysis is participants' bids for the different sustainability labels for a 12oz bag of coffee. The presence of zero bids is common in experimental auctions and it's the main reason to use both the Tobit and Cragg's double hurdle models, which are widely used in the literature (Lusk et al. 2001, 2004; Demont et al. 2013; Greene 2003). The way each of these models considers the purchase decision differs in that the Tobit model regards it as a one-step process while the Cragg model contemplates a two-step process. Hence, we estimate both models to compare findings.

In the Tobit model, the consumer's decision to purchase or not to purchase a product and the WTP for the product is considered a unique variable that is affected in the same way by the set of characteristics included in the model. The Cragg model utilizes a double hurdle process in which the first hurdle is the consumer's decision to purchase or not to purchase, and the second step includes the consumer's WTP conditional on the response of the first step. The Cragg model (Cragg 1971) uses a Probit model in the first step and a truncated normal model for the positive bids of the second step.

First, we estimate a random-effects Tobit regression model due to having a panel where participants submitted six bids in each of the two rounds (12 bids in total). The Tobit model, first proposed by Tobin (1958), defines the dependent variable in terms of the underlying latent variable:

$$y_{it}^{*} = \beta_0 + X_{it}\boldsymbol{\beta} + v_i + \mu_{it} \tag{1}$$

where y_{it}^{*} is the unobserved latent variable for individual i's bid on coffee bag t, β_0 is the intercept term, X_{it} is a vector of explanatory variables, $\boldsymbol{\beta}$ is a vector of unknown parameters, v_i is the term for the random effects, and μ_{it} is the error term. The random effects are independent and identically distributed (IID) and distributed normally with mean zero and variance of σ_v^2. The error term is also IID and distributed normally with mean zero and variance of σ_μ^2 independent of v_i. For each bid from individual i= 1, 2,…., N for coffee bags t:

$$y_{it} = max\ (0, y_{it}^{*}). \tag{2}$$

The lower bound of the Tobit model is set to zero to account for the zero bids:

$$y_{it} = \begin{cases} 0 & if\ y_{it}^{*} \leq 0 \\ y_{it}^{*} & if\ y_{it}^{*} > 0. \end{cases} \tag{3}$$

Expanding equation (1) for each of the bidding rounds:

$$y_{it}^{*} = \beta_0 + \beta_1 FairTrade + \beta_2 Organic + \beta_3 FairTrade\_Organic +$$

$$\beta_4 RainforestAlliance + \beta_5 DirectTrade + \beta_6 WarmGlow * labels + \beta_7 Altruism *$$

$$labels + \beta_8 Biospheric * labels + \ \beta_9 Egoism * labels + \beta_{10} Like\_coffee * labels +$$
$$\beta_{11} Knowledge * labels + \beta_{12} Female + \beta_{13} Female * labels + \beta_{14} Age + \beta_{15} Age * labels +$$
$$\beta_{16} Education + \ \beta_{17} Education * labels + \beta_{18} Race + \ \beta_{19} Race * labels + \beta_{20} Income +$$
$$\beta_{21} Income * labels + \ v_i + \mu_{it}, \quad (4)$$

where y_{it}^* represents individual *i*'s bids, in dollars, for coffee bag *t*; *FairTrade* is a dummy variable equal to one if the coffee bag participants bid on was labeled Fair Trade; *Organic* is a dummy variable equal to one if the coffee bag participants bid on was labeled USDA Organic; *FairTrade_Organic* is a dummy variable equal to one if the coffee bag participants bid on was labeled for both, Fair Trade and USDA Organic; *RainforestAlliance* and *DirectTrade* are dummy variables equal to one if the coffee bag participants bid on was labeled Rainforest Alliance and Direct Trade, respectively. *Warm_Glow*, *Altruism, Egoism*, and *Biospheric* are variables indicating the warm glow effect, altruistic, egoistic and biospheric value orientation indexes. These variables and the subsequent ones are interacted with a variable called "*labels*". This variable captures all coffee alternatives with sustainability labels. It is a binary variable that takes the value of one if the bid is for a coffee bag with one of the five sustainability labels, and zero otherwise. *Like_Coffee* is a variable that indicates how much participants like coffee, and *Knowledge* is a variable that shows if participants had previous knowledge of the coffee labels. The demographic variables are *Female,* a binary variable equal to one if the participant identified as female, zero otherwise; *Age* is equal to participants' age, and *Education* reflects if participants' level of education is a bachelor's degree or higher attainment. *Race* is a dummy variable equal to one if the participant is white, zero otherwise. *Income* is equal to participants' approximate annual household income before taxes.

The Cragg model's first step is the probability of a consumer purchasing a product, given by

$$Prob\ (y_{it} = 0) = \Phi(-\alpha_1 Z_{it}), \tag{5}$$

where y_{it} is participant *i*'s bid on coffee bag *t*, Φ is the standard normal distribution, $Z_{it}$is a vector of explanatory variables, and α_1 is a vector of coefficients. This first step allows the identification of the determinants of zero. Once the first step is calculated, the second step of the model estimates the impact of the independent variables on the WTP conditional on the consumer's decision to purchase the product. The distribution of y_{it} conditional on being positive is truncated at zero with means $\alpha_2 Z_{it}$ and variance σ^2. The second hurdle is given by:

$$f(y_{it}|y_{it} > 0) = \left\{\left(\frac{1}{\sigma}\right)\phi\left(\frac{y_{it-}\alpha_2 Z_{it}}{\sigma}\right)\right\}/\Phi\left(\frac{\alpha_2 Z_{it}}{\sigma}\right), \tag{6}$$

where ϕ is the cumulative standard normal density function and the new variable α_2 is a vector of coefficients. This specification of the double-hurdle model assumes error terms in equations (5) and (6) are independent and normally distributed. The two steps can be estimated separately or together. The joint likelihood function for the double hurdle model of the two steps can be found in Haines et al. (1988).

Since the Tobit model is a restricted version of the Cragg's model, the appropriateness of the model can be tested with a likelihood ratio test (Lin and Schmidt 1984). The likelihood ratio statistic is calculated as:

$$LR = -2\left[lnLF_{Tobit} - lnLF_{Probit} - lnLF_{Truncated\ Regression}\right] \tag{7}$$

where LF represents the log likelihood function values for each of the models. The null hypothesis is that the Tobit model is the appropriate specification. If the calculated likelihood statistic exceeds the critical chi-square value with number of degrees of freedom, the Tobit is rejected in favor of the Cragg's model (Lusk and Shogren 2007).

2.4 Empirical Results

Sample Characteristics

The sample characteristics are as follows. The sample includes a slightly higher share of female participants (55%) than men, which is similar to the U.S. population (U.S. Census Bureau 2018). The average age of participants is 32, which is slightly younger than the U.S. population (CIA 2019), with the youngest respondent being 18 and the oldest being 76. The average household size is two. About 53% of the sample had at least a college degree, 55% were white, and the average income was approximately $51,934 annually. A summary of the descriptive statistics for the sample along with statistics for the general U.S. population can be found in appendix B, table B.

Descriptive Statistics for Coffee Bids

Descriptive statistics for the coffee bids show that the WTP for sustainability labels on coffee differs among the labels and changes when information regarding the labels is provided. Table 2.1 shows the mean WTP for each of the rounds. In round 1 no information was provided before the auction. Before round 2, information regarding the meaning of the labels was provided.

Table 2.1 Descriptive Statistics for Bids in Rounds 1 and 2

In USD for 12 oz	Mean	SD	Min	Max	Difference from conventional[a]	Diff. in means R1 vs. R2[b]
Round 1 (Before information)						

Conventional (no label)	$1.59	$2.16	$0	$12		
Fair Trade	$2.64	$3.06	$0	$18.65	+$1.05*** (0.03)	
Organic	$2.86	$3.34	$0	$20	+$1.26*** (0.04)	
Fair Trade + Organic	$3.28	$3.33	$0	$15	+$1.69*** (0.05)	
Rainforest Alliance	$2.79	$3.06	$0	$15.65	+$1.20*** (0.04)	
Direct trade	$2.61	$2.91	$0	$17.65	+$1.01*** (0.03)	
Round 2 (After information)						
Conventional (no label)	$1.64	$2.16	$0	$10		+$0.04** (0.02)
Fair Trade	$3.21	$3.55	$0	$20	+$1.57*** (0.05)	+$0.57*** (0.03)
Organic	$2.86	$3.26	$0	$16	+$1.21*** (0.05)	+$0.004 (0.03)
Fair Trade + Organic	$3.75	$3.93	$0	$19.75	+$2.11*** (0.06)	+$0.42*** (0.03)
Rainforest Alliance	$3.17	$3.42	$0	$20.99	+$1.53*** (0.05)	+$0.37*** (0.04)
Direct trade	$2.97	$3.37	$0	$18.55	+$1.33*** (0.05)	+$0.36*** (0.03)

Notes: R1 = Round 1; R2 = Round 2, ***p<0.01, **p<0.05, *p<0.10. Standard deviations of the differences are reported in parentheses.

[a] Paired t-test that the label is different than the profile (base) reference (no label).

[b] Paired t-test that the label is different from Round 1.

Overall, the bids are lower than the average price of 12oz coffee bags in the market, which are around $6 to $12. This can be explained by the fact that coffee in the store provides a lot more information than just one or two labels. Hence, we measure the value for the sustainability attributes rather than a whole coffee product. During the first round 90%, of the participants submitted a positive bid for Fair Trade coffee, 95% for Fair Trade + Organic, 78% for Rainforest Alliance, 87% for Direct Trade, and 91% for the Organic coffee bag. During the second round, participation increased 7% for Fair Trade, 4% for Fair Trade + Organic, 10% for Rainforest Alliance, 3% for Direct Trade, and 1% for Organic coffee. We hypothesize that the increase in participation is due to information provided in round 2. As expected, the lowest bids were for the conventional coffee bag. Table 2.1 reports the difference in bids from the reference coffee bag as well as the difference between rounds. All bids for sustainability labels in round 1 are higher than for the reference coffee bag; the highest difference to the reference coffee bag is $1.69 for the combination of Fair Trade and Organic coffee labels while the lowest difference is an extra $1.01 for Direct Trade.

Bids in the second round exhibit the highest difference for Fair Trade + Organic coffee with $2.11 more than for the conventional coffee (reference coffee bag). The lowest difference compared to the reference coffee was for Organic coffee with an extra WTP of $1.21. We expected the WTP for the other labels to be higher than for the Organic coffee due to consumers being more exposed to the concept of organic than to other labels. The difference in dollars between the first round and the second round is $0.57 for Fair Trade, $0.42 for Fair Trade + Organic, $0.37 for Rainforest Alliance, $0.36 for Direct Trade, and $0.004 for Organic coffee. All the differences with respect to the reference (unlabeled) coffee are significant at the 1% level for both rounds as determined by a pairwise t-test. The differences between the first and second round are all significant at the 1% level except for the Organic label, which reported the lowest difference after the information was provided—again based on a pairwise t-test. To further illustrate differences in price among the labels and rounds, Figure E in appendix E depicts the effect of information on bids and the WTP for the labels compared to the reference coffee bag. It shows that the difference between the two rounds is almost zero for the conventional and the Organic coffee bags and the largest differences in bids between rounds are found for Fair Trade and Fair Trade + Organic.

Descriptive Statistics of Value Measures

Table 2.2 reports the descriptive statistics for the warm glow scale, as well as for the altruistic, egoistic and biospheric values. Table 2.2 reports the calculated means of the aggregated responses and the single items used to construct the indexes. It also reports each associated index's Cronbach's α. The Cronbach's α values for warm glow (0.83), altruistic (0.86), egoistic (0.77), and biospheric (0.90) indicate acceptable and good internal reliability of the measures.

The original measurement for warm glow shown in Table 2.2 was on a 5-point scale. The mean value for the aggregate response is 4.15 for warm glow. With respect to warm glow, all single items are close to 4 with respondents strongly agreeing with the pleasant feeling of making contributions towards human well-being and the quality of the natural environment. The item with which respondents agree least regards personal satisfaction of doing something for climate change. The original measurement for the questions related to altruistic, egoistic, and biospheric values are also displayed in Table 2.2. They were measured on a scale from -1 to 7. The mean value for the aggregated altruistic index is 5.42, for the egoistic index is 3.49, and for the biospheric index 5.37. The altruistic index shows that the value that receives the highest agreement is "regarding an equal opportunity for all" and the item with which respondents agree least is "working for the welfare of others". The egoistic index shows that the value participants agree with least is "social power" as a means of controlling or dominating others, and the value they agree with the most is "ambition" which includes attributes of aspiration and hard-working. Finally, for the biospheric index, the item that respondents agree with least is the one related to "unity with nature", and the item that respondents agree with the most is "protecting the environment".

Table 2.2 Warm-Glow, Altruistic, Egoistic and Biospheric Values Measurement

Index	Mean	SD	Cronbach's α
Warm glow[1]	4.15	0.58	0.83
Doing something for charity and non-profit organizations gives me a pleasant feeling of personal satisfaction	4.26	0.70	
I am happy with myself whenever I make contributions towards human well-being and the quality of the natural environment	4.30	0.63	
Doing something for social justice gives me a pleasant feeling of personal satisfaction	3.99	0.90	
Participating in programs helping me to give back to society makes me feel satisfied	4.10	0.74	
Doing something for climate change gives me a pleasant feeling of personal satisfaction	3.96	0.93	
Reducing waste at home e.g. recycling, I feel happy contributing to the quality of the natural environment	4.28	0.75	
Altruistic[2]	5.42	1.45	0.86
Equality: Equal opportunity for all	5.70	1.60	
A world at peace: Free of war and Conflict	5.59	1.64	
Social justice: Correcting injustice, care for the weak	5.26	1.80	
Helpful: Working for the welfare of others	5.12	1.82	
Egoistic[2]	3.49	1.42	0.77
Social power: Control over others, dominance	1.43	2.20	
Wealth: Material possession, money	3.44	1.89	
Authority: The right to lead or command	2.51	2.05	
Influential: Having an impact on people and events	4.40	1.94	
Ambitious: hard-working, aspiring	5.65	1.69	
Biospheric[2]	5.37	1.55	0.90
Respecting the earth: Harmony with other species	5.46	1.69	
Unity with nature: Fitting into nature	4.78	1.99	
Protecting the environment: Preserving nature	5.65	1.64	
Preventing pollution: Protecting natural resources	5.59	1.71	

Note: [1]Scale from 1=Strongly disagree to 5=Strongly agree. [2]Scale from -1=Opposed to my values to 7=Extremely important

Knowledge of Sustainability Labels

With regards to prior knowledge regarding sustainability labels the label that consumers knew best was USDA Organic followed by Fair Trade, Rainforest Alliance, and Direct Trade labels. Approximately 39% of the participants responded that they were knowledgeable to very knowledgeable of the USDA Organic label, 24% of Fair Trade, 11% of Rainforest Alliance, and 9% of the Direct Trade label. Approximately 64% of participants were not knowledgeable of the Rainforest Alliance label, while 15% responded they were not knowledgeable of the USDA Organic label. More details can be found in appendix F, Figure F.

Coffee preferences and buying behavior

Next, we report the results for the categorical variable Like_coffee. Participants responded to the question "How much do you like coffee?" The measurement ranged from 1 = not at all to 6 = very much. Approximately 16% of participants responded that they don't like coffee at all, 4% indicated that they like it very little, 9% like it a little, and 24% like it somewhat. Approximately 18% responded they like coffee much, and 29% noted they like it very much. We also asked participants about being responsible for coffee shopping in their households. Approximately 31% of participants were not responsible for coffee shopping, while 37% were sometimes responsible and 32% were always responsible for purchasing coffee.

Econometric Results

In our econometric analysis, we consider all labels, e.g., Fair Trade, USDA Organic, to be sustainability labels. To analyze WTP for coffee sustainability labels we use dummy variables that are equal to one if a coffee bag carried the respective label, e.g., Fair Trade, and zero otherwise.

The unlabeled coffee bag serves as a reference (base) profile, and the WTP for any sustainability label is compared to the unlabeled coffee. Using regressions, we examined bidding behaviors between the two rounds, allowing for the possibility of isolating the effect of the information provided.

We used equation (7) to test the appropriateness of the Tobit specification against the Cragg's model. The calculated likelihood ratio statistics for the first round is -2[-1090.97+302.19+1117.97] = -658.38, which is compared to the 95% critical chi-square with twenty-two degrees of freedom, which is 33.92. These calculations indicate that the Tobit model cannot be rejected in favor of the double hurdle model. Similarly, for the second round, the likelihood ratio statistics indicate that the Tobit model cannot be rejected in favor of the double hurdle model.

We estimated the Tobit model and the two-step Cragg's model for each of the two bidding rounds. Table 2.3 displays the results for the Tobit regression in each round for the full sample. We estimated three models to analyze the relevance of the main variables of interest. Model 1 includes the coffee labels only, in model 2 variables for the value orientations were added, and in model 3, value orientations and demographics were added. Results of the Cragg's model can be found in Table C, appendix C. The interpretation of the estimates is for a 12oz coffee bag. We will discuss the findings below.

Willingness to Pay for Sustainable Coffee Before Information (Round 1)

In Table 2.3, Model 1 indicates that the WTP for the five labels is significant and positive, ranging from \$1.37 (Direct Trade) to \$2.23 (Fair Trade+Organic). These results indicate a premium for the respective labels as they are all compared to the conventional coffee that did not carry any label.

Table 2.3 Willingness to Pay for Sustainable Coffee – Full model

Dependent Variable:	**Model 1**		**Model 2**		**Model 3**	
Coffee Bids	Round 1	Round 2	Round 1	Round 2	Round 1	Round 2
Fair Trade	1.45***	2.20***	1.46***	2.22***	1.79***	3.08***
Organic	1.70***	1.73***	1.71***	1.76***	2.04***	2.62***
Fair Trade+Organic	2.23***	2.80***	2.24***	2.83***	2.57***	3.68***
Rainforest Alliance	1.62***	2.18***	1.63***	2.20***	1.96***	3.06***
Direct Trade	1.37***	1.86***	1.38***	1.89***	1.71***	2.75***
Warm Glow*labels			0.13	0.29*	0.03	0.20
Altruism*labels			0.01	0.03	0.05	-0.02
Biospheric*labels			0.09	0.02	0.15	0.28
Egoism*labels			0.27*	0.18	0.07	0.01
Like coffee*labels					-0.14*	-0.26***
Knowledge*labels					0.10*	0.00
Female					-0.06	0.06
Female*labels					0.44	0.87***
Age					0.01	0.03
Age*labels					0.01	0.01**
Bachelor					1.09	0.99
Bachelor*labels					-0.54	-1.13***
Race					-1.22	-1.30*
Race*labels					-0.71***	-0.97***
Income					-0.00	-0.00
Income*labels					-0.00	0.00
Constant	0.63***	0.70*	0.62*	0.67*	0.49	0.17
σ	3.53***	3.60***	3.53***	3.62***	3.36***	3.50***

Note: ***$p<0.01$, **$p<0.05$, *$p<0.10$; N=684. Standard errors are clustered by the subject. “Labels” is a binary variable that takes the value of one if the bid is for a coffee bag with one of the five sustainability labels, and zero otherwise.

In model 2 we added the value orientations and the warm glow effect, each of them interacted with the variable “labels.” This variable captures all coffee alternatives with sustainability labels. The signs, significance, and magnitude for all labels tested remained the same. The interaction between egoism and labels is significant and positive, indicating that an increase of one standard deviation in egoistic values is associated with a higher WTP for coffee with sustainability labels.

Model 3 is the result of adding sociodemographic variables to model 2. The five sustainability labels are significant and positive, indicating that participants bid significantly more for the labeled coffee bags compared to the reference profile (unlabeled coffee). While similar in sign, results differ by about $0.33 in magnitude. The results are similar to the ones obtained in the descriptive analysis of the labels, where the highest bid in the first round was for the Fair Trade + Organic coffee label compared to the reference profile. Results indicate that consumers are willing to pay a premium of approximately $1.79 for a 12oz bag of Fair Trade coffee, $2.04 for Organic, $2.57 for Fair Trade + Organic, $1.96 for Rainforest Alliance, and $1.71 for Direct Trade coffee. Previous knowledge of sustainability labels increased the WTP while liking coffee decreased it. White consumers were willing to pay $0.71 less for sustainable coffee compared to participants of other races. Income, age, gender, and having a bachelor’s degree or higher attainment were not statistically significant.

To identify the premium of the value orientations on the specific labels, we interact the value orientation with each label. Specific information can be found in Table D, appendix D. In round 1, findings for the interactions between warm glow and altruism with any of the sustainability labels are not significant. However, the interaction of the biospheric orientation with the Organic label and the combination of Fair Trade and Organic labels were significant and positive. This result suggests that an increase of one standard deviation in biospheric values is associated with being willing to pay a premium of $0.40 for coffee with the Organic label and $0.39 for coffee with both the Fair Trade and Organic labels. Similarly, an increase of one standard deviation in egoistic values suggests an additional WTP of $0.55 for the Organic label and $0.53 for the combination of Fair Trade and Organic.

Willingness to Pay for Sustainable Coffee After Information (Round 2)

The second round accounts for the effect of information on WTP for sustainable coffee. As expected, WTP for sustainability labels was higher after receiving information about them (Model 1). Model 2 adds again the value orientations interacted with the variable "labels". Findings for the sustainability labels are again stable between models 1 and 2, indicating higher point estimates for round 2 compared to round 1 where participants had not received any specific information. After being informed about the different sustainability labels, the warm glow effect is significant and positive, which might be explained by the characteristics that define this effect. Customers that are motivated by the warm glow effect receive social recognition from displaying their actions in public settings or by a rewarding feeling of doing something good for society. These participants are willing to pay a premium of $0.29 for coffee with a sustainability label. The altruistic, biospheric, and egoistic orientations are not significant in this model.

Model 3 adds demographics to the previous model. All the labels' point estimates are significant and positive, and higher in magnitude (about $1 higher) than the ones obtained when no information was provided to participants. The premium for the Direct Trade label is $2.75, and for the combined label of Organic and Fair Trade, the WTP premium is $3.68 more than for unlabeled coffee. These results imply that if consumers have more information regarding the meaning of the labels their WTP increases. The WTP for Organic only slightly increased, which can be explained by the fact that consumers are more exposed to this label through other food products (NCA 2008). The highest increase is found for the Fair Trade label, which focuses more on social justice and farmers' livelihood. This gives insight into what motivates consumers to pay a premium for their coffee purchases. However, the value orientations are not significant when demographics are added. After providing information participants that like coffee lower their WTP for sustainable coffee, which can be explained by the fact that none of the labels focuses on the quality of the coffee. Except for income, all the sociodemographic variables interacted with labels are significant in Model 3 Round 2. Providing information has a positive effect on women indicating that female consumers would pay $0.87 more than men for sustainable coffee when being provided with background information on coffee labels. Holding a bachelor's degree and being White significantly decreases WTP by $1.13 for the former and $0.97 for the latter. Previous knowledge has no significant effect. Except for Race none of the socio-demographics are significant by themselves. White participants have a negative WTP of $1.30 for coffee in general.

Table D in appendix D also reports the premium of the value orientations on the specific labels after providing information about the labels. When consumers know the meaning of Fair Trade and Rainforest Alliance, those with a greater warm glow are willing to pay a premium of $0.40 and $0.53, respectively. They are also willing to pay $0.56 more if the coffee carries both Fair Trade and Organic labels. A similar result holds for participants with a higher altruistic value orientation. They were willing to pay a premium of $0.39 for coffee with a combination of Fair Trade and Organic labels. An increase of one standard deviation in biospheric values is associated with a WTP of $0.39 for Fair Trade coffee and $0.34 for Fair Trade and Organic coffee. Participants scoring high in egoistic values are willing to pay $0.54 for Fair Trade and Organic coffee.

Willingness to Pay for Sustainable Coffee (Pooled Model)

Overall, the point estimates in the second round are higher than in the first round where no information was given to participants. However, no direct comparisons can be made as these models are estimated separately. Thus, we test the effect of information by estimating a pooled model including observations from the first and the second round. Again the dependent variable is the coffee bids. Table 2.4 exhibits the results of the three models we estimated.

The first model includes the five sustainability labels and an information variable, which takes the value of one if the participant received information regarding the meaning of the label, and zero otherwise. Model 4 displays significant and positive coefficients for all labels. The information variable is significant and positive, demonstrating that providing information to participants increases their bids for coffee.

Model 5 includes the interaction effect of information with each of the sustainability labels to test the effect of providing specific information for each of the labels. The point estimate for the information variable is positive but not significant. However, the interaction of the variable with Fair Trade, Rainforest Alliance, the combination of Fair Trade and Organic, and Direct Trade labels are significant and positive. These results indicate that providing information on the labels increases participants' bids for all labels but Organic. This was expected given that this label is already highly recognized in the food market.

Table 2.4 Willingness to Pay for Sustainable Coffee: Pooled Model

Dependent Variable: Coffee Bids	Model 4	Model 5	Model 6
Sustainability attributes			
Fair Trade	1.82***	1.45***	1.45***
Organic	1.71***	1.71***	1.71***
Fair Trade+Organic	2.50***	2.23***	2.23***
Rainforest Alliance	1.90***	1.63***	1.63***
Direct Trade	1.61***	1.38***	1.38***
Effect of information on WTP			
Information	0.40***	0.00	0.01
Fair Trade*Information		0.73***	0.73***
Organic*Information		0.00	0.00
Fair Trade+Organic*Information		0.55**	0.55**
Rainforest Alliance*Information		0.54**	0.54**
Direct Trade*Information		0.46*	0.46*
Association between information and values as it relates to WTP			
Warm Glow*Information			0.09
Altruism*Information			-0.03
Biospheric*Information			-0.02
Egoism*Information			-0.14*
Constant	0.49	0.69*	0.69*
σ	3.50***	3.50***	3.51***

Note: ***p<0.01, **p<0.05, *p<0.10

Model 6 adds the value orientations and the warm glow effect interacted with the information variable. Results show that information decreases the WTP for coffee when participants have a high egoistic orientation. The interactions of information with the sustainability labels are significant and positive, and the magnitude is similar to Model 5.

4.6.4. Effect of Preferences and Buying Behavior on Willingness to Pay for Sustainable Coffee

To account for participants in the sample that did not like coffee or do not shop for it, we estimated models only including “coffee likers” and “coffee shoppers”—again estimating separate models for round 1 and round 2. These models account for consumers’ coffee preferences and shopping behavior. In the coffee likers model, we included observations for only those who indicated they somewhat, much, and very much like coffee. In the coffee shoppers models, we included observations for only those who indicated they sometimes and/or always are responsible for coffee shopping in their household. This serves also as a test for potential differences with respect to our main results discussed above. More generally studies may use heterogeneous samples in terms of consumption and shopping related to the product under investigation. We are interested in analyzing how results may differ when including only “coffee likers” and “coffee shoppers”.

Results are reported in Table 2.5. As found in Table 2.3 for the full sample, the sustainability labels are all significant and positive for both rounds and both sub-samples. The coefficients are mostly larger in the second round than in the first round except for the Organic label. After coffee likers learned about the meaning of the Organic label their WTP decreased by about $0.02. The highest bids are found again for coffee carrying both, the Fair Trade and Organic labels, confirming the descriptive statistics results reported in Table 2.1. Coffee likers who reported higher levels of warm glow are willing to pay $0.35 for sustainable coffee after information is provided. Female participants are willing to pay more, while White consumers and consumers with a bachelor’s degree or higher attainment have a negative WTP for sustainable coffee. Coffee shoppers with a high level of warm glow are willing to pay a premium of $0.45 after information is provided. Previous knowledge is not significant. Participants with a bachelor's degree or higher attainment have a significantly negative WTP, while female shoppers are willing to pay $0.88 more for coffee with a sustainability label. The remaining sociodemographics are not significant, which indicates that they do not impact coffee bids of regular or sustainable coffee.

Table 2.5 Willingness to Pay for Coffee Depending on Buying Behavior

Dependent Variable:	**Coffee likers**		**Coffee shoppers**	
Coffee Bids	Round 1	Round 2	Round 1	Round 2
Fair Trade	1.10**	1.99***	1.21**	2.24***
Organic	1.38***	1.36***	1.45***	1.68***
Fair Trade_Organic	1.92***	2.52***	1.88***	2.87***
Rainforest Alliance	1.50***	1.91***	1.57***	2.25***
Direct Trade	1.11**	1.61***	1.21**	1.96***
Warm_Glow* labels	0.13	0.35**	0.26	0.45**
Altruism* labels	0.06	0.05	-0.05	-0.08
Biospheric* labels	0.10	0.01	-0.26	-0.28
Egoism* labels	-0.00	0.01	-0.06	-0.06
Knowledge* labels	0.12**	0.04	0.16***	0.07
Female	0.69	0.86	1.14	1.27
Female* labels	0.40	0.83**	0.53*	0.88**
Age	-0.01	-0.00	-0.01	0.01
Age* labels	0.00	0.01	-0.00	-0.00
Bachelor	0.44	0.27	-0.09	0.00
Bachelor* labels	-0.54	-1.07***	-0.49	-0.95**

Race	-0.69	-0.94	-0.93	-1.08
Race* labels	-0.78**	-0.92**	-0.52	-0.60
Income	-0.00	-0.00	-0.00	-0.00
Income* labels	-0.00	-0.00	-0.00	0.00
Constant	1.78*	1.68*	1.80*	1.25
σ	2.96***	2.99***	2.84***	2.93***
N[a]	486	486	474	474

Note: ***p<0.01, **p<0.05, *p<0.10; We tested the correlation between coffee likers and coffee shoppers, and found that 64 % of coffee likers are coffee shoppers. [a] Standard error are clustered by the subject.

By focusing on these two sub-samples compared to our full sample, we find that the demographics' results are relatively stable across all models. Besides age, the demographics that are significant in the full sample are significant in the sub-samples. Most of the sustainability label coefficients are similar in magnitude, having a higher WTP in round 2 after information is provided. An exception is the decrease of WTP by coffee likers for Organic coffee. The main difference is found for the significance of the warm glow effect of giving. Results from the sub-samples indicate that coffee likers and coffee shoppers with higher warm glow are willing to pay more for coffee with a sustainability label.

2.5 Discussion and Conclusions

We conducted a non-hypothetical experimental auction to identify consumers' WTP for sustainable coffee and to explain their WTP with underlying motivations related to a warm glow, altruistic, biospheric, and egoistic values. In addition, we analyzed whether information for a variety of sustainability labels affects WTP. The WTP estimates reveal important characteristics of consumer preferences for sustainable coffee and give some insights into this market. Overall, this study found that providing specific information regarding each of the labels notably impacted consumers' WTP for sustainable coffee. The same holds for the warm glow effect of giving for coffee likers and coffee shoppers.

There are significant differences in the bids received for the five sustainability labels on coffee bags compared to the reference profile that did not carry a label. We found that the combination of a Fair Trade label together with the USDA Organic label was associated with the highest bids during both rounds. During the first round, this can be explained by the relevance of the Organic label for several food products and the efforts of the Fair Trade Organization to make their logo more visible. This could also be the result of the monotonicity of preferences of rational consumers, who prefer more (Fair Trade + Organic) over less (USDA Organic or Fair Trade by themselves). The second highest bids were associated with the Organic label which was the label with which participants were more knowledgeable. This is also supported by the NCA (2008) who found that the Organic label has the highest awareness in the U.S. compared to other sustainability labels for coffee. Following the Organic label were the Rainforest Alliance and the Fair Trade labels, which were previously associated with lower recognition and, hence, exhibited lower WTP

(Van Loo et al. 2015). We are also contributing to the literature by reporting WTP estimates for the Direct Trade label that has not been tested before.

An important contribution of our research to social characteristics that shape the sustainability market is the finding regarding the warm glow effect. Consumers are willing to pay more for coffee that assures them that the way it is produced takes care of social and/or environmental issues. Our findings suggest that consumers are willing to pay more for coffee production methods that tackle the temporal and social dimensions of sustainability. This result has been hypothesized in other studies as the reason why consumers pay a premium for eco-friendly coffee in the absence of any additional experience quality trait for the consumer (Sorqvist et al. 2013). Our results in Table 2.3 for the full sample suggest that altruism, egoism, and biospheric value orientations are not determinants of WTP for sustainable coffee. However, results change when sub-samples of only coffee likers and coffee shoppers are considered. Results from the sub-samples indicate that the warm glow effect influences WTP for sustainable coffee. The WTP related to value orientations in Table WA3 reveals that both the warm glow effect of giving and altruism have an effect on WTP but only when it is supported with information. Providing information on the efforts of Fair Trade combined with the Organic label had a positive effect on WTP for all the value orientations including egoistic consumers. This result seems counterintuitive; however, there are reasons that might explain this: (1) it has been found that one of the main factors that influence consumers to buy organic food are egoistic motivations as organic is commonly associated with the perceived health benefits of the farming practices (Yadav 2016), and (2) monotonicity in preferences.

The act of providing information on sustainability labels increases the WTP for coffee labels in this study, which demonstrates that there is a need to make these labels better known in the market. Although we found that around 39% of participants considered themselves knowledgeable to very knowledgeable regarding the Organic label, only 24% indicated that they knew of Fair Trade, 10% of Rainforest Alliance, and 9% of Direct Trade. An important finding between rounds 1 and 2 is that participants with previous knowledge about the sustainability labels responded slightly differently after information was provided. During the first round, previous knowledge increased coffee bids but after providing information, previous knowledge was not significant. This finding is supported by literature in social psychology where people tend to reject external information when they feel knowledgeable about a topic (Vertzberger 1990). We also found that female participants reacted positively to the provided information. This finding is consistent with the market report 2018 by Ethical Consumer (2018) that found that women were much more likely to conduct ethical activities than men. Also, previous studies found that women are more likely than men to purchase food with sustainability labels (Vecchio and Annunziata 2015; D'Souza et al. 2007).

Nevertheless, this study is not without limitations. One limitation comes from the laboratory experiment and the auction setting, which sacrifices external validity for more internal precision. Our setting utilized an environment that encouraged participants to reveal their WTP for sustainable coffee and allowed us to identify and measure altruism, egoism, and other relevant values. This specific design excludes more realistic experiences that customers face in the market when making food choices. While the laboratory setting does not enable us to include more realistic characteristics of a real food shopping experience, this design allowed us to conclude that the warm glow effect of giving and information are related to WTP for sustainable coffee. Another limitation of this study is the sample which is not representative of the U.S. population in terms of demographic characteristics. Future studies could aim for a more representative sample to better reflect the U.S. population and test whether findings are transferrable. Future research could include a larger and more representative sample, and could also increase the number of attributes in the study, accounting, for instance for taste and brand.

Finally, marketers could consider the market niche of warm glow-oriented coffee consumers by promoting the benefits that represent each of the sustainability labels. Our study found that a lack of information regarding these labels negatively affected consumers' WTP. Hence, reframing promotion and advertising with labels that focus more on altruism and less on self-benefit, could have a higher impact on WTP.

CHAPTER 3

U.S. IMPORT DEMAND FOR ARABICA AND ROBUSTA COFFEE DIFFERENTIATED BY COUNTRY OF ORIGIN

3.1 Introduction

The world demand for coffee is expected to increase 26% by 2020, mainly driven by rising consumption in emerging markets and increased demand for specialty coffees (Sachs et al. 2020). Despite growing demand, coffee producers face uncertainty with respect to the international price of coffee, climate change, and how to cover their basic costs of production. For several years, producing countries have followed strategies to reduce local costs and differentiate their coffee from their competition (Sick 2008). However, there are other factors beyond production costs and quality that need to be considered when analyzing the global coffee market. Because of coffee's significance as an export crop in certain countries, domestic policies are important, but so are global prices and terms of trade (Bates 1999). The price paid by importing countries is determined by many factors, including production costs, transportation, insurance, and the exchange rate with respect to the currency of the exporting country. The role of exchange rates, its transmission to agricultural import prices, and the effects on other exporting countries have not received enough attention in the literature. This paper develops and implements a differential demand system for arabica and robusta green coffee, and includes an analysis of the effects of exchange rates on U.S. imports from Colombia, Brazil, and Mexico. We also estimate short-run and long-run exchange-rate pass-through in the context of the U.S. demand for raw coffee imports originating from major coffee exporters.

The U.S. is the largest coffee importing country in the world followed by Germany, France and Italy. Despite its high demand, the U.S. produces coffee in Hawaii and California but is unable to satisfy its domestic market. Therefore, it relies heavily on imports to meet coffee demand. Under current U.S. coffee policy, producing countries export green coffee to the U.S. with little or no barriers to trade (CBP 2006). Most producing countries are located between the Tropics of Cancer and Capricorn in an area known as the "Coffee Belt," which is characterized by rich soils, mild temperatures, constant rain and shaded sun.

Factors that influence the quality of green coffee (regular coffee beans that are not roasted and remain raw), include environmental characteristics, cultivation practices, postharvest treatments, and storage (Wintgens 2009). Producing countries regularly attempt to improve their cultivation practices and postharvest treatments to compete in the global coffee market, but the intrinsic characteristics of each exporting country remain an important factor in determining U.S. coffee demand. U.S. import demand for coffee is also heavily influenced by classification and price. There are approximately 6,000 botanical classifications for various coffee varieties (NCAUSA 2020). The commercial coffee industry is differentiated by two main types of coffee: arabica and robusta. Therefore, denomination of origin, coffee type, relative prices, and U.S. exchange rates with respect to each of the major coffee exporting countries must all be taken into consideration when estimating the U.S. import demand for coffee.

Besides differences in natural endowments, environmental conditions, and processes and storage, other factors also affect the demand for imported coffee. Floating exchange rates create a complex scenario in which interactions and effects on prices affect trade flows. Previous work by Campa and Goldberg (2005) evaluated the short and long run effect of exchange rates on the import prices of 23 countries. Their study separates goods by sector, finding differences in the speed at which the cost is passed-through to several sectors, but they did not find a significant pass-through effect of the exchange rate associated with aggregated agricultural products. However, recent studies have found evidence of significant exchange rate pass-through effects in both the short and long run once agricultural imports are disaggregated. For example, Valdez-Lafarga and Schmitz (2016) and Valdez-Lafarga, Schmitz, and Englin (2019) examined the pass-through cost of the exchange rate for U.S. tomato imports with respect to Mexico and Canada. They found that the inclusion of the exchange rate in import demand analysis is appropriate, significant, and provides insights into a more complex picture of bilateral trade in disaggregated agricultural products.

A study by Anders and Fedoseeva (2017) investigated the connection between real exchange rates and long-run asymmetries in bilateral trade of coffee. Their research focused on robusta and arabica coffee and included 9 major U.S. coffee suppliers. Their study used a nonlinear autoregressive distributed lag (NARDL) to estimate long-run trade elasticities and found that exchange rate elasticities for arabica tend to be more elastic than for robusta. Their results also show that the dependency of U.S. importers on a specific coffee's quality and country of origin influence bilateral trade. Our analysis provides further insights into the import price dynamics of the main coffee producing countries. This paper contributes to the literature on differential demand for agricultural products by including an analysis of the exchange-rate effect on green coffee import prices to the U.S. by the major exporting countries, differentiated by type and country of origin. It is important to account for these specific characteristics of the US coffee market for three reasons: (1) the U.S. depends heavily on coffee imports to satisfy its domestic demand, (2) coffee is highly differentiated, and (3) coffee is produced in several countries. Measuring the speed of exchange-rate transmission, expenditure elasticities, own-price and cross-price elasticities associated with import demand provide valuable insights into the complex structure of the global coffee trade.

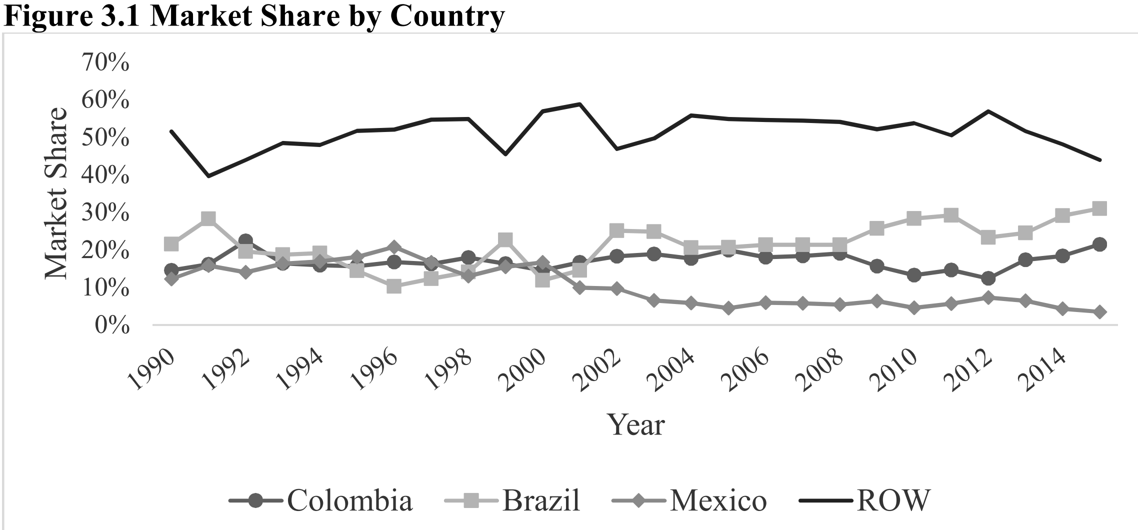
The remainder of this paper is organized as follows. The next section provides a background of the global coffee market and the justification for including exchange rates. It continues with a discussion of the incorporation of exchange rates into a differential import demand system, followed by specification of the econometric model used to estimate various parameters associated with the U.S. import demand for coffee differentiated by type and country of origin, and the explanation and sources of the data used. The last sections present the empirical results and conclusions.

3.2 Contextual Background

The Coffee Market

Coffee is one of the highest value traded products and beverages demanded in the world (Mussato et al. 2011). Given its increasing demand and the market dependency on imports, coffee requires special attention from the perspective of international trade. Before the dissolution of the International Coffee Agreement (ICA), an export quota regime supported international prices keeping uncertainty under control. From 1970 through 1987 the minimum price oscillated between \$1.06 to \$3.34 per pound of coffee. After the dissolution of the ICA, prices fell as low as \$0.40 per pound. The dissolution of the coffee import quota system, increasing concerns regarding production practices, and the increase in demand led by producing and emerging economies add to the complexities involved with estimating the international demand for coffee (Soderbery 2015). The U.S. demand for green coffee increased by 28% from 2002 to 2018 (USDA 2018). More than 80% of U.S. imports originate from Latin America, especially Brazil and Colombia, which contribute 23% and 22%, respectively (Lewin et al. 2004; USDA 2018). Market shares by the producing countries included in this study for the period of 1990 to 2015 are provided in Figure 3.1. We include the 3 larger coffee exporting countries to the U.S. excluding Vietnam due to missing information. Brazil, Colombia and Mexico account for nearly 50% of the world's coffee production. Brazil is a top producer of robusta, Colombia is a top producer of arabica, while Mexico produces both types of coffee.

Figure 3.1 Market Share by Country

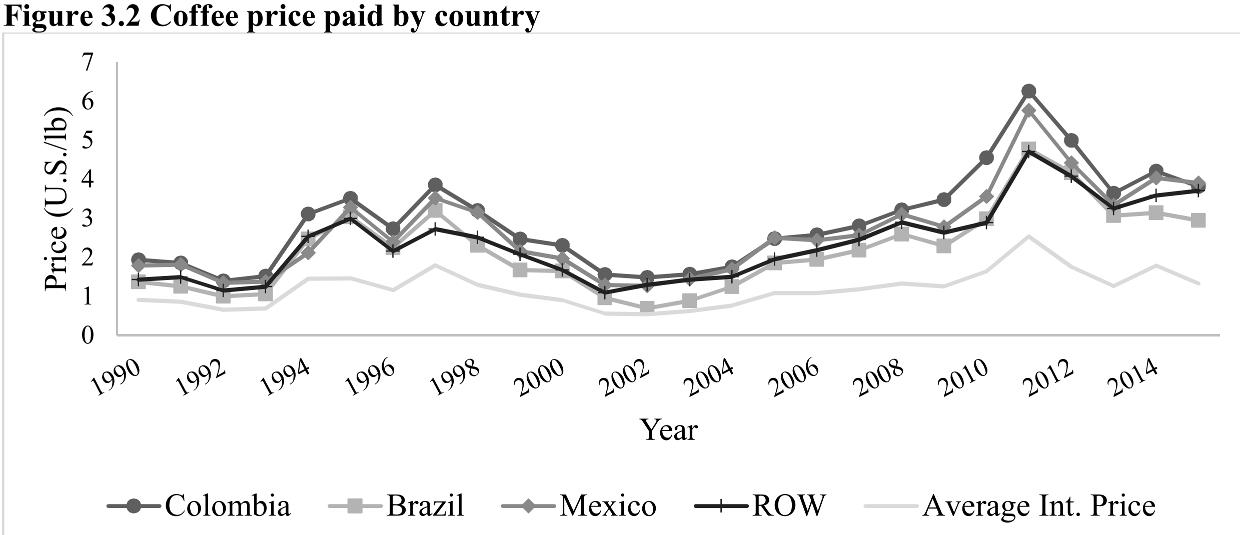


Brazil, Colombia and Mexico exported from 45% to 61% of the total coffee imports of the U.S. Colombia and Brazil have maintained a relatively steady market share but Mexican exports decrease considerably from 2003 to 2015. Mexico was one of the top coffee suppliers to the U.S., reaching a 21% market share by 1996, but then experienced declining market share, reaching a low of four percent in 2015. The loss in market share coincides with the Mexican peso crisis and the financial crisis initiated by capital flight that decreased gross income per capita by 17% in agriculture (Pereznieto 2010). The Rest of the World (ROW) also exhibits a substantial market share of international trade with regards to U.S. coffee imports and is, therefore, included in our import demand analysis.

The major competitive factors driving exporting countries' shares in the U.S. import market differ from country to country. Brazil produces around 33% of the world coffee supply and has a productivity advantage because of its cultivated area, widespread technification of production, and the production of the two most demanded types of coffee (USDA 2020). Colombia has opted for a more marketing-driven approach, investing in renovation of coffee trees and offering higher quality due to the harvest by hand technique (Wharton 2013). The geographical proximity to the U.S. is an advantage to Mexico, besides its natural resources are suited to grow coffee in different altitudes. Brazil, Colombia and Mexico have invested in marketing efforts to differentiate their coffee by using geographical indicators such as "Café de Colombia", and denomination of origin such as "Café Chiapas" and "Café Veracruz" for coffee in Mexico, and "Regiao do Cerrado Mineiro" for coffee from Cerrado Mineiro in Brazil. Other factors that affect the top coffee-producing countries are climate change and coffee rust management. Coffee rust is a fungus that mostly affects arabica coffee, hence, arabica-producing countries such as Brazil, Colombia and Mexico experienced significant reductions in the area planted to coffee in regions affected by coffee rust (USDA 2017).

Historically, Colombia has received a higher average price for its coffee ($2.91), followed by Mexico ($2.60) and Brazil ($2.12). Figure 3.2 shows the average price received per pound of coffee in the major producing countries, and the average international price for coffee. Low prices from 1998 to 2003 were caused by excess supply, which drove prices downward, and Brazil and Vietnam over-produced in 2004, holding stocks and creating uncertainty around future prices (ICO 2004). Vietnam went from producing 0.1% of the world's total coffee to 20% in only 30 years. The recent increase in Vietnamese coffee production was heavily influenced by the move from a communist economy towards a more capitalist market-oriented economy, enabling the coffee industry to strengthen and increase its production (FAO 2007). For purposes of our analysis, coffee from Vietnam is grouped in the previously mentioned ROW category.

Figure 3.2 Coffee price paid by country



Exchange-Rate pass-through into import prices

Exchange rate volatility can affect the import price of different goods and services (Campa and Goldberg 2005). In the framework of coffee trade between the U.S. and its main trading partners, the effect of the exchange rates and their transmission to the import price might drive trading decisions. Given the fact that the exchange rate is in constant fluctuation, any import demand analysis should at least test for the short and the long run pass-through of import prices. If there is evidence of incomplete exchange rate pass-through, exchange rates should be incorporated into the import demand analysis.

The approach this study follows is the one developed by Campa and Goldberg (2005) which analyzes the pass-through cost of the exchange rate into import prices in both the short and long run. Their model has the advantage of including exporter costs and accounting for the dynamics of the exchange rate. Import prices at time *t* by country *j* are depicted as:

$$P_t^{m,j} = E_t^j P_t^{x,j} \tag{1}$$

Where E_t^j is the exchange rate of country *j* (domestic currency per unit foreign currency) and $P_t^{x,j}$ are the export prices of a trading partner. This specifies import prices as a transformation of a country's *j* trading partners using the exchange rate. The export prices of the trading partner are a markup ($mkup_t^x$) over the exporter's marginal costs (mc_t^x)

$$ln(P_t^m) = ln(E_t) + ln(mkup_t^x) + ln(mc_t^x) \tag{2}$$

In this equation the markup and the marginal costs depend on several factors. For instance, $mkup_t^x$ is comprised of two components, an industry-specific fixed effects ϕ and a component sensitive to macroeconomic conditions Φ, such as the exchange rate (*E*):

$$ln(mkup_t^x) = \phi + \Phi\, ln(E_t) \tag{3}$$

The marginal costs mc_t^x of exporters is a function of the exporter market wage (w_t^x) and its market conditions (y_t) as:

$$ln(mc_t^x) = c_0\, ln(y_t) + \ c_1\, ln(w_t^x) \tag{4}$$

Replacing the markup price and the marginal costs in the import price equation, yields the following:

$$ln(P_t^m) = \ \phi + (1 + \Phi)\, ln(E_t) + c_0\, ln(y_t) + \ c_1\, ln(w_t^x) \tag{5}$$

The term (1+ Φ)= β denotes the exchange rate pass through depending on the structure of competition within the industry.

Estimation has a log-linear specification as:

$$ln(p_t) = \alpha + \delta\, ln(w_t) + \beta\, ln(e_t) + \varphi\, ln(y_t) + \ \varepsilon_t \tag{6}$$

Where p_t represents the local currency import prices, w_t is a primary control variable that depicts exporter's costs, e_t is the exchange rate, and y_t is a vector of other controls, such as the GDP of the destination market.

Using data regarding the primary control variable of the relative costs of a country's aggregated trading partners; Campa and Goldberg (2005) construct a consolidated export partners cost proxy. The way to calculate it is to take the real (*rer*) and the nominal (*ner*) exchange rates and compute:

$$W_t^j = ner_t^j \left(\frac{P_t^j}{rer_t^j}\right) \tag{7}$$

To account for the short and long run exchange rate transmission into import prices, it is necessary to express it in first differences. We include four lags for the exchange rate (e_t) and another four lags for the foreign production costs (w_t).

$$\Delta\, ln\left(p_t^j\right) = \alpha + \sum_{i=0}^{4} a_i^j\, \Delta\, ln\left(e_{t-1}^j\right) + \sum_{i=0}^{4} b_i^j\, \Delta\, ln\left(w_{t-1}^j\right) + c^j \Delta\, ln\left(gdp_t^j\right) + \vartheta_t^j \tag{8}$$

In this framework, the four lags help to account for the short and long run of the pass-through cost. The short run pass-through is captured by the term a_0^j, while the long run pass-through is set equal to the sum of the current rate plus the four quarters $\sum_{i=0}^{4} a_i^j$.

We estimate the parameters using ordinary least square with data on quarterly nominal exchange rates between the U.S. Dollar and the Colombian Peso (COP), the Brazilian Real (BRL) and the Mexican Peso (MXN). We include U.S. GDP and quarterly U.S. coffee imports from Colombia, Brazil and Mexico from 1990 to 2015. Our empirical analysis of U.S. coffee import demand and the effect of the exchange rate makes use of data on the U.S. monthly quantity and value (USD-valued) of green coffee imports, specifically arabica and robusta beans not decaffeinated. These data were obtained from the U.S. Department of Commerce, U.S. Imports Merchandise database for the period 1990 to 2015 (U.S. Department of Commerce, various years). The countries included are Brazil, Colombia and Mexico, which represent around 50% of total U.S. imports over the sample period. The rest of the exporting countries are aggregated into a rest of the world group (ROW). The monthly nominal exchange rates for the countries included were obtained from the International Financial Statistics (IFS) of the International Monetary Fund (IMF) from 1990 to 2015; and data regarding U.S. GDP was obtained from the Federal Reserve Bank of St. Louis Economic (2018). Table 3.1 provides descriptive statistics for the variables included in the model.

Table 3.1 Descriptive Statistics

		Country	Mean	Median	Maximum	Minimum	Std. Dev.
Import Values (million USD)	Arabica	Colombia	35.22	26.15	152.7	3.40	26.45
		Brazil	35.86	20.17	226	1.64	36.93
		Mexico	14.54	9.33	98.13	0	15.41
		ROW	70.35	50.13	250.8	6.09	56.96

	Robusta	Colombia	11.58	10.45	34.69	1.92	6.16
		Brazil	13.82	11.72	53.75	2.37	8.63
		Mexico	6.97	2.74	94.71	0.10	11.57
		ROW	42.63	40.13	107.8	12.28	17.72
Quantity (million tons)	Arabica	Colombia	11.37	10.66	31.16	2.18	5.28
		Brazil	13.67	12.37	39.17	0.81	8.74
		Mexico	5.35	3.94	35.84	0	5.14
		ROW	22.40	20.26	49.26	3.66	10.87
	Robusta	Colombia	4.75	4.15	21.86	0.40	3.52
		Brazil	8.08	6.60	37.70	0.86	5.48
		Mexico	3.54	1.08	32.31	0.03	5.65
		ROW	25.31	24.26	47.43	11.18	7.43
Price (US Dollars)	Arabica	Colombia	2.90	2.64	6.71	1.07	1.27
		Brazil	2.30	2.14	6.01	0.72	1.11
		Mexico	2.60	2.41	6.22	0.92	1.17
		ROW	2.81	2.58	6.46	1.03	1.19
	Robusta	Colombia	2.92	2.75	6.82	1.15	1.23
		Brazil	1.94	1.90	4.45	0.49	0.85
		Mexico	2.59	2.45	6.18	0.84	1.15
		ROW	1.74	1.71	3.71	0.54	0.66
USD Real Exchange Rate		USD/COP	1,758	1,897	3,246	474.62	687.76
		USD/BRL	1.68	1.80	3.89	0.00	0.96
		USD/MXN	9.45	10.24	17	2.75	3.65
GDP (billions)		U. S	11,574	11,127	18,354	5,872	3,775

The parameter results associated with the U.S. exchange rate-pass through model for Colombia, Brazil, and Mexico are found in Table 3.2 There is evidence of a long-run (defined as four quarters) pass-through elasticity into U.S. import prices for Colombian coffee of 3.6% and no evidence of a short-run (defined as one quarter) pass-through cost. Brazil has a long-run pass-through cost of 18.2% and a short-run cost of 16.5%, which are statistically significant at the 99% and 90% levels, respectively. U.S. coffee imports from Mexico exhibit statistically significant short-run pass-through elasticities into import prices of 12.5%, but there is no evidence of a long-run pass-through cost. The control variables that depict exporter costs were significant for all countries at the 99% level. The parameter estimates associated with U.S. GDP was significant for Brazil but not for Colombia and Mexico. These findings represent evidence of a pass-through cost to U.S. coffee import prices by the three exporting countries included in this study.

Table 3.2 Exchange rate pass-through for coffee by producing countries

Coefficient	Colombia	Brazil	Mexico
a_0	0.008 (0.049)	0.1653* (0.089)	-0.1259** (0.061)
a_1	-0.7307*** (0.236)	0.8969*** (0.309)	-1.2360*** (0.351)
a_2	-0.0030 (0.062)	0.3616 (0.285)	0.7514*** (0.236)
a_3	0.1265** (0.056)	0.1266 (0.291)	-1.1353*** (0.268)
a_4	0.0286 (0.048)	0.7283** (0.297)	0.0575 (0.207)
$\sum_{i=0}^{4} a_i^j$	-0.0367** (0.015)	-0.1824*** (0.052)	0.0260 (0.044)
b_0	-0.0270 (0.039)	0.0000 (0.012)	0.0109 (0.029)
b_1	0.3260** (0.136)	0.0117 (0.012)	0.8024*** (0.155)
b_2	-0.1262 (0.137)	-0.0400** (0.015)	-0.5777*** (0.142)
b_3	-0.0790 (0.115)	0.0013 (0.012)	0.0528 (0.100)
b_4	0.0177 (0.045)	-0.0172 (0.010)	-0.0802** (0.038)
$\sum_{i=0}^{4} b_i^j$	0.0195*** (0.007)	0.0064*** (0.002)	0.0240*** (0.005)
$c^{U.S}$	0.1252 (1.735)	4.1307* (2.170)	0.1144 (1.819)
α	0.2492 (0.247)	0.0034 (0.114)	0.2979* (0.1175)

*,**,*** indicate [statistical] significance at the 10%, 5%, and 1% level. Standard errors in parenthesis

Demand Theory

There exists a plethora of models in the economic literature that have been used to identify and analyze demand systems in empirical applications. We use a differential demand system, based on an extension of the Rotterdam model (Theil 1965). We begin by extending the original Rotterdam model to include factors affecting demand in a way similar to the approaches taken by Brown and Lee (2002) used to analyze women's labor on fresh fruit consumption, Marsh et al. (2004) used to analyze meat product recalls, and Capps and Schmitz (1991) used to estimate cholesterol indexes in meat products. While these studies demonstrated the usefulness of including key preference variables in their models, they did not account for the exchange rate effect in an import demand framework. Marquez (1994) analyzed the exchange rate pass-through in the context of the Rotterdam model of U.S. consumption disaggregated by source and included spending behavior and a Cobb-Douglas model to illustrate pricing behavior. While the approach in the latter paper did include the exchange rate and a demand system, it did not incorporate the effect of the exchange rate on the import price in international trade. Another study by Acharya and Schmitz (2004) included the effect of the exchange rate on a demand system for the apples. They found evidence of the effect but failed to account for potential exchange rate pass-through effects.

The Rotterdam model is derived by taking a system-wide differential approach to demand estimation. It has the advantage of allowing a theoretically correct specification of key factors in consumer demand system with or without imposing functional restrictions on preference variables

(Brown and Lee 1993). The Rotterdam parameterization under the differential approach is useful in estimating the demand for disaggregated commodities (Seale et al. 1992). The model in this paper follows the approach taken by Valdez-LaFarga, Schmitz, and Englin (2019) by incorporating exchange rate pass-through in a differential demand system in order to estimate the effect of the exchange rate on the exporting countries into the import prices. The speed at which the exchange rate pass through the price is also analyzed.

3.3 Econometric Model

The traditional Rotterdam model as proposed by Barten (1964) and Theil (1965) is as follows:

$$w_i d(log\, q_i) = \theta_i d(log\, Q) + \sum_j \pi_{ij} d\left(log\, p_j\right) + \beta_i d\,(log\, z), \tag{9}$$

$$i = 1,2,3, \dots, n$$

where $w_i = p_i q_i / x$ is the budget share for good *i*; $\theta_i = p_i(\partial q_i / \partial x)$ is the marginal budget share; $d(logQ) = \sum w_i d\,(logq_i)$ is the Divisia volume index; $\pi_{ij} = (p_i p_j / x) s_{ij}$ is the Slutsky coefficient, where $s_{ij} = (\partial q_i / \partial p_j + q_j \partial q_i / \partial x)$ being the $(i,j)^{th}$ element of the substitution matrix *S*; and $\beta_i = w_i(\partial logq_i / \partial z)$ is the preference variable coefficient that in this case is the exchange rate.

The general restrictions on demand systems are:

<u>Adding up</u>

$$\sum_i \theta_i = 1; \sum_i \pi_{ij} = 0; \sum_i \beta_i = 0 \tag{10}$$

<u>Homogeneity</u>

$$\sum_i \pi_{ij} = 0; \tag{11}$$

Symmetry

$$\pi_{ij} = \pi_{ji} \tag{12}$$

The coefficients θ and π are usually treated as constant in the Rotterdam model. While the β_i coefficients can also be treated as a constant, Brown and Lee (2002) suggested an alternative parameterization, where:

$$\beta_i = -\sum_h \pi_{ih}\ \gamma_h \quad i = 1, \dots, n, \tag{13}$$

where $y_h = \partial log(\partial_u/\partial_{qh})\ /\partial log\ z$, which represents the elasticity of the marginal utility of good h with respect to the preference variable z. This parameterization allows the imposition of restrictions on the preference variables through γ instead of the β. The main advantage is that γ_h is directly related to utility. The restrictions on γ are consistent with the adding up condition.

Restrictions can be directly imposed on the traditional Rotterdam model. By transforming the right-hand side according to the new parameterization of β we obtain:

$$w_i d(log\ q_i) = \theta_i d(log\ Q) + \sum_{j=1,\dots,n-1} \pi_{ij}[d\left(log\ p_j\right) - d\ (log\ p_n) - \gamma_j^n d\ (log\ z)], \tag{14}$$

$$i = 1, \dots, n-1$$

where $\gamma_j^n = \gamma_j - \gamma_n$. This new equation treats γ_j^n's as constants in the role of structural coefficients, while the β's are interpreted as the reduced form coefficients.

The γ_i can't be identified, but a linear combination of the γ_i is recoverable by taking advantage of the following relationship

$$\beta_{ij} = -\pi_{ij}\gamma_i \tag{15}$$

The adding up restrictions cannot be directly imposed on β_{ij}, since they are not constant but they can be imposed on the γ_i's. These characteristics allow the effect of the exchange rate to adjust to prices, offering a more accurate estimate of the dynamic effects of the exchange rate on import prices. The interpretation of the structural coefficient γ_i is the elasticity of marginal utility of a specific exchange rate with respect to a base elasticity. Under this framework, the Slutsky compensated elasticities can be recovered from the demand parameter estimates through the following equations:

Expenditure elasticity:

$$\delta_i = \frac{\theta_i}{w_i} \tag{16}$$

Price elasticity:

$$S_{ij} = \frac{\pi_{ij}}{w_i} \tag{17}$$

Exchange rate elasticity:

$$\varepsilon_{ij} = \frac{\beta_{ij}}{w_i} \tag{18}$$

An estimate of δ_i greater than one for the conditional expenditure elasticity implies that a one percent increase in the total amount spent on coffee by U.S. consumers leads to more than a one percent increase in consumption of coffee from country *i*, while an estimate of δ_i less than one implies that a one percent increase in the total amount spent on coffee by U.S. consumers leads to less than a one percent increase in consumption of coffee from country *i*.

Regarding the conditional compensated own-price elasticity, holding all else constant, if the absolute value of S_{ii} is greater than one, then a one percent increase in the price of coffee from country i will decrease the quantity of coffee demanded from country i by more than one percent. If the absolute value is less than one, then coffee from country i is price inelastic, which implies that a one percent increase in the price of coffee from country i will decrease the quantity of coffee demanded from country i by less than one percent. In terms of the cross-price elasticity estimates, a positive sign of the estimate S_{ij} indicates that product i and j are substitutes and a negative sign represents that they are complements. Finally, if the estimate for the conditional compensated exchange rate elasticity between country i and j (ε_{ij}) is significantly greater than zero, then an appreciation of the U.S. Dollar against the foreign currency positively affects the consumption of coffee from country i.

We use an iterative seemingly unrelated regression (SUR) to estimate the differential demand system. We imposed the demand theory restrictions of adding-up, homogeneity and symmetry, and dropped one equation to avoid the singularity of the error variance-covariance matrix. Since the estimation of the γ parameters are recovered through their relationship with β, the standard errors are recovered from the relationship:

$$\gamma_j^n = \prod^{-1}\beta \tag{19}$$

where $\prod$ represents the matrix of the price parameters and β is the vector of the exchange rate parameters.

3.4 Empirical Results

A differential demand system was estimated for U.S. coffee imports from Brazil, Colombia, Mexico, and ROW. Table 3.3 provides the model parameter estimates and Slutzky price elasticities. ROW accounts for the largest marginal share of total U.S. coffee imports (44.3%), followed by Colombia (27.5%), Brazil (17.2%) and Mexico (11%). The largest total marginal share is for robusta coffee (26.4%) and arabica coffee (17.8%) from ROW, followed by robusta coffee from Colombia (16%) and arabica coffee from Brazil (12.4%). The marginal shares reported are statistically significant at a one percent level with the exception of robusta coffee from Mexico, and the Slutsky own-price parameters are negative and significant except for Colombian exports of robusta coffee. These results are in accordance with demand theory. The cross-price parameters indicate substitution and complement relationships among countries.

Estimates of the cross-price elasticity between Colombian arabica and arabica from ROW and robusta from Mexico are statistically significant, indicating a substitution relationship between them. An increase in the price of arabica coffee from Colombia increases the quantity imported by the U.S. of arabica from ROW and robusta from Mexico. A complementary relationship between arabica from Colombia and arabica from Mexico is also significant, indicating that an increase in price of Colombian arabica decreases the quantity imported of Mexican arabica. However, a different result is obtained for Colombian robusta and its relationship with the other countries where none of the estimates are significant.

The cross-price elasticity between arabica and robusta from Brazil is negative and significant, suggesting that an increase of Brazilian arabica reduces U.S. imports of Brazilian robusta. Meanwhile, the relationship between arabica from Brazil and arabica from Mexico is positive and significant reflecting a substitution effect. The cross-price elasticity for robusta from Brazil is significant with Mexico and with robusta from ROW but not with Colombia. There is a substitution relationship between robusta from Brazil and arabica from Mexico and robusta from ROW and a complementary relationship with robusta from Mexico. A price increase in robusta coffee from Brazil increases U.S. imports of arabica from Mexico and robusta from ROW, while decreasing the quantity imported to the U.S. of Mexican robusta. There is a substitution effect between arabica from Mexico and arabica from ROW, which suggests that an increase in the price of Mexican arabica increases quantity imported of arabica from ROW. As expected, most of the cross-price elasticities reflect substitution effects as a result of price changes. However, these results also reinforce the differences that exist between these two types of coffees and its demand in the U.S. market.

The expenditure, own-price and cross-price elasticity estimates are provided in Table 3.4.

Table 3.3 Rotterdam Model: Conditional Parameter Estimates without Exchange Rates

		Price (π_{ij})								
Country		**Colombia**		**Brazil**		**Mexico**		**ROW**		**Marginal Shares (Θ_i)**
	Coffee Type	Arabica	Robusta	Arabica	Robusta	Arabica	Robusta	Arabica	Robusta	
Colombia	Arabica	-0.0585*	-0.0280	0.0230	-0.0015	-0.0459**	0.0581***	0.0467**	0.0061	0.1139***
		(0.0330)	(0.0214)	(0.0177)	(0.0125)	(0.0216)	(0.0160)	(0.0225)	(0.0132)	(0.0139)
	Robusta		-0.0251	-0.0068	0.0108	0.0116	0.0049	0.0153	0.0172	0.1608***
			(0.0234)	(0.0157)	(0.0111)	(0.0198)	(0.0147)	(0.0197)	(0.0124)	(0.0134)
Brazil	Arabica			-0.0387*	-0.0238*	0.0344*	-0.0059	0.0269	-0.0090	0.1249***
				(0.0202)	(0.0122)	(0.0187)	(0.0140)	(0.0178)	(0.0124)	(0.0148)
	Robusta				-0.1096***	0.0431***	-0.0273**	0.0147	0.0937***	0.0470***
					(0.0125)	(0.0154)	(0.0115)	(0.0130)	(0.0112)	(0.0159)
Mexico	Arabica					-0.1092***	0.0190	0.0442*	0.0027	0.1042***
						(0.0379)	(0.0228)	(0.0233)	(0.0183)	(0.0229)
	Robusta						-0.0726***	0.0079	0.0158	0.0054
							(0.0217)	(0.0172)	(0.0139)	(0.0172)
ROW	Arabica							-0.1509***	-0.0050	0.1787***
								(0.0313)	(0.0151)	(0.0155)
	Robusta								-0.1217***	0.2648***
									(0.0190)	(0.0204)

*,**,*** indicate [statistical] significance at the 10%, 5%, and 1% level.

Table 3.4 Conditional Expenditures and Slutsky Price Elasticity Estimates without Exchange Rates

				Cross-Price Elasticities							
Country	Type	Expenditure Elasticities	Own-Price Elasticities	Colombia		Brazil		Mexico		ROW	
				Arabica	Robusta	Arabica	Robusta	Arabica	Robusta	Arabica	Robusta
Colombia	Arabica	0.7855***	-0.4039*	--	-0.1937	0.1591	-0.0107	-0.3166**	0.4007***	0.3227**	0.0425
		(0.0963)	(0.2281)		(0.1482)	(0.1221)	(0.0862)	(0.1495)	(0.1106)	(0.1555)	(0.0912)
	Robusta	2.5275***	-0.3952	-0.4415	--	-0.1069	0.1700	0.1828	0.0775	0.2416	0.2716
		(0.2116)	(0.3680)	(0.3378)		(0.2480)	(0.1756)	(0.3121)	(0.2311)	(0.3105)	(0.1948)
Brazil	Arabica	0.9538***	-0.2956*	0.1761	-0.0519	--	-0.1821*	0.2628*	-0.0455	0.2053	-0.0689
		(0.1133)	(0.1546)	(0.1351)	(0.1204)		(0.0933)	(0.1429)	(0.1073)	(0.1358)	(0.0948)
	Robusta	0.6689***	-1.5590***	-0.0222	0.1538	-0.3393*	--	0.6131***	-0.3886**	0.2095	1.3327***
		(0.2264)	(0.1788)	(0.1778)	(0.1588)	(0.1738)		(0.2197)	(0.1636)	(0.1849)	(0.1605)
Mexico	Arabica	1.7435***	-1.8284***	-0.7683**	0.1947	0.5763*	0.7217***	--	0.3181	0.7401*	0.0456
		(0.3843)	(0.6355)	(0.3627)	(0.3323)	(0.3133)	(0.2586)		(0.3822)	(0.3905)	(0.3067)
	Robusta	0.1277	-1.7100***	1.3686***	0.1161	-0.1406	-0.6439**	0.4477	--	0.1878	0.3742
		(0.4069)	(0.5117)	(0.3778)	(0.3463)	(0.3312)	(0.2711)	(0.5381)		(0.4068)	(0.3285)
ROW	Arabica	0.6454***	-0.5451***	0.1689**	0.0555	0.0971	0.0532	0.1597*	0.0288	--	-0.0183
		(0.0561)	(0.1132)	(0.0814)	(0.0713)	(0.0642)	(0.0469)	(0.0842)	(0.0623)		(0.0546)
	Robusta	1.2561***	-0.5772***	0.0292	0.0819	-0.0428	0.4446***	0.0129	0.0753	-0.0241	--
		(0.0971)	(0.0905)	(0.0627)	(0.0588)	(0.0589)	(0.0535)	(0.0869)	(0.0661)	(0.0718)	

*,**,*** indicate [statistical] significance at the 10%, 5%, and 1% level.

Expenditure elasticities vary from country to country, estimates are significant at a 1% level and positive with the exception of robusta coffee from Mexico. Arabica coffee from Colombia, Brazil and ROW are significant and expenditure inelastic, while arabica from Mexico is significant and expenditure elastic. Robusta coffee is significant and expenditure elastic from Colombia and ROW, and significant and expenditure inelastic from Brazil. The expenditure elasticity for robusta from Mexico is inelastic but is not statistically significant. An increase in U.S. coffee expenditures will increase consumption of arabica coffee from Mexico relatively more than arabica coffee from Colombia, Brazil and ROW. Similarly, an increased expenditure on coffee will increase consumption of robusta coffee from Colombia and ROW more than robusta from Brazil or Mexico.

Arabica from Colombia, Brazil and ROW are significant and own-price inelastic. However, arabica and robusta from Mexico and robusta from Brazil are significant and own-price elastic, meaning that small changes in prices of robusta coffee from Brazil and both types of coffee from Mexico lead to large changes in its quantity demanded. The effect of changes in prices of Colombian and Brazilian arabica and arabica from ROW have a small impact on their quantity demanded.

The cross-price elasticities indicate substitution and complementary effects varying from types of coffee and producing country. The relationship between robusta and arabica from Brazil is significant and complementary indicating that an increase in the price of robusta leads to a decrease in the quantity of arabica. An increase in price of Mexican arabica is significant and positive with both types of coffee from Brazil, which represents a substitution relationship but a significant and negative relationship with the quantity of arabica from Colombia. The cross-price elasticity between Mexican robusta and Colombian arabica is significant and positive, while the elasticity estimate for robusta from Brazil is significant and negative indicating a complementary relationship. The relationship between arabica from ROW and arabica from Colombia and Mexico is significant and positive, demonstrating that an increase in the price of arabica from ROW increases the demand for arabica from Colombia and Mexico. In the case of robusta coffee from ROW, the cross-price elasticity estimate with Brazilian robusta is significant and positive, which means that an increase of robusta price from ROW increases the quantity demanded of robusta from Brazil.

To test the restrictions imposed in the traditional Rotterdam model, we conducted a log-likelihood test. The test statistics for the log-likelihood ratio test is defined as:

$$LRT = 2[LogL(\theta^*) - LogL(\theta)] \tag{20}$$

where θ^* is the vector of parameters estimates with no restrictions, and θ is the vector with restrictions imposed in the model (Harvey 1990). This value is compared with the critical value of a $\chi^2(q)$, where q is the number of restrictions. The number of restrictions with homogeneity and symmetry is given by:

$$q = (c-1) + \left(\frac{(c-1)(c-2)}{2}\right) \tag{21}$$

where c represents the number of countries per type of coffee included in this study (8). With these values we can compare both models by obtaining the value of the test statistic for the unrestricted and the restricted models. The log-likelihood value of the unrestricted model is 3666.67 and the log-likelihood of the restricted model is 3614.01. Given that in this model $q = 28$, the critical value at a significance of 1% is 48.27 and the result of the test statistics is 105.3, we cannot reject homogeneity and symmetry in the model, which is consistent with demand theory.

Extension of the traditional Rotterdam model to include exchange rates provides additional insights into the dynamics of international trade in the coffee market. We estimated marginal shares with the inclusion of the exchange rates of the Colombian Peso (COP/USD), the Brazilian Real (BRL/USD) and the Mexican Peso (MXN/USD). The importance of these exporting countries and the estimates of short-run and long-run pass-through costs to import prices are the reason we included them in the analysis.

The parameter estimates are provided in Tables 3.5, 3.6 and 3.7. The marginal expenditure shares of each country and type of coffee reveal relatively small changes. Results are significant and positive, revealing a slight increase in the marginal share of Brazil and ROW, and a slight decrease in the shares of Colombia and Mexico (Table 5). The marginal shares of coffee from Colombia, robusta from ROW, and arabica from Mexico are significant and positive but slightly lower than when the exchange rate was not included. The marginal share of robusta from Mexico is positive but is not statistically significant. Slutsky own-price parameters are similar to the ones obtained without the exchange rates. The estimates are significant at a 10%, 5%, and 1% level and negative with the exception of robusta coffee from Colombia. Similarly, the cross-price parameters do not change much in their magnitude and most of the significant parameters remain the same. In addition to the parameters that were significant before including the exchange rate, the cross-price elasticity between arabica from Colombia and arabica from Brazil is significant and positive indicating a substitution effect after accounting for the exchange rate in the estimation. A similar substitution relationship becomes significant between arabica from Brazil and arabica from ROW. This result indicates that a change in price of arabica from Brazil affects the quantity demanded of arabica from ROW.

The parameters for the effect of the exchange rates for each country with respect to the U.S. are provided in Table 3.6. The exchange rate COP/USD represented by β_{Col} is statistically significant for arabica coffee from Colombia and both types of coffee from ROW. Arabica coffee from Colombia and ROW are positively affected by an appreciation of the U.S. Dollar with respect to the Colombian Peso. The estimate of the Brazilian Real with respect to the U.S. Dollar (β_{Bra}) is significant for both types of coffee from Colombia and from ROW. These estimates indicate that arabica from ROW and Colombia are positively affected by an appreciation of the U.S. Dollar with respect to the Real, while it negatively impacts robusta imports from Colombia and ROW. The exchange rate MXN/USD represented by β_{Mex}, is statistically significant for arabica and robusta imported from both Brazil and Mexico. Our results are similar to the ones found by Sven and Fedoseeva (2017) in which the Mexican coffee trade is highly exchange-rate elastic. Results indicate that it positively affects arabica imports from both countries but negatively affects robusta imports.

Table 3.5 Differential Demand Parameter Estimates Inclusion of Exchange Rates

		Price (π_{ij})								Marginal Shares (Θ_i)
Country		**Colombia**		**Brazil**		**Mexico**		**ROW**		
	Coffee Type	Arabica	Robusta	Arabica	Robusta	Arabica	Robusta	Arabica	Robusta	
Colombia	Arabica	-0.0542* (0.0324)	-0.0333 (0.0209)	0.0301* (0.0174)	-0.0003 (0.0122)	-0.0324 (0.0217)	0.0539*** (0.0157)	0.0325 (0.0227)	0.0037 (0.0127)	0.1133*** (0.0143)
	Robusta		-0.0226 (0.0225)	-0.0100 (0.0154)	0.0121 (0.0109)	0.0001 (0.0197)	0.0080 (0.0143)	0.0271 (0.0193)	0.0186 (0.0119)	0.1593*** (0.0138)
Brazil	Arabica			-0.0412** (0.0201)	-0.0259** (0.0121)	0.0340* (0.0189)	-0.0068 (0.0139)	0.0310* (0.0178)	-0.0111 (0.0122)	0.1251*** (0.0155)
	Robusta				-0.1082*** (0.0124)	0.0371** (0.0153)	-0.0231** (0.0113)	0.0176 (0.0128)	0.0908*** (0.0111)	0.0573*** (0.0165)
Mexico	Arabica					-0.1006*** (0.0384)	0.0086 (0.0226)	0.0565** (0.0237)	-0.0034 (0.0179)	0.0088*** (0.0235)
	Robusta						-0.0660*** (0.0213)	0.0094 (0.0170)	0.0160 (0.0135)	0.0163 (0.0176)
ROW	Arabica							-0.1759*** (0.0317)	0.0015 (0.0145)	0.1811*** (0.0157)
	Robusta								0.1162*** (0.0183)	0.2584*** (0.0209)

*,**,*** indicate [statistical] significance at the 10%, 5%, and 1% level.

Table 3.6 Exchange Rate Parameters for U.S. Import Demand for Green Coffee

Country	Coffee Type	β_{Col}	β_{Bra}	β_{Mex}
Colombia	Arabica	0.0549***	0.0043*	-0.0159
		(0.0190)	(0.0024)	(0.0162)
	Robusta	-0.0093	-0.0059**	-0.0194
		(0.0183)	(0.0023)	(0.0156)
Brazil	Arabica	-0.0215	0.0022	0.0300*
		(0.0205)	(0.0026)	(0.0177)
	Robusta	-0.0089	0.0015	-0.0461**
		(0.0217)	(0.0028)	(0.0190)
Mexico	Arabica	-0.0097	-0.0007	0.1010***
		(0.0313)	(0.0041)	(0.0270)
	Robusta	0.102	-0.0005	-0.0796***
		(0.0232)	(0.0030)	(0.0201)
ROW	Arabica	0.0416*	0.0087***	0.0007
		(0.0213)	(0.0027)	(0.0179)
	Robusta	-0.0571**	-0.0096***	-0.0293
		(0.0275)	(0.0036)	(0.0241)

*,**,*** indicate [statistical] significance at the 10%, 5%, and 1% level.

Table 3.7 Conditional Expenditures and Slutsky Price Elasticity Estimates with Exchange Rates

				Cross-Price Elasticities							
				Colombia		Brazil		Mexico		ROW	
Country	**Type**	**Expenditure Elasticities**	**Own-Price Elasticities**	Arabica	Robusta	Arabica	Robusta	Arabica	Robusta	Arabica	Robusta
Colombia	Arabica	0.7816*** (0.0987)	-0.3741* (0.2234)	--	-0.2299 (0.1443)	0.2077* (0.1205)	-0.0023 (0.0847)	-0.2237 (0.1502)	0.3720*** (0.1087)	0.2245 (0.1571)	0.0258 (0.0882)
	Robusta	2.5049*** (0.2173)	-0.3564 (0.3540)	-0.5240 (0.3290)	--	-0.1586 (0.2422)	0.1909 (0.1718)	0.0024 (0.3102)	0.1259 (0.2251)	0.4270 (0.3035)	0.2927 (0.1873)
Brazil	Arabica	0.9553*** (0.1183)	-0.3148** (0.1537)	0.2299* (0.1333)	-0.0770 (0.1176)	--	-0.1982** (0.0925)	0.2598* (0.1442)	-0.0520 (0.1061)	0.2371* (0.1365)	-0.0847 (0.0932)
	Robusta	0.8157*** (0.2349)	-1.5393*** (0.1774)	-0.0047 (0.1746)	0.1726 (0.1554)	- 0.3691** (0.1723)	--	0.5276*** (0.2186)	-0.3293** (0.1609)	0.2504 (0.1830)	1.2919*** (0.1579)
Mexico	Arabica	1.4868*** (0.3943)	-1.6837*** (0.6426)	-0.5429 (0.3646)	0.0026 (0.3302)	0.5697* (0.3162)	0.6210*** (0.2573)	--	0.1448 (0.3795)	0.9468** (0.3969)	-0.0584 (0.3007)
	Robusta	0.3840 (0.4154)	-1.5557*** (0.5026)	1.2706*** (0.3713)	0.1888 (0.3374)	-0.1607 (0.3275)	-0.5456** (0.2666)	0.2039 (0.5343)	--	0.2214 (0.4007)	0.3773 (0.3195)
ROW	Arabica	0.6540*** (0.0568)	-0.6355*** (0.1148)	0.1175 (0.0823)	0.0981 (0.0697)	0.1122* (0.0646)	0.0636 (0.0464)	0.2043** (0.0856)	0.0339 (0.0614)	--	0.0056 (0.0524)
	Robusta	1.2255*** (0.0994)	-0.5513*** (0.0872)	0.0177 (0.0606)	0.0883 (0.0565)	-0.0526 (0.0579)	0.4310*** (0.0527)	-0.0165 (0.0852)	0.0759 (0.0643)	0.0074 (0.0689)	--

*,**,*** indicate [statistical] significance at the 10%, 5%, and 1% level.

Expenditure elasticities and compensated own-price and cross-price elasticity estimates are provided in Table 3.7. Similar to the elasticities before the inclusion of the exchange rate, expenditure elasticities are positive and statistically significant at the 1% level with the exception of robusta from Mexico. Own-price elasticities are significant and negative, only slightly changing in magnitude without affecting the significance of the estimates. The inclusion of the exchange rate results in additional cross-price elasticities becoming significant. The U.S. demand for arabica coffee from Colombia is affected by a change in the price of arabica from Brazil, while U.S. imports of arabica from Brazil are affected by changes in the price of arabica from ROW.

The exchange rate elasticities are provided in Table 3.8. The exchange rate between the Colombian Peso and the U.S. Dollar is significant for arabica from Colombia and both types of coffee from ROW but not for Brazil and Mexico. The signs on the elasticities indicate that an appreciation of the U.S. Dollar with respect to the Colombian Peso will increase U.S. imports of arabica from Colombia and ROW, while decreasing imports of robusta from ROW. The exchange rate between the Brazilian Real and the U.S. Dollar is significant for both types of coffee from Colombia and from ROW. Therefore, an appreciation of the U.S. Dollar with respect to the Real will increase U.S. imports of arabica from Colombia and from ROW, but will decrease the imports of robusta from Colombia and ROW. The exchange rate between the U.S. Dollar and the Mexican Peso is significant for both types of coffee from Brazil and from Mexico. An appreciation of the Peso increases U.S. imports of arabica and reduces U.S. imports of robusta from Brazil and from Mexico. The appreciation of the U.S. Dollar with respect to the currencies included in this study positively affects U.S. imports of the arabica type but reduces the import quantity of the robusta type, independently of the country. Our results suggest that quality has a significant role in U.S. coffee imports. The appreciation of the U.S. Dollar increases imports of high-quality coffee (arabica) while reducing imports of lower quality. Our findings confirm the results found by Sven and Fedoseeva (2017) that raw coffee needs to be considered a quality-differentiated good where type and country of origin are important price factors.

Table 3.8 Exchange Rate Elasticities

Country	Coffee Type	εCol	εBra	εMex
Colombia	Arabica	0.3786*** (0.1314)	0.0297* (0.0170)	-0.1101 (0.1120)
	Robusta	-0.1470 (0.2881)	-0.0937** (0.0374)	-0.3051 (0.2467)
Brazil	Arabica	-0.1645 (0.1570)	0.0174 (0.0205)	0.2291* (0.1354)
	Robusta	-0.1267 (0.3093)	0.0224 (0.0410)	-0.6556** (0.2707)
Mexico	Arabica	-0.1626 (0.5247)	-0.0122 (0.0686)	1.6908*** (0.4521)
	Robusta	0.2404 (0.5476)	-0.0124 (0.0721)	-1.8765*** (0.4748)
ROW	Arabica	0.1502* (0.0769)	0.0314*** (0.0098)	0.0027 (0.0646)
	Robusta	-0.2711** (0.1304)	-0.0458*** (0.0173)	0.1392 (0.1144)

*,**,*** indicate [statistical] significance at the 10%, 5%, and 1% level.

3.5 Conclusions and Future Research

The global coffee market is affected by several factors including weather conditions, transportation costs, relative prices, exchange rates, and other macroeconomic variables. The degree to which these factors affect trade flows is reflected in import prices, trade and macroeconomic policies. Information regarding the various factors that influence the global coffee trade can provide valuable insights for coffee producers and coffee importers alike. We analyzed the pass-through cost of the exchange rate to U.S. import prices, and found evidence of incomplete pass-through. We also estimated various elasticities using a differentiated demand system allowing the exchange rates of Colombia, Brazil and Mexico against the U.S. dollar to affect coffee demand simultaneously. The results of our analysis indicate that exchange rates have a significant impact on U.S. coffee imports. We found evidence that low long-run pass-through costs mainly affect U.S. imports from Mexico, while Colombia and Brazil exhibit significant long-run pass-through costs. As found by Campa and Goldberg (2005), low variability in exchange rates or stable monetary policies are factors that could explain low pass-through costs. Colombia has had relatively stable monetary and exchange rate policies. Brazil changed its currency from the Brazilian Cruzeiro to the Brazilian Real in 1994 as a way to stabilize the economy. Before the official change in the currency, its inflation rates were among the highest in the world, and its stabilization began to take effect immediately. This could help explain the low rates of pass-through estimates obtained for Brazil in the short-run and the long-run pass-through import costs.

Our parameter estimates provide evidence of the complexities inherent in the international coffee market and reveal information regarding the possible effects of increased U.S. coffee expenditure on the relative market shares of export countries. Results indicate that, in terms of U.S. coffee import demand, most types of coffee from various countries are substitutes, but there are some exceptions in which a complementary relationship arises. Inclusion of the exchange rate in the estimation of U.S. coffee import demand is appropriate and excluding it from the analysis would lead to different elasticity estimates. Our results indicate that including the exchange rate of the U.S. Dollar with respect to each exporting country can have a significant effect on the U.S. demand for different types of coffee from different countries of origin. We found that an appreciation of the U.S. dollar with respect to the Colombian Peso, Brazilian Real, and Mexican Peso would result in an increased consumption of arabica coffee (higher quality), as exports to the U.S. market become cheaper.

If more data were to be made available, future research could incorporate other economic factors into the demand system, such as transportation costs, costs associated with climate change, and sustainable production of coffee. Moreover, the differential demand system could be expanded to allow for a less restrictive, nested model along the lines of Schmitz and Seale (2002) or Zhang et al. (2020) by incorporating exchange rates while conforming to the inherent restrictions implied by demand theory. These additional factors could provide further insight into the global import demand for coffee differentiated by type and country of origin, not just for the U.S., but also other coffee importing countries.

CHAPTER 4

CONSUMERS' WILLINGNESS TO PAY FOR SOCIALLY AND ENVIRONMENTALLY SUSTAINABLE COFFEE

4.1 Introduction

Consumers are increasing their purchases of sustainable food. Climate change, limited agricultural water and land, and a growing global population explain this new consumption pattern. There is a link between consumer preferences for sustainable foods and their understanding of how their actions contribute to responsible consumer behavior. For instance, a global survey found that 66% of respondents are willing to pay more for sustainable goods (Nielsen 2015). The coffee industry has been a pioneer with regards to sustainability labeling schemes. However, the supply chain of coffee is experiencing a sustainability problem where there is an increasing demand by consuming countries and a crisis in producing countries.

Additionally, there is an overflow of low-quality coffee while a shortage of high-quality coffee exists (Daviron and Ponte 2005). There are several sustainability initiatives, such as Fair Trade, the Forest Stewardship Council Initiative, and Rainforest Alliance. While past studies have analyzed various initiatives, no studies have evaluated consumers' preferences for the latest initiative, Direct Trade. The current research contributes to the literature by analyzing coffee consumers' preferences for coffee labeled as 'Direct Trade' using online choice experiments.

Three waves have characterized coffee consumption: the "First Wave," in the early 20s, was marked by the spread of commodity coffee and the rise of coffee companies (i.e., Folgers and Maxwell House). The "Second Wave" came in the late 60s, characterized by the increase of small roasters (i.e., Peets coffee and Starbucks) that recovered the unique qualities of coffee flavors. An essential aspect of this wave was the increased concern about social and environmental issues of coffee production. This is the reason for the rise of several labeling initiatives. Finally, the current "Third Wave" is a movement driven mainly by the demand for high-quality coffee without ignoring social and environmental issues. Specialty coffees come from "micro-lots" from special geographic microclimates that produce coffee beans of unique quality (Gerard et al. 2019).

Studies found that price is the attribute that constrains coffee purchases the most (Cranfield et al. 2010, Andorfer and Liebe 2015); therefore, estimating consumers' WTP for sustainable coffee is important. Other factors that influence the purchase of sustainable coffee include labels, information, and quality (Nilsson et al. 2004, DePelsmacker et al. 2007). For example, Van Loo et al. (2015) found that consumers were willing to pay a premium of $1.16 for Organic, $0.84 for Rainforest Alliance, and $0.68 for Fair Trade for a 12oz. bag of coffee. A similar study on Belgium consumers estimated a premium willingness to pay (WTP) of approximately 10% for 250 gr of Fair Trade coffee (De Pelsmacker and Janssens 2007). Chinese consumers are willing to pay 22% more for Fair Trade coffee than for conventional (Yang et al. 2012), while Taiwanese consumers would pay a premium of 2.59% for Fair Trade and 5.32% for Organic (Liu et al. 2019). We use online choice experiments to elicit consumers' WTP for coffees labeled for different sustainability initiatives, such as, Fair Trade and Direct Trade.

4.2. Contextual Background

Sustainability in the Coffee Supply Chain

In 2015 all United Nations members adopted the 17 Sustainable Development Goals, also called Global Goals or SDGs. It entails 169 goals that member countries attempt to reach by 2030 (United Nations 2022). These goals are grouped into 17 main objectives. Some of them include no poverty (SDG 1), gender equality (SDG 5), and responsible consumption and production (SDG 12), among others. These goals align with the coffee industry's efforts along the supply chain. The Sustainable Coffee Challenge promoted by Conservation International (CI) has set goals to make coffee the first fully sustainable agricultural product (Conservation International 2020).

With approximately 400 billion cups of coffee consumed every year, coffee is a globally preferred beverage (Sachs et al. 2019). According to the National Coffee Data Trend (NCDT) report, 60% of Americans had coffee in the past day, more than any beverage, including tap water (47%), soda (39%), or tea (47%) (NCA 2021). Coffee is also the main productive activity for more than 60 million people, primarily located in developing countries. However, low international coffee prices, rising production costs, and more pests and diseases affecting plantations push vulnerable farmers out of their farms. Under these circumstances, the interaction of supply and demand forces coffee farmers to find new economic activities, or they are forced to grow coffee extensively to fill the demand. This is a sustainability problem because when farmers encounter food insecurity, they are forced to employ minors, deforest their farms, or migrate to bigger cities (Valkila and Nygren 2010). Additionally, soil degradation, water pollution, and climate change might alter agroclimatic conditions in coffee-producing zones (Lynbbaek et al. 2001).

Given the problems that coffee farmers face, the labeling efforts have concentrated on the three pillars of sustainability: Social, Economic, and Environment (Moldan et al. 2012). The sustainability efforts in the coffee industry focus on:

1). Improving livelihoods: This goal is reached by reducing poverty (SDG1), improving farmers' health and well-being (SDG2), and reducing food insecurity (SDG3). These goals are achieved by paying farmers a fair price for their coffee and helping them access health care and more nutritious foods. Additionally, making education accessible to farmers and their families (SDG4), empowering women and girls (SDG5), promoting sustainable economic growth empowering farmers and their families, and giving them a security net for the present and future.

2). Sustain supply: This goal is reached by facilitating access to finance, inputs, technical assistance, and renovation of their farms (SDG9). These solutions would ease the burden on farmers regarding sustainable farming practices and lack of assistance in managing technical problems.

3). Conserve nature: Give farmers access to clean water and sanitation and tools for its proper use in their plantations (SDG6). Additionally, provide farmers access to affordable, clean, and sustainable energy (SDG7). Actions towards forest conservation and restoration (SDG13) to support the fight against climate change (SDG15) by recovering the natural ecosystem in which coffee grows.

The final aspect to consider in the coffee industry and its relationship with sustainability relates to coffee consumers (SDG12). The WTP of conscious coffee consumers is crucial to making the coffee industry sustainable. Consumer education and awareness of the consequences of their purchase decisions significantly impact sustainability efforts.

To mitigate the social and environmental effects of conventional coffee farming practices, some organizations work on increasing the visibility of these problems to coffee consumers. Since consumers can not physically identify sustainability efforts when purchasing or consuming coffee, sustainability standards need to be communicated through labeling. Consequently, consumers can use labels by the food supply chain, third-party certifying companies, and the government issuing labels, such as, Fair Trade and Direct Trade, that indicate different aspects of sustainable production. Ultimately, sustainability organizations and roasters offer coffee farmers a way to obtain larger profits by following sustainable production practices, which are then labeled on their coffee, and can subsequently lead to higher quality profits.

Coffee Sustainability Labels

There are three broad categories to classify sustainability labels: Mandatory, voluntary, and private (Ponte 2004). In this research, we focus only on the voluntary and private labels, as the mandatory pertains to a form of government regulation out of this research's scope.

Voluntary Sustainable Standards

According to Ponte (2004), voluntary standards result from either a formal coordinated process in which a sector seeks consensus or as a response to consumer requests or NGO initiatives. Most of these labels are part of the "Second Wave" of coffee in which consumers' awareness increase regarding social and environmental issues in the production process. Some of these standards include the following labels:

Fair Trade

Fair Trade is defined as "an alternative approach to conventional trade aiming to improve livelihoods and well-being of small producers by improving their market access, strengthening their organizations, paying them a fair price with a fixed minimum, and providing continuity in trading relationships" (Giovannucci and Koekoek 2003).

The Fair Trade label aims to improve the position of poor and disadvantaged farmers in developing countries by setting specific standards that enable a trade to take place respecting the interest of farmers (Bacon et al. 2008). The certification program promotes sustainability initiatives such as economic, social, and environmental development by improving the producers' profit margins and production capacity (Arnould et al. 2007). The Fair Trade standards help the development of smallholders and support producer groups to have participation and a transparent administration to manage the Fair Trade premium. Additionally, the organization created a Fairtrade Minimum Price (FMP) that covers farmers' production costs and allows them to access the market (Fair Trade America 2020).

The Fair Trade labeling Organization International (FLO) and associate organizations mediate between the certified producers and the Fair Trade importers (Giovannucci and Ponte 2005). This certification is well-known in the coffee industry; however, in 2009, only 1.8% of global coffee exports were Fair Trade certified. By 2019, Fair Trade coffee represented only about 2% of the worldwide market (Fair Trade America 2019).

Cranfield et al. (2010) used conjoint analysis (CA) to elicit consumers' preferences for Fair Trade coffee attributes and found that consumers strongly valued price and labeling claims. Similarly, DePelsmacker et al. (2006) found that the Fair Trade label was an important attribute for purchasing coffee. Trudel and Cotte (2009) found that consumers were willing to pay a $1.40/lb premium for Fair Trade coffee. Other research has used choice experiments, field and laboratory experiments to identify consumers' preferences and WTP for sustainable coffee. The consensus regarding the Fair Trade coffee label is that consumers are willing to pay a premium (Basu and Hicks 2008; Rousu and Corrigan 2008).

USDA Organic and Rainforest Alliance

The USDA Organic label represents the application of agricultural practices to support on-farm resources to promote ecological balance and conserve biodiversity. These practices include maintaining and enhancing soil and water quality, preserving wildlife, and avoiding the use of synthetic fertilizers, irradiation, and genetic engineering (USDA 2019). There is a consensus in the literature that consumers perceive organic products as higher quality and healthier than conventional products (Hughner et al. 2007; Schuldt and Hannahan 2013).

A study found that consumers are willing to pay more for organic coffee than for conventional and Fair Trade coffee (Van Loo et al. 2015).

The Rainforest Alliance's primary goal is to integrate productive agriculture, biodiversity conservation, and human development (Rainforest Alliance 2022b). The Rainforest Alliance label certifies large and smallholder producers of different products, including coffee. The certification standards include that coffee grows under shade, minimum use of agrochemicals, and fair treatment and conditions for producers (Ponte 2004). Van Loo et al. (2015) found that consumers were willing to pay more for Rainforest Alliance coffee than for Fair Trade coffee but less than for Organic coffee. Other certifications on coffee, such as shade-grown and the Smithsonian Migratory Bird Center (SMBC) label, have received less attention in the literature.

Several papers have looked at the governance, the social and environmental impact, and the WTP for voluntary sustainability standards (Auld 2010; Bacon 2005; Rice 2001). Research has also compared the effect of coffee sustainability labels on producers and consumers. For instance, Guedes Pinto et al. (2014) focused on the networking effect of the coffee certification scheme for producers in Brazil, while Raynolds et al. (2007) focused on the governance and certificate requirements of the Organic, Fair Trade, Rainforest Alliance, Utz Kapeh, and Shade/Bird Friendly labels. In terms of consumers' attention and WTP, Van Loo et al. (2015) included the organic, Fair Trade, Rainforest Alliance, and Carbon footprint labels in their eye-tracking experiment. They found that the longer the consumer looked at the labels, the more they were willing to pay for a label.

Loureiro and Lotade (2005) conducted face-to-face surveys to identify how receptive consumers were to Fair Trade, Organic, and shade-grown coffee. They concluded that consumers were very receptive to Fair Trade and shade-grown coffee and consequently willing to pay more for both labels than organic coffee. Most of the literature has focused on voluntary sustainability standards and their implications for producers and consumers.

Private Sustainability Standards

In addition to social and environmental concerns, there is a current growing interest in specialty coffees that led to the creation of Direct Trade, a private sustainability standard (Panhuysen and Pierrot 2018). This standard is part of the "Third Wave" of coffee, where ethical and environmental responsibilities must accompany quality. Private standards are developed and managed by individual companies.

Direct Trade

Direct Trade is a relatively new initiative that promotes coffee roasters buying directly from smallholder farmers to guarantee that they receive a fair payment for the sustainable production of their high-quality coffee (MacGregor et al. 2017). This initiative was started by roasters such as Counter Culture Coffee, Intelligentsia Coffee, and Stumptown Coffee Roasters.

The direct relationship reduces intermediaries between buyers and sellers, leading to longer relationships of trust that benefit consumers and producers. This could also lead to further knowledge exchange between roasters and farmers to better understand expectations and limitations beyond a product transaction (Borrella et al. 2015). Another characteristic of this standard is that there is no third-party verifying their production process; therefore, there are no specified rules that farmers need to comply with (Hernandez Aguilera et al. 2018). Consumers and roasters promoting direct trade argue that this initiative might solve the issue that only 20% of the coffee certified as Fair Trade is sold as such (Giovanucci and Ponte, 2005). Research on this label has focused on analyzing quality practices (Holland et al. 2015), opportunities and constraints (Borrella et al. 2015), governance and regulations (MacGregor et al. 2017), and motivations to source directly (Gerard et al. 2019). Hindsley et al. (2020), using choice experiments, examined consumers' preferences for three attributes of direct coffee. They found that consumers are willing to pay more for social efforts involved with direct trade practices and their cultural worldviews affect WTP. Our study goes beyond the analysis of Direct Trade by identifying consumers' preference and WTP for the Direct Trade label and other sustainability labels for coffee, namely, Fair Trade, USDA Organic, and Rainforest Alliance labels. We also evaluate the combination between Direct Trade and Organic, which is commonly seen in the market.

4.3 Methodology

Study Design

In 2022 we surveyed 830 coffee consumers in the U.S. to elicit their preferences and WTP for sustainable coffee. The survey was pre-registered on as.predicted.org, and the study was exempt by the IRB of a large university in the U.S. We programmed our survey and collected the data through Qualtrics. We asked participants to provide their consent to participate in the study if they were 18 years or older. Only coffee buyers were recruited, using the question "Do you buy coffee?" as a screener.

Choice Experiments

Our study used a choice experiment (CE) to elicit consumers' preferences for sustainable coffee. This method identifies consumers' importance of specific product attributes when making their food choices (Hauber et al. 2016). CEs are widely used in applied economics to examine consumer food preferences as they exhibit good external validity (Brooks and Lusk 2010).

We used Ngene to program an efficient experimental design for the choice tasks. Choice sets were characterized by the following labels being either present or absent: Fair Trade, Organic, Direct Trade, Rainforest Alliance, as well as, four different price levels. We created an efficient design following Scarpa et al.'s (2012) sequential-stage approach. In the first stage, we generated an Optimal Orthogonal in the Differences (OOD) design to reduce the 48 possible combinations of attributes and levels ($4 \times 3 \times 2^2$) and obtained 24 "scenarios." We used the data obtained from the OOD to estimate a multinomial logit model (MNL). In the second stage, we used the coefficients from the MNL model as priors to generate an efficient design. We used the generators suggested by Street and Burgess (2007) to set the CE profiles for four attributes with 4, 3, 2, and 2 attribute levels (Table 4.1). We obtained a practical set of 36 scenarios with a D-Efficiency of 98.08%. To avoid fatigue, Ngene divided the 36 choice tasks into four blocks of 9, and participants were randomly assigned to one of the four blocks. Participants could select among four options where 3 were product profiles, and one was the "no-purchase" option. The no-purchase option increases consumers' similarity to a real shopping experience. Furthermore, since our experiment is hypothetical, we included a "cheap talk script" before the choice questions. The "cheap talk" explained to participants the importance of revealing their real WTP for the products shown, making them aware that buying a product means less money is available for other purchases (Van Loo et al. 2011). Before participants made their choices, we provided them with information about the product's attributes, precisely the meaning of the sustainability labels.

Table 4.1 Attributes and Attribute Levels in the Choice Experiment

Attribute	Price / 12 lbs.	Trade	USDA Organic	Rainforest Alliance
Level	$6.49	Direct Trade	Yes	Yes
	$9.49	Fair Trade	No label	No label
	$12.49	No label		
	$15.49			

In each choice scenario, we ask participants to choose between 3 coffee bag alternatives characterized by the following labels: Fair Trade or Direct Trade, USDA Organic, and Rainforest Alliance. We also included the "none of these" option in each choice task.

We selected the prices based on market observation of online and in-store current prices. We include the Fair Trade label because it is the most recognized ethical label worldwide and has the most prominent coffee brands (Fair Trade America 2022). Direct Trade emerged with the third-wave coffee culture. It is of particular interest since the relationship is directly between roasters and farmers, guaranteeing a fair price according to the coffee's quality (Hindsley et al. 2020). The USDA Organic label is one of the most common food labels in the U.S. The NCAs National Coffee Data Trends reported that 44% of coffee drinkers are likely to very likely to buy Organic coffee (NCAUSA 2020). Finally, we included the Rainforest Alliance label, which started a strong traceability program after merging with UTZ and represented the umbrella program for several coffee farmers (Rainforest Alliance 2022a). We also included an interaction effect between the Trade and USDA Organic labels to test whether WTP is higher if a product carries a Trade (Fair Trade or Direct Trade) label and a USDA Organic label.

In the choice experiment, participants were asked to choose one alternative from a choice set, where each alternative is described by the different labels (present or absent) and the price. Nine choice sets were presented to each participant. An example of a choice set is given in Figure 4.1.

Figure 4.1 Example Choice Set

	Option 1	**Option 2**	**Option 3**	**Option 4**
Trade	DIRECT TRADE	DIRECT TRADE	FAIR TRADE CERTIFIED	None
Organic		USDA ORGANIC		
Rainforest Alliance	RAINFOREST ALLIANCE CERTIFIED		RAINFOREST ALLIANCE CERTIFIED	
Price	**$6.49** (12oz bag)	**$15.49** (12oz bag)	**$9.49** (12oz bag)	
I choose	○	○	○	○

Empirical Model

Consistent with random utility theory (McFadden 1974), the *n*th consumer's utility of choosing option *j* in choice situation *t* can be represented as:

$$U_{njt} = \beta'_n x_{njt} + \varepsilon_{njt} \qquad (1)$$

where x_{njt} is a vector of observed variables relating to alternative *j* and individual *n*; β_n is a vector of structural parameters which characterizes choices by the overall situation; ε_{njt} is the error term, which is assumed to be independent of β and x and unobserved by the researcher.

To transform the random utility model into a choice model, assumptions need to be made with reference to the joint distribution of the vector error component and the functional form of the deterministic utility function. The functional form selection depends on the assumption regarding consumers' preferences. If heterogeneity of preferences across consumers is expected, the mixed multinomial logit (MNL) model's results will be biased, and a new specification is needed. It is appropriate to consider the random parameter logit (RPL) model with a panel data structure that allows random variation in preferences, unrestricted substitution patterns, and correlation in unobserved factors over time (Train 2009).

According to Train (2003), considering a sequence of observed choices *i* by individual n, one for each time period in an assigned sequence of *T* choice tasks ($i_1,\ldots i_T$), conditional on β the probability L_{ni} that individual *n* makes this sequence of choices is represented as:

$$L_{ni}(\beta) = \prod_{t=1}^{T} \left[\frac{e^{\beta'_n x_{nit}}}{\sum_j e^{\beta'_n x_{nit}}} \right] \qquad (2)$$

and the error terms ε_{njt} are independent over utilities, choices, and participants. Therefore, the unconditional probability is the integral of this product over all values of β:

$$p_{ni} = \int L_{ni}(\beta) f(\beta) d\beta \qquad (3)$$

Due to equation (3) lacking a closed-form solution, we follow Train (2009); the parameters are estimated by simulated maximum likelihood estimation techniques. All parameters but price are assumed to be independent and normally distributed. Price coefficients are invariant across individuals. The calculation of WTP for each attribute is the ratio of the partial derivative of the utility function with respect to a specific attribute divided by the derivative of the utility function with respect to price.

RPL Model with Error Component

According to Scarpa et al. (2007), to have robust estimates consistent with behavior theory, it is important to address a modeling issue of the RPL model estimation. Some of these issues include the correlation across utilities and parameters. The correlation between utilities occurs when participants are asked to select their preferred option between a set of alternatives and a no-purchase option. The no-purchase option is the only option experienced by participants, while the other experimentally designed options are suppositions. This situation makes the experimentally designed options more likely to be correlated between themselves than with the no-purchase option (Scarpa et al. 2005). We estimate an RPL with an error component (RPL—EC) model to address this issue. The error component is a parameter with a mean of zero and is normally distributed. It is assigned to the experimentally designed options but not the no-purchase option. The advantages of using this model are that it accounts for heterogeneous consumer preferences and the additional variance of the utility of the experimentally designed alternatives to differ from the no-purchase option (Scarpa 2005).

Utility Model

Respondents completed nine choice tasks, where the coffee alternatives were labeled with different credence attributes levels. Therefore, we estimate the utility function for the RPL and the RPL-EC model as follows:

$$U_{njt} = \beta_p price_{njt} + \beta_1 FairTrade_{njt} + \beta_2 Organic_{njt} + \beta_3 RainforestAlliance_{njt} + \beta_4 DirectTrade_{njt} + \varepsilon_{njt} \qquad (4)$$

where β_0 is the price coefficient, and β_i are the coefficients for attribute levels that vary by individual *i*. FairTrade, Organic, RainforestAlliance, and DirectTrade are dummy variables equal to one if the coffee bag was labeled Fair Trade, Organic, Rainforest Alliance, and Direct Trade, respectively, and zero otherwise. The base profile is conventional coffee with no sustainability label. ε_{njt} is a random error term. The indirect utility function estimated in the RPL-EC model is modified by changing the error term ε_{njt} of equation (4) to $\eta_{ij} + \varepsilon_{ijt}$, where η_{ij} is the error component term that is associated with alternatives that represent a purchase decision. The utility for the no-purchase option doesn't include this error component. Following Caputo et al. (2013), we use dummy coding even though one of the attributes of our CE exceeds two levels, and it could lead to potential confounding effects with the no-purchase constant. This confounding effect should be reduced by the low probability predicted for the no-purchase option in our model (Van Loo et al. 2014).

Willingness to pay

Random utility theory allows the transformation of parameter estimates of the attributes into WTP for product characteristics (Hanemann 1984). The WTP for each attribute is calculated by dividing the estimated mean value of the specific coefficient by the negative of the price coefficient. The interaction WTP is calculated as follows:

$$WTP_{12} = \frac{(\beta_1+\beta_2+\beta_{12})}{-\beta_p} \qquad (5)$$

where β_p is the price coefficient, and β_{12} is the coefficient for the interaction term. To calculate the variance of the interaction WTP, we follow Syrengelas et al. (2018):

$$Var(WTP_{12}) = \left(-\frac{1}{\beta_p}\right)^2 [w_{11} + w_{22} + w_{mm} + 2(w_{21} + w_{m1} + w_{m2})] +$$

$$\left(-\frac{1}{\beta_p}\right)\left(\frac{\beta_1+\beta_2+\beta_m}{(-\beta_p)^2}\right)[2(w_{p1} + w_{p2} + w_{pm})] + \left(\frac{\beta_1+\beta_2+\beta_m}{(-\beta_p)^2}\right)^2 w_{pp} \qquad (6)$$

where β_1 and β_2 are the estimated parameters of the specific attribute and β_m is the coefficient for the interaction term. The variances are w_{11}, w_{22}, and w_{pp}, and the covariances are w_{12}, w_{p1}, and w_{pm}, for the respective estimated parameters.

The WTP estimates for the interaction effects indicate if consumers use Fair Trade and Organic, and Direct Trade and Organic to complement or substitute one another. If two labels complement each other, there is a super-additive effect; however, there is a sub-additive effect if they substitute one another (Grebitus et al. 2018). According to Meas et al. (2015), the complementary or substitution nature can be conveniently determined through the signs of the interaction terms. Two attributes are complementary if the interaction term is greater than zero and substitutes if it is smaller than zero.

Additionally, we calculate associated confidence intervals using the Krinsky and Robb bootstrapping method (Krinsky and Robb 1986). The methodology applied is to use the means and covariance matrix of the coefficient estimates to generate confidence intervals. To calculate the new parameter estimate, we use the following:

$$b = \hat{\beta} + C'Z \qquad (7)$$

Where $\hat{\beta}$ is the coefficient estimate, C' is the Cholesky decomposition of the variance-covariance matrix of $\hat{\beta}$, such that $C * C' = V_{\hat{\beta}}$ and Z is the random draw from the standard normal distribution with mean zero and variance one. The new vector b will follow a multivariate normal distribution with means $\hat{\beta}$ and variance $V_{\hat{\beta}}$. Halton draws are commonly used in simulation as they provide a more efficient distribution for numerical integration than random draws (Bhat 2003). We can obtain confidence intervals of b and calculate the WTP by taking 1,000 draws of Z. Data were analyzed using NLOGIT 6.0.

4.4 Empirical Results

Sample Characteristics

Participants were recruited for the Qualtrics online survey from the U.S. Respondents had to consent to participate in the study and had to be at least 18 years old to participate in the survey. The first screening question asked them, "Do you buy coffee?" We only surveyed respondents that answered positively to this question. Participants answered demographic questions at the end of the survey. Our sample characterized the U.S. population in general with 50% female and 49% male. The sample mean of age is 45 years, which is slightly older than the national mean of 38.4 years. The U.S. median income is approximately $64,994, while in our sample, the median income is lower at $53,807. 32% of our sample finished high school, and 20% had a bachelor's degree. This is similar to the U.S population, where 28% completed high school and 22% hold a bachelor's degree (Census Bureau 2019). Table 4.2 depicts some sociodemographic characteristics collected.

Table 4.2 Socio-demographic Characteristics of Sample

Sociodemographic Characteristic	**% of total**
Gender	
Male	49%
Female	50.4%
Other	0.4%
Age Group	
18 – 24 years	6.2%
25 – 34 years	20.9%
35 – 44 years	22.7%
45 – 54 years	20%
55 – 64 years	27.4%
65 years or older	2.8%
Educational Level	
High School	32.9%
Some College	28.6%
Technical School Diploma	8.9%

Bachelor's degree	20.2%
Master’s degree	7.9%
Doctorate	1.2%
Race	
Asian	3.9%
White	78.4%
African-American	13.3%
American Indian or Alaska Native	0.4%
Native Hawaiian or Other Pacific Islander	0.4%
Others	2.7%
Hispanic	9.5%
Average household income	
Under $20,000	22.4%
$20,000 - $39,999	26.7%
$40,000 - $59,999	18.3%
$60,000 - $79,999	13.3%
$80,000 - $99,999	7.2%
$100,000 - $119,999	3.6%
$120,000 - $139,999	2.2%
$140,000 - $159,999	3.1%
$160,000 and over	2.8%
N=830	

Consumer Preferences for Coffee

We excluded one observation from the data due to missing values in the choice experiment. Hence, we had in total 829 valid responses. Table 4.3 reports the estimated parameters for the MNL, RPL, and RPL-EC models. We include these models and test the performance of each of the models. The AIC value is the lowest in the RPL-EC, while the log-likelihood is the highest for the same model. Furthermore, the standard deviation of the additional error component term was statistically significant, which indicates the importance of accounting for the error component. The null hypothesis that all coefficients are zero is rejected by a likelihood ratio test (p-value<0.01).

The price coefficient is significant and negative in the models, indicating that as the price of the coffee bags increased, participants' utility decreased and, therefore, their likelihood of purchasing. All the coefficients for the coffee labels are significant and positive, meaning holding price constant participants prefer having one of the sustainable coffees to having nothing at all. Moreover, the coefficient for the "none of these" option is significant and negative, reinforcing that participants obtained higher utility for choosing sustainable coffee compared to not choosing it. The standard deviations for all the coefficients were significant, indicating that consumers had heterogeneous preferences for all attribute’s levels.

Table 4.3 Results from MNL, RPL, and RPL-EC Model - Base

	MNL	**RPL**	**RPL-EC**
Price	-0.18***	-0.24***	-0.25***
	(0.00)	(0.00)	(0.00)
Fair Trade	1.03***	1.16***	1.34***
	(0.05)	(0.07)	(0.08)
Direct Trade	0.83***	0.97***	1.17***
	(0.04)	(0.05)	(0.07)
Rainforest Alliance	0.28***	0.42***	0.44***
	(0.03)	(0.06)	(0.06)
Organic	0.45***	0.61***	0.58***
	(0.03)	(0.05)	(0.06)
None of these	-1.75***	-5.35***	-5.74***
	(0.06)	(0.33)	(0.37)
Standard Deviations			
Fair Trade		0.89***	1.58***
		(0.06)	(0.08)

Direct Trade		0.75***	1.34***
		(0.06)	(0.08)
Rainforest Alliance		0.95***	1.20***
		(0.06)	(0.06)
Organic		1.06***	1.00***
		(0.06)	(0.06)
None of these		-4.30***	
		(0.31)	
Error component			4.65***
			(0.38)
N	7,461	7,461	7,461
LL	-8456.6	-6995.0	-6858.9
AIC	16925.3	14012	13759.8
χ^2		6696.2	6968.4

Note: ***p<0.01, **p<0.05, *p<0.10

Table 4.4 reports the coefficients for the interaction between Fair Trade and Organic, as well as the interaction between Direct Trade and Organic, in addition to the base model of table 4.3. As expected, the price coefficient is significant and negative, and the labels are significant and positive. The interactions are not significant in any of the models. These results indicate no increase in utility when both labels (Fair Trade and Organic; Direct Trade and Organic) are present on a coffee product. While the interaction coefficients were not significant for the mean estimates, the standard deviation coefficients are significant, indicating that some consumers prefer coffee labeled as Trade and Organic.

Table 4.4 Results from MNL, RPL, and RPL-EC Model – with interactions

	MNL	**RPL**	**RPL-EC**
Price	-0.18***	-0.25***	-0.26***
	(0.00)	(0.00)	(0.00)
Fair Trade	1.01***	1.28***	1.45***
	(0.07)	(1.00)	(0.12)
Direct Trade	0.83***	0.98***	1.04***
	(0.05)	(0.06)	(0.08)
Rainforest Alliance	0.28***	0.42***	0.45***

	(0.04)	(0.06)	(0.08)
Organic	0.43***	0.61***	0.58***
	(0.07)	(0.09)	(0.11)
None of these	-1.76***	-5.50***	-5.66***
	(0.07)	(0.32)	(0.34)
Fair Trade * Organic	0.04	-0.08	-0.26
	(0.10)	(0.14)	(0.16)
Direct Trade * Organic	0.00	0.01	0.02
	(0.07)	(0.10)	(0.13)
Standard Deviations			
Fair Trade		0.98***	1.86***
		(0.06)	(0.13)
Direct Trade		0.44***	0.78***
		(0.11)	(0.11)
Rainforest Alliance		1.04***	1.53***
		(0.06)	(0.10)
Organic		0.90***	1.31***
		(0.07)	(0.13)
Fair Trade * Organic		0.20	0.58***
		(0.18)	(0.19)
Direct Trade * Organic		1.16***	1.96***
		(0.09)	(0.16)
None of these		4.28***	
		(0.30)	
Error component			4.52***
			(0.22)
N	7,461	7,461	7,461
LL	-8456.5	-6955	-6749.3
AIC	16929.2	13940	13570.7
χ^2		6776.2	7187.5

Note: ***p<0.01, **p<0.05, *p<0.10

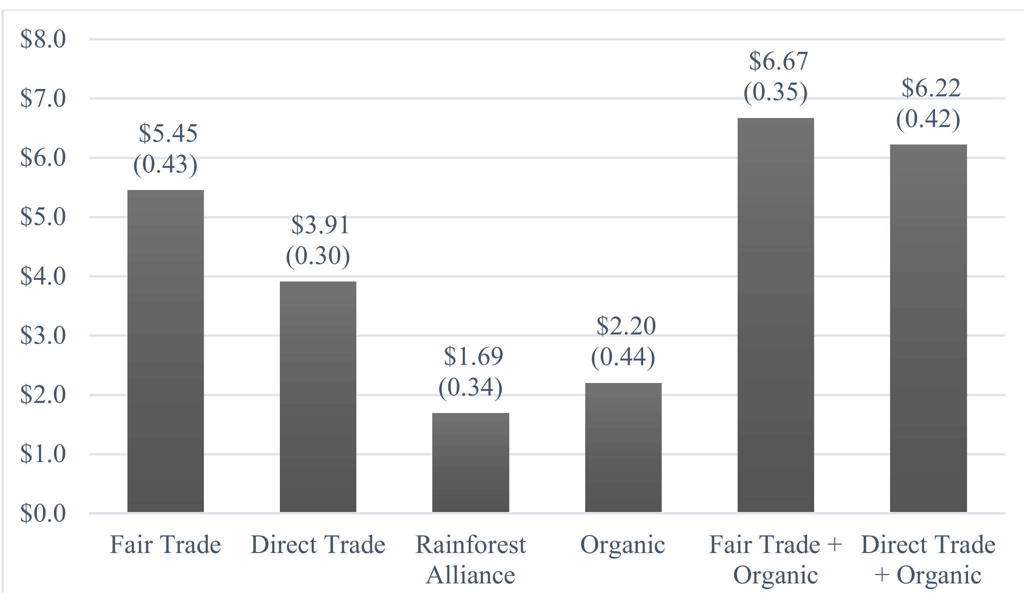
Appendix G reports the MNL, RPL, and RPL-EC for the Fair Trade and Organic interaction. Results of the interaction from the model with the error component is significant and negative, indicating no increase in utility to participants when both labels were present. We obtained different results when including the interaction between Direct

Trade and Organic. Although the individual coefficients of Direct Trade and Organic stay significant, their interaction is not significant in any models. Appendix H reports the latter interaction's MNL, RPL, and RPL-EC.

Consumers' Willingness to Pay for coffee

Results show that WTP is significant and positive at a 1% level for Fair Trade, Direct Trade, Rainforest Alliance, and Organic labels. Figure 3 indicates that consumers are willing to pay $5.45 / 12oz more for coffee with the Fair Trade label. Coffee with a Direct Trade label increases $3.91 in value per bag, while coffee labeled Organic increases $2.20 in value per bag. The label that consumers were willing to pay the least for was Rainforest Alliance. Consumers were willing to pay $1.69 more for a coffee bag with the Rainforest Alliance label.

Figure 4.2 Mean Willingness to Pay in U.S. Dollars per 12 oz. coffee bag



Finally, we looked at the interactions between the Fair Trade and Organic, and Direct Trade and Organic variables to analyze if these labels are sub-additive or super-additive. Though the coefficients of the interactions in the RPL-EC models were negative and not significant, the WTP for the interactions is significant and positive. The WTP for the combination of Fair Trade and Organic is $6.67, and for the interaction between Direct Trade and Organic is $6.22. The positive value of the estimates of the interaction terms indicates that the relationship between Fair Trade and Organic and between Direct Trade and Organic is complementary (super-additive).

4.5 Conclusions

In this research, we investigate consumer preferences for sustainability labels on coffee bags. Given the importance of coffee worldwide, determining consumers' preferences and WTP facilitates stakeholders along the supply chain to understand coffee consumers. Furthermore, it enables the creation of target-oriented efforts to promote sustainability iniatives to coffee consumers. This study gives producers an insight into what coffee consumers demand and how much they are willing to pay for it. This is relevant given the number of labels that coffee can carry, in which the coffee industry has been a pioneer. The coffee industry needs to know what information consumers value the most to reach the industry’s sustainability goals.

We employ choice experiments, including four sustainability labels and price, and we estimate consumer preferences and WTP for these labels. We use random parameter logit models and account for consumer heterogeneity in our analysis. We find that consumers prefer coffee with a sustainability label and are willing to pay a premium for all of them. On average, the Fair Trade label resulted in a higher utility than Direct Trade, Organic, and Rainforest Alliance. Furthermore, the interaction between the Fair Trade and Organic and Direct Trade and Organic did not increase participants' utility.

We find that participants are willing to pay more for coffee with the Fair Trade label, followed by Direct Trade, Organic, and Rainforest Alliance. Similar results are found in previous literature where Fair Trade is the label that gives participants the highest utility and is the label that consumers are willing to pay the most (Loureiro and Lotade 2005). Moreover, Direct Trade is the second label that consumers value the most and the second label they are willing to pay for the most. These results demonstrate that consumers value the labels with main focus on solving issues from the social pillar of sustainability most.

Our study showed that consumers support initiatives that aim to improve livelihoods (SDG1 – SDG5) and sustain supply (SDG9). The WTP increased the most for the interaction of Fair Trade and Organic, and Direct Trade and Organic. These findings imply that an increase on social efforts from roasters to farmers represented by the Direct Trade label could increase coffee consumers' WTP for this label. Since this label links fair payment to farmers and high quality coffee beans, this initiative has an opportunity to emphasize their work on coffee shops through videos and pictures. This would make the social efforts of the Direct Trade initiative visible to consumers.

Finally, we found a complementary relationship between Organic and Fair Trade and Organic and Direct Trade. This indicates a super-additive effect that is useful to inform marketers in terms of strategies that increase consumers' WTP for sustainable coffee.

CHAPTER 5

CONCLUSIONS AND FUTURE CHALLENGES

The coffee industry is complex and coffee has the challenge of becoming the first fully sustainable agricultural product (Conservation International 2020). This initiative started as millions of coffee smallholders struggled with low profitability, and extensive, conventional coffee farming practices were destroying the natural ecosystem of several species. Several sustainability efforts in which the coffee industry has been a pioneer signal the commitment to overcome the industry's pressing issues, including unregulated use of natural resources, inequality, and poverty. Following the United Nations Sustainability Development Goals, there are several goals that the coffee industry aims to meet. Several initiatives from private companies to NGOs and coffee stakeholders joined efforts to communicate to coffee customers in developed countries about the pressing sustainability issues. The way to share these issues, as sustainability efforts are credence attributes, is through labeling. Labels allow consumers to identify that the products they purchase follow ethical standards that respect the environment and protect the farmer. However, some different labels and standards represent various sustainability efforts. This dissertation analyzed the most popular labels: Fair Trade, Rainforest Alliance, and USDA Organic, which require a certification, and Direct Trade, a private initiative that does not require certification.

In particular, Chapter 2 analyzed consumer values, motivations, and willingness to pay (WTP) for Fair Trade, Rainforest Alliance, USDA Organic, and Direct Trade using non-hypothetical laboratory experiments. I include an information treatment to identify the premium of providing information about coffee labels. I find that value orientations do not affect WTP for sustainable coffee, but the warm glow effect positively impacts coffee consumers. The WTP for sustainable coffee differs by label: The highest premium is for Fair Trade and Organic, followed by Organic, Rainforest Alliance, Fair Trade, and Direct Trade. However, after providing information on the sustainability efforts of each label, the highest premium is for Fair Trade and Organic, followed by Fair Trade, Rainforest Alliance, Direct Trade, and Organic. I hypothesized that the slight increase in the premium for Organic coffee is because customers are already familiarized with this label, hence new information did not impact their WTP.

In terms of international trade, chapter 3 focuses on analyzing U.S. imports of the main type of coffee from Colombia, Brazil, and Mexico. These producing countries are the largest coffee exporters of South and Central America. Arabica and robusta have a particular way to grow: arabicas are more commonly produced in high altitudes where machinery is not available. They require more attention as they are prone to more diseases than robusta. Robusta coffee is more resistant to diseases, grows quickly in the sun, and is easier to produce. Since these two types of coffee are easily differentiated, I separate total coffee imports by type and analyze if they are complements or substitutes. I find that an increase in U.S. coffee expenditures increases imports of arabica from Mexico more than from Colombia, Brazil, and ROW. Similarly, an increase in U.S. coffee expenditures leads to a rise in consumption of robusta from Colombia and ROW more than from Brazil and Mexico.

Chapter 4 of this dissertation utilized a hypothetical online choice experiment to determine consumers' preferences and WTP of a U.S. national sample. This deepens the analysis of Direct Trade as the primary initiative of the third wave of coffee which focuses on the direct relationship between farmers and roasters. This initiative emphasizes the importance of the quality of specialty coffee. This study shows that consumers obtained the highest utility for Fair Trade, followed by Direct Trade, Organic and Rainforest Alliance. However, when the interactions between Fair Trade and Organic, and Direct Trade and Organic were included, these were not significant. However, I find that people are willing to pay a premium for all sustainability labels. The highest WTP is found for Fair Trade and Organic, followed by Direct Trade and Organic, Fair Trade, Direct Trade, Organic, and Rainforest Alliance. Fair Trade and Direct Trade have the focus on solving social issues related to better payment to farmers and more opportunities for them to overcome the poverty trap. This chapter demonstrates that consumers are willing to pay more for sustainability labels that concentrate their efforts on solving social issues followed by environmental and organizational issues.

Nevertheless, my research is not without limitations. Although the auction experiment produces valuable results, the sample is not representative of the U.S. population. Future studies could aim for a larger sample that reflects the U.S. population to make results more transferable. The choice experiment design includes only sustainability labels; future studies could include more attributes related to a real shopping experience, such as brand and country of origin. The U.S. coffee imports data I use differentiate imports by type of coffee but no other characteristics. In 2011, the U.S. reported import data separating conventional from organic, making the analysis of sustainable coffee imports more enriching. If more data is available, further research could focus on including costs associated with transportation conforming to the restrictions by demand theory.

REFERENCES

Acharya, R.N., and Schmitz, T.G. (2004). A System-Wide Approach for Analyzing the Effect of Exchange Rates on Fresh Apple Import Demand. Paper presented at the annual meeting of the American Agricultural Economics Association. Denver, Colorado

Alexandratos, N. and Bruinsma, J. (2012). World Agriculture Towards 2030/2050. The 2012 Revision. ESA Working Paper No.12-03. Rome, FAO

Anders, S. M. and Fedoseeva, S. (2017). Quality, Sourcing, and Asymmetric Exchange-Rate Pass-Through into U.S. Coffee Imports." *Journal of Agricultural and Resource Economics,* 42(3), 372-385

Andorfer, V.A., and Liebe U. (2015). Do Information, Price, or Morals Influence Ethical Consumption? A Natural Field Experiment and Customer Survey on the Purchase of Fair-Trade Coffee. *Social Science Research, 52*, 330-350

Andreoni, J. (1990). Impure Altruism and Donations to Public Goods: A Theory of Warm-Glow Giving. *The Economic Journal, 100*, 464-477

Andreoni, J. (1989). Giving with Impure Altruism: Applications to Charity and Ricardian Equivalence. *Journal of Political Economy, 97*(6), 1447-1458

Arnot, C., Boxall, P.C., and Cash S.B. (2006). Do Ethical Consumers Care About Price? A revealed Preference Analysis of Fair-Trade Coffee Purchases. *Canadian Journal of Agricultural Economics, 54*, 555-565

Arnould, E.J., Plastina, A., and Ball, D. (2007). Market Disintermediation and Producer Value Capture: The Case of Fair Trade Coffee in Nicaragua, Peru, and Guatemala. Product and Market Development for Subsistence Marketplaces. *Advances in International Management*, 20, 319-340

Auld, G. (2010). Assessing Certification as Governance: Effects and Broader Consequences for Coffee. *The journal of Environment and Development*, 19(2), 215-241

Bacon, C. (2005). Confronting the Coffee Crisis: Can Fair Trade, Organic, and Specialty Coffees Reduce Small-Scale Farmer Vulnerability in Northern Nicaragua? *World Development*, 33(3), 497-511

Bacon, C., Méndez, V., Gliessman, S., Goodman, D., and Fox, J. (2008). *Confronting the Coffee Crisis: Fair Trade, Sustainable Livelihoods, and Ecosystems in Mexico and Central America*. MIT Press.

Barten A. P. (1964). Consumer Demand Functions under Conditions of Almost Additive Preferences. *European Economic Review*, 1, 7-73

Bates, R. (1999). *Open-Economy Politics: The Political Economy of the World Coffee Trade*. Princeton, NJ: Princeton University Press.

Bhat, C.R. (2003). Simulation Estimation of Mixed Discrete Choice Models using Randomized and Scrambled Halton Sequences. *Transportation Research Part B: Methodological*, 37, 837–855

Becker, G. S. (1974). A Theory of Social Interactions. *Journal of Policy Economy* 82:1063-1093

Basu, A.K., and Hicks, R.L. (2008). Label Performance and the Willingness to Pay for Fair Trade Coffee: A Cross-National Perspective. *International Journal of Consumer Studies, 32*, 470-478

Borrella, I., Mataix, C., and Carrasco-Gallego, R. (2015). Smallholder Farmers in the Specialty Coffee Industry: Opportunities, Constraints and the Businesses that are Making it Possible. *Institute of Development Studies (IDS) Bulletin*, 46(3), 29-44

Bougherara, D. and Combris, P. (2009). Eco-labeled Food Products: What are Consumers Paying for? *European Review of Agricultural Economics, 36*(3), 321-341

Brooks, K and Lusk, J.L. (2010). Stated and Revealed Preferences for Organic and Cloned Milk: Combining Choice Experiment and Scanner Data. *American Journal of Agricultural Economics*, 92(4), 1229-1241

Brown, M. G., and Lee, J. Y. (1993). Alternative Specifications of Advertising in the Rotterdam Model. *European Review of Agricultural Economics*, 20, 419-436

Brown, M. G., and Lee, J. Y. (2002). Restrictions on the effect of Preference variables in the Rotterdam Model. *Journal of Agricultural and Applied Economics,* 34(1),17-26

Campa, J.M. and Goldberg, L.S. (2005). "Exchange Rate pass-through into import prices." *The Review of Economics and Statistics* 87(4): 679-690.

Capps, O. Jr., and Schmitz, J.D. (1991). A Recognition of Health and Nutrition Factors in Food Demand Analysis. *Western Journal of Agricultural Economics,* 16, 21-35

Caputo, V., Nayga, R.M., and Scarpa, R (2013). Food Miles or Carbon Emissions? Exploring Labeling Preference for Food Transport Footprint with a Stated Choice Study. *Australian Journal of Agricultural and Resource Economics*, 57(4), 465-482

CIA. (2019). The World Factbook – United Stated. Central Intelligence Agency (CIA). Available online at: https://www.cia.gov/the-world-factbook/countries/united-states

Conservation International (2020). Sustainable Coffee Challenge. Available online at: https://www.conservation.org/stories/sustainable-coffee-challenge

Conservation International (2020) Our Collective Commitment. Available online at: https://www.sustaincoffee.org/2025targets

Cragg, J.G. (1971). Some Statistical Model for Limited Dependent Variables with Applications to Demand for Durable Goods. *Econometrica, 39*, 829-844

Cranfield, J. Henson, S., Northey, J., and Masakure, O. (2010). An assessment of consumer preference for fair trade coffee in Toronto and Vancouver. *Agribusiness*, 26(2), 307-325

Custom and Border Protection. (2006). What Every Member of the Trade Community Should Know About: Coffee. Available online at: https://www.cbp.gov/sites/default/files/documents/icp085_3.pdf

Darby, M.R. and Karni, E. (1973). *Free competition and the optimal amount of fraud, Journal of Law and Economics*, 6, 67-88.

Daviron, B., and Ponte S. (2005). *The Coffee Paradox. Global Markets, Commodity Trade and the Elusive Promise of Development*. Bloomsbury Academic. November 2005. The Netherlands.

Deaton, A. and Muellbauer, J. (1980). An Almost Ideal Demand System. *The American Economic Review,* 70(3), 312-326

DeGroot, J.I.M., and Steg, L. (2008). Mean or Green: Which Values can Promote Stable Pro-Environmental Behavior? *Conservation Letters, 2*, 61-66

Demont, M., Rutsaert, P., Ndour, M., Verbeke, W., Seck, P.A., and Tollens, E. (2013). Experimental Auctions, Collective Induction and Choice Shift: Willingness-to-Pay for Rice Quality in Senegal. *European Review of Agricultural Economics, 40,* 261-286

DePelsmacker, P., Janssens, W. (2007). A Model for Fair Trade Buying Behavior: The Role of Perceived Quantity and Quality of Information and of Product-Specific Attitudes. *Journal of Business Ethics*, 75, 361–380

DePelsmacker, P., Driesen, L., and Rayp, G. (2006). Do Consumers Care about Ethics? Willingness to Pay for Fair-Trade Coffee. *The Journal of Consumer Affairs, 39*(2), 363-385

Doherty, B., Huybrechts, B., and Smith, S. (2013). Assessing the Gender Impacts of Fair Trade. *Social Enterprise Journal, 9*(1), 102-122

D'Souza, C., Taghian, M., Lamb, P., and Peretiatko, R. (2007). Green Decisions: Demographics and Consumer Understanding of Environmental Labels. *International Journal of Consumer Studies, 31*, 371-376

Ethical Consumer. (2018). Ethical Consumer Market Report 2018. Available online at: https://www.ethicalconsumer. org/sites/default/files/inline-files/EC%20Markets%20Report%202018%20FINAL.pdf

Fair Trade America (2022). Fairtrade Certified Coffee. Available online at: https://www.fairtradeamerica.org/shop-fairtrade/fairtrade-products/coffee/

Fair Trade America. (2020). Coffee Impact Report 2018 & 2019. Available online at: https://www.fairtradeamerica.org/why-fairtrade/global-impact/reports-trends/coffee-2019/

Fair Trade America (2019). We love coffee. Are we Willing to Pay the Price? Available online at: https://www.fairtradeamerica.org/news-insights/we-love-coffee-are-we-willing-to-pay-the-price/.

Fair Trade Certified. (2019). What Fair Trade Certification Means. Available online at: https://www.fairtradecertified.org/why-fair-trade/our-global-model

Federal Reserve Bank of St. Louis Economic Research. (2018). "Gross Domestic Product (GDP)-Billions of Dollars-Quarterly." Available online at https://fred.stlouisfed.org/series/GDP

Fehr, E., & Schmidt, K.M. (1999). A Theory of Fairness, Competition, and Cooperation. *The Quarterly Journal of Economics, 114*(3), 817-868

Food and Agriculture Organization (FAO) 2007. “Diversification By Smallholder Farmer: Vietnam Robusta Coffee.” Agricultural Management, Marketing and Finance – Working Document. Rome. Available online at https://www.fao.org/3/ap301e/ap301e.pdf.

Fox, J.A. (1995). Determinants of Consumer Acceptability of Bovine Somatotropin. *Review of Agricultural Economics, 17*(1), 51-62

Fransson, N. & Garling, T. (1999). Environmental Concern: Conceptual Definitions, Measurement Methods, and Research Findings. *Journal of Environmental Psychology, 19*(4), 369-382

Gerard, A., Lopez, M.C., and McCright, A.M. (2019). Coffee Roasters’ Sustainable Sourcing Decisions and Use of the Direct Trade Label. *Sustainability*, 11,5437

Giovannucci, D. and Koekoek, F.J. (2003). The State of Sustainable Coffee: A Study of Twelve Major Markets. IISD, UNCTAD, ICO

Giovannucci, D. and Ponte, S. (2005). Standards as a New Form of Social Contract? Sustainability Initiatives in the Coffee Industry. Food Policy 30(3), 284-301

Gobbi, J.A. (2000). Is Biodiversity-Friendly Coffee Financially Viable? An analysis of 5 Different Coffee Production Systems in Western El Salvador. *Ecological Economics, 33*(2), 267-281

Grebitus, C., Lusk, J.L., & Nayga Jr. R.M. (2013a). Explaining Differences in Real and Hypothetical Experimental Auctions and Choice Experiments with Personality *Journal of Economic Psychology, 36*, 11-26

Grebitus, C., Peschel, A.O., and Hughner, R.S. (2017). Voluntary Food Labeling: The additive Effect of “Free from” Labels and Region of Origin. *Agribusiness*, 34(4), 714-727

Grebitus, C., Steiner, B.E., & Veeman, M. (2013b). Personal Values and Decision Making: Evidence from Environmental Footprint in Labeling in Canada. *American Journal of Agricultural Economics, 95*(2), 397-403

Greene, W. (2003). *Econometric Analysis*. (fifth ed.). Prentice Hall, Englewood Cliffs.

Grolleau, G., Ibanez, L., and Mzoughi, N. (2009). Too Much of a Good Thing? Why Altruism can Harm the Environment. *Ecological Economics, 68*(7), 2145-2149

Grunert, K.G., Hieke, S., and Wills, J. (2014). Sustainability Labels on Food Products: Consumer Motivation, Understanding and Use. *Food Policy, 44*, 177-189

Grunert, K.G. (2011). Sustainability in the Food Sector: A Consumer Behavior Perspective. *International Journal on Food System Dynamics, 2*(3), 207-218

Guedes Pinto, L.F., Gardner, T., McDermott, C.L., and Lara Ayub, K.O. (2014). Group Certification Supports an Increase in the Diversity of Sustainable Agriculture Network–Rainforest Alliance Certified Coffee Producers in Brazil. *Ecological Economics*, 107, 59-64

Hanemann, W.M. (1984). Discrete/Continuous Models of Consumer Demand. *Econometrica,* 52, 541-561

Harvey A.C. 1990. *The Econometric Analysis of Time Series*. 2 ed. Cambridge, MA:MIT Press

Haines, P.S, Guilkey, D.K., & Popkin, B.M. (1988). Modeling Food Consumption Decisions as a Two-Step Process. *American Journal of Agricultural Economics, 70*(1), 543-552

Hartmann, P., Eisend, M., Apaolaza, V. & D'Souza, C. (2017). Warm Glow vs. Altruistic Values: How Important is Intrinsic Emotional Reward in Pro-Environmental Behavior? *Journal of Environmental Psychology, 52,* 43-55

Hauber A.B., González, J.M., Groothuis-Oudshoorn C.G, Prior T., Marshall D.A. (2016). Statistical Methods for the Analysis of Discrete Choice Experiments: A Report of the ISPOR Conjoint Analysis Good Research Practices Task Force. *Value in Health*, 19(4), 300-315

Helleyer, N., Fraser, I. & Haddock.F., J. (2012) Food Choice, Health Information and Functional Ingredients: An Experimental Auction Employing Bread. *Food Policy, 37*(3), 232-245

Hernandez Aguilera, J.N., Gomez, M.I., Rodewald, A.D, Rueda, X., Anunu, C., Bennett, R., and Van Es, H.M. (2018). Quality as a Driver of Sustainable Agricultural Value Chains: The Case of the Relationship Coffee Model. *Business Strategy and the Environment*, 27(2), 179-198

Hindsley, P., David M. McEnvoy, and O. Ashton Morgan. (2020). Consumer Demand for Ethical Products and the Role of Cultural Worldviews: The Case of Direct-Trade Coffee. *Ecological Economics*, 177,106787
Holland, E., Kjeldsen, C. and Kerndrup, S. (2014). Coordinating Quality Practices in Direct Trade Coffee. *Journal of Cultural Economy*, 9(2), 186-196

Hoogland, C.T., De Boer, J., and Boersema, J.J. (2007). Food and Sustainability: Do Consumers Recognize, Understand and Value On-Package Information on Production Standards? *Appetite, 49*, 47-57

Horne, R.E. (2009). Limits to Labels: The Role of Eco-Labels in the Assessment of Product Sustainability and Routes to Sustainable Consumption. *International Journal of Consumer Studies, 33*(2), 175-182

Hughner, R.S., McDonagh, P., Prothero, A., Shultz II, C.J. and Stanton, J. (2007). Who are Organic Food Consumers? A Compilation and Review of why People Purchase Organic Food. *Journal of Consumer Behavior*, 6(1-2), 94-110

ICO (2002). Global Coffee Crisis: A Threat to Sustainable Development. Johannesburg, 30 August 2002. Available online at: https://www.ico.org/documents/ed1849.pdf.

International Coffee Organizations (ICO). 2004. "Lessons from the World Coffee Crisis: A Serious Problem for Sustainable Development." Report presented at the annual meeting of the UNCTAD XI, Sao Paulo, Brazil, June 13-18.

Iweala, S., Spiller, A., and Meyerding, S. (2019). Buy Good, Feel Good? The Influence of the Warm Glow of Giving on the Evaluation of Food Items with Ethical Claims in the U.K. and Germany. *Journal of Cleaner Production, 215*(1), 315-328

Kareklas, I., Carlson, J.R., & Muehling, D.D. (2014). I Eat Organic for my Benefit and Yours: Egoistic and Altruistic Considerations for Purchasing Organic Food and their Implications for Advertising Strategists. *Journal of Advertising, 43*(1), 18-32

Kimura, A., Mukawa, N., Yamamoto, M., Masuda, T., Yuasa, M., Goto, S., Oka, T., & Wada, Y. (2012). The influence of Reputational Concerns ono Purchase Intention of Fair-Trade Foods Among Young Japanese Adults. *Food Quality and Preference, 26*(2), 204-210

Kremer C. and Miles, A. (2012). Ecosystem Services in Biologically Diversified versus Conventional Farming Systems: Benefits, Externalities, and Trade-Offs. *Ecology and Society*, 17(4), 40

Krinsky, I. and Robb, A.L. (1986). On Approximating the Statistical Properties of Elasticities. *The Review of Economics and Statistics*, 64(4), 715-719

Lewin, B., D. Giovannucci, and P. Varangis. 2004. "Coffee Markets New Paradigms in Global Supply and Demand." ARD – Agricultural and Rural Development Discussion Paper 3: The World Bank. Available online at: http://documents.worldbank.org/curated/en/899311468167958765/pdf/283000REVISED0Coffee1Markets01PUBLIC1.pdf
Lin, T.F., & Schmidt, P. (1984). A Test of the Tobit Specification Against an Alternative Suggested by Cragg. *Review of Economics and Statistics, 66*, 174-177.

Liu, C.C., Chen, C-W., and Chen, H-S. (2019). Measuring Consumer Preferences and Willingness to Pay for Coffee Certification Labels in Taiwan. *Sustainability*, 11(5), 1297

Loureiro, M.L. & Lotade, J. (2005). Do Fair Trade and Eco-Labels in Coffee Wake Up the Consumer Conscience? *Ecological Economics, 53*(1), 129-138

Lusk, J.L. & Shogren, J.F. (2007). *Experimental Auctions: Methods and Applications in Economic and Marketing Research.* Cambridge University Press.

Lusk, J.L., House, L.O., Valli, C., Jaeger, S.R., Moore, M., Morrow J.L., & Trail, W.B. (2004). Effect of Information about Benefits of Biotechnology on Consumer Acceptance of Genetically Modified Food: Evidence from Experimental Auctions in the United States, England, and France. *European Review of Agricultural Economics, 31*(2), 179-204

Lusk, J.L., Fox, J.A., Schroeder, T.C., Mintert, J., & Koohmaraie, M. (2001). In-Store Valuation of Steak Tenderness. *American Journal of Agricultural Economics, 83*(3), 539-550

Lyngbaek, A.E., Mushchler, R.G., and Sinclair, F.L. (2001). Productivity and Profitability of Multistrata Organic versus Conventional Coffee Farms in Costa Rica. *Agroforestry Systems,* 53, 205-2013

MacGregor, F., Ramasar, V., & Nicholas, K.A. (2017). Problems with Led-Voluntary Sustainability Schemes: The Case of Direct Trade Coffee. *Sustainability, 9*(4), 651

Marquez, J. (1994). "The Econometrics of Elasticities or the Elasticity of Econometrics: An Empirical Analysis of the Behavior of U.S. Imports." *The Review of Economics and Statistics* 76(3):471-481

Marsh, T.L., Schroeder, T.C., and Mintert, J. (2004). Impacts of meat product recalls on consumer demand in the USA. *Applied Economics* 36:897–909

McFadden, D. (1974). *Conditional Logit Analysis of Qualitative Choice Behavior*. P. Zarembka (Ed.), Frontiers in Econometrics, Academic Press, New York, 105-142

Meas, T., Hu, W., Batte, M.T., Woods, T.A. and Ernst, S. (2015). Substitutes or Complements? Consumer Preference for Local and Organic Food Attributes. *American Journal of Agricultural Economics*, 97(4), 1044-1071

Moldan, B., Janouskova, S., and Hak, T. (2012). How to Understand and Measure Environmental Sustainability: Indicators and Targets. *Ecological Indicators*, 17, 4-13

Monier-Dilhan, S. & Berges, F. (2016). Consumers' Motivations Driving Organic Demand: Between Self-Interest and Sustainability. *Agricultural and Resource Economics Review, 45*(3), 522-538

Mussatto, S.I., Machado, E., Martins, S., and Teixeira, J.A. (2011). Production, Composition, and Application of Coffee and its Industrial Residues. *Food and Bioprocessing Technology*, 4,661-672

National Coffee Data Trends. Fall. (2021). Available online at: https://www.ncausa.org/Portals/56/PDFs/Market%20Research/NCDT_fall_2021_media_highlights.pdf?ver=7wqZSrDxjyojFyWhxthxlA%3d%3d

NCAUSA (2020). Organic-Certified Coffee in the U.S. Available online at: https://www.ncausa.org/About-Coffee/Organic-Coffee

NCA. (2008). *Report on Sustainable Coffee*. National Coffee Association (NCA), New York.

NCDT. (2017). 2017 U.S. Specialty Coffee Consumption Trend. National Coffee Data Trend (NCDT). Available online at: https://scanews.coffee/2017/11/29/2017-u-s-specialty-coffee-consumption-trends/

Nielsen. (2015). The Sustainability Imperative. New Insights on Consumer Expectations. Available online at: https://www.nielsen.com/wp-content/uploads/sites/3/2019/04/Global20Sustainability20Report_October202015.pdf

Nilsson, H., Tuncer, B., and Thidell, A. (2004). The Use of Eco-Labeling like Initiatives on Food Products to Promote Quality Assurance—is there Enough Credibility? *Journal of Cleaner Production,* 12, 517-526

Nunes Torga, G. and Spers, E.E. (2020). *Perspectives of Global Coffee Demand. Coffee Consumption and Industry Strategies in Brazil*, Woodhead Publishing

Panhuysen, S. and Pierrot, J. 2018. Coffee Barometer (2018). The Hague: Hivos. Available online at: https://hivos.org/assets/2018/06/Coffee-Barometer-2018.pdf.

Pereznieto, P. (2010). The Case of Mexico's 1995 Peso Crisis and Argentina's 2002 Convertibility Crisis: Including Children in Policy Responses to Previous Economic Crisis" Social and Economic Policy – United Nations Children's Fund (UNICEF), Policy, Advocacy and Knowledge Management, Division of Policy and Practice. Available online at: https://www.unicef.org/socialpolicy/files/Impact_of_Econ_Shocks_Mexico_and_Argentina(3).pdf.

Peschel, A.O., Grebitus, C., Steiner, B., & Veeman, M. (2016). How Does Consumer Knowledge Affect Environmentally Sustainable Choices? Evidence from a Cross-Country Latent Class Analysis of Food Labels. *Appetite, 106*, 78-91

Ponte, S. (2004). Standards and Sustainability in the Coffee Sector. A Global Value Chain Approach. Sustainable Commodity Initiative – United Nations Conference on Trade Development and International Institute for Sustainable Development IISD. Available online at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.453.2341&rep=rep1&type=pdf

Rahn, E., Laderach P., Baca, M., Cressy, C., Schroth, G., Malin, D. Rikxoort, H., & Shriver, J. (2014). Climate Change Adaptation, Mitigation, and Livelihood Benefits in Coffee Production: Where are the Synergies? *Mitigation & Adaptation Strategies for Global Change, 19*, 1119-37

Rainforest Alliance (2022a). Full mutual recognition. Available online at https://www.rainforest-alliance.org/business/certification/full-mutual-recognition/

Rainforest Alliance (2022b). Our Approach- Rainforest Alliance. Available online at: https://www.rainforest-alliance.org/about/

Rainforest Alliance (2019). What does Rainforest Alliance Certified Mean? https://www.rainfo rest-alliance.org/faqs/what-does-rainforest-alliance-certified-mean

Rainforest Alliance (2017). Sustainable Agriculture Standard: For Farms and Producer Groups Involved in Crop and Cattle Production. Available online at: https://www.rainforest-alliance.org/business/wp-con tent/uploads/2017/11/03_rainforest-alliance-sustainable-agriculture-standard_en.pdf

Raynolds, L.T., Murray, D. & Heller, A. (2007) Regulating Sustainability in the Coffee Sector: A Comparative Analysis of Third-Party Environmental and Social Certification Initiatives. *Agriculture and Human Values, 24*, 147-163

Reinecke J., Manning, S. & Von Hagen, O. (2012). The Emergence of a Standards Market: Multiplicity of Sustainability Standards in the Global Coffee Industry. *Organization Studies, 33*(5/6), 789-812

Renard, M.C. (2005). Quality Certification, Regulation and Power in Fair Trade. *Journal of Rural Studies, 21*, 419-431

Rice, R.A. (2001). Noble Goals and Challenging Terrain: Organic and Fair Trade Coffee Movements in the Global Marketplace. *Journal of Agricultural and Environmental Ethics*, 14, 39-66

Rokeach, M. (1973) *The Nature of Human Values*. New York: Free Press.

Rotaris, L. and Danielis, R. (2011) Willingness to Pay for Fair Trade Coffee: A Conjoint Analysis Experiment with Italian Consumers. *Journal of Agricultural and Food Industrial Organization,* 9(1), Art 6

Rousu, M. and Corrigan, J. (2008). Consumer Preferences for Fair Trade Foods: Implication for Trade policy. Kenyon College, Department of Economics, Working papers. 23

Rushton, J.P. (1982). Altruism and Society: A Social Learning Perspective. *Ethics, 92*(3), 425-446

Rushton, J. P., Ronald D. C., & Fekken, C. (1981). The Altruistic Personality and the Self-Report Altruism Scale. *Personality and individual differences, 2*(4), 293-364

Sachs, J.D., Cordes, K., Rising, J., Toledano, P., and Maennling, N. (2019). Ensuring Economic Viability and Sustainability of Coffee Production. Columbia Center on Sustainable Investment. Available online at http://dx.doi.org/10.2139/ssrn.3660936

Sachs, J.D., K.Y. Cordes, J. Rising, P. Toledano, and N. Maennling. (2020). Executive Summary on Ensuring Economic Viability and Sustainability of Coffee Production. Columbia Center on Sustainability Investment Staff Publications. Available online at: https://scholarship.law.columbia.edu/sustainable_investment_staffpubs/54

Scarpa, R., Zanoli, R., Bruschi, V, and Naspetti, S. (2012). Inferred and Stated Attribute Non-Attendance in Food Choice Experiments. *American Journal of Agricultural Economics*, 95(1), 165-180

Scarpa, R., Campbell, D., and Hutchinson, G. (2007). Benefit Estimates for Landscape Improvements: Sequential Bayesian Design and Respondents Rationality in a Choice Experiment. *Land Economics,* 8, 617-634

Scarpa, R., Ferrini, S., and Willis, K.G. (2005). *Performance of Error Component Models for status-quo Effects in Choice Experiments*. In: Scarpa., Alberini, A (Eds), Applications of Simulation Methods in Environmental and Resource Economics. Chapter 13. Springer Publisher, Dordrecht, The Netherlands, 247-273

Schmitz, T.G. and J.L. Seale, Jr. (2002). "Import Demand for Disaggregated Fresh Fruits in Japan." *Journal of Agricultural and Applied Economics*. 34(3):585-602

Schuldt. J. P. and Hannahan, M. (2013). When Good Deeds Leave a Bad Taste: Negative Inferences from Ethical Food Claims. *Appetite*, 62, 76-83

Schwartz, S. (1996) Value Priorities and Behavior: Applying a Theory of Integrated Value Systems. *The Psychology of Values: The Ontario Symposium*, *8*, 1-24

Schwartz, S. (1994) Are There Universal Aspects in the Structure and Content of Human Values. *Journal of Social Issues, 50*(4), 19-45

Seale, J.L., Sparks, A., and Buxton, B.M. (1992). A Rotterdam Application to International Trade in Fresh Apples: A Differential Approach. *Journal of Agricultural and Resource Economics*, 17(1):138-149

Sick, D. 2008. "Coffee, Farming Families, and Fair Trade in Costa Rica: New Markets, Same Old Problems?" *Latin American Research Review,* 43(3):193-208

Sirieix, L., Delanchy, M., Remaud, H., Zepeda, L., & Gurviez, P. (2013). Consumers' Perceptions of Individual and Combined Sustainable Food Labels: A UK Pilot Investigation. *International Journal of Consumer Studies, 37*, 143-151

Soderbery, A. (2015). Estimating import supply and demand elasticities: Analysis and implications. *Journal of International Economics*, 96(1):1-17

Sorqvist, P., Hedblom, D., Holmgren, M., Haga, A., Langeborg, L., Nostl, A. & Kagstrom, J. (2013). Who Needs Cream and Sugar when There is Eco-Labeling? Taste and Willingness to Pay for "Eco-Friendly" Coffee. *PloS ONE, 8*(12), e0080719

Steg, L., Dreijerink, L. & Abrahamse, W. (2005). Factor Influencing the Acceptability of Energy Policies: A Test of VBN Theory. *Journal of Environmental Psychology, 25*(4), 415-425

Stern, P. C., Kalof, L., Dietz, T., & Guagnano, G.A. (1995) Values, Beliefs and Pro-Environmental Action: Attitude Formation Toward Emergent Attitude Objects. *Journal of Applied Social Psychology, 25*, 1611-1636

Street, D.J. and Burgess, L. (2007). *The Construction of Optimal Stated Choice Experiments.* John Wiley & Sons.

Syrengelas, K.G., DeLong, K.L., Grebitus, C., and Nayga Jr., R.M. (2018). Is the Natural Label Misleading? Examining Consumer Preferences for Natural Beef. *Applied Economic Perspectives and Policy,* 40(3), 445–460

Teisl, M.F., Peavey, S., Newman, F., Buono, J. & Hermann, M. (2002). Consumer Reactions to Environmental Labels for Forest Products: A Preliminary Look. *Forest Products Journal,* 52(1), 44-50

Theil, H. 1965. The Information Approach to Demand Analysis. *Econometrica* 33(1):67-87

Tobin, J. (1958) Estimation of Relationships for Limited Dependent Variables. *Econometrica,* 26(1), 24-36

Train, K. (2009). *Discrete Choice Methods with Simulation*. Cambridge: Cambridge University Press.

Trudel, R. and Cotte, J. (2009). Does it Pay to Be Good? MIT Sloan Management Review. 50, 61-68

Umberger, W.J., Thilmany McFadden, D.D., & Smith, A.R. (2009). Does Altruism Play a Role in Determining U.S. Consumer Preferences and Willingness to Pay for Natural and Regionally Produced Beef? *Agribusiness, 25*(2), 268-285

United Nations (2022). The 17 Goals. Department of Economic and Social Affairs – Sustainable Development. Available online at https://sdgs.un.org/goals

United Nations (2019) The Sustainable Development Agenda. Sustainable Development Goals. Available online at: https://www.un.org/sustainabledevelopment/development-agenda/

United Nations (2012). The Future we Want. Resolution adopted by the general assembly on 27 July 2012 (A/RES/66/288). United Nations, New York. Available online at: https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_RES_66_288.pdf

U.S. Census Bureau (2019) Available online at: https://www.census.gov/quickfacts/fact/table/US/PST045221

U.S. Census Bureau (2018) U.S. Population. Available online at: https://www.census.gov/quickfacts/fact/table/US/PST045219

USDA. (2020). Coffee: World Markets and Trade. Washington DC: U.S. Department of Agriculture, Foreign Agricultural Service. Available online at: https://downloads.usda.library.cornell.edu/usda-esmis/files/m900nt40f/377214491/z029pw759/coffee.pdf

USDA. (2019). Organic 101: What the USDA Organic label means. U.S. Department of Agriculture (USDA). Available online at: https://www.usda.gov/media/blog/2012/03/22/organic-101-what-usda-organic-label-means

USDA. (2018). Coffee: World Markets and Trade. Washington DC: U.S. Department of Agriculture, Foreign Agricultural Service. Available online at https://downloads.usda.library.cornell.edu/usda-esmis/files/m900nt40f/41687n67f/nk322j622/coffee.pdf

USDA. (2017). Mexico, Coffee Annual Coffee Production to Increase Washington DC: U.S. Department of Agriculture, Foreign Agricultural Service. Available online at https://apps.fas.usda.gov/newgainapi/api/report/downloadreportbyfilename?filename=Coffee%20Annual_Mexico%20City_Mexico_5-25-2017.pdf

U.S. Department of Commerce. Various years. "U.S. Imports of Merchandise Monthly." [DVD-ROM], Washington D.C: U.S. Department of Commerce, Economics, and Statistics Administration, U.S. Census Bureau.

UTZ (2017). The Rainforest Alliance and UTZ to Merge, Forming New, Stronger Organization. Available online at: https://www.rainforest-alliance.org/articles/rainforest-alliance-utz-merger

Valdez-Lafarga, O and T. Schmitz. 2016. "A Country-Differentiated Import Demand Model for Fresh Tomatoes in the United States: An Estimation of Price and Income Elasticities for 1991 through 2014" Paper presented at the annual meeting of the Agricultural and Applied Economics Association, Boston, MA, July 31-August 2

Valdez-LaFarga, O., Schmitz, T.G and Englin, J.E. (2019). The Role of Exchange Rates on Country-Differentiated Demand: The Case of United States Tomatoes. *Journal of Agricultural and Resource Economics,* 44(1):62-79

Valkila, J., and Nygren, A. (2010). Impacts of Fair Trade Certification on Coffee Farmers, Cooperatives, and Laborers in Nicaragua. *Agriculture and Human Values,* 27, 321-333

Van Loo, E.J., Caputo, V., Nayga, R.M., Seo, H.S., Zhang, B., & Verbeke, W. (2015). Sustainability Labels on Coffee: Consumer Preferences, Willingness-to-Pay and Visual Attention to Attributes. *Ecological Economics, 118*, 215-225

Van Loo, E.J., Caputo V., Nayga Jr., R.M, Verbeke, W. (2014). Consumers' Valuation of Sustainability Labels on Meat. *Food Policy*, 49, 137-150

Van Loo, E.J., Caputo, V., Nayga Jr. R.M., Meullenet, J.F., and Ricke, S.C. (2011). Consumers' Willingness to Pay for Organic Chicken Breast: Evidence from Choice Experiment. *Food Quality Preferences,* 22, 603-613

Vecchio, R. & Annunziata, A. (2015) Willingness-to-Pay for Sustainability-Labelled Chocolate: An Experimental Auction Approach. *Journal of Cleaner Production, 86*(1), 335-342

Vertzberger, Y.Y.I. (1990) *The World in their Minds: Information, Processing, Cognition and Perception in Foreign Policy Decision Making.* Stanford University Press.

Wintgens, J.N. (2004). Factors influencing the Quality of Green Coffee. in J.N. Wintgens, eds., Coffee: Growing, Processing, Sustainable Production. Corseaux, Switzerland: Wiley, 797-817.

WCED (1987). *Our Common Future*. World Commission on Environmental Development's View (WCED). Oxford University Press.

Wharton. Knowledge@Wharton. 2013. "Coffee in Colombia: Walking Up to an Opportunity." The Wharton School, University of Pennsylvania. Available online at: https://knowledge.wharton.upenn.edu/article/coffee-in-colombia-waking-up-to-an-opportunity/.

World Bank. (2017). For Up to 800 Million Rural Poor, a Strong World Bank Commitment to Agriculture. Available online at: https://www.worldbank.org/en/news/feature/2014/11/12/for-up-to-800-million-rural-poor-a-strong-world-bank-commitment-to-agriculture.

Yadav, R. (2016). Altruistic or Egoistic: Which Value Promotes Organic Food Consumption Among Young Consumers? A Study in the Context of a Developing Nation. *Journal of Retailing and Consumer Services, 33,* 92-97

Yang, S-H, Hu, W., Mupandawana, M. & Liu, Y. (2012). Consumer Willingness to Pay for Fair Trade Coffee: A Chinese Case Study. *Journal of Agricultural & Applied Economics, 44*(1), 21-34

Zhang, L., Seale Jr., J.L., Paggi, M.S., and Schmitz, T.G. (2020). The Food Safety Modernization Act and Differential Revenues to Differently Sized U.S. and Foreign Fresh Tomato Producers. *Journal of Agricultural and Resource Economics,* 45(3):571-588

APPENDIX A

INFORMATION RELATED TO THE COFFEE LABELS

Table A

Label	Logo
Fair Trade Certified This certification provides proof of the company's efforts to reduce poverty and empower producers in the poorest countries in the world by paying them more for their coffee. Farmers create coffee associations to sell larger quantities of coffee	
Organic This certification provides proof of the company's efforts to produce coffee without the use of chemical fertilizers, pesticides, or herbicides	
Rainforest Alliance Certified This certification provides proof of the company's efforts to conserve biodiversity and improve the livelihoods of endangered species.	
Direct Trade This logo provides proof of the company's efforts to develop closer relationships with the farmers and processors who sell coffee. Coffee roasters go directly to coffee farmers and agree to pay a good price for the quality of the coffee produced.	
Fair Trade Certified + Organic This certification provides proof of the company's efforts to reduce poverty and empower producers in the poorest countries in the world by paying them more for their coffee. Farmers must produce coffee avoiding all kind of chemical fertilizers, pesticides, or herbicides.	

APPENDIX B

SAMPLE CHARACTERISTICS

Table B

Variable	Sample	U.S.
Gender (% female)	55.2%	50.8%
Age (in years)	31.6	38.5
Household (HH) size	2.2	2.6
Annual HH income	$51,934	$60,293
Race (% white)	55.2%	76.0%
Education: college degree and higher	5.35%	31.5%
N	114	327.2 million

125

APPENDIX C

REGRESSION RESULTS. CRAGG'S MODEL

Table C

Dependent Variable:	**Round 1**		**Round 2**	
Coffee Bids	Hurdle 1	Hurdle 2	Hurdle 1	Hurdle 2
Fair Trade	-0.03	3.76	0.45	10.61
Organic	0.03	4.67	0.20	9.87
Fair Trade+Organic	0.20	5.82	0.58	12.82*
Rainforest Alliance	-0.05	4.60	0.56	10.19
Direct Trade	-0.13	3.86	0.14	10.73
Warm Glow* labels	-0.24*	1.02	-0.20	1.19
Altruism* labels	0.35**	-0.68	0.35**	-0.45
Biospheric* labels	-0.47***	-0.21	-0.27*	-1.29
Egoism* labels	0.07	-0.57	-0.21	0.27
Like coffee* labels	0.18**	-0.69	0.17**	-0.33
Knowledge* labels	0.10**	0.66	0.06	0.55
Female	-0.15	6.29	-0.13	9.57
Female* labels	-0.31	-0.71	-0.17	-2.62
Age	0.00	0.03	0.00	0.12
Age* labels	-0.00	0.04	0.00	0.00
Bachelor	0.55**	-0.39	0.36	-1.44
Bachelor* labels	-0.07	0.19	-0.21	0.37
Race	-0.26	-4.23	-0.23	-8.13
Race* labels	-0.25	0.25	-0.23	0.34
Income	-0.00	-0.00	-0.00	0.00
Income* labels	0.00	-0.00	0.00	-0.00
Constant	0.25	-8.27	0.05	-18.84
N	684	527	684	551

Note: ***p<0.01, **p<0.05, *p<0.10

APPENDIX D

WILLINGNESS TO PAY RELATED TO VALUE ORIENTATION

Table D

Dependent Variable:	**Warm Glow**		**Altruism**		**Biospheric**		**Egoism**	
Coffee Bids	**Round 1**	**Round 2**	**Round 1**	**Round 2**	**Round 1**	**Round 2**	**Round 1**	**Round 2**
Fair Trade	1.46***	2.23***	1.44***	2.19***	1.45***	2.21***	1.45***	2.21***
Organic	1.72***	1.75***	1.70***	1.73***	1.71***	1.74***	1.69***	1.74***
Fair Trade+Organic	2.24***	2.83***	2.21***	2.79***	2.24***	2.81***	2.21***	2.82***
Rainforest Alliance	1.64***	2.21***	1.62***	2.17***	1.63***	2.19***	1.62***	2.18***
Direct Trade	1.38***	1.88***	1.37***	1.85***	1.38***	1.87***	1.37***	1.86***
Warm_Glow	-0.29	-0.36						
Fair Trade*Warm Glow	0.19	0.40**						
Organic*Warm Glow	0.21	0.15						
FairTrade+Organic*Warm Glow	0.27	0.56***						
Rainforest Alliance*Warm Glow	0.24	0.53***						
Direct Trade*Warm Glow	0.18	0.20						
Altruism			0.10	-0.06				
Fair Trade*Altruism			0.19	0.17				
Organic*Altruism			0.15	0.15				
Fair Trade+Organic*Altruism			0.30	0.39**				
Rainforest Alliance*Altruism			0.06	0.28				
Direct Trade*Altruism			0.21	0.23				
Biospheric					-0.34	-0.38		
Fair Trade* Biospheric					0.18	0.39**		
Organic* Biospheric					0.40**	0.16		
FairTrade+Organic*Biospheric					0.39**	0.34*		
Rainforest Alliance* Biospheric					0.10	0.23		
Direct Trade* Biospheric					0.14	0.07		
Egoism							-0.02	-0.27
Fair Trade* Egoism							0.17	0.28
Organic* Egoism							0.55***	0.27
Fair Trade+Organic* Egoism							0.53***	0.54***

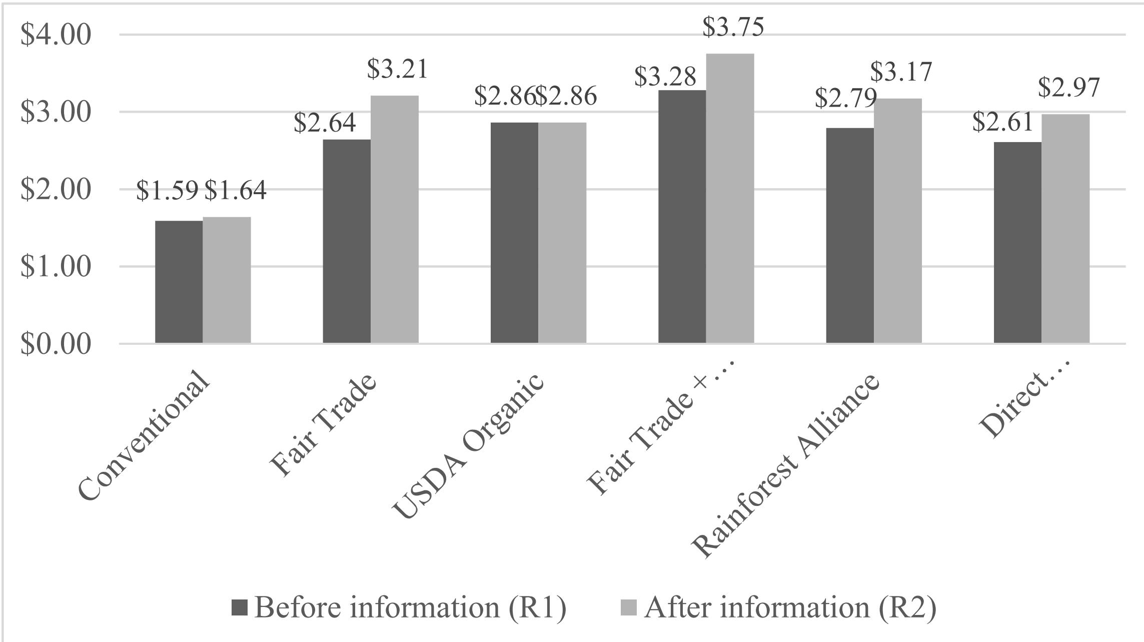
Rainforest Alliance* Egoism							0.07	0.07
Direct Trade* Egoism							0.18	0.12
Constant	0.62*	0.67*	0.64*	0.70*	0.62*	0.69*	0.63*	0.68*
σ	3.53***	3.61***	3.52***	3.60***	3.53***	3.60***	3.52***	3.61***

Note: ***p<0.01, **p<0.05, *p<0.10

APPENDIX E

WILLINGNESS TO PAY ON COFFEE IN USD/12OZ.

Figure E

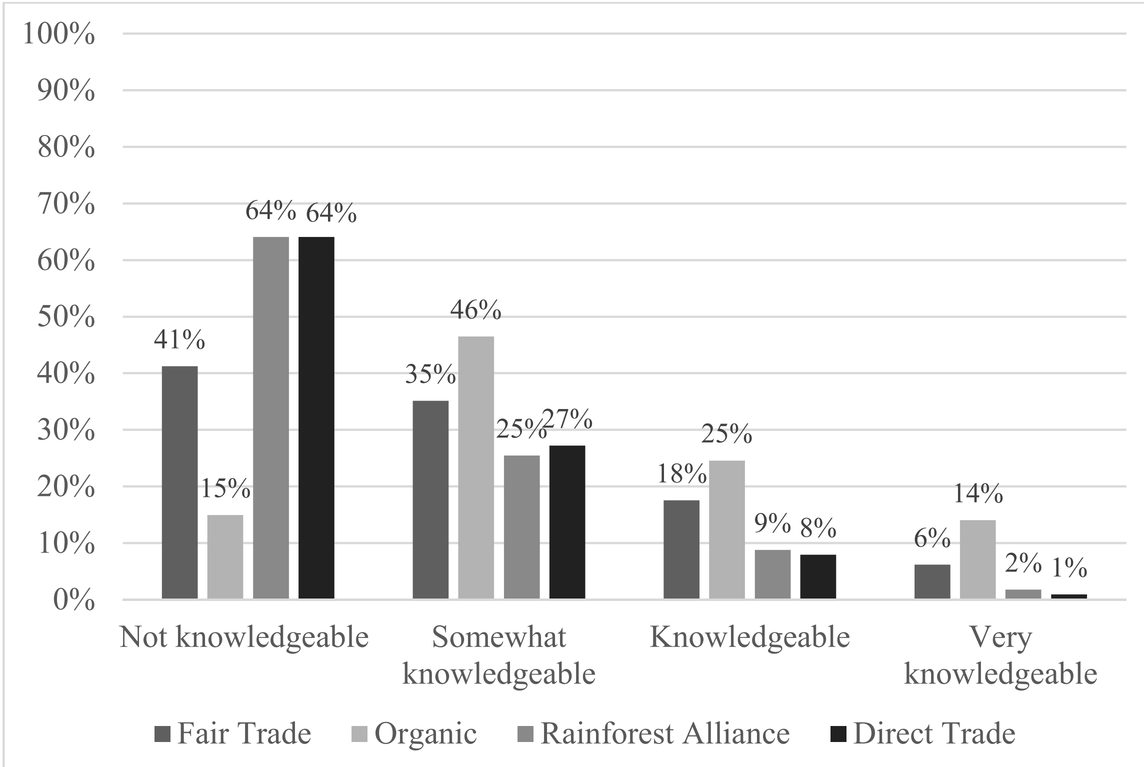


$4.00
$3.00
$2.00
$1.00
$0.00
$1.59
$1.64
$2.64
$3.21
$2.86
$2.86
$3.28
$3.75
$2.79
$3.17
$2.61
$2.97
Conventional
Fair Trade
USDA Organic
Fair Trade +…
Rainforest Alliance
Direct…
Before information (R1)
After information (R2)

APPENDIX F

PREVIOUS KNOWLEDGE OF SUSTAINABILITY LABELS ON COFFEE

Figure F


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
41%
15%
64%
64%
35%
46%
25%
27%
18%
25%
9%
8%
6%
14%
2%
1%
Not knowledgeable
Somewhat knowledgeable
Knowledgeable
Very knowledgeable
Fair Trade
Organic
Rainforest Alliance
Direct Trade

APPENDIX G

RESULTS – FAIR TRADE INTERACTIONS

Table G

	MNL	**RPL**	**RPL-EC**
Price	-0.18***	-0.24***	-0.25***
Fair Trade	1.01***	1.22***	1.54***
Direct Trade	0.83***	0.96***	1.14***
Rainforest Alliance	0.28***	0.43***	0.38***
Organic	0.43***	0.66***	0.70***
None of these	-1.76***	-5.39***	-5.41***
Fair Trade * Organic	0.04	-0.09	-0.37**
Standard Deviation			
Fair Trade		0.92***	1.99***
Direct Trade		0.74***	1.32***
Rainforest Alliance		0.98***	1.23***
Organic		1.05***	1.18***
Fair Trade * Organic		0.10	0.90***
Error component			4.27***
None of these		4.47***	
N	7,461	7,461	7,461
LL	-8456.5	-6992.9	-6838.3
AIC	16927.2	14011.9	
χ^2		6700.3	7009.5

Note: ***p<0.01, **p<0.05, *p<0.10

APPENDIX H

RESULTS – DIRECT TRADE INTERACTION

Table H

	MNL	RPL	RPL-EC
Price	-0.18***	-0.25***	-0.26***
Fair Trade	1.03***	1.23***	1.27***
Direct Trade	0.83***	0.98***	1.09***
Rainforest Alliance	0.28***	0.40***	0.45***
Organic	0.46***	0.57***	0.47***
None of these	-1.75***	-5.38***	-5.58***
Direct Trade * Organic	-0.00	0.03	-0.01
Standard Deviation			
Fair Trade		1.00***	1.85***
Direct Trade		0.40***	0.76***
Rainforest Alliance		1.04***	1.48***
Organic		0.90***	1.10***
Direct Trade * Organic		1.23***	1.92***
Error component			4.42***
None of these		4.24***	
N	7,461	7,461	7,461
LL	-8456.6	-6955.4	-6756.8
AIC	16927.3	13936.9	13569.6
χ^2		6775.3	7172.6

Note: ***p<0.01, **p<0.05, *p<0.10

APPENDIX I

PERMISSION LETTERS

ASU W. P. Carey School of Business
Arizona State University

To:
Katherine Fuller

April 20, 2022

Dear Katherine Fuller

I am writing to grant you permission to use the article, which I am a co-author in your dissertation. The reference to the article is below.

Fuller, Katherine; Grebitus, Carola, and Schmitz, Troy G. "The Effects of Values and Information on the Willingness to Pay for Sustainability Credence Attributes for Coffee" *Agricultural Economics* (2022): 1-17.

Title of the article: The Effects of Values and Information on the Willingness to Pay for Sustainability Credence Attributes for Coffee

Author of the article: Fuller, Katherine; Grebitus, Carola, and Schmitz, Troy G.

Periodical Title: Agricultural Economics

Volume: Date: March 2022 Pages: 1 – 17

This request grants permission to Katherine Fuller to include the content of the above-mentioned article in her dissertation, here at the Arizona State University. With this permission, the article can be included in the dissertation, whether in full or in part and submitted to the university's repository in either print or electronic form.

If you have any questions, please feel free to contact me at troy.schmitz@asu.edu.

Sincerely,

Dr. Troy Schmitz
Director and Professor
Morrison School of Agribusiness
Arizona State University | W.P. Carey School of Business

Morrison School of Agribusiness
7231 E. Sonoran Arroyo Mall, Santan Hall, Suite #230, Mesa, AZ 85212
p: 480-727-1586 **f:** 480-727-1961 **email:** wpcarey.Morrison@asu.edu **web:** www.wpcarey.asu.edu

W. P. Carey
School of Business
Arizona State University

To:
Katherine Fuller

April 4, 2022

Dear Katherine Fuller

I am writing to grant you permission to use the article, which I am a co-author in your dissertation. The reference to the article is below.

Fuller, Katherine; Grebitus, Carola, and Schmitz, Troy G. "The Effects of Values and Information on the Willingness to Pay for Sustainability Credence Attributes for Coffee" *Agricultural Economics* (2022): 1-17.

Title of the article: The Effects of Values and Information on the Willingness to Pay for Sustainability Credence Attributes for Coffee

Author of the article: Fuller, Katherine; Grebitus, Carola, and Schmitz, Troy G.

Periodical Title: Agricultural Economics

Volume: Date: March 2022 Pages: 1 – 17

This request grants permission to Katherine Fuller to include the content of the above-mentioned article in her dissertation, here at the Arizona State University. With this permission, the article can be included in the dissertation, whether in full or in part and submitted to the university's repository in either print or electronic form.

If you have any questions, please feel free to contact me at carola.grebitus@asu.edu.

Sincerely,

Dr. Carola Grebitus
Associate Professor of Food Industry Management
Morrison School of Agribusiness
Arizona State University | W.P. Carey School of Business

Morrison School of Agribusiness
7231 E. Sonoran Arroyo Mall, Santan Hall, Suite #230, Mesa, AZ 85212
p: 480-727-1566 **f:** 480-727-1961 **email:** wpcarey.Morrison@asu.edu **web:** www.wpcarey.asu.edu

APPENDIX J

IRB APPROVAL LETTERS

EXEMPTION GRANTED

Carola Grebitus
WPC: Agribusiness, Morrison School of
480/727-4098
Carola.Grebitus@asu.edu

Dear Carola Grebitus:

On 4/3/2019 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	The effect of altruism on willingness to pay for coffee attributes
Investigator:	Carola Grebitus
IRB ID:	STUDY00009980
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Protocol , Category: IRB Protocol; • consent, Category: Consent Form; • recruit, Category: Recruitment Materials; • email, Category: Recruitment Materials; • ad, Category: Recruitment Materials; • survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • flyer, Category: Recruitment Materials;

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 4/3/2019.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

ASU Knowledge Enterprise Development

EXEMPTION GRANTED

Carola Grebitus
WPC: Agribusiness, Morrison School of
480/727-4098
Carola.Grebitus@asu.edu

Dear Carola Grebitus:

On 12/7/2021 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Consumer purchase decisions for coffee
Investigator:	Carola Grebitus
IRB ID:	STUDY00015081
Funding:	None
Grant Title:	None
Grant ID:	None
Documents Reviewed:	• Consent, Category: Consent Form; • Protocol , Category: IRB Protocol; • survey, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);

The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 12/7/2021.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

If any changes are made to the study, the IRB must be notified at research.integrity@asu.edu to determine if additional reviews/approvals are required. Changes may include but not limited to revisions to data collection, survey and/or interview questions, and vulnerable populations, etc.

REMINDER - All in-person interactions with human subjects require the completion of the ASU Daily Health Check by the ASU members prior to the interaction and the use of face coverings by researchers, research teams and research participants during the interaction. These requirements will minimize risk, protect health and support a safe research environment. These requirements apply both on- and off-campus.

The above change is effective as of July 29th 2021 until further notice and replaces all previously published guidance. Thank you for your continued commitment to ensuring a healthy and productive ASU community.

Sincerely,

IRB Administrator