universität wien

MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

Purchase Drivers of Voluntary Carbon Offset Schemes in the Aviation Industry

verfasst von / submitted by

Niklas Heck, B.A.

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien, 2020 / Vienna, 2020

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	UA 066 914
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium Internationale Betriebswirtschaft
Betreut von / Supervisor:	o. Univ.-Prof. Mag. Dr. Rudolf Vetschera
Mitbetreut von / Co-Supervisor:	Mag. Oksana Galak, PhD

Abstract

As the issue of greenhouse gases and their origins becomes more and more central to the economy, actors in the aviation industry also need to increasingly reflect on their business models and adapt them where necessary. In addition to the so-called "compliance markets", through which the aviation industry is mainly influenced by regulations, there is also the possibility of voluntary offsetting the CO2 emissions caused by flights. This option is transferred to the end consumer in the form of "voluntary carbon offsets". Previous research indicates above all the low level of awareness among air travellers on the subject of voluntary carbon offsets. Within the scope of this work, it was investigated which properties of such a voluntary carbon offset product contribute significantly to the air travellers' willingness to purchase. For this purpose a Choice-Based Conjoint Analysis was used.

Key words: Voluntary Carbon Offset, Airlines, Aviation Industry, Conjoint Analysis

Abstrakt

Da die Thematik der Treibhausgase und ihrer Herkunft immer mehr in den Mittelpunkt der Wirtschaft rückt, müssen auch die Akteure in der Luftfahrtindustrie zunehmend über ihre Geschäftsmodelle nachdenken und diese gegebenenfalls anpassen. Neben den so genannten "Compliance-Märkten", durch die die Luftfahrtindustrie vor allem durch Regulationen beeinflusst wird, besteht auch die Möglichkeit die durch Flüge verursachten CO2-Emissionen freiwillig auszugleichen. Diese Möglichkeit wird in Form von „Voluntary Carbon Offsets" auf den Endverbraucher übertragen. Bisherige Forschung weist vor allem auf die hohe Unkenntnis von Flugreisenden bei der Thematik von Voluntary Carbon Offsets hin. Im Rahmen dieser Arbeit wurde untersucht, welche Eigenschaften eines solchen freiwilligen Klimaschutzproduktes wesentlich zur Kaufbereitschaft der Flugreisenden beitragen. Dazu wurde eine Choice-Based Conjoint Analyse durchgeführt.

Schlüsselwörter: Freiwilliger CO2-Ausgleich, Airlines, Luftfahrtindustrie, Conjoint Analyse

Table of Content

List of Figures

List of Tables

Abbreviations

PEB	Pro-Environmental Behaviour
CBC	Choice-Based Conjoint Analysis
CO_2	Carbon Dioxide
CORSIA	Carbon Offset and Reduction Scheme for International Aviation
CSR	Corporate Social Responsibility
EU ETS	EU Emissions Trading Scheme
FFM	Frequent Flyer Miles
GHG	Greenhouse Gases
HB	Hierarchical Bayesian Estimation
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
NGO	Non-governmental Organization
PPP	Polluter Pays Principle
UNFCCC	United Nations Framework Convention on Climate Change
VCO	Voluntary Carbon Offset
WTO	Willingness to Offset
WTP	Willingness to Pay

1. Introduction

1.1 Voluntary Carbon Offset and the Need for it

"Climate change has evolved from an 'inconvenient hypothesis' to an 'inconvenient truth'"

(Brouwer et al., 2008, p.300)

Airlines are known to be an essential part of the transportation system and influence the development of modern society (Li et al., 2016). A 20-year passenger forecast predicts a doubling of passenger demand within the next two decades (IATA, 2019a). Air transportation connects people, countries as well as cultures around the entire world. Its economic importance is enormous, as it promotes employment and guarantees the rapid and reliable flow of services and goods. At the same time, it has an undesirable impact on climate and the environment.

The issue of sustainability has become an integral part of the public debate. New reports and studies are regularly published in an attempt to quantify the impact of human activity on the planet's ecosystems. These reports point out that sustainable and environmentally compatible forms of mobility are among the critical challenges of the 21st century (Mutschler, 2012).

The aviation industry understands the need to address the global challenge of climate change. In 2009, the International Air Transport Association (hereafter referred to as IATA) implemented a set of targets to mitigate carbon dioxide (hereafter referred to as CO_2) emissions that stem from air transportation. Among others, it can be read that IATA aims at "a reduction in net aviation CO_2 emissions of 50% by 2050 (…)" (IATA, 2018).

Reaching targets such as this is only feasible with the right mixture of technological, operational, and policy measures, in combination with the use of sustainable alternative jet fuels (Staples et al., 2018). Yet, only four airports are regularly deployed with Sustainable Aviation Fuel (ICAO, 2017). Today's state of the global aviation market is characterized by intense competition as well as rapid changes through deregulation, rapid technology improvements, industry consolidation, and innovations (Babić et al. 2017). Due to the intense competition and the speed of market

changes, airlines need to focus on their own business models, mainly by reducing non-fuel costs (Babić et al. 2017).

As IATA's emissions targets are ambitious but focused on long-term success, and the fact that the aviation industry is not yet ready to make full use of Sustainable Aviation Fuel, non-governmental organisations (hereafter referred to as NGO) have also started to target air travellers with CO_2 emissions. Air travellers are a suitable target group for those organizations since a lot of them have experienced a feeling of guilt after having booked a flight. This was particularly evident in Sweden in 2018, when an environmental movement called flight shame, led by Greta Thunberg, a young Swedish climate activist, spread around the world (Hasberg, 2019). One possibility to overcome this feeling would be not to fly – which does not seem to be a valid alternative for many travellers. Another option is to make amends. This is called Voluntary Carbon Offset (hereafter referred to as VCO). A number of organizations and airlines exist that offer airline customers the option to offset the emissions that have been caused by their flights.

For the global climate, it is irrelevant where in the world greenhouse gases (hereafter referred to as GHG) are emitted into the atmosphere and where they are reduced. For this reason, GHGs can be emitted in one location but may be offset in another. If flying is unavoidable, VCOs offer the possibility of reducing the emissions caused by flying in alternative ways (Goodward & Kelly, 2010).

By engaging in those schemes, travellers invest in certified sustainable energy projects that aim at offsetting the amount of CO_2 emissions evoked by their flight. In addition to selling VCOs online to air travellers, many VCO providers cooperate with tour operators who either offset all their customers' flights or at least offer them the opportunity to do so (Boon et al., 2007).

But is such payment a sensible measure to mitigate the ecological consequences of a business trip to Zurich and a holiday in the Caribbean? Or is it only a superficial relief for the conscience, without really helping the climate? Either way, air travellers who offset their flight will remember that the price of flying exceeds the cost of the ticket. According to an article in the German national weekly newspaper ZEIT, EUR 9.5 million in compensation payments were received by the organization ‘Atmosfair’ in 2018. This is 40% more than in the year before. Atmosfair’s Business-Development manager Julia Zhu also forecasts that the trend continues and could even increase (ZEIT ONLINE, 2019). Many airlines from all over the world already offer the

possibility to purchase VCO on their individual website at the end of a booking process (e.g., Qantas). However, the majority of these airlines have experienced low VCO purchase rates.

Figure 1 shows an example of a VCO offered by an airline. Besides the origin and the destination of the flight, the air traveller is also given the option to choose the cause that should be supported by the financial contribution.

Figure 1, Screenshot of a Carbon Offset Option at Qantas Airways (n.d.)

1.2 Research Goal and Research Question

The study aims to deepen the understanding of how VCO schemes need to be offered to airline customers in order to maximize their willingness to offset (hereafter referred to as WTO). Previous studies have already shown that the WTO for VCO varies depending on certain attributes. This means that different attributes of a VCO are investigated.

More specifically, the aim of this study is to determine what air travellers value when deciding to offset their flight by ranking these attributes according to the weight each criterion has in the final decision. Consequently, this study aims at answering the following research question:

„How strong are the influences of various attributes of Voluntary Carbon Offset (VCO) schemes in the aviation industry relative to each other on the customer's willingness to offset?"

In order to achieve this, a two-stage method is used. The first step is an excessive literature search to determine which criteria play a role during the decision-making process.

In the second step, it is empirically tested how each of the criteria identified in the first step influences the overall choice.

The quantitative method chosen for this study is a Choice-Based Conjoint Analysis (hereafter referred to as CBC), a method that elicits consumer preferences for single product attributes. The main reason for choosing this method was its ability to simulate the real choice situation fairly accurately. In CBC analysis, the identified criteria serve as attributes that describe the product offering as realistically as possible. The product offers are classified by attribute levels that are predetermined for each attribute.

The participants in the study had to consider several products with different VCO compositions and select the most attractive one for them. Each respondent answered choice tasks in two scenarios: a *short-haul* scenario and a *long-haul* scenario. Each scenario consisted of nine choice tasks. The respondents had to make trade-offs for each choice task, which is due to the fact that respondents evaluate products differently due to their different attributes. In the end, it was possible to compute how much each attribute affected the choice.

1.3 Structure of the Thesis

This work is divided into a theoretical and an empirical part. In the theoretical part, the basis for the further chapters is worked out. The theoretical part is developed through a literature search in libraries, statistical data material, the internet, peer-reviewed articles, working papers, and databases.

After an introduction to the theoretical framework of pro-environmental behaviour of people and the principle of VCO, the methodology part provides an overview of conjoint analysis. This overview enables the selection of a suitable analysis with regard to practical implementation. Based on the theoretical part, the hypotheses are derived. The empirical part of the work is intended to answer the research questions. For this

purpose, the appropriate method is brought to practical implementation through a survey questionnaire and the subsequent statistical analysis.

In the discussion and final chapter of the thesis the results are interpreted to discuss possible explanations for why certain criteria are more important than others. In addition, the preferred levels within the attributes are analysed, which sheds more light on the needs of airline customers when making VCO purchases. The results of the study are valuable for business practitioners and can be used for a better understanding of how VCO schemes need to be offered to customers in order to maximize their WTO. They also make a scientific contribution to the voluntary carbon offset behaviour of air travellers and their evaluation of various product characteristics.

2. From Theory to Hypotheses

2.1 Rising CO2 Emissions and Mitigation Methods in the Airline Industry

This chapter provides an overview of the current status of carbon dioxide emissions caused by the airline industry. In addition, two mitigation options are presented that are currently relevant to the aviation industry to offset rising emissions.

2.1.1 Aviation Industry and Greenhouse Gas Emissions on the Upswing

"Someone flying from Paris to New York and back generates roughly the same level of emissions as the average person in the EU does by heating their home for a whole year."

(European Commission, 2016b)

Although tourism is constantly growing and is hence expected to continue to bring significant benefits both in terms of socio-economic development and job creation worldwide, it has a negative impact on the environment (World Tourism Organization & International Transport Forum, 2019).

The number of international tourist arrivals rose from 770 million in 2005 to 1.2 billion in 2016 and is expected to reach 1.8 billion in 2030 (World Tourism Organization & International Transport Forum, 2019). In fact, kerosene used for aircraft is mainly fossil fuel and therefore contributes to global CO2 emissions and related global warming (Lee, 2018).

Total CO_2 emissions from all commercial aviation activities, including passenger movements and cargo, amounted to 918 million metric tons (MMT) in 2018. This corresponds to 2.4% of global CO_2 emissions from fossil fuel use and is an increase of 32% between 2013 and 2018 (Graver et al., 2019). If the aviation industry were to be considered as a country, it would rank 10th among polluters (European Commission, 2016b). On a European level, the European Commission (2016b) states that direct emissions from aviation account for about 3% of total EU GHG emissions. Data shows that in 2018, 747 MMTs of passenger traffic accounted for 81% of total commercial aviation emissions (Graver et al., 2019).

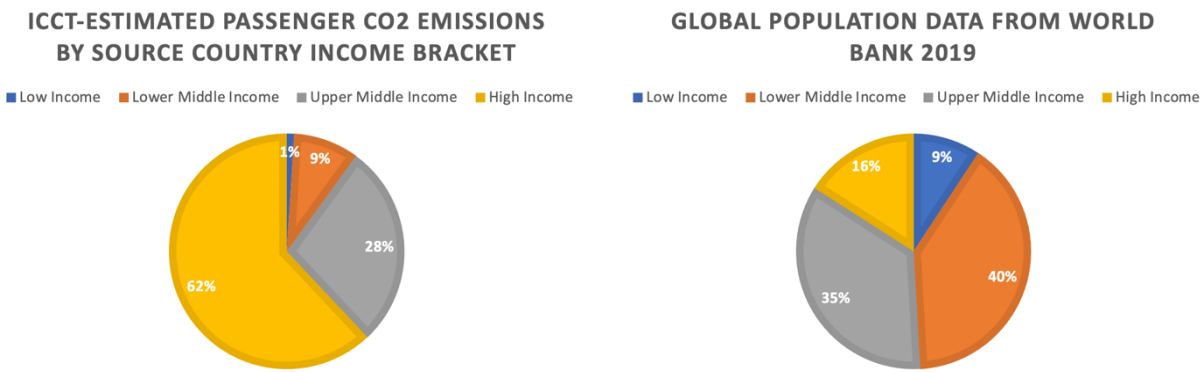

Figure 2: Passenger CO_2 emissions, by source country income bracket, 2018 and Global population data 2019 (own illustration, based on Graver et al., 2019; The World Bank, 2019)

When it comes to the origin of the emissions Graver et al. (2019) have published an overview which shows that high-income countries are responsible for 62% of CO_2 emitted from passenger aircraft in 2018 while only accounting to 16% of the global population. In contrast, a contribution of only 10% can be attributed to lower-middle and low-income countries that amount to 49% of the global population. The emissions caused nevertheless have a global impact on the environment. Rising CO2 figures have been documented for several decades.

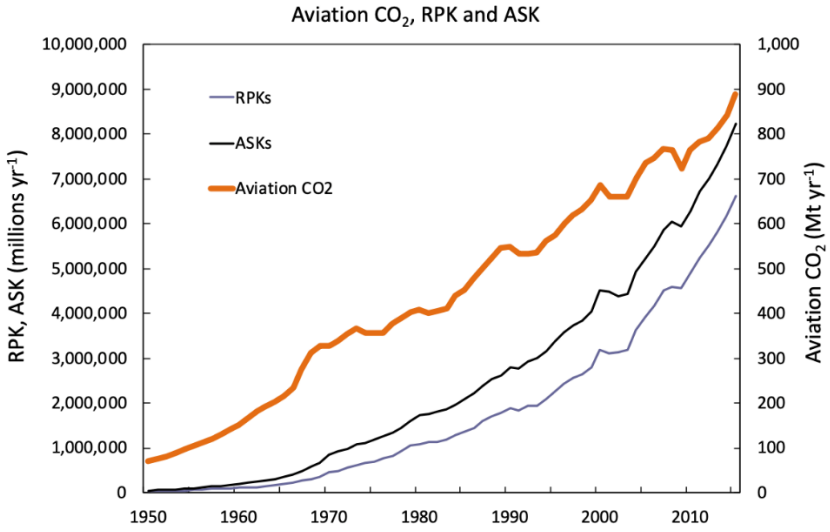

Figure 3: CO_2 emissions since 1950 Mt per year (Lee, 2018, p. 3)

Figure 3 shows the growth in available passenger kilometres (indicated in the figure by ASK – defined as one available seat per kilometre flown (Belobaba et al., 2016)) and revenue passenger kilometres (indicated in the figure by RPK – defined as

one paying passenger flown one kilometre (Belobaba et al., 2016)) on the left y-axis and CO2 emissions (right y-axis) between 1950 and 2015 in millions of tons per year on the x-axis. It implies that global air traffic has increased significantly and that its CO2 emissions continue to rise despite a number of technological improvements and operational efficiency.

The UN specialized agency International Civil Aviation Organization (hereafter referred to as ICAO) predicted that emissions of carbon dioxide, which is one of the primary GHG in the earth's atmosphere, from aircraft will triple from 918 million tons in 2018 by 2050. However, new research by the International Clean Transport Council has shown that emissions from global aviation could grow more than 1.5 times faster than the UN estimates (Graver et al., 2019).

In the meantime, also airlines are trying to mitigate the rising emissions caused by the increased demand with modern technology. The most current energy innovation in aviation is Sustainable Aviation Fuel. It is produced from sustainable and renewable raw materials, and its chemistry is very similar to that of fossil aircraft fuel. Sustainable Aviation Fuel achieves an 80% reduction in CO_2 emissions over the lifecycle of the fuel compared to fossil aircraft fuel, depending on the sustainable raw material used, the airport's supply chain, and the production method (Air BP Limited, 2019). However, high and ambitious scenarios by the UNWTO and the International Transport Forum concluded that the corresponding costs were still three times higher than the conventional fuel price in 2015 (World Tourism Organization & International Transport Forum, 2019). According to the ICAO, even the self-issued goal of zero-carbon growth after 2020 is unlikely to be achieved. Renewable alternative fuels have the potential to close the gap to carbon-neutral growth, but not in the short-term, and data are still lacking to predict their availability with confidence in the long term (Giorgino, 2019).

Technological efficiency improvements are currently still characterised by excessively high costs and therefore do not yet represent a realistic approach to a solution for the aviation industry. The growing demand and the resulting increase in emissions, therefore, require further solutions. One approach is the compensation of flight emissions described in the following subchapter.

2.1.2 Offset Markets

In order to eliminate GHG emissions completely, governments, companies, and citizens need to do more than they have done so far. Nowadays, many emitters are moving towards carbon offsetting - a quantifiable measure to reduce GHG.

Carbon offsets are generated by projects that perform emission reduction activities and are measured in a unit of carbon dioxide equivalent (CO_2e) or metric tons of carbon dioxide equivalent (tCO_2e) that are reduced. They can be traded on a compliance market where issuers are required by government regulations to reduce emissions or – if a reduction is hard to implement – purchase offsets or on voluntary markets where buyers and sellers negotiate on their own initiative. Currently, legal regulations in the voluntary market do not exist. However, there are strict regulations in the compliance market (Hamrick & Gallant, 2018).

The Compliance Market

Regulatory regimes exist under the Kyoto Protocol, which was adopted in December 1997 and put into force in February 2005. The Kyoto Protocol implemented the United Nations Framework Convention on Climate Change (hereafter referred to as UNFCCC) and is imposing national caps on the GHG emissions for industrialized countries. The UNFCCC is the legal umbrella under which countries develop policies in order to regulate their emissions of GHG (Olsthoorn, 2001; United Nations, n.d.). Although airline emissions are a major contributor to global GHG emissions, they are not covered under the Kyoto Protocol (Green, 2016).

With the adoption of the Paris Agreement in 2015, countries have committed themselves to keep the global average temperature increase well below two degrees Celsius above pre-industrial levels and to continue efforts to further limit the temperature increase to 1.5°C (United Nations, 2015). However, according to Green (2016), following the Kyoto Protocol, the Paris Agreement remains similarly silent on the aviation industry.

Currently, two important CO_2 emission reduction schemes are in force that refer to aviation: The EU Emissions Trading Scheme (hereafter referred to as EU ETS), which includes the aviation industry since 2012, and the Carbon Offsetting and Reduction

Scheme for International Aviation (hereafter referred to as CORSIA), which was introduced by the ICAO (Scheelhaase et al., 2018).

The EU ETS is based on the 'cap and trade' principle, within which member states have a quota of emission allowances. Companies receive or purchase emission allowances that they can sell when not needed. The cap set on the total number of allowances available guarantees that they have a value. Ultimately, the cap is reduced over time so that overall emissions fall (European Commission, 2016a; International Energy Agency, 2008). In order to also cap CO_2 emission resulting from flight traffic, the aviation sector has been included in EU ETS since 2012. Initially, all flights to and from European airports have been covered. However, the scope was reduced to intra-European flights only (Transport & Environment, 2020). According to Transport & Environment (n.d.), this was done due to international and industry pressure, and Scheelhaase et al. (2018) claim that with the limitation to intra-European flights EU ETS only accounts for 8.5% of global emission from passenger traffic.

In September 2016, the ICAO adopted CORSIA on the principles of a market-based mechanism. CORSIA aims at stabilizing net CO_2 emissions from international civil aviation to assist the achievement of the “CNG 2020 goal” - a carbon-neutral growth from 2020 onwards (Becken & Mackey, 2017; ICAO, 2016). CORSIA is an offset scheme at a carrier level. In order to offset, carriers must purchase carbon credits or invest in projects that help to reduce CO_2 emissions (Scheelhaase et al., 2018). It is estimated that international aviation will offset around 2.5 billion tons of CO_2 emissions between 2021 and 2035 to achieve carbon-neutral growth (Giorgino, 2019). CORSIA starts in 2020 and consists of three phases: A Pilot Phase (from 2021 through 2023), Phase 1 (from 2024 through 2026), which applies to states that voluntarily participate in the scheme and will be subject to offsetting requirements and Phase 2 (from 2027 through 2035), in which all international flights will have to meet the offsetting requirements (IATA, 2019b; ICAO, n.d.). As this regulation will not be mandatory for airlines until 2027, a rhetoric has emerged among climate researchers and government agencies that attributes great potential to voluntary carbon mitigation strategies. It is argued that voluntary action could at least reduce the need for enforcement measures to reduce emissions (Giorgino, 2019).
Alberto Carrillo, Head of Climate Business Engagement at WWF International, is of the opinion that measures agreed upon in the Paris Agreement are not enough to keep

global warming at a reasonable level. Based on several scenarios, he claims that there is a gap between the reduction of emissions countries have committed to and those that are still outstanding in keeping global warming within the 1.5°C or 2°C range (Carillo, n.d.).

This statement has also been confirmed by the Climate Action Tracker, an independent scientific study that monitors government action on climate change. Climate Action Tracker (2018) claims that existing commitments under the Paris Agreement are not sufficient to achieve the 1.5°C objective. Even if states meet their national targets, temperatures will rise between 2.4°C and 3.8°C. According to Carillo not only more ambitious commitments from governments are needed to close the gap, but also the support of non-state actors, including the business sector (Carillo, n.d.).

The Voluntary Carbon Market

As the compliance market is limited in its ability to reduce CO_2 emissions in short to medium term, emissions that cannot be avoided can be offset on a voluntary basis. On the one hand, airlines, e.g. easyJet, have started to offset their flights themselves (easyJet Airline Company Limited, 2019). On the other hand, some airlines are passing the option to offset the flight onto the air traveller (Gössling et al., 2007; IATA, 2008). Hamrick & Gallant (2018) analysed the world's largest airlines to investigate whether they voluntarily offset their flights themselves or offer air travellers to do so. Among the 129 airlines, 29 offer offsetting to their customers, and 15 airlines voluntarily offset their own emissions to some extent. Overall, airlines based in Oceania (38%) were the most frequently equipped with VCOs for their customers, followed by airlines headquartered in North America (29%) and Asia (29%).

The voluntary market is different from the compliance systems under the Kyoto Protocol and the EU ETS. Offsetting avoids the same amount of pollution, usually elsewhere, or captures the same amount of CO_2 that is emitted (Climate Corporation, n.d.; International Energy Agency, 2008). Since the beginning of VCO trading at the end of 2000, VCO projects have contributed to the reduction, separation, or avoidance of more than 437 MtCO2e in all sectors. However, this is only a drop in the ocean. Even with the new commitments made by the countries under the Paris Agreement, estimates indicate that at least 11,000 MtCO2e of the emissions reduction gap prevents global warming from staying below the two degrees Celsius target.

Nowadays, there are VCO projects in 83 countries around the world, and most of them can be freely exchanged between buyers and sellers in the same or different countries (Hamrick & Gallant, 2018; International Energy Agency, 2008).

When it comes to the actual sale of VCOs, different strategies are applied to the market. While some VCO developers create their own marketing and advertising and approach the individual end buyer (e.g. the air traveller) directly, other VCO developers prefer to have their product advertised by a reseller or broker, who takes the responsibility to confront the air traveller (Hamrick & Brotto, 2017).

When a flight is booked, air travellers are often asked whether they are willing to pay for a VCO which helps preventing or reducing a similar amount of emissions elsewhere. Those VCOs can be acquired through specialized compensation service providers or carbon brokers and obtained from various suppliers with project activities (e.g., afforestation or renewable energy projects). In return, the buyer receives a record from the seller containing detailed information about the project and the amount of reduced CO2 (IATA, 2008). Figure 4 illustrates this process.

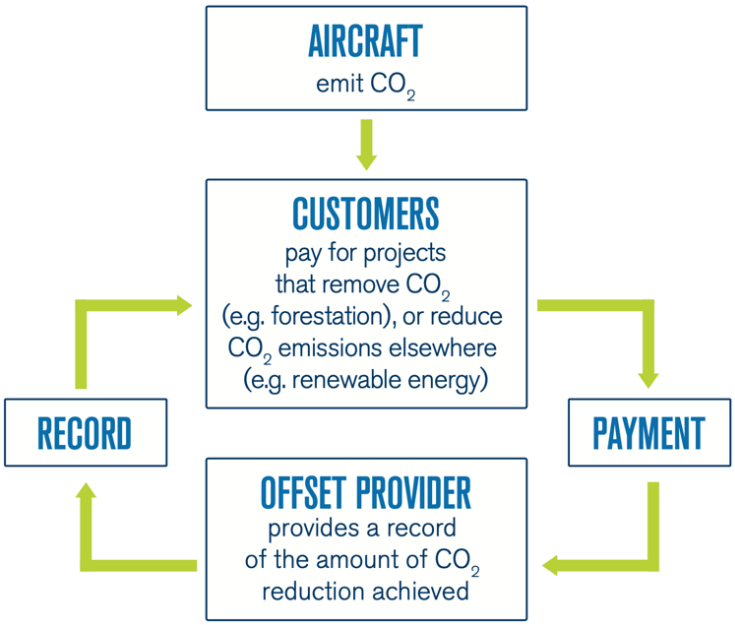

Figure 4: Illustration of the VCO Process (IATA, 2008)

Kollmuss & Bowell (2007, p. 25) determined three requirements for VCOs, providers have to consider: “they have to educate the consumer, be user-friendly and accurate”.

In order to be able to tell air travellers the amount needed to offset the CO2 emissions associated with their flight, correct calculators are needed. Those calculators can provide electronic feedback of the CO2 footprint flown by the airline on a specific flight (IATA, 2008). Kollmuss & Bowell (2007), however, claim, above everything else, calculators need to be kept as transparent as possible.

In order to follow a more consistent approach of calculating the CO2 footprint of flights and consequently the cost to offset the CO2 emissions emitted, IATA proposes VCO providers the following methodology and steps (Hooper et al., 2008; IATA, 2008):

1. User input
   (Airline's booking system specifies the itinerary and indicates the departure and arrival airports and any stopovers.)
2. Trip distance
   (The great circle distance between two airports is computed based on latitude and longitude coordinates.)
3. Aircraft type
   (To calculate the amount of CO2, the type of aircraft that will be used for the flight on the specified flight route must be defined. If no actual data is used, using information from flight plans is suggested.)
4. Total fuel burn
   (In order to determine the total fuel consumption for the flight, the most reliable results would be obtained by using actual travel fuel data. In the absence of such data, there is an alternative data source, the Emission Inventory Guide.)
5. Passenger to freight ratio
   (To estimate the passenger-related fuel consumption for the flight, the total fuel consumption is divided between the number of air travellers and tonnage
   of mail and freight using load factor data. If actual flight data is not used, average load factors for air travellers and cargo can be used to calculate the ratio.)
6. Seat capacity and passenger load factor
   (The passenger-related fuel consumption of the flight is divided by the number of air travellers on the flight. If the actual figures are not used, some

assumptions must be made for the seat capacity and passenger load factor on the flight, taking averages either by airline or industry.)

After having obtained information about the CO2 footprint caused by a flight, air travellers often have the desire to fund certain projects. Offset providers offer a wide range of projects. According to IATA (2008), these may include the following:

- LULUCF (Land Use, Land Use Change, and Forestry)
- Industrial greenhouse gas offsets
- Methane (CH4) capture and use in energy generation
- Energy efficiency
- Renewable energy

VCO projects are not undergoing a national approval process from the project participants or the process of registration and verification from the UNFCCC. Instead, calculations and certification of projects are carried out according to a number of standards developed by the industry (Climate Corporation, n.d.). A carbon offset equivalent will only be issued when the respective project meets the requirements of the standard. Projects need to be validated and verified by third parties, ensuring that projects achieved the relevant emission reduction (Goodward & Kelly, 2010; Hamrick & Gallant, 2018; International Energy Agency, 2008).

Nowadays, most projects follow the methods defined by one of the many voluntary standards. The standards may vary depending on the permitted activities and the regulations that the projects must comply with. Nevertheless, all standards agree on the following requirements (Hamrick & Gallant, 2018, p. 1):

- **Real:** project effectively excludes or avoids emissions
- **Additional:** emissions reductions would not have occurred without respective project activities
- **Measurable:** reduction in emissions can be accurately measured
- **Verifiable:** emissions reductions have been verified by a neutral, third-party auditor

Criticism of Voluntary Offsetting Schemes

> *"It should also be clear that offsets are environmentally risky options that do nothing to directly reduce aviation emissions"*
> (Gössling et al., 2007, p. 241)

VCOs have been criticised in a number of ways, among others, the lack of transparency (Broderick, 2008; Mair & Wong, 2010), complexity and confusion for the air travellers (Broderick, 2008; Polonsky & Garma, 2008); the variability of the different schemes (Broderick, 2008; Gössling et al., 2007); and because they transfer the responsibility for offsetting to the air traveller and not to the polluter - the airline (Mair & Wong, 2010).

The main criticism relates to the opacity of the market, which makes it difficult to determine the quality of VCO. The caused lack of transparency is mainly due to uncertainties in the measurement and implementation of reduction processes (Brouwer et al., 2008), as well as low transparency of projects (Gössling et al., 2009). According to Gössling et al. (2007), one reason for the lack of transparency is the great difference in the several project standards. All these uncertainties may deter air travellers from buying VCOs.

Kollmuss & Bowell (2007) take their criticism in a different direction. The two authors argue that VCOs should not be considered a way to purchase "environmental pardons", as they are of limited value in the whole framework of fighting climate change. Instead of entirely changing lifestyles and optimizing travel behaviour, travellers might rather use VCOs in order to assuage their guilt (Kollmuss & Bowell, 2007). Some of the concerns claim that this can eventually lead to exactly the opposite of what was intended: an increase in emissions. Other criticism also questions the principle that everyone can benefit from VCO projects. They see these projects as yet another example of how the industry in rich countries can find quick and cost-effective solutions abroad instead of focusing on domestic solutions (International Energy Agency, 2008).

Voluntary Carbon Offset's Potential to Close the Gap

Macintosh & Wallace (2009) expect it very unlikely that emissions from aviation can be stabilized and set in order to meet international emission reduction targets without reducing air traffic. An entire change in transport and tourism behaviour is

needed. Hence, air travellers need clear, reliable, and especially consistent information about tourism's impact on the climate and positive signals about the mitigation measures they can take (Eijgelaar, 2011). Due to the strong growth of the aviation sector, both technological and behavioural changes are necessary to make the air transport industry sustainable, with behavioural changes being of the utmost importance. Combining both mandatory mitigation measures and voluntary schemes could be the optimal approach (Gössling et al., 2007). Yet, the adoption rate of VCO products in the aviation industry is low, ranging from 1% to 10% (Choi et al., 2016; Choi & Ritchie, 2014; McLennan et al., 2014). In order to increase VCO sales, it is important to study the influence of VCO's attributes on the willingness to offset of the air traveller.

2.2 Behavioural Reasons For Voluntary Carbon Offset Payments of Air Travellers

This chapter aims to provide an overview of previous research that has been focusing on behavioural reasons for people to purchase pro-environmental products such as VCOs. Further, it identifies the attributes of VCO products that play a role in the decision-making process of air travellers.

2.2.2 Pro-environmental Behaviour and Feelings of Guilt

This chapter is dedicated to revealing why people engage in pro-environmental behaviour. First, it looks at the current public attitude towards the environment and the pro-environmental behaviour theory by Stern (2000). It focuses on determinants influencing the VCO purchase behaviour of air travellers. The impact of the length of the flight and the price of the VCO will be discussed.

Public Attitude Towards the Environment

According to Schleicher (1989) 'environmental education' combines both natural and human dimensions and will make citizens aware of the fact that conflicts of goals between human and natural environmental demands become visible. According to a Eurobarometer survey conducted by the European Commission in 2017, 94% of all respondents are of the opinion that the protection of the environment is personally important to them. It was found that in all socio-demographic groups for at least nine out of ten respondents, the protection of the environment is 'very' or 'fairly important'.

In addition, 81% claim that environmental issues are directly affecting their daily life as well as their health.

Most people feel that they have a responsibility in protecting the environment, however, also think that they personally, governments, institutions, and businesses all must improve their sustainable behaviour (European Commission, 2017). As part of the Eurobarometer surveys, respondents were asked which environmental issues they consider to be the most important. The majority of Europeans claims that the most important environmental issue is climate change, directly followed by the pollution of the air and the increasing amount of waste. In total, 94% of the respondents are in agreement with the fact that 'big polluters' should mostly be responsible for compensating the environmental damage they have caused themselves. Nevertheless, still, 79% of Europeans think that big companies and industries are not doing enough in order to protect the environment. In comparison, 66% are also of the opinion that they could do more for the preservation of the environment (European Commission, 2017).

Pro-Environmental Behaviour Theory

There is increasing scientific evidence that we are experiencing an unsustainable way of life, with the natural capital of the earth being wasted, depleted and degraded at an ever-faster rate. As glaciers melt, sea levels rise and floods, droughts and severe weather become more frequent (Miller, 2012). In the search for innovative solutions to the problem of ecological degradation, the field of environmental psychology began to develop in the 1960s. The focus of this field was the interaction between humans and the environment. Ecological degradation and its psychological roots became a major issue, along with barriers to environmentally sound behaviour (Kollmuss & Agyeman, 2002).

Many researchers have been dealing with the question of why people take actions with an environmental intent such as carbon offsetting in the first place. Stern (2000) developed a value-belief-norm (VBN) theory of environmentalism in order to explain pro-environmental behaviour (hereafter referred to as PEB). PEB can be described as a behaviour that consciously tries to reduce the negative impact of its actions on the environment (Kollmuss & Agyeman, 2002; Sawitri et al., 2015). Homburg & Stolberg (2006, pp. 1–2) give examples for PEB: "environmental activism (e.g., active involvement in environmental organizations), non-activist behaviour in the public

sphere (e.g., petitioning on environmental issues), private sphere environmentalism (e.g., saving energy, purchasing recycled goods), and behaviour in organizations (e.g., design of products)". According to Ramus & Killmer (2007), PEB can be considered a special type of pro-social behaviour. The authors define pro-social behaviour as behaviour that is aimed at the well-being of an individual, a group or an organisation and is conducted with the intention of promoting it.

PEB is based on a causal chain of certain values, beliefs about the environment and one's own influence on the environment, and finally, personal norms, through which a commitment to environmentally conscious action arises (Stern, 2000). Regarding the values, Stern (2000) refers to findings from researchers that have found that postmaterialistic values of quality of life have caused PEB in developed countries which enjoy a certain level of prosperity (Inglehart, 1990 as cited in Stern, 2000) and that PEB is anchored in some religions, which value the environment as sacred (Dietz et al. 1998; Greeley, 1993; Kempton et al. 1995 as cited in Stern, 2000). Other researchers have found that altruistic values have motivated people to act pro-environmentally and hereby care for public goods (Heberlein, 1972 as cited by Stern, 2000). Stern (2000) claims that people with these values believe that objects in the environment are threatened through human life and that they themselves have the power to reduce this threat. Based on those beliefs people develop a personal norm through which they show PEB.

Guilt and Pro-Environmental Behaviour

When it comes to PEB, researchers identified determinants of such behaviour (e.g. Bamberg, 2003; Hines et al., 1987). One identified determinant is the feeling of guilt. Generally, guilt is defined as a negative and unpleasant state that arises when a person's behaviour or intentions contradict his or her moral standards or social norms (Baumeister et al., 1994). Once a person has learned morals, feelings of guilt arise that lead to self-assessment (Baumeister et al., 1994; Kugler & Jones, 1992). The role of emotions in the form of guilt has been studied by Elgaaïed-Gambier (2012), who examined the influence of anticipatory feelings of guilt on one type of pro-environmental behaviour, namely recycling. Huhmann & Brotherton (1997) synthesized previous studies on the concept of guilt and identified "anticipatory guilt" as one type of guilt. Anticipatory guilt refers to the expectation of a feeling one might feel when considering violating one's personal norms. Ulitmately, Elgaaïed-Gambier

(2012) found a positive mediating effect of anticipatory guilt on the relationship between the awareness of negative consequences linked to non-recycling and the intention to recycle.

Allpress et al. (2010) compare the traditional views of guilt and shame. According to the authors, guilt is caused by bad behaviour. Shame, on the other hand, “arises because one is a bad person" (p. 77). Guilt was thus associated with prosocial behaviour and shame with antisocial behaviour. That means that if one has behaved badly, one can apologize or make amends for the damage done. Negative self-related emotions such as feelings of guilt cause reparative behaviour to compensate for the damage done to others and for which one feels at least some responsibility (Rees et al., 2015). Guilt helps people to draw from past mistakes and avoid similar behaviour in the future (Monteith, 1993). This encourages people to adopt moral paths in life (Tangney et al., 2007) and results in moral and pro-social behaviour (Baumeister et al., 1994). Guilt as such promotes pro-social behaviour: actions that do not benefit the individual directly, but the collective. Mallett (2012) applies the theory to the environment. For him, environmental guilt “arises when people think about times when they have not met personal or social standards of environmental behaviour" (p. 223).

Responsibility and Pro-Environmental Behaviour

Besides the feeling of guilt, there are also other factors, such as the sense of responsibility, which can lead to pro-social and therefore also pro-environmental behaviour. Basil et al. (2006) focused on assessing how guilt appeals work in fundraising. The results of their study demonstrate that a sense of responsibility is mediating the effect of guilt appeals on charitable giving. This indicates that promoting a sense of responsibility can be beneficial in the process of generating charitable donations.

The question of who bears ultimate responsibility is not always clear in the aviation industry. Brouwer et al. (2008) take up this line of thought and refer to the “Polluter Pays Principle” (hereafter referred to as PPP). The OECD (1992, p. 5) describes the PPP as a measure where “(…) the polluter should bear the expenses of carrying out the pollution prevention and control measures (…)”. However, it is difficult to apply this principle to the example of aviation, where it is not clear who can be regarded as the polluter. Is it the airline itself that ultimately operates the flight, or is it the air traveller who is demanding the flight in the first place? One option to address the responsibility

of both parties (the airline and the air traveller) could be to offer VCOs where the air traveller only compensates for a fraction of the caused emissions.

Hooper et al. (2008) asked the respondents to their survey about who should take responsibility for the climate impacts of flights. Although the majority of respondents felt that the individual air traveller could mitigate the climate effects of their flights, only 14.8% were of the opinion that the air traveller is primarily responsible to pay for the VCO. Much larger proportions of the respondents believed that the government (40.7%) or the airlines (35.5%) are mainly responsible for offsetting the flights. Gössling et al. (2009) add that airlines and the industry should also encourage public participation in VCO schemes by making it clear that, under international carbon conventions, it is not only the airlines themselves but also individual air travellers who are responsible for carbon emissions.

Given people's tendency to regard airlines and governments to be mainly responsible for the offset, one can conclude that air travellers are not willing to be solely paying for the offset.

Air Travellers' Willingness to Offset

In order to get over the feeling of guilt when flying, air travellers can buy VCOs, which requires a monetary contribution. In the course of this thesis, the following two terms will be of central importance: willingness to offset and willingness to pay (hereafter referred to as WTP). The WTO can be described as the general willingness of air travellers to voluntarily offset the emissions caused by a flight. Beyond the general WTO, there is WTP. The WTP describes how much money people are willing to pay for a certain purpose (e.g. WTP for specified VCO projects) and is a characteristic of buyers and consumers (Orme, 2019). Thus, WTP requires a general WTO. On the one hand, the WTP for VCOs, which has already been identified by other researchers, will be considered. On the other hand, the WTP for single attributes of the VCO product will be calculated.

A whole series of studies, particularly in the last decade, have examined the travellers' WTP for VCOs in a variety of ways. Diederich & Goeschl (2011, p. 3) identified a mean WTP of EUR 6.30 per ton CO_2 among German travellers. According to the authors, "this mean WTP could be expected to be sufficient to reduce CO_2 emissions in Germany by four percent". Löschel et al. (2013), whose study was

conducted in Germany as well, determined a WTP of EUR 11.89 per ton CO_2. Brouwer et al. (2008) interviewed more than 400 air travellers at Amsterdam's international airport about their WTP for a mandatory carbon travel tax, used to offset the emissions caused by their flights. Applying the contingent valuation method, they derived a WTP of 60 Cents per 100 km from the whole sample. This corresponds to EUR 25 per ton CO_2. Moreover, the authors found out that WTP is strongly influenced by the ticket price and the distance travelled. Brouwer et al's (2008) data set was taken by Akter et al. (2009), who showed that with rising tax, the WTP shrinks.

Lu & Shon (2012) used the contingent valuation method and determined the WTP of Taiwanese air travellers. A mean of USD 5 to USD 29 per trip was identified. Blasch & Farsi (2014) conducted a choice experiment, in which the authors offered different types of offsetting opportunities. The options were presented in four different consumption contexts, such as air travel, space heating, hotel overnight stays, and rental car use. Eventually, the authors concluded that for 60% of their sample, air travel had been associated with the lowest cost sensitivity.

Overall, previous research results regarding the WTP are very heterogeneous. This is mainly due to the different samples used. Choi & Ritchie (2014) could demonstrate that WTP estimates can vary significantly among the respondents based on air travellers' different background characteristics.

Similarly to the thesis at hand, MacKerron et al. (2009) conducted a choice experiment, in order to explore the WTP of young and educated people in the UK. The authors point out that there is only little knowledge as to the fact what factors influence the participation in and WTP for VCOs, in this fragmented and non-standardized market. In addition to the price attribute, they are taking the availability of certificates for purchasers to enhance the credibility of projects, such as human development, conservation and biodiversity, technology and market development into consideration. They also include a none option, if none of the attributes applies to the respondent's opinion. Ultimately, MacKerron et al. (2009) identified an average WTP of 24 GBP per flight. A concern that arises is the exclusion of the length of flights. MacKerron et al. (2009) are of the opinion that respondents may pay proportionally more to offset longer flights.

The Impact of the Length of the Flight

Depending on the length of the flight, the prices for offsetting payments vary. Logically, a VCO of a *long-haul* flight is more expensive than that of a *short-haul* flight. Brouwer et al. (2008) have found out that the WTP for a carbon travel tax differs between domestic (*short-haul*) and international (*long-haul*) flights. Respondents of their study felt that a carbon travel tax on *short-haul* flights was a legitimate measure. The authors explain this by the fact that alternative modes of travel are unavailable for *long-haul* flights. Similarly, Higham & Cohen (2011) documented different views on the responsibility for CO_2 emissions, depending on the length of the flight. *Short-haul* flights have been associated with a "carbon guilt", while *long-haul* flights were more likely to have a reason for existence. This identified moral concern and even fear for the consequences of their flights make many travellers decide to stop flying (at least temporarily) (Higham & Cohen, 2011).

Consequently, the observed higher WTP for a carbon travel tax on continental flights (Brouwer et al., 2008) which is supported by the perceived "carbon guilt" on *short-haul* flights (Higham & Cohen, 2011) raises the question whether the purchase behaviour of air travellers differs between *short-haul* and *long-haul* flights. Thus, stronger feelings of guilt can be translated into lower cost sensitivity (Blasch & Farsi, 2014). Individuals seem to link personal responsibility for carbon emissions to frequent domestic flights, but not to intercontinental flights.

The stronger feelings of guilt associated with *short-haul* flights, lead to the first hypothesis:

H1 a	Air travellers are more willing to offset the emissions of their flight when travelling on *short-haul* compared to *long-haul*

In order to identify whether air traveller's attitude towards a partial compensation of the caused emissions, this thesis will give the participants of the survey the option to only offset 25%, 50% or 100% of the emissions caused by a flight. The lower cost sensitivity based on stronger feelings of guilt associated with *short-haul* flights, lead to the second hypothesis:

H1 b	Air travellers are more willing to purchase a 100% voluntary carbon offset when travelling on *short-haul*

The associated lower sense of guilt towards *long-haul* flights suggests a greater cost sensitivity. This leads to the third hypothesis:

H1 c	The higher the price and the corresponding offset level on *long-haul* flights, the lower the willingness to offset among air travellers

2.2.3 The Influence of Trust on The Willingness to Offset

This chapter considers trust as a moderator in the relationship between the awareness of the negative consequences of someone's actions and pro-environmental behaviour and reveals a correlation between knowledge about VCO programs and VCO purchase. Furthermore, the matter of trust towards and credibility of NGOs and the role of VCO projects will be addressed.

Trust and Pro-Environmental Behaviour

Trust is defined as "the expectation that arises within a community of regular, honest, and cooperative behaviour, based on commonly shared norms, on the part of other members of the community" (Fukuyama, 1995, p. 26). It is believed that trust, as a part of social capital, is an important means of promoting collective action to protect the environment. Pretty (2003) and Rydin & Pennington (2000) argue that individuals who have higher levels of trust also have a stronger tendency to act in a collective way for the protection of the environment. The goal of Moon's (2017) study is to examine the influence of trust on pro-environmental behaviour. Moon (2017) found a statistically significant relationship between social and institutional trust and the decision to be environmentally proactive, indicating that people with higher stocks of trust towards people and governmental institutions are more likely to be purchasing energy-efficient products. Based on this finding, some studies investigated why citizens refuse to pay for the environment and found that the refusal was based on the distrust of government management (e.g. Damigos & Kaliampakos, 2003; Jones et al., 2008). Thus, distrust negatively influences pro-environmental behaviour while trust has a positive influence on it. Some studies not related to the environment have found a positive relationship between knowledge and trust (e.g. Doney et al., (1998); Jiang et al., (2008)). Jiang et al. (2008) observed a positive correlation between knowledge and trust in purchasing behaviour, arguing that the whole issue of "information economy" is based on the paradigm of information, knowledge and uncertainty. This was also tested with regard to pro-environmental products. People who trust others to buy

green products and believe that others trust themselves to buy those as well (high levels of trust) are more likely to purchase green products compared to people with low levels of trust (Gupta & Ogden, 2009). They are also more likely to recycle (Sønderskov, 2011), and to use public transportation (Van Lange et al., 1998). Consequently, a direct and positive relationship was observed between trust and the willingness to take action to protect the environment.

If money is invested for pro-environmental purposes, it is clear that the money provider wants to know who is investing the money and how. According to Keating & Thrandardottir (2017) trust is of exceptional importance when analyzing the relationship between NGOs and donors, as most NGOs are highly dependent on them on financial support. While the term "NGO" is widespread, there is also a lot of other overlapping terms such as "non-profit" and "civil society" organisations. In many cases, the use of different terms is due to the consequence of the different cultures and histories in which the concept of NGOs has emerged (Hamilton et al., 2010). For example, in the USA, where civil society organisations are rewarded with taxation benefits if they demonstrate that they are not commercial, profit-oriented organisations and work for the public good, the term "non-profit organisation" is often used. In the United Kingdom, the term "voluntary organisation" or "charity" is often referred to, drawing on a long tradition of voluntary work and volunteering, characterised by Christian values and the evolvement of charitable law. However, the status of charity in the United Kingdom depends on an NGO being "non-political" (Hamilton et al., 2010).

According to Keating & Thrandardottir (2017), the trustworthiness of NGOs was especially questioned in the 1990s. A loss of perceived trustworthiness towards NGOs can lead to major problems, as donors tend to use their resources elsewhere, with potentially serious consequences for NGOs. Especially in an environment in which the donor has multiple options, it is important to maintain trustworthiness from the perspective of an NGO. This is mainly due to the fact that donors have a certain expectation that their money will be used wisely (Keating & Thrandardottir, 2017). Keating & Thrandardottir (2017) argue that NGOs are not perceived in the same way as other types of institutions. People are more inclined to regard them as trustworthy, even if sometimes things go wrong.

Populus (2018), a research and strategy consultancy in collaboration with the Charity Commission for England and Wales, published a report in 2018 that looks at

public expectations towards charities. The research shows that the majority (58%) of respondents to their survey believe that charities now play a "significant" or "very important" role in society. Although trust in charities is below that of recent years, charities are still more reliable than many other sectors and institutions, such as private companies. Especially, those aged 18-24 show a significantly higher likelihood to trust charities compared to those aged 55 and older. The research shows that when charities are able to demonstrate that the majority of their donations go directly to the ultimate purpose, and achieve measurable positive results, confidence, and propensity to donate increases. This indicates that trust towards the receiving end of the donation is important in the behaviour of those who donate.

The Role of the VCO Provider

Based on the finding, that trust positively influences PEB, this paragraph focuses on the impact of trust and credibility on the purchase of VCOs.

Hagmann et al. (2015) surveyed travellers in Germany and came to the result that 31.9% of travellers have heard of offsetting, while only 7.6% had also purchased VCOs in the past. Higham et al. (2016) found uncertainty and general scepticism about VCO schemes among travellers in four Western countries (Norway, the United Kingdom, Germany and Australia).

The main reason for uncertainty can be caused by complexity and confusion for the consumer (Broderick, 2008; Polonsky & Garma, 2008). On the one hand, travellers are often unsure about their own role in the offsetting environment, due to the fact that VCO schemes perhaps do not provide travellers with enough information on projects (Polonsky et al., 2011). On the other hand, there is a wide range of tools and possibilities to offset, which may lead to an information overload for the traveller. This overload can lead to a lack of transparency and eventually to ignorance of VCOs (Brouwer et al., 2008). This is primarily because travellers may not be willing to purchase a high-quality VCO if they cannot distinguish it from a low-quality VCO (Blasch & Farsi, 2014). Kotchen et al. (2009) suggest offering VCOs with a certification by an independent third party. This might help to increase trust on the traveller's side and solve the problem of asymmetric information in the offset markets. Ultimately, Blasch & Farsi (2014) found that certificates can lead to a higher propensity to offset. They emphasize this recommendation, indicating that 52% of their survey respondents claimed to feel some kind of suspicion and distrust towards VCOs. MacKerron et al.

(2009) came to a similar conclusion. Respondents to their study claimed that they would have a significantly higher WTP for VCOs if they were aware of certification schemes.

If there was a world with perfect information, and people knew everything, decision-making would have been different. Many people follow others and put trust in their actions because of a proven heuristic. Consequently, trust is an aspect of herding behaviour used by people to save time, money, and aggravation of social interaction (Altman, 2012). This herding behaviour was also identified by Brouwer et al. (2008), who found that travellers tend to only purchase VCOs when other travellers do so. Consequently, besides the need to put enough effort into informing unaware travellers, it is important to increase the trust in VCO schemes (Gössling et al., 2009). Increased trust can be achieved through an effective VCO message which contains the cost-effectiveness of VCOs, in particular in comparison with other similar methods of ecological consumption (Kim et al., 2016).

A predominant uncertainty towards VCO schemes is influencing the VCO purchase behaviour of air travellers. Based on the fact that people are more inclined to regard NGOs as trustworthy, plus the fact that NGOs are still perceived to be more reliable than many other sectors and institutions, it can be hypothesized that air travellers prefer an NGO to be the VCO provider, not the airline.

This raises the following hypothesis:

H2	Air travellers are willing to pay more for a VCO if an NGO is the VCO provider compared to when an airline is the VCO provider

The Role of VCO Project

With respect to the awareness of air travellers towards VCOs, Lu & Shon (2012) found that the fewer people know about a scheme, the lower their WTP. The same logic holds true for schemes that are assumed to be ineffective in their way of reducing GHG, which signifies that if air travellers believe that a project is ineffective, their WTP to this project is low. However, critics argue that the project owner will always be better informed than the investor, which makes it difficult to assess the quality of the offset (Segerstedt & Grote, 2016). Nevertheless, it seems to be important for air travellers not

only who the provider of the VCO is, but also how the money is invested (Segerstedt & Grote, 2016). When it comes to PEB each individual has its own preference regarding pro-environmental projects. Some people might e.g. perceive social development projects as more important than biodiversity projects. The possibility to choose a project based on one's own preference is likely to be perceived as beneficial (MacKerron et al., 2009). Moreover, the feeling of transparency can be increased by providing people with the option to select a project of their own choice. This, ultimately, might be seen as additional information which leads to an increase of trust (Segerstedt & Grote, 2016).

Depending on the project, air travellers can be encouraged respectively discouraged to engage in the VCO, and the WTP varies (MacKerron et al., 2009). Properties of a specific project such as "human development" and "environmental protection and biodiversity" have been taken by MacKerron et al. (2009) as an independent variable for determining WTP. Ultimately, they could both show a significantly positive influence on the WTP. MacKerron et al. (2009) consequently suggest policymakers and VCO providers to stronger emphasize the projects that are offered. Blasch & Farsi (2014) also documented a tendency of people to donate for afforestation projects and renewable energy projects compared to energy efficiency and methane reduction projects.

It can, therefore, be stated that air travellers would like to receive details about the projects of VCO providers. If there is less information about the projects, it can be assumed that the willingness to offset is likewise lower. This enables the following hypotheses to be made:

H3	Air travellers are willing to pay more for a VCO, which lets the air traveller choose the VCO project oneself

2.2.4 Frequent Flyers Miles as Method of Payment

This chapter describes why loyalty rewards programmes are increasingly incorporating social responsibility. Frequent flyer programmes often offer their air travellers to use their frequent flyer miles (hereafter referred to as FFM) as a payment method for their VCO purchases.

Increased competition in tourism led to the development of loyalty reward programmes (Rudež, 2010). Generally, loyalty reward programmes are widely used in consumer marketing. Most of them are operationalised by a reward system. Members

of loyalty programmes collect points, which are usually based on the criteria of volume, value and frequency of spending. The member redeems the collected points and thereby receives a variety of rewards, e.g. free flights or cash back (Smith & Sparks, 2009).

While loyalty reward programmes encourage the air traveller to fly more frequently, more and more importance is attached to ethical consumption in today's business world. Corporate social responsibility (hereafter referred to as CSR) means that organizations not only assume responsibility towards their shareholders and customers but also towards others in society. The purpose of CSR can vary widely, for an example from the improvement of the quality of life of people to the solution of environmental or socio-cultural problems at a local or global level. It can, therefore, be considered as a commitment to ethical behaviour. CSR is usually seen as an act of the company in the interest of society and the environment (Holloway, 2004). Consumers are aware of various problems and (economic) crises. Tourism organisations can also play a positive role in these issues, for example by linking CSR and loyalty programmes (Rudež, 2010). However, yet little is known about how they can be brought together for the benefit of the business and social welfare (Gao & Mattila, 2019). Nevertheless, Rudež (2010) believe that a well-designed customer loyalty program that incorporates social responsibility can build trust and create stronger and longer-lasting relationships between customer and supplier.

Nowadays, it is not a differentiating feature of an airline offering a frequent flyer programme to its customers. Loyalty programmes in the aviation industry are no longer limited to airlines. It is now also possible to earn miles by renting cars or staying in hotels. Similarly, when redeeming miles, the traveller is no longer limited to the airline, but can also use them for a variety of purposes, such as eating in a restaurant or subscribing to a magazine (Basumallick et al., 2013).

Although it is more complex in its design, some airlines also offer to pay VCO with earned FFM (e.g. Delta, United Airlines, Cathay Pacific). According to IATA (2008), experience suggests that the usage of FFM as a payment method is popular among air travellers.

Liston-Heyes (2002) assessed the perceived value of frequent flyer miles. The perceived value of FFM is defined as the value that the consumer subjectively associates with FFM. The author found that air travellers overestimated the true monetary value of air miles, which makes them a particularly cost-effective marketing

tool. Ultimately, the author claimed that FFM have begun to assume the status of a "pseudo-currency". According to Mimouni-Chaabane & Volle (2010), frequent flyer miles are one of the most popular currencies in the world.

It can be concluded that, due to the overestimation of the value of FFM, selection of FFM as payment method increases with rising VCO prices. As the price for the VCO of a *long-haul* flight is generally higher than the price for the VCO of a *short-haul* flight, the following hypotheses can be derived:

H4 a	Willingness to offset is higher when the VCO can be paid with FFM rather than with money transfer

H4 b	For *long-haul* flights more air travellers choose to pay the VCO with FFM than for *short-haul* flights

While this chapter summarized recent findings regarding the influence of VCO specific determinants on the air traveller's decision to purchase a VCO, the next chapter takes a look at the socio-economic and socio-demographic characteristics of people showing pro-environmental behaviour such as VCO purchases.

3. Methodology

This chapter focuses on the quantitative method used for the survey questionnaire and discusses why, among the many options, a choice-based conjoint analysis was chosen as the most appropriate research method. It also describes the sample of the survey questionnaire used.

> *"Information on consumer preferences and choice behaviour is needed to forecast market demand for new or modified products, estimate the effects of product changes on market equilibrium and consumer welfare, develop and test models of consumer behaviour, and reveal determinants and correlates of tastes"*
> (Ben-Akiva et al., 2019, p. 3)

With this quote, Ben-Akiva et al. show that it is fundamentally important for the analysis of products with different attributes to elicit consumer preferences in order to expose determinants and to uncover correlating tastes.

One option to elicit consumer preferences for single product attributes is called Conjoint analysis. Conjoint analysis has become the most frequently used method of analysis for determining consumer preferences. Conjoint analysis plays a particularly important role in the introduction of new or modified products (Ben-Akiva et al., 2019). It is, therefore, suitable as a market research method as well as for the object of investigation at hand. In the following, the conjoint analysis as a preference elicitation method is presented, and its individual steps are explained in more detail. In particular, the CBC is deepened and presented as a suitable method for this research question.

Against the background of consumer preference elicitation, this thesis is devoted to identifying which characteristics of VCO schemes are regarded as particularly important by air travellers and thus have a special influence on their willingness to offset. The software was obtained through a student license from Sawtooth. Sawtooth is a computer software company based in Utah, USA. Their platform handles survey questions but is best known for conjoint analysis, an integrated solution for predictive analysis (Sawtooth Software, 2020).

3.1 Research Method

Luce & Tukey (1964) first presented the conjoint analysis (also known as Conjoint-Measurement or Trade-Off-Analysis) in its mathematical fundamentals to the scientific public in 1964. It initially attracted attention only in the psychology field. In the 1970s, it was introduced to marketing science in the USA as a method and has since developed into the most important analytical method for determining consumer preferences, also in Europe (Green & Rao, 1971; Wittink et al. 1992). The main objective of the conjoint analysis is to determine the joint effect of different product attributes and their characteristics on the benefit of the consumer.

The basic idea behind this preference elicitation method is that each product consists of a combination of several attributes and their corresponding characteristics (Haines et al., 1970; Rao, 2014). In contrast to the direct determination of the significance of individual product properties and their characteristics, the entire product is evaluated as a bundle of those. Estimated values are later used to determine the relative influence of the individual characteristics on the overall preference (Ben-Akiva et al., 2019).

For example, automobiles produced by the Volkswagen Group can be characterized by the specific characteristics of several attributes: Brand (VW, Audi, Skoda, Seat), engine (petrol, diesel), performance (90 hp, 110 hp, 130 hp), price (EUR 15,000, EUR 20,000, EUR 25,000), etc. In the end, the customer always decides on a concrete combination of these characteristics (e.g., Skoda with 90 PS diesel engine for EUR 15,000). Conjoint analysis can, therefore, be used whenever preferences for multi-attributive objects are investigated, which can be characterized by the specific characteristics of several object attributes.

The term preference refers to the result of a benefits comparison carried out by a person, which refers to a specific set of such evaluation objects, the so-called evoked set (Haines et al., 1970). Hence, the conjoint analysis is essentially a method that is particularly useful when examining the trade-offs that individuals face within a (purchase-) decision process (Jansen at al. 2011, p. 127). Rao (2014, p. 37) claims that "the conceptual model of conjoint analysis is quite straightforward", as it assumes that multi-attributed item's utility can be dismantled into attributes and their contributions as well as their interactions. Since the method is easy to conduct when the number of attributes is small, most studies focus only on providing a subset of alternatives.

However, over the course of years, the method has been further developed and now has many different variants, differing mainly in the way consumer preferences are elicited for a set of alternatives (Rao, 2014).

Figure 5 shows the usual process of a conjoint analysis from the original reason for the investigation to the analysis of the obtained data. The very first step of designing a conjoint analysis is to define the purpose of the analysis, meaning to identify a problem and the intended use of the results. This is followed by designing choice sets, which includes the selection of attributes and levels in order to construct hypothetical product profiles. Following this, a questionnaire needs to be designed, and data must be collected by finding respondents. This can be done in multiple ways: personal interview, telephone, mail, or via computer. In the final step, the obtained data must be evaluated and analysed. Part-worth functions and attribute trade-offs must be found to find reasonable results to the study purpose (Rao, 2014).

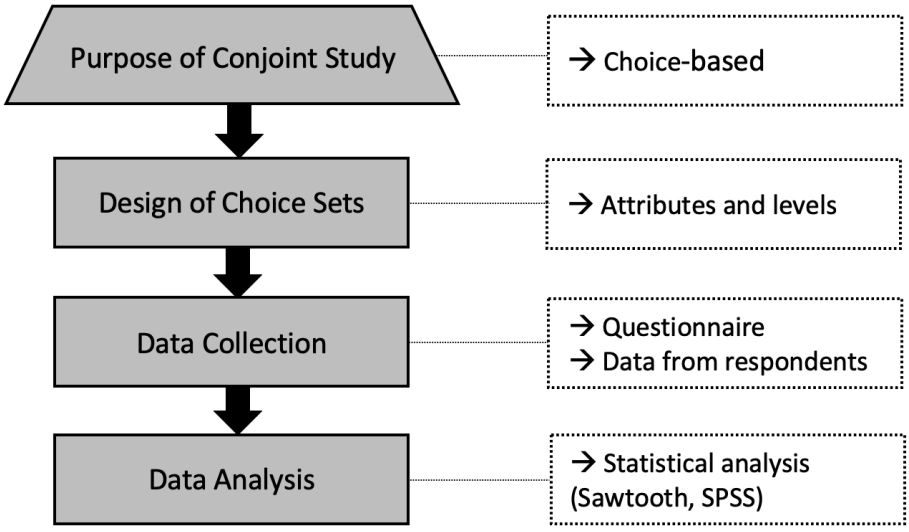

Figure 5: CBC process based on Rao (2014)

3.2 Format of Data Collection

In principle, four different types of conjoint analysis exist. Namely, the traditional method which uses stated preference ratings; the CBC which uses stated choices; the adaptive conjoint analysis which addresses the problem of large numbers of attributes; and the self-explicated conjoint analysis that follows a bottom-up principle. The first three can be recognized as decompositional methods. This is due to the fact that both stated preference and stated choice are dismantled in order to obtain a part-worth

function. The fourth method is, however, considered a compositional approach, as it consists of preference scores coming from ratings of scores on attribute levels (Lieder et al., 2018; Rao, 2014).

The most widely used method among those presented is CBC. This is due to the advantage that respondents are confronted with a set of options, of which they can choose their most favoured one. Hence, this scenario represents a classic marketplace situation, where customers are faced with different competing products and need to make a decision. This is why CBC is considered to be more realistic than the rest of the methods mentioned, as respondents are not asked to rank or rate options (Ben-Akiva et al., 2019; Lieder et al., 2018).

The Choice-Based Conjoint Analysis

The Choice-Based Conjoint Analysis gained popularity in the early 1990s and can nowadays be considered the most frequently used method (Rao, 2014). CBC elicits consumer preferences regarding product or service attributes and their price by asking consumers to choose their most favourable option. Information about the relative importance of each attribute can be obtained (Ben-Akiva et al., 2019; Gensler et al., 2012).

CBC is a stated preference method – Respondents reveal how they would act in a particular situation (Alriksson & Öberg, 2008). The basic idea behind the CBC is that individuals repeatedly make a choice from a given set of alternatives, keeping in mind that they want to maximize utility. Consequently, the underlying assumption is that the option chosen provides the individual with the highest utility and consumer surplus (Gensler et al., 2012; Rao, 2014). To be more specific, decisions made by respondents can be represented by utility functions, which can be concluded based on the willingness to maximize utility – which, therefore, allows estimations of future demand (Lancaster, 1966; Lieder et al., 2018).

There are two types of CBC: Binary choice experiments, when the response is solely binary (e.g., “yes” or “no”) and Multinomial, when respondents can choose among a set of three or more alternatives, sometimes including a “no choice”-option. If the respondent chooses the “no choice”-option, he declares that a purchase of the product is not an acceptable option (Gensler et al., 2012; Rao, 2014). Providing respondents with a “no choice”-option is especially crucial when trying to estimate the purchase threshold of consumers.

The obtained information specifies consumer preferences for specific product attributes and their price, as well as their WTP. When a respondent selects an option other than the "no choice"-option, he indicates that his WTP must be equal to or higher than the given price of the product. Conversely, it can be said that the selection of the "no choice"-option indicates that the WTP of the respondent is below the given price of all alternatives in the choice set (Gensler et al., 2012). Ultimately, CBC's goal is to elicit customers' WTP for given attributes and consequently predicting future market behaviour, rather than making estimates about future demand (Ben-Akiva et al., 2019). According to Lieder et al. (2018), several conjoint analyses (such as Osburg et al., 2016; van Heek et al., 2017) have begun to focus on customer preferences in the area of sustainability characteristics.

Selection of Attributes and Levels

Conjoint analysis is capable of eliciting consumer preference in complex choice situations where products can have a number of attitudes that potentially have an influence on the final purchase decision (Rolfe et al., 2000). Consequently, the well-thought-out selection of attributes and levels is an essential step in the preparation process of conjoint analysis (Rao, 2014). Blamey et al. (2002) recommend the consideration of "demand-relevant, policy-relevant and measurable". However, the authors also claim that CBC only allows a maximum of ten attributes with a maximum of fifteen levels per attribute (Blamey et al., 2002). Hill (2017) is of the opinion that only six attributes should be offered to a respondent, who would otherwise end up ignoring unimportant ones. Ultimately, it can be concluded that CBC should only be considered when the number of attributes is low, and interactions are likely to occur.

Various methods exist for researchers to determine attributes and corresponding levels. Information taken from previously conducted studies can be used to identify a set of attributes. Also, consumer reports can be a suitable source. Primary study, however, is a quite deliberate step, focusing on a small sample of consumers in order to obtain attitudes explicitly (Rao, 2014). Due to conducted studies in this field, the first-mentioned method has been used for this study to define the attributes.

First, socio-economic information of the participant was asked, such as age, gender, profession and current flight behaviour (how often someone flies by plane and which the usual flight distances are). In order to draw a meaningful comparison between

long-haul and *short-haul* flights, the participants were confronted with two different scenarios, which only differed in the length of the flight, i.e., the prices for a specific offset amount of the VCO payments. Each respondent was nine times asked to select his/her favourite option within a given choice set for the scenario of a *short-haul* flight. The same procedure was then done for the scenario of a *long-haul* flight. The goal was to be able to compare the meaning of different attributes on the basis of different flight lengths. In the following, the derivation of the found attributes from literature is described.

1. *Offset Price For a Specific Offset Level*

In order to test *H1 a, H1 b* and *H1 c*, which refer to the attribute price for a specific offset level, realistic market prices of VCOs were considered. These prices are representing the approximate range of prices that are currently charged in the market. Consequently, they are being offered by a number of offsetting suppliers such as atmosfair gGmbH, Foundation myclimate, Climate Austria (a product of Kommunalkredit Public Consulting), and Primaklima e.V..

Prices and offset levels in this analysis are differentiated between *short-haul* and *long-haul* flights. For a *short-haul* flight, respondents had the chance to offset 100% of the flight, which required a payment of EUR 16. For a *long-haul* flight, EUR 80 were required for a full VCO. For smaller participation in the VCO, the prices were correspondingly lower. Table 1 shows the individual price breakdown for both lengths of flights.

Short-haul scenario		*Long-haul* scenario	
Attribute	***Level***	***Attribute***	***Level***
Price for a Specific Offset Level	EUR 16 and 100% EUR 8 and 50% EUR 4 and 25%	Price for a Specific Offset Level	EUR 80 and 100% EUR 40 and 50% EUR 20 and 25%

Table 1: VCO Prices For a Specific Level

2. *VCO Provider*

H2 deals with the question of what offset provider air travellers prefer. As indicated by Brouwer et al. (2008), a lack of transparency can cause ignorance of VCO. This has also been confirmed by other studies that found a general lack of knowledge about

aviation's environmental impact and the corresponding lack of information of VCO (e.g., Lu & Shon, 2012).

Attribute	***Level***
VCO Provider	- Airline - NGO

Table 2: CBC Option Investor of Financial Contribution

The offered levels to the attribute are based on findings of the literature review: The found uncertainty and general scepticism about VCO schemes among travellers in four Western countries (Higham et al., 2016) and the fact that charities are still more reliable than many other sectors and institutions (Populus, 2018).

3. *Project Type*

H3 tests whether air travellers want to engage in the choice of the project. The recommendation of MacKerron et al. (2009) to stronger emphasize the availability of different VCO projects and criticism which relates to the opacity of the market, are decisive for the further investigation of the importance of the project type. A dichotomous option is given: Respondents can either choose the project themselves or will buy a VCO where the project is unspecified.

Attribute	***Level***
Project Type	- Project of your choice - Unspecified project

Table 3: CBC Option Project Type

4. *Method of Payment*

H4 a and *H4 b* test what method of payment air travellers prefer for the purchase of VCOs. So far, research has been largely silent on this topic. IATA (2008) is of the opinion that using FFM as a payment method is popular among air travellers (IATA, 2008). Consequently, the attribute "Method of Payment" is divided into two levels, namely "Money" and "Frequent Flyer Miles". It is not yet known what kind of payment travellers and especially frequent travellers prefer.

Attribute	*Level*
Method of Payment	- Money - Frequent Flyer Miles

Table 4: CBC Option Method of Payment

Empirical Model of Choice-Based Conjoint Analysis

The choices that respondents make are discrete, as they are provided with different sets of options from which respondents are asked to choose their preferred alternative. Louviere et al. (2000) who published research on discrete choice models claim that the probability P of an individual q choosing alternative i and a set of alternatives J can be expressed as follows:

$$P_{iq} = \frac{\exp\,(V_{iq})}{\sum_{j=1}^{J} \exp\,(V_{jq})}$$

where V_{iq} represents the utility V for an individual q of an alternative i. It is believed that a random component of utility ε_{iq} contributes to the total utility U, which is normally distributed. This random component is a factor in choice processes that cannot be described by observation:

$$U_{iq} = V_{jq} + \varepsilon_{iq}$$

The choice of an alternative provides information about the representative (observable) utility when the above assumptions are met and the error ε_{iq} has a mean value of zero with constant variance and independence.

Estimation of Results

All conjoint analysis procedures are based on a common assumption about the assessment of products: The individual product characteristics are associated by the respondents with more or less strong assumptions of utility, and the totality of these assumptions of utilities from all product characteristics leads to an overall assessment

of the product, which is reflected in the preference (strength of the preference over alternatives) and finally in a choice decision (e.g., purchase) (Bichler & Trommsdorff, 2009).

Sawtooth Software claims that the majority of CBC users are leveraging Hierarchical Bayesian estimation (hereafter referred to as HB) in order to calculate the importance values of CBC data by using part-worth utilities. While aggregate logit provides a decent starting point for the general understanding of the obtained data, Sawtooth Software suggests using HB for further, more accurate, and robust insights (Hill, 2017; Orme, 2019).

In the past, methods such as MONANOVA, LINMAP, and OLS regression have dominated the evaluation of CBCs. Using HB methods has become increasingly popular in recent years.

These methods allow the analysis of part-worth values on an individualized level and show stable and accurate results even for small samples, keeping the very inconsistent and heterogeneous response behaviour of the respondents intact. Inconsistencies are eliminated by estimating the parameters of a formula (Orme, 2000).

HB "borrows" information from other respondents in order to calculate relatively stable results at the individual level, particularly when respondents make multiple observations (Orme, 2000).

Especially the efficiency and accuracy of HB have been proven by CBC experiments. It is, therefore, the chosen method to estimate the benefit for this conjoint experiment.

HB presumes that the respondent is responding to selection tasks according to a Multinomial Logistics Model, as introduced on the previous page.

After having obtained the utility values, those need to be examined. The Market Simulator that is offered by Sawtooth Software pretends to have gathered the respondents in one room only to vote on product concepts in competitive situations. Using the utility data obtained, it can be predicted how respondents would choose between certain products. The simplest market simulation is based on a first-choice model. A first-choice model presumes that respondents purchase the product alternative or choose from the group of products that has the highest total utility determined by the sum of the part-worth utilities related to the levels that describe each product (Orme, 2019).

How Choice Sets Are Displayed

The design of CBC experiments can be created in different ways with several types of effects that one wants to model and quantify in such choice experiments. In choice-based experiments, the stimuli can display either a full profile or a partial profile. Full profile experiments show a level of each attribute in the study. Partial profile experiments, however, use profiles that indicate a level for only a subset (typically five or less) of the attributes studied (Chrzan & Orme, 2000). In the course of this survey, a clear comparison of individual attributes is important in order to determine their relative importance in the overall picture of the VCO product. Therefore, the full profile method was chosen for this study.

A random design was also chosen for this study. In this design, respondents are randomly selected to receive the selection sets in different versions.. This means that the profiles created varied from respondent to respondent. Sawtooth allows researchers to choose one of the below four methods of design generation (Chrzan & Orme, 2000; Hill, 2017):

1. **Complete Enumeration**: profiles are almost orthogonal, and the frequency of level combinations between attributes is equally balanced. Within the choice sets, attribute levels appear doubled as little as possible (a characteristic known as "minimal overlap").
2. **Shortcut**: profiles are created for each respondent using the least frequently used attribute levels of previous concepts for a that respondents, again with minimal overlap.
3. **Random**: this option uses profiles that are selected from the pool of possible profiles and placed in choice sets. Overlaps can and will occur, although no duplicate profiles are allowed within a choice set, which are the same on all attributes.
4. **Balanced Overlap**: this approach is a compromise between the full enumeration and random method - it has more overlaps than the former, however, less than the latter. This method does not allow duplicate concepts within the same task. The balanced overlap method is almost as efficient as the full enumeration and abbreviation methods in terms of the main effects but is quantifiably better than any of these methods in respect of increasing the

accuracy of interaction term estimates. Consequently, a balanced overlap was chosen for the purpose of this study.

For some research, analysts wish to prohibit certain attribute levels from being combined with others. Those combinations can be banned from appearing. However, prohibitions lead to a level imbalance and dependencies, which consequently decreases the design efficiency. In this study, the use of prohibitions was not required (Hill, 2017).

3.3 Survey Design

The empirical analysis is founded on data from an online survey conducted in the period from 12.02.2020 to 16.03.2020. Besides direct and personal invitations to participate in the study, three online postings (Facebook, LinkedIn, and XING) were made. The results were of high quality, and only a few respondents spent very little time filling out the survey.

The survey questionnaire was developed with Sawtooth Software's Lighthouse Studio. Afterwards, the survey questionnaire was provided online to the respondents. Under https://whydodontyouoffsetyourflight.sawtoothsoftware.com/login.html, respondents could find the survey questionnaire. Sawtooth Software offers the online platform only for a limited period of time, so the survey is no longer available at this link.

Online surveys have many advantages: they are cost-effective, they don't have the potential for interviewer bias, and respondents are likely more comfortable answering sensitive questions and conducting the survey at their own pace (Bateman et al., 2004). Nevertheless, online surveys also have their drawbacks: In contrast to face-to-face or telephone surveys, online surveys do not allow for detailed questions, and some respondents may not fully comprehend what is being asked (Dickie et al., 2007; Marta-Pedroso et al., 2007).

It appears, however, that the problems reported for online evaluation surveys relate primarily to individuals recruiting respondents into paid and quasi-professional research panels (Dickie et al., 2007), a sampling method that was not used here.

Before publishing the actual survey, a pilot study with ten respondents was conducted. This pilot study made it possible to find out whether participants understood the tasks of the survey questionnaire or had any other feedback. After the

pilot study with the ten participants ran without any further problems, the survey questionnaire could be published completely. The survey questionnaire started with socio-demographic questions and questions regarding the travel behaviour of respondents.

The core of the research was a selection experiment. Respondents were asked to imagine both: flying on a *short-haul* flight and on a *long-haul* flight. In addition, respondents have been given the opportunity to offset their CO_2 emissions caused by their flight and asked how much they would pay to do so. In both scenarios, the participants were given four different products to choose their favourite from. The attributes' levels offered to the respondents were varied at random. One of these products was always the option not to offset their flight. Figure 6 shows the attributes and corresponding levels that have been used.

Short-haul scenario

Attribute	***Level***
Price for a Specific Offset Level	EUR 16 and 100% EUR 8 and 50% EUR 4 and 25%
Method of Payment	- Money - Frequent Flyer Miles
Investor of Financial Contribution	- Airline - NGO
Project Type	- Project of your choice - Unspecified project

Long-haul scenario

Attribute	***Level***
Price for a Specific Offset Level	EUR 80 and 100% EUR 40 and 50% EUR 20 and 25%
Method of Payment	- Money - Frequent Flyer Miles
Investor of Financial Contribution	- Airline - NGO
Project Type	- Project of your choice - Unspecified project

Figure 6: Attributes and levels used in the experiment

To avoid order effects, the order of the conjoint experiment and the section with questions on preferences was randomised by Sawtooth.
In addition to the conjoint experiment, respondents could also voluntarily tell why they have offset their flights so far, or why they have not.

3.4 Testing the Experimental Design

Sawtooth Software (n.d.) recommends running the test design function, which provides a more precise test to ensure that the CBC questionnaire, based on the planned sample size, is capable of estimating with sufficient accuracy the attribute effects (utility values) to be studied. Moreover, it is recommended for the test to aim

for standard error for the levels of each attribute to be .05 or lower (for the precision of the main effects), and for interaction effects to be .10 or lower. The standard error for the none option can be ignored, as it is just a constant and scales with the number of times it was selected.

	Std Err	Attribute	Level	
1	0.04865	1	1	100% Offset
2	0.04824	1	2	50% Offset
3	0.04748	1	3	25% Offset
4	0.03328	2	1	Money Transfer
5	0.03328	2	2	Frequent Flyer Miles
6	0.03368	3	1	Airline
7	0.03368	3	2	NGO
8	0.03338	4	1	Project of your Choice
9	0.03338	4	2	Unspecified Project
10	0.07421			NONE

Table 5: Obtained Test Design Report

Examining the standard errors for each of the levels elaborated (except the None, which can be further ignored) for a sample size of 141 respondents, it can be seen that the precision of all the levels is better than the suggested target (<.05). The obtained test design report is the same for both, the *short-haul* and the *long-haul* scenario, as only the values (price levels) of the attribute's level differ.

4. Empirical Analysis

This chapter deals with the description of the sample, and the analytical evaluation of the received survey. Different statistical evaluations were used to answer the hypotheses of this thesis.

4.1 Sample Description

This chapter is devoted to describing the obtained sample from the conducted survey questionnaire. It also presents the survey design and presents the test performed before publication.

The average total time respondents spent answering the entire survey questionnaire from the introduction page until the last page was 9 minutes and 30 seconds. Those that spent less than 3 minutes completing the survey questionnaire have been excluded from the sample. After the answers of 23 participants who answered the study too quickly were deleted from the data set, 141 completely answered questionnaires remained.

Each respondent answered 18 choice questions, nine of a *short-haul* scenario, and nine of a *long-haul* scenario, both filled with four alternatives, including a none option. Figure 7 shows the adopted attributes and their corresponding levels in the scenario of

a short- and *long-haul* flight (screenshots of the whole survey questionnaire can be found in the appendix).

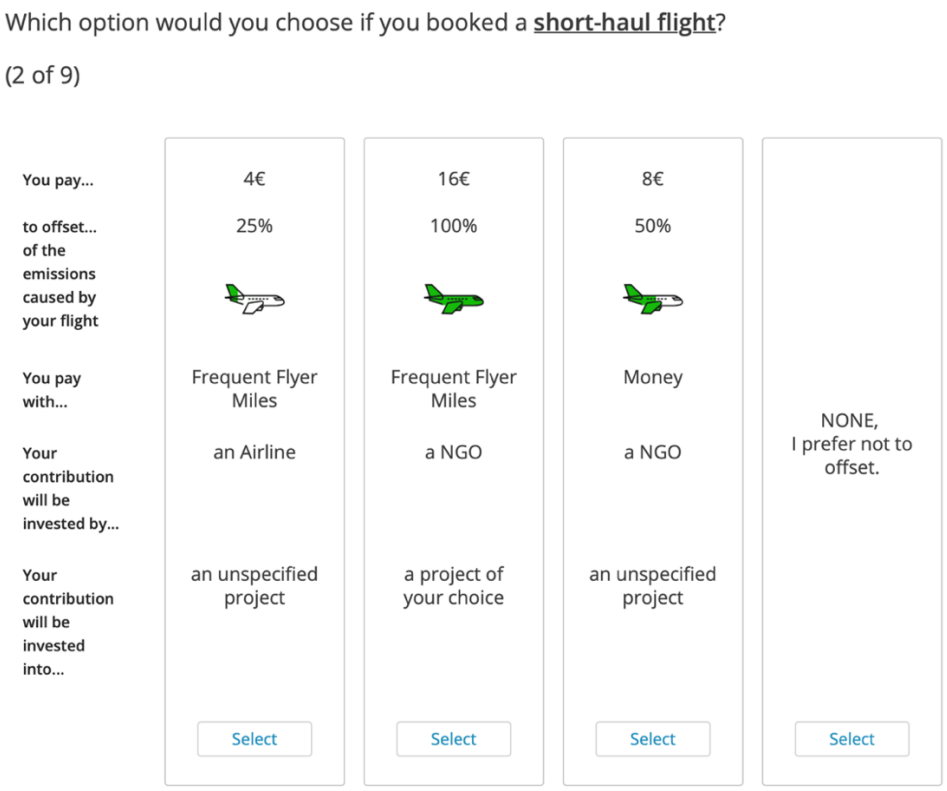

Figure 7: Example of a Choice Set

Among the respondents there were 73 male (51.8%), 67 female (47.5%) and one person (.7%) who did not specify their gender.

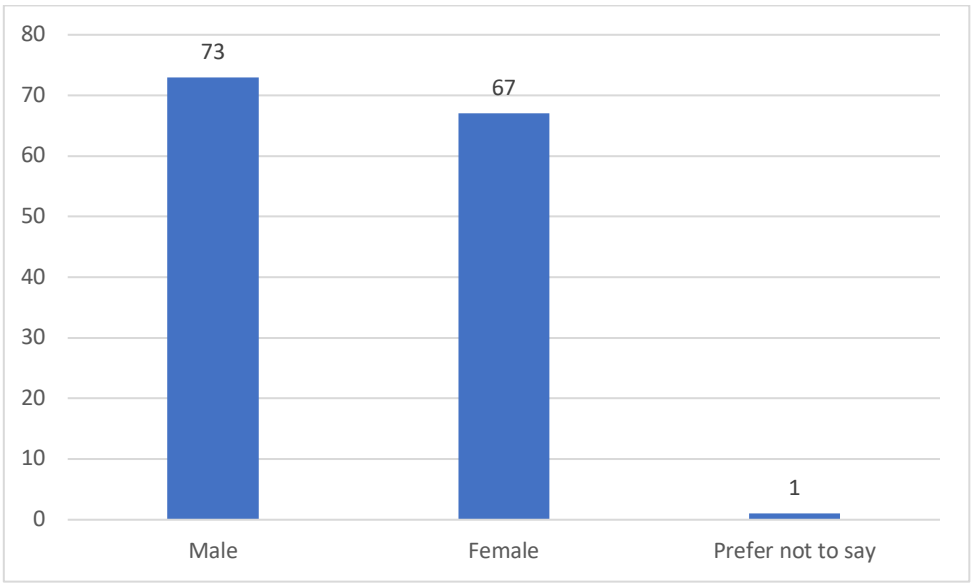

Figure 8: Distribution of Gender

In order to be able to draw inferences about different age groups, participants were asked about their age category. This can help to target VCO offers even more

specifically to certain age groups. The classification is based on Armstrong's (2019) "Twelve Stages of Human Life". 113 participants stated that they are between 18 and 35 years old (80.1%), ten persons (7.1%) are between 35 and 50 years old, 17 persons (12.1%) are between 50 and 70 and one person took part in the study stating that he/she is over 70 years old.

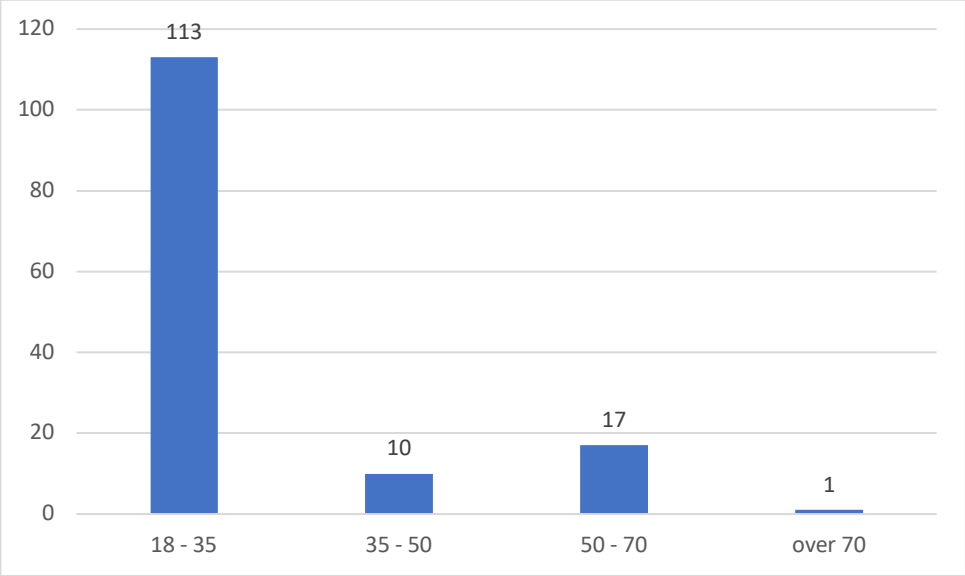

Figure 9: Distribution of Age

Another category that may help to bring VCO products to the market in a more targeted way is the type of employment of the participants. The categories to be selected were employee, self-employed, student or already retired. A total of 78 participants said they were employees (55.3%), five persons (3.5%) said they were self-employed, 55 persons (39%) are studying, and three persons (2.1%) are retired. No unemployed person took part in this survey questionnaire.

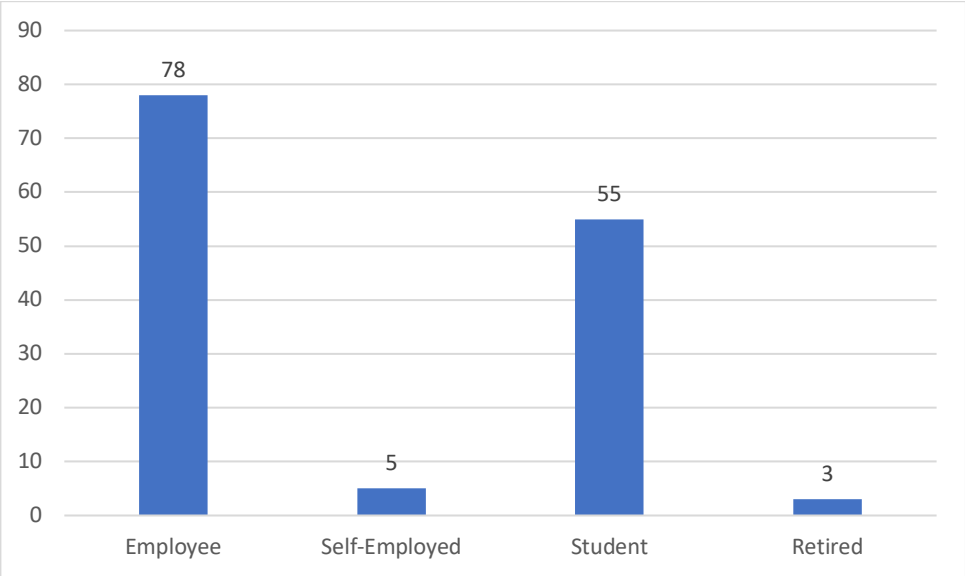

Figure 10: Distribution of Employment

The participants also provided information on their travel behaviour in relation to flights given a timeframe over the last three years. This should help to find out whether frequent flyers have a different WTO than those who fly less often or not at all. While the majority (69.5%) flies 1 - 5 times a year, only a few (14.9%) fly 6 - 10 times. A total of 14.2% stated that they fly more than 10 times a year, which is why they can be considered as frequent travellers. Only two people did not fly at all.

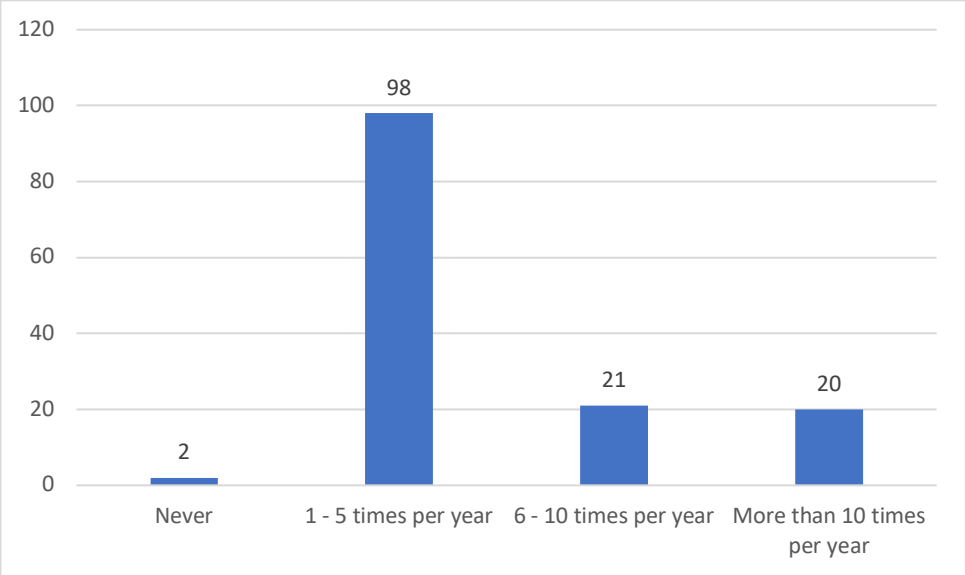

Figure 11: Distribution of Frequency of Flights

Among those who stated that they travel by air (98.6%), most (78.7%) travel on short distances. 12.8% reported travelling on medium-haul routes and 7.1% mainly fly *long-haul*.

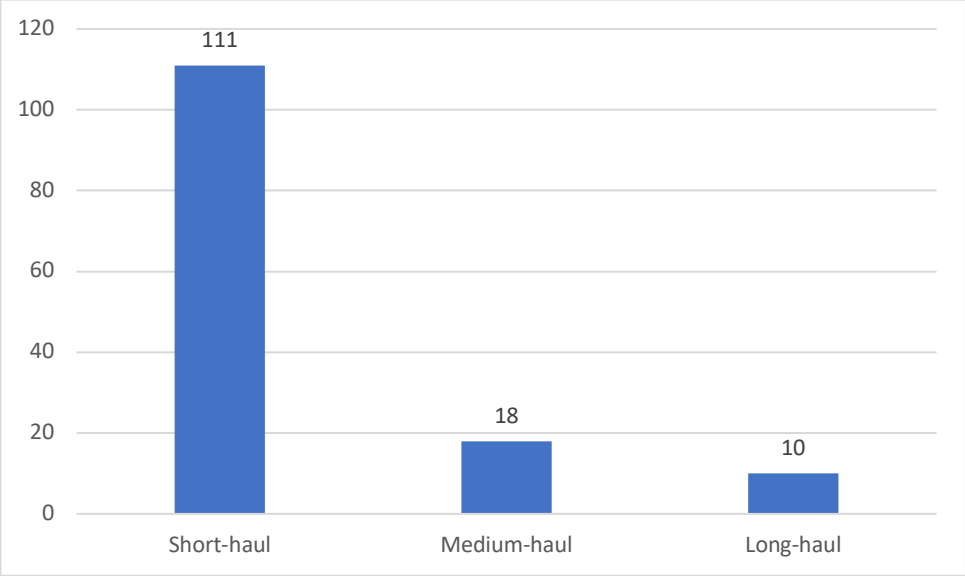

Figure 12: Distribution of Length of Flights

Participants in the study were also asked about their offset behaviour in the past. This was the result of an open question ("Have you ever purchased a Voluntary Carbon Offset? If yes, why? If no, why not?"), which was not mandatory. Almost a third of the participants did not answer this question. Nevertheless, 45.4% of the remaining sample said they had not yet offset their flights. Further, 26.2% claimed to have spent their money at least once for offset purposes.

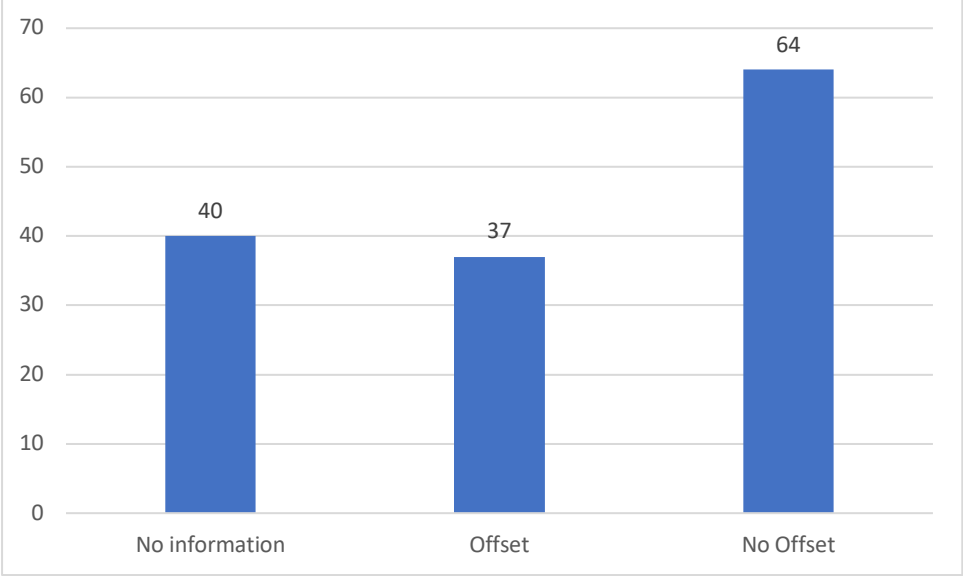

Figure 13: VCO Past of Respondents

4.2 Individual Criteria Utilities

After identifying the criteria that play a role in the purchase decision of VCOs and the classification of these criteria, it is interesting to consider the differences between the products that are associated with the level of each criterion. The following section is devoted to the calculation of these utilities (part-worths), the interpretation and discussion of the results.

4.2.1. Relative Impact of Each Attribute

When working with CBC, the data can be analysed by counting the number of times an attribute level was selected in relation to the number of times it was available for selection. This is a very basic one-way analysis, as it provides an excellent intuitive appeal. It is taken from Sawtooth's Counts programme. As no prohibitions were used, counts proportions are closely linked to conjoint utilities. Counts can be considered as ratio data.

In the first step, the relative impact of each attribute is calculated simply by counting the choices. This provides a quick estimation of the main effects as well as common effects for the data set. In any CBC project, each level of an attribute has the same chance to occur with any level of another attribute. Therefore, the impact of each level can be measured just by counting the number of times an option including it is selected. The ratio for each level can be calculated by taking the number of times a level is chosen, divided by the number of times the level has occurred in the survey. A Chi-Square test was run to see whether results are statistically significant (Hill, 2017).

In the scenario of a *short-haul* flight, the VCO price and the relative VCO level showed significant results ($\chi^2(2) = 7.210$, $p<.01$). The preferably chosen level was a 50% VCO with a corresponding price of EUR 8.

The VCO provider (Airline or NGO) showed significant results as well ($\chi^2(1) = 34.690$, $p<.01$): NGO was selected in 33.1% of the times it occurred. Airlines, on the other hand, were selected less frequently (23.3%).

Also, the type of project was significant ($\chi^2(1) = 104.083$, $p<.01$). Respondents wanted to select the project themselves in 36.9% of the time the option occurred, while the level "unspecified project" was chosen only 19.3% of the time the option occurred. The method of payment (money vs. FFM) turned out to be not significant. For this attribute, the levels have been chosen in a very balanced way (28.3% vs. 27.9%). The "none-option" was selected in 15.7% of the time.

In the scenario of a *long-haul* flight, all attributes showed significant results: for the price and level of VCO, the majority (30.1%) of the respondents voted for the most inexpensive offer ($\chi^2(2) = 36.034$, $p<.01$). In contrary to the *short-haul* scenario, the method of payment showed significant results. Respondents prefer to pay their VCO with their FFM for *long-haul* flights (28.7% vs. 22.7% money) ($\chi^2(1) = 13.222$, $p<.01$). Still significant but apparently less important is the choice of the investor of the financial contribution: 29.6% chose NGO over airlines (21.8%) ($\chi^2(1) = 22.409$, $p<.01$). Being able to choose the project themselves was important for the respondents when it comes to *long-haul* flights (35.3% vs. 16.1% unspecified project) ($\chi^2(1) = 135.891$, $p<.01$). The "none-option" was selected more often compared to the *short-haul* scenario with 22.9%.

In summary, almost all Chi-Square tests were significant. It can, therefore, be concluded that the relative influence of the selected attributes is to be understood in such a way that the participants in the study accepted that the emissions of a flight would not be offset for 100%, that offset providers should be an NGO and not an airline and that the choice of the projects remains to themselves.

Short-haul		Long-haul	
Offset Price		**Offset Price**	
	Total		Total
Total Respondents	141	Total Respondents	141
16 EUR/100% Offset	0.289	80 EUR/100% Offset	0.191
8 EUR/50% Offset	0.305	40 EUR/50% Offset	0.271
4 EUR/25% Offset	0.250	20 EUR/25% Offset	0.310
Within Att. Chi-Square	7.210	Within Att. Chi-Square	36.034
D.F.	2	D.F.	2
Significance	p < .05	Significance	p < .01
Method of Payment		**Method of Payment**	
	Total		Total
Total Respondents	141	Total Respondents	141
Money transfer	0.283	Money transfer	0.227
Miles	0.279	Miles	0.287
Within Att. Chi-Square	0.078	Within Att. Chi-Square	13.222
D.F.	1	D.F.	1
Significance	not sig	Significance	p < .01
Offset Provider		**Offset Provider**	
	Total		Total
Total Respondents	141	Total Respondents	141
Airline	0.230	Airline	0.218
NGO	0.331	NGO	0.296
Within Att. Chi-Square	34.690	Within Att. Chi-Square	22.409
D.F.	1	D.F.	1
Significance	p < .01	Significance	p < .01
Projects		**Projects**	
	Total		Total
Total Respondents	141	Total Respondents	141
Own Choice	0.369	Own Choice	0.353
Unspecified project	0.193	Unspecified project	0.161
Within Att. Chi-Square	104.083	Within Att. Chi-Square	135.891
D.F.	1	D.F.	1
Significance	p < .01	Significance	p < .01

Table 6: Results from Sawtooth's Counts Programme

4.2.2. Interaction

Sawtooth's counts programme, where the results of the previous chapter have been taken from, also reports an interaction Chi-Square test for all attributes taken. A significant interaction between two variables exists when a significant change in the outcome variable can be observed as both predictors jointly change (Field, 2013).

In total, only one interaction has shown to be statistically significant ($\chi^2(2) = 7.153$, $p<.05$). For the *long-haul* flight scenario, the interaction between the VCO price for a specific offset level and the method of payment seem to interact. This means that the effect of the price is weaker when the payment is made with FFM rather than with money transfer. Consequently, the most preferred interaction is the combination of the lowest VCO price and the payment via FFM (32.2 %).

Price for a Specific Offset Level x Method of Payment		
		Total
Total Respondents		141
80 EUR/100% Offset	Money transfer	0,141
80 EUR/100% Offset	Miles	0,239
40 EUR/50% Offset	Money transfer	0,240
40 EUR/50% Offset	Miles	0,302
20 EUR/25% Offset	Money transfer	0,298
20 EUR/25% Offset	Miles	0,322
Interaction Chi-Square		7,153
D.F.		2
Significance		p < .05

Table 7: Interaction Findings of long-haul scenario

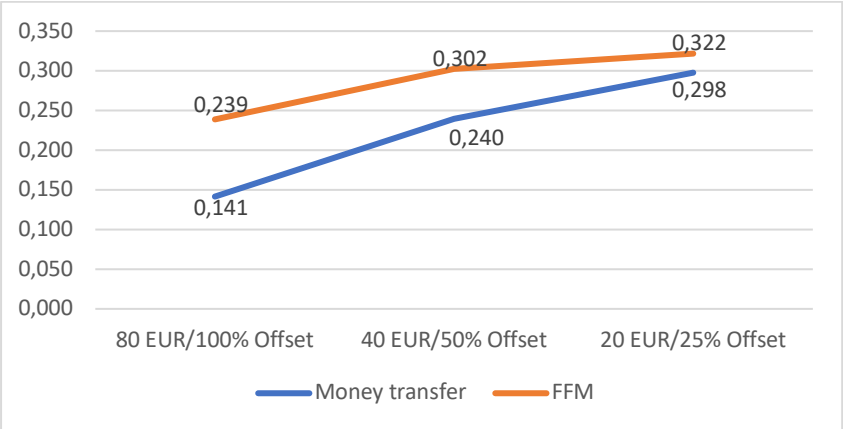

Figure 14: Interaction Findings of long-haul scenario

4.2.3. Hierarchical Bayesian Estimates

In order to measure relative desirability, part-worth utilities for attribute levels were calculated as a maximum likelihood outcome through a hierarchical Bayesian model. Part-worth values for the attribute levels used are presented in the table below. The values are not comparable across different attributes due to the arbitrary origin of each level in an attribute. This means that although two levels of two different attributes have the same part-worth value it can not be interpreted that they are equally preferred (Orme, 2019).

Within HB, part-worth values are scaled to sum to zero within each given attribute. Levels with a high positive average utility value increased the likelihood of respondents selecting the products. Accordingly, the negative value obtained for the other level does not mean that it is undesirable for respondents, but only that it is less desirable than other levels within the attribute that have a higher average utility value.

When calculating importance values from the obtained sample, it is advisable to use HB estimation, especially if there are attributes where respondents disagree on the order of preference of levels (Orme, 2019).

For the HB results, a lower and upper 95% credible interval is reported for each parameter estimate. A credible interval is a Bayesian equivalent to a classical confidence interval. However, it differs slightly in its interpretation. The credible interval defines the range in which the actual parameter value falls with a 95% probability (Winkler, 2003).

The obtained utilities shown below are re-scaled values determined using the zero-cantered "Diffs" method. The "diffs" method rescales the utilities in order to have so the total sum of the differences in utility for each individual between the worst and best level of each attribute across the attributes equal to the number of attributes times 100 (Sawtooth Software, n.d.).

Table 8 shows these partial values that were calculated using the HB method. The resulting part-worth values of the attributes show that in the **scenario of *short-haul* flights**, the second most expensive option with EUR 8 for a VCO level of 50% was the preferred option. A full VCO at EUR 16 was the least favoured option. With the method of payment, participants preferred to pay via money transfer to paying with FFM. As a VCO provider, the majority of the participants would like to have an NGO and preferred to be able to choose the project to which the money flows.

The resulting partial values of the attribute values in the ***long-haul* flight scenario** showed a similar trend. The 50% VCO in the price of EUR 40 got the highest value of utility, followed by the cheapest option displayed of EUR 20, which is a 25% VCO. In contrast to the scenario of *short-haul* flights, the participants of this scenario preferred to pay their VCOs in the form of FFM. Also, in this scenario, it can be seen that it is important for the participants of the study to see for which project their money is used.

***Short-haul* Scenario**		***Long-haul* Scenario**	
Label	**Utility**	**Label**	**Utility**
Price and Offset Amount		**Price and Offset Amount**	
16 EUR/100% Offset	-19,23	80 EUR/100% Offset	-65,06
8 EUR/50% Offset	28,96	40 EUR/50% Offset	32,66
4 EUR/25% Offset	-9,73	20 EUR/25% Offset	32,40
Method of Payment		**Method of Payment**	
Money transfer	4,78	Money transfer	-8,67
Miles	-4,78	Miles	8,67
Offset Provider		**Offset Provider**	
Airline	-23,35	Airline	-18,91
NGO	23,35	NGO	18,91
Projects		**Projects**	
Own Choice	45,04	Own Choice	46,27
Unspecified project	-45,04	Unspecified project	-46,27
None	-210,57	None	-114,76

Table 8: Part-worth estimates, using Hierarchical Bayes estimation

4.2.4. Importance Scores

When parameters are available at an individual level, researchers often calculate the importance of different attributes (Green et al., 2001; Ofek & Srinivasan, 2002). This measure of importance for the preference change is derived from the utility range of the different values of the attribute. Consequently, the coefficient shows the impact of this change (from worst to best) on overall utility.

The coefficient denominator is the sum of values obtained in the numerator for all attributes that normalizes the addition of results to 100%.

The importance scores generated some interesting information about the factors of VCO purchases. Both scenarios were consistent in the order of analysed importance values. With the two most important attributes being the "Price for a specific Offset Level" and the "Projects" it is clear that on the one hand the monetary aspect matters, but on the other hand, also issues of trust are important to air travellers when making VCO purchase decisions. The higher price of VCOs for *long-haul* flights played a greater role than the price of VCOs of *short-haul* flights. The attributes "Offset Provider" and "Method of Payment" were equally important to the participants in the decision-making process.

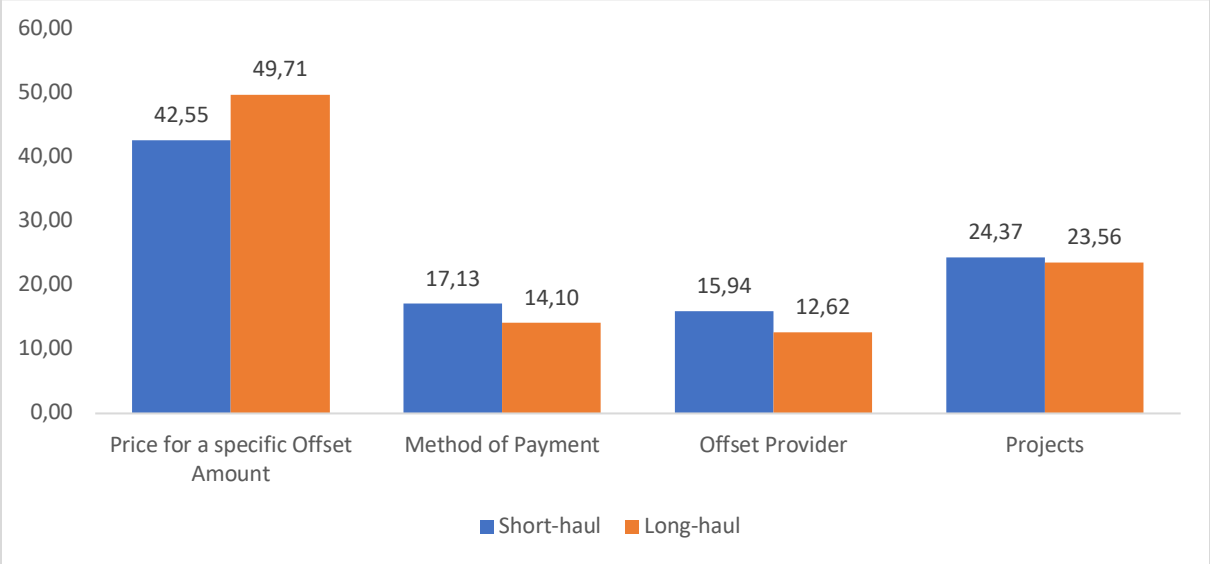

Figure 15: Importance Scores, using Hierarchical Bayesian estimation

4.2.5. Market Simulation Results

The market simulator is usually regarded as the most important tool resulting from the conjoint analysis. The simulator transforms raw conjoint data (part-worth) into something much more useful: simulated market decisions (Orme, 2019). In order to compare the change of different values of attributes, the remaining attributes were kept the same according to the preferences of participants resulting from the hierarchical Bayesian calculation. The identified preferences of participants were "50% offset" as the VCO level for both *long-haul* and *short-haul*, "Money Transfer" as the method of payment for *short-haul* and "FFM" for long-haul, "NGO" as the VCO provider for *long-haul* and *short-haul*, and "Own Choice" as project type again

for both *long-haul* and *short-haul*. As an interaction effect was found between the price for a specific VCO level and the method of payment in the *long-haul* scenario, such that the effect of the price is weaker when the payment is made with FFM rather than with money transfer, both methods of payment were taken into consideration for the *long-haul* scenario.

The Impact of the Length of the Flight

When determining the **willingness to offset** among the respondents in the ***short-haul* scenario**, respondents did not show any differences in their WTO their flight among the 25% VCO for EUR 4 (85.8%) and the 50% VCO for EUR 8 (85.1%). However, when participants were faced with the decision to either offset 100% of their flight and pay EUR 16 or not to offset, the percentage of participants willing to offset decreased to 76.5%.

When determining the **willingness to offset** among the respondents in the ***long-haul* scenario**, respondents were more willing to offset their flight when not paying the full level of VCO, regardless of the method of payment. When participants were faced with the decision to either offset 100% of their flight and pay EUR 80 via money transfer or not to offset, 55.9% opted for offsetting. For a 50% VCO with a price of EUR 40, 71.3% favoured to offset, while for a 25% VCO with a price of EUR 20, 80.7% were willing to offset. Comparing these shares to the market simulator results taking FFM as the method of payment, similar tendency can be observed. However, other than expected from the interaction anaylsis, a weaker effect of the price on the willingness to offset when paying with FFM compared to money transfer could not be observed.

Short-haul		*Long-haul*		
Label	**Shares of Preference** [1]	**Label**	**Shares of Preference** [2]	[3]
EUR 4/25%	85,80%	EUR 20/25%	80,70%	82,20%
None	14,20%	None	19,30%	17,80%
EUR 8/50%	85,10%	EUR 40/50%	71,30%	73,50%
None	14,90%	None	28,70%	26,50%
EUR 16/100%	76,50%	EUR 80/100%	55,90%	55,50%
None	23,50%	None	44,10%	44,50%

Table 9: Choice Simulation, The Impact of the Length of the Flight

For both scenarios, the percentage of respondents who decided to offset the emissions of their flight decreased when the price for a specific offset increased. For the *long-haul* scenario, however, the decrease in the WTO was considerably higher compared to the *short-haul* scenario. This indicates a higher price sensitivity regarding VCOs on *long-haul* routes.

The Role of the Voluntary Carbon Offset Provider

In order to determine the **willingness to pay** among the respondents for a specific VCO attribute, a price sensitivity analysis suggested by Orme (2001) was conducted. The idea of this analysis is to compare two products that differ regarding one characteristic but in the beginning, cost the same. In the next step, the price of the favoured product increases incrementally until the shares of both products are the same. The difference between the initial price and the final price determines the WTP for a special product feature (Orme, 2001).

When determining the **willingness to pay for different offset providers** (Airline vs. NGO) among the respondents in the ***short-haul* scenario** results showed that 82.8% of all participants decided to offset their flights when the VCO was provided

[1] All other paramaters being equal → Method of Payment: Money transfer; Offset Provider: NGO; Project: Own Choice
[2] All other paramaters being equal → Method of Payment: Money transfer; Offset Provider: NGO; Project: Own Choice
[3] All other paramaters being equal → Method of Payment: FFM; Offset Provider: NGO; Project: Own Choice

by an airline for EUR 4. Compared to that 85.8% of participants opted for offsetting their flight when the VCO was provided by an NGO for EUR 4. It can be seen that when increasing the price to 8 EUR, almost the same level of participants (85.1%) still chose to offset. Further increasing the price to EUR 16 resulted in 76.5% of participants opting to offset. Consequently, the WTP more when the VCO is provided by an NGO, compared to when it is provided by an airline, lies between EUR 4 and EUR 12.

The **willingness to pay for different offset providers** among the respondents in the ***long-haul*** **scenario** when the VCO is provided by an NGO, compared to when it is provided by an airline, lies between EUR 0 and EUR 20. This applies to FFM and money transfer as method of payment. However, other than expected from the interaction anaylsis, a weaker effect of the price on the willingness to offset when paying with FFM compared to money transfer could neither be found. The above explained methodology to calculate the WTP was also applied here and for the following computations.

Short-haul		***Long-haul***		
Label	**Shares of Preference** [4]	**Label**	**Shares of Preference** [5]	[6]
Airline, EUR 4/25%	82,80%	Airline, EUR 20/25%	77,20%	78,60%
None	17,20%	None	22,80%	21,40%
NGO, EUR 4/25%	85,80%	NGO, EUR 20/25%	80,70%	82,20%
None	14,20%	None	19,30%	17,80%
NGO, EUR 8/50%	85,10%	NGO, EUR 40/50%	71,30%	73,50%
None	14,90%	None	28,70%	26,50%
NGO, EUR 16/100%	76,50%	NGO, EUR 80/100%	55,90%	55,50%
None	23,50%	None	44,10%	44,50%

Table 10: Choice Simulation, The Impact of the Offset Provider

[4] All other paramaters being equal → Method of Payment: Money Transfer; Project: Own Choice
[5] All other paramaters being equal → Method of Payment: Money Transfer; Project: Own Choice
[6] All other paramaters being equal → Method of Payment: FFM; Project: Own Choice

The **willingness to pay for different project types** among the respondents in the ***short-haul*** **scenario** when the when the participants were able to select a project of their own choice, compared to an unspecified project is >EUR 12.

The **willingness to pay with different project types** among the respondents in the ***long-haul*** **scenario** when the when the participants were able to select a project of their own choice, compared to an unspecified project lies between EUR 20 and EUR 60. This applies to FFM and money transfer as method of payment. Yet again, other than expected from the interaction anaylsis, a weaker effect of the price on the willingness to offset when paying with FFM compared to money transfer could neither be found here.

Short-haul		***Long-haul***		
Label	**Shares of Preference** [7]	**Label**	**Shares of Preference** [8]	[9]
Unspecified, EUR 4/25%	75,50%	Unspecified, EUR 20/25%	66,20%	67,70%
None	24,50%	None	33,80%	32,30%
Own Choice, EUR 4/25%	85,80%	Own Choice, EUR 20/25%	80,70%	82,20%
None	14,20%	None	19,30%	17,80%
Own Choice, EUR 8/50%	85,10%	Own Choice, EUR 40/50%	71,30%	73,50%
None	14,90%	None	28,70%	26,50%
Own Choice, EUR 16/100%	76,50%	Own Choice, EUR 80/100%	55,90%	55,50%
None	23,50%	None	44,10%	44,50%

Table 11: Choice Simulation, The Impact of the Offset Project

[7] All other paramaters being equal → Method of Payment: Money transfer; Offset Provider: NGO
[8] All other paramaters being equal → Method of Payment: Money transfer; Offset Provider: NGO
[9] All other paramaters being equal → Method of Payment: FFM; Offset Provider: NGO

The Role of the Method of Payment

When determining the **willingness to offset with different methods of payment** (FFM vs. Money Transfer) among the respondents in general (not focusing on a particular scenario), respondents preferred offsetting the emissions of their flight via FFM (42.4%) over money transfer (38.3%) or not at all (19.25%).

When determining the **willingness to offset with different methods of payment** among the respondents in the ***short-haul* scenario**, respondents however, preferred money transfer (45%) over FFM (40.5%). In the ***long-haul* scenario**, respondents preferred FFM as the method of payment (44.3%) instead of offsetting via money transfer (31.6%).

	Overall	***Short-haul***[10]	***Long-haul***[11]
Label	**Shares of Preference**		
FFM	42,40%	40,50%	44,30%
Money Transfer	38,30%	45,00%	31,60%
None	19,25%	14,40%	24,10%

Table 12: Choice Simulation, The Impact of the Method of Payment

4.2.6. Short-haul and Long-haul Comparison

A Phi-test was conducted to find out whether participants of the study were more likely to choose to offset their flight when flying on a *short-haul* route compared to a *long-haul* route.

		Length of the Flight		
		Short-haul	***Long-haul***	**Total**
Offset/no offset	Offset	1180	869	2049
	No offset	230	259	489
Total		1410	1128	2538

*Table 13: Offset/no offset * Length of the Flight Crosstabulation*

A significant association between the length of the flight and the participants' WTO was found Φ=-.084, p<0.01. Based on the odds ratio, air travellers who fly on *short-*

[10] All other paramaters being equal → Price and Offset Amount: 8 EUR/50%; Offset Provider: NGO; Project: Own Choice

[11] All other paramaters being equal → Price and Offset Amount: 40 EUR/50%; Offset Provider: NGO; Project: Own Choice

haul are 1.529 times more likely to offset the emissions of their flight compared to air travellers who travel on *long-haul.*

4.3 Explorative Analysis

In the course of the explorative analysis, the answers to the open question were reviewed and further analysis regarding socio-demographic differences in the decision to offset was conducted. The use of CBC allows for a cross-analysis via the requested additional socio-demographic data. This information can be analysed through the HB estimate in order to conclude relative utilities. Moreover, Chi-square tests were used in order to make inferences over the offset behaviour taking socio-demographic information into consideration. Since a sample must be at least n=30 in order to make inferences over the population, only gender (73 male and 67 female), employment (77 employees and 55 students) and the frequency of flights (1 – 5 times per year: 90 and more than five times per year: 40) can be derived from this study for a cross-analysis (Field, 2013, p. 54). Consequently, the sample used for the Chi-square tests was reduced to 130 respondents.

The open question ("Have you ever purchased a Voluntary Carbon Offset? If yes, why? If no, why not?") which was placed at the end of the survey questionnaire, could be answered on a voluntary basis. The aim of the question was to find out individually what the participants' opinion on the topic of offsetting is. Of the 141 participants, 101

responded to this question. For simplicity, the answers were grouped into seven categories.

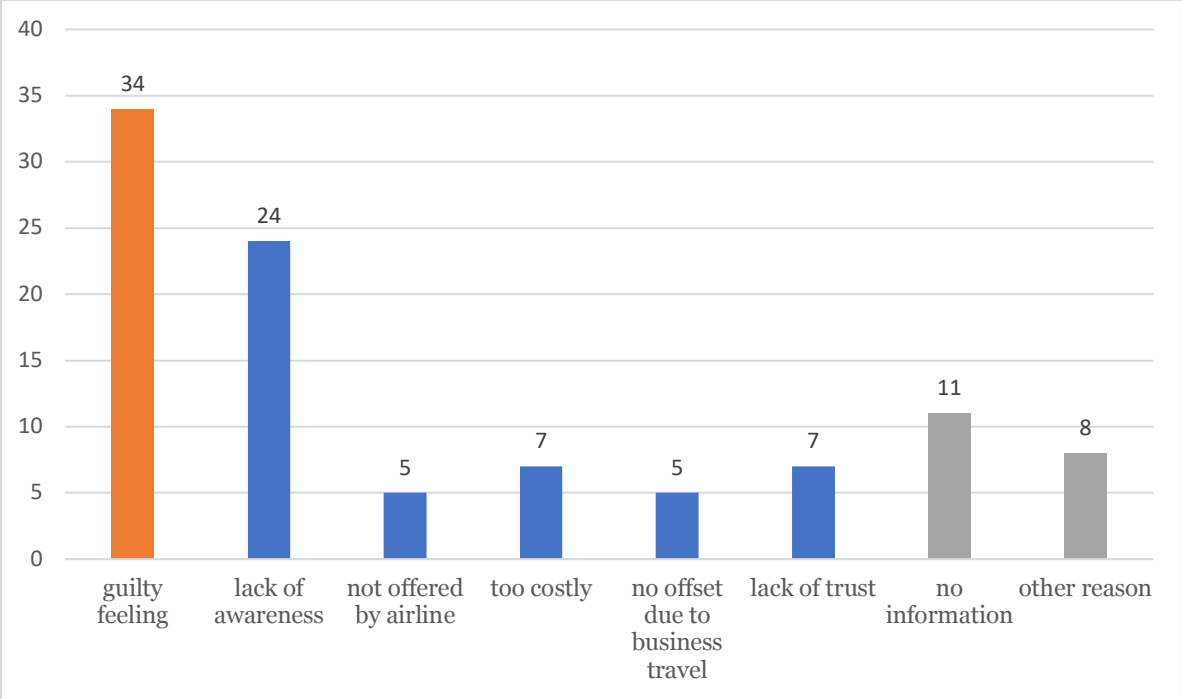

Figure 16: Open Question Segmentation

In total, 24.1% stated that they were acting or would act in the future, mainly out of a guilty conscience. Of a total of 17%, the answer can be understood as meaning that their lack of investment in VCOs to date is mainly due to the lack of information and awareness about it. 4% of the participants also stated that the VCO options were not offered by the airline they use. Another 5% of participants noted that the compensation payments have been too expensive for them so far. 4% of participants indicated that they travelled by air, mainly for business purposes, which is why they do not offset themselves. A further category identified was the lack of trust in the VCO schemes (seven people). 8% of participants answered the question with only one word (mostly "yes" or "no"). They did not elaborate on their answer. The answers of 6% could not be categorised.

When comparing the **sexes** in the ***short-haul* scenario** in terms of utility values, there are no differences between males and females. Both sexes prefer a 50% offset (EUR 8) to a 25% (EUR 4) and the most expensive option of 100% (EUR 16). In addition, both genders prefer to pay via money transfer, to have an NGO as offset provider and be able to choose the project themselves. The order of the importance scores is the same for both sexes, however, they are weighted differently. While males

have an importance of 45.4% for the offset price, only 39.3% of females. On the other hand, females feel that the method of payment is more important (19%) than males (15.6%). The importance of projects is also higher for females (26.4%) than for males (22.4%). Only in the case of the offset provider do the two sexes not differ significantly (males 16.6% and females 15.3%).

When comparing the **sexes** in the ***long-haul* scenario** in terms of utility values, it is noticeable that males have the highest utility value for the cheapest offset (EUR 20 for 25%) followed by the 50% offset (EUR 40) and lastly by a full offset (EUR 80). As regards the other attributes, the preferences are the same for both sexes. In the method of payment, both genders prefer the payment method FFM, as for offset providers an NGO is preferred and the choice of the project should be given. With regard to the importance scores, the two sexes do not differ considerably. With an importance score of just under 50%, the price for a specific offset level is of the utmost importance. This is followed by the projects (22.5% for females and 24.7% for males), the method of payment (13.7% for females and 14.6% for males) and the offset provider (12.3% for females and 13% for males).

Utility						
	Short-haul			Long-haul		
Label	Total	Male	Female	Total	Male	Female
100% Offset	-19,23	-17,49	-19,46	-65,06	-64,61	-64,44
50% Offset	28,96	25,85	32,22	32,66	31,77	33,67
25% Offset	-9,73	-8,36	-12,75	32,40	32,84	30,77
Money transfer	4,78	7,71	1,49	-8,67	-6,55	-11,00
Miles	-4,78	-7,71	-1,49	8,67	6,55	11,00
Airline	-23,35	-26,97	-19,55	-18,91	-19,93	-17,91
NGO	23,35	26,97	19,55	18,91	19,93	17,91
Own Choice	45,04	39,84	50,43	46,27	43,49	49,15
Unspecified project	-45,04	-39,84	-50,43	-46,27	-43,49	-49,15
None	-210,57	-213,62	-215,38	-114,76	-117,54	-118,00

Importance						
	Short-haul			Long-haul		
Attribute	Total	Male	Female	Total	Male	Female
Offset Price	42,55	45,40	39,25	49,71	49,96	49,26
Method of Payment	17,13	15,57	19,00	14,10	14,58	13,73
Offset Provider	15,94	16,64	15,32	12,62	13,01	12,31
Projects	24,37	22,39	26,42	23,56	22,45	24,70

Table 14: Gender Comparison Utility and Importance Scores

When focusing on the **employment** of participants in the ***short-haul* scenario**, it is noticeable that employees and students have the greatest value at a 50% offset. As far as the other attributes are concerned, there are also no differences between the individual employment categories: in the method of payment, money transfer is always favoured, as an offset provider the participants prefer an NGO and in the project, the participants prefer to be able to choose the project themselves.

With the importance scores, it should be noted that for employees and students the importance of the individual attributes is in the same order. Nevertheless, it is striking that the choice of project is still more important for employees (26%) than for students (22%)

In the analysis of employment in the ***long-haul* scenario,** it is striking that employees had the highest utility values at the lowest price. This does not apply to

students who had a higher propensity to buy in total (EUR 40 for 50% VCO). Concerning the other attributes, there are no differences between the individual employment categories: when it comes to the method of payment, employees and students have the greatest utility for paying the VCO with FFM, when choosing the offset provider, all NGOs are preferred and employees and students want to be involved in the project selection themselves.

The importance scores show that both employees and students feel similar importance. Thus, the price for a specific offset level comes first, followed by project choice, method of payment and finally the offset provider. Nevertheless, the price attribute is even more important for employees (53%) than for students (47%).

Utility						
	Short-haul			Long-haul		
Label	**Total**	**Employee**	**Student**	**Total**	**Employee**	**Student**
100% Offset	-19,23	-26,21	-12,71	-65,06	-72,95	-52,40
50% Offset	28,96	30,54	26,14	32,66	31,47	33,06
25% Offset	-9,73	-4,33	-13,43	32,40	41,49	19,34
Money transfer	4,78	2,25	7,19	-8,67	-12,68	-6,81
Miles	-4,78	-2,25	-7,19	8,67	12,68	6,81
Airline	-23,35	-20,45	-22,34	-18,91	-15,90	-18,47
NGO	23,35	20,45	22,34	18,91	15,90	18,47
Own Choice	45,04	49,30	38,62	46,27	44,40	48,39
Unspecified project	-45,04	-49,30	-38,62	-46,27	-44,40	-48,39
None	-210,57	-174,98	-271,32	-114,76	-77,78	-175,86

Importance						
	Short-haul			Long-haul		
Attribute	**Total**	**Employee**	**Student**	**Total**	**Employee**	**Student**
Offset Price	42,55	42,11	44,32	49,71	53,03	47,32
Method of Payment	17,13	16,90	18,18	14,10	13,17	15,37
Offset Provider	15,94	14,95	15,40	12,62	11,49	12,34
Projects	24,37	26,03	22,10	23,56	22,31	24,97

Table 15: Employment Comparison Utility and Importance Scores

Further explorative analysis of the socio-demographic information provided by the respondents was conducted using a Chi-square test.

A significant association between the sexes of the participants and their WTO on *short-haul* flights was found $\chi^2(1) = 4.500$, $p<.05$. Based on the odds ratio, female air travellers who fly on *short-haul* are 1.423 times more likely to offset the emissions of their flight compared to male air travellers. For the *long-haul* scenario, no significant association was found between the sexes of the participants and their WTO.

Looking at the employment of participants, a significant difference between students and employed participants regarding their WTO was found for both *short-haul* ($\chi^2(1) = 17.325$, $p<.01$) and *long-haul* flights ($\chi^2(1) = 19.323$, $p<.01$). On *short-haul* routes, students are 2.133 times more likely to offset the emissions of their flight compared to employees, while this number shrinks to 1.959 on *long-haul* routes.

Taking the flight past of participants into consideration, a significant association between the participants' indicated frequency of flights and the WTO could be found for both *short-haul* ($\chi^2(1) = 13.360$, $p<.01$) and *long-haul* flights ($\chi^2(1) = 13.453$, $p<.01$). On *short-haul* flights, air travellers who travel 1 – 5 times per year are 1.848 times more likely to offset the emissions of their flight compared to those travelling more than five times per year, while this number decreases to 1.716 on *long-haul* routes.

Further associations of gender (male/female), employment (employed/student) and frequency of flight (1 -5 times per year/more than 5 times per year) with the method of payment, the offset provider and the project type were investigated for both scenarios. For this investigation, each respondent's preference per attribute was taken. A significant association was only found between the frequency of flights and the offset provider in the long-haul scenario ($\chi^2(1) = 4.627$, $p<.05$). Air travellers who travel more than five times per year are 2.49 times more likely to choose an airline as a VCO provider compared to those who travel 1 – 5 times per year.

5. Discussion and Limitations of the Research

This study investigated the influencws of various attributes of VCO schemes in the aviation industry on the customer‘s WTP. This chapter is dedicated to the interpretation of the results obtained. Following that, the hypotheses will be answered on the basis of the results obtained and put in relation to the research carried out so far. Moreover, this chapter discusses the limitations of the empirical research of this thesis.

5.1 Discussion of the Findings

The Impact of the Length of the Flight

H1 a	Air travellers are more willing to offset the emissions of their flight when travelling on *short-haul* compared to *long-haul*	accepted

The study shows a basically positive attitude of people towards VCO. In the analysis of both scenarios (*short-haul* and *long-haul*), the large majority of participants are willing to offset their flights. The conducted Phi-test showed that the number of participants choosing to offset their *short-haul* flight was significantly higher (1.529 times) than the number of participants choosing to offset their *long-haul* flight. This supports the theory which associates greater feelings of guilt with *short-haul* flights. Consequently, *H1 a* can be accepted.

H1 b	Air Travellers decide for a 100% offset when travelling on *short-haul*	rejected

The result of the simple counting of the individual levels showed that among the participants in the study, the largest share is decided for the 50% VCO (EUR 8) for a *short-haul* flight and for the 25% VCO (EUR 20) for a *long-haul* flight. The market simulation tool, however, took a closer look at this result and calculated situations in which offsetting with a certain price was the only option besides choosing not to offset. The market simulator found that 85.8% of air travellers offset their flight when the VCO price was at EUR 16 and they thereby offset the full level. The percentage of air travellers who offset their flight when the VCO price was EUR 8 (50% VCO) and EUR 4 (25% VCO) was, however, not considerably lower or equally high (85.1% and 85.8%

respectively). From this, it can be seen that the prices of VCO for *short-haul* flights did not influence the WTO of the participants. Accordingly, *H1 b*, which suggests that air travellers decide for a 100% VCO when travelling on *short-haul*, needs to be rejected. Hence, this finding cannot fully support the idea of a perceived "carbon guilt" on *short-haul* flights which would suggest a 100% VCO of a flight.

H1 c	The higher the price and the corresponding offset level on *long-haul* flights, the lower the willingness to offset among air travellers	accepted

A slightly different picture can be observed for *long-haul* flights. Counting the selections in relation to the frequency of the displays leads to the conclusion that most participants prefer the VCO of 25% for EUR 20. Through the market simulator it was found that as the VCO level and its corresponding price increase, the proportion of those willing to offset becomes smaller. This finding supports the theory that *long-haul* flights are associated with less guilt as alternative modes of transport are often not available on *long-haul* routes. However, an alternative explanation could be the greater price sensitivity on *long-haul* flights. This means that *H1 c* can be accepted.

Logically, the VCO of longer distances and thus greater emissions is associated with higher costs. As a result of this study, it can be summarized that air travellers have a higher WTO when flying on *short-haul* than on *long-haul*. This goes along with the theory that claims that air travellers associate a greater feeling of guilt to *short-haul* flights, due to the vast alternative options (Brouwer et al., 2008).

However, other than expected, participants did not predominantly choose the 100% VCO option on a *short-haul* flight. Considering the lower cost sensitivity of air travellers when flying on *short-haul* flights, highlighted by Blasch & Farsi (2014), the price of the VCO should not have had a strong influence on the offset decision.

It can be further concluded that air travellers WTO decreases with rising VCO price. This shows that air travellers accept to only partially offset their *long-haul* flight for the trade-off of a lower VCO price. At the same time, this implies that air travellers only partially mitigate the negative consequences of their travel on the environment.

H2	Air travellers are willing to pay more if an NGO is the VCO provider	rejected for long-haul / accepted for short-haul

A lack of knowledge about the availability of VCO offers can also be seen in the sample of this study. In the open question at the end of the questionnaire, only 24% of the participants stated that they did not know about VCOs. Compared to Gössling et al. (2009), who found out that 75% of air travellers do not know about VCO, a larger number of people seem to have been reached in the last decade. Mair (2011) felt that simplifying the VCO purchase process at the end of a booking process on an airline's webpage would not necessarily lead to increased sales. One reason for this may be a lack of trust (Blasch & Farsi, 2014; J. Higham et al., 2016; MacKerron et al., 2009).

This study found that air travellers when travelling on *short-haul*, are willing to pay more for a VCO when an NGO is the VCO provider compared to when the provider is an airline. It was computed that the WTP for a VCO when an NGO is the VCO provider lies between EUR 4 and EUR 12.

For *long-haul* flights, the results show that more participants decided to offset their flight for EUR 20 when the VCO provider was an NGO compared to when the VCO provider was an airline. However, as the price for a VCO offered by an NGO increased to EUR 40, fewer participants were still willing to offset their flight. The WTP for an NGO to be the VCO provider was calculated to lie between EUR 0 and EUR 20.

Due to the fact that in the *long-haul* scenario it could not be clearly determined whether air travellers are willing to pay more for the VCO with an NGO, *H2* must be rejected as it does not differentiate between *short-haul* and *long-haul*. Nevertheless, it should be noted that when only considering the *short-haul* scenario *H2* could be accepted.

Not knowing how a profit-oriented company like an airline uses the money seems to confirm the uncertainty emphasized by Broderick (2008) and Polonsky & Garma (2008) and the tendency of people to trust an NGO more than private companies (Populus, 2018). Consequently, airlines are well-advised to market their VCO services in cooperation with NGOs instead of doing so independently.

The Role of the VCO Project

H3	Air travellers are willing to pay more for a VCO, which lets the air traveller choose the VCO project oneself	accepted

A significant point of criticism is the lack of transparency (Babakhani et al., 2017; Brouwer et al., 2008; Gössling et al., 2009; Mair & Wong, 2010) in the VCO market. This study found that air travellers are willing to pay more when being able to choose the VCO project compared to when the project is unspecified. It was computed that the WTP for choosing the VCO project on *short-haul* flights is >EUR 12. Due to the structure of the survey, a maximum WTP could be determined. On *long-haul* flights, the WTP lies between EUR 20 and EUR 60. For both scenarios, air travellers prefer to know where their money is going instead of donating blindly to have a positive feeling quickly. Thus, *H3* can be accepted.

The findings imply that airlines are well-advised to provide air travellers with the option to choose the VCO project themselves rather than leaving the project unspecified. Further, they confirm findings of Blasch & Farsi, (2014) and MacKerron et al. (2009) who claim that air travellers are keen to learn about the details of the project.

The Role of the Method of Payment

H4 a	Willingness to offset is higher when the VCO can be paid with FFM rather than with money transfer	accepted

H4 b	For *long-haul* flights more air travellers choose to pay the VCO with FFM than for *short-haul* flights	accepted

This study distinguishes between various variables and also investigates the as yet unexplored field of the FFM payment method.

It was found that in general (not focusing on a particular scenario) participants preferred the option to pay the VCO via FFM over money transfer. *H4 a* can, therefore, be accepted. On closer analysis of the facts and differentiation between different flight lengths, it is noticeable that for *short-haul* flights, the majority of participants preferred to pay with their money over redeeming FFM for a VCO purchase. On *long-haul* flights, the majority of participants preferred to redeem their FFM over paying

the VCO with their money. This suggests that for many people, the value of their FFM is not equivalent to a monetary value. Especially in the scenario of *short-haul* flights, however, the lower cost sensitivity of air travellers, that has been identified by Blasch & Farsi (2014), is noticeable. This suggests that for shorter flights and smaller VCO prices, there is no real demand for an alternative payment method.

In sum, it can be said that the WTO with money decreases with increasing distance and air travellers prefer to be able to redeem their FFM. Consequently, *H4 b* can be accepted.

Especially for frequent flyers, for whom a VCO payment from their own budget can lead to high amounts of expenses, the possibility to redeem FFM for the purchase of VCOs would be an interesting option to encourage more air travellers to offset their flights. The fact that FFM is more demanded than money transfer on long-haul, shows that people who are travelling on long-haulflights are more likely to have FFM.

Ultimately, airlines may, therefore, be advised to develop an interface between their customer loyalty programs and sustainability offers.

5.2 Limitations and Future Research

The content of the survey also has its weaknesses. Firstly, the criteria were defined through an in-depth literature review. While a good overview could be gathered, the chosen attributes and their associated levels may not reflect every aspect of the decision situation of an air traveller. Representatives of airlines and VCO providers, the ones who are actually involved in the acquisition process, were not asked to tell what criteria they pay attention to. Doing so could have resulted in a different list of criteria.

Secondly, it should be noted that the socio-demographic characteristics of the sample were not balanced. While mainly people aged between 15-30 years participated, a balanced sample would possibly lead to different results.

Thirdly, the prices for specific VCO levels given in three categories allow only a very vague statement regarding the WTP of people. Here it would be advisable to include a slider to get the exact price people want to pay. This has not been possible in the course of this CBC.

Conjoint analysis has been criticised in a number of ways. According to Freeman III et al. (2014) and Urama & Hodge (2006), different elicitation formats have different utility functions and therefore come to different results. Also, Gregory et al. (2006)

claim that the attributes used and their associated levels do not necessarily reflect the true preferences of respondents. Accordingly, one takes the risk of running an analysis that does not address the actual preferences.
Rolfe et al. (2000) believe that there must be a balance in informing respondents about the survey and their role: In general, it can be said that too little information can lead to respondents not understanding their role in the survey, while too much information runs the risk of obtaining a non-representative sample.

In his study, Baumeister (2017) examines whether the choice of flights made by air travellers can make a difference in terms of their environmental impact. He noted that there were significant differences between flights, as carbon emissions per passenger could vary greatly. In case air travellers wish to mitigate the environmental impact of flights, they must rely on certain environmental measures, such as the use of modern, fuel-efficient aircraft or non-stop flights (Cowper-Smith & de Grosbois, 2011; Davison et al., 2014; Mayer et al., 2012). With each new generation of aircraft, fuel efficiency improves. This results in lower carbon dioxide emissions per passenger. At present, however, air travellers can only opt for flights that cause less carbon dioxide emissions per passenger with greater investigative effort. The choice is further complicated by the large variance of emissions from different airlines and aircraft types on the same route (Baumeister, 2017). Baumeister (2017) illustrates this with an example: On the *short-haul* route between Los Angeles and San Francisco, emissions per passenger can range from 71 kg CO2 on a direct flight to more than five times that amount when flying via Dallas. The same applies to a *long-haul* flight: from Los Angeles to London Heathrow, emissions per passenger vary from 594 kg CO2 on a non-stop flight to 1207 kg CO2 when transferring in Istanbul.

There exist two different business models airlines are using, which are called “Hub-and-Spoke” and “Point-to-Point”. The "Hub-and-Spoke" model promotes and increases the transfer and thus the distance covered between an origin and a destination. The “Point-to-Point” model concentrates on direct flights and fewer connections. Both of these models affect the distance flown and the type of aircraft used by an airline, which in turn has an impact on fuel consumption and emissions. The quantification of air transport emissions depends on the distance travelled (World Tourism Organization & International Transport Forum, 2019).

This shows that not only the actual flight length is decisive, but also the stopovers selected during the flight selection. Consequently, the choice of the flight and its stopovers certainly matter. This means that avoiding stopovers can also be seen as

another option to reduce CO2 emissions (Baumeister, 2017). In the course of this thesis, however, the focus was only put on flight length, not on possible stopovers.

Miyoshi & Mason (2009) point out that there is a discrepancy between the environmental performance of different airlines. Building on this, it can be argued that selecting the right flight could have an impact on the journey's environmental impact.

Conclusion

The aim of this thesis was to evaluate the influence of identified attributes of VCOs in the aviation industry on the customer's WTO. Therefore, four different product attributes were considered. First, the price of the VCO for a specific VCO level. Participants had the option to choose not to offset 100% of the emissions of their flight in order to find out whether air travellers who are willing to offset also accept to pay only fractions of a VCO. Further, due to known lack of trust towards VCOs, the choice of the provider of the VCO (is it offered by an airline or an NGO?) was given to the respondents. Also, the option to choose the VCO project that will benefit from the monetary contribution was provided to the respondents. Lastly, as some airlines already offer the redemption of FFM for the purchase of VCOs, respondents could choose to either pay the VCO with money or collected FFM. Due to the fact that it is known that the attitude towards different flight lengths varies, two scenarios were presented to the respondents of the study in order to examine the influence of these attributes on the respective distances.

The assessment of the examined attributes served to answer the research question of this thesis:

„How strong are the influences of various attributes of Voluntary Carbon Offset (VCO) schemes in the aviation industry relative to each other on the customer‘s willingness to offset?“

The following conclusion can be drawn from the study:

A generally high WTO exists among air travellers. For both scenarios *short-haul* and *long-haul*, the most important aspect for the participants was the price for a specific offset level.

The WTO is higher for *short-haul* flights than for *long-haul* flights, which reflects the theory that claims that air travellers perceive a greater feeling of guilt when flying on *short-haul*, due to the alternative modes of transport available. This feeling of guilt could be an indicator of the willingness of air travellers to choose a 100% VCO. Nevertheless, it was found that the share of air travellers who offset their flight was not considerably different among the contributions offered (25%/50%/100%). This shows that the price of the VCOs of *short-haul* flights alone does not have an impact on the

WTO, as the participants could not show significant preferences on the different prices and their level of offset. However, this also means that they were not (much) less willing to pay for a 100% offset, than a smaller amount. For *long-haul* flights, the proportion of those willing to offset becomes smaller. The importance of the price for a specific offset level was even higher compared to *short-haul* flights. It was found participants are accepting to only partially offset their flight at a lower price. This finding supports the theory that *long-haul* flights are less blameworthy as alternative modes of transport are often not available on *long-haul* routes.

The second important attribute influencing the air traveller's purchase decision is the option to choose the VCO project by oneself. For both scenarios *short-haul* and *long-haul*, air travellers are willing to pay more when they are able to choose the VCO project themselves instead of investing the money for an unspecified project. From this, it can be concluded that air travellers want to engage with their VCO payment and do not want to buy their VCO by a simple click at the end of the booking process of the flight. This confirms that details about the VCO improve transparency and reduce uncertainty about the investment. Giving air travellers the opportunity to choose the VCO project themselves is advice that can be given to airlines.

The method of payment is the next attribute that influences the VCO purchase decision. While FFM have begun to assume the status of a "pseudo-currency, it can be said that the WTO with money is higher for *short-haul* flights. For *long-haul* flights, air travellers prefer being able to redeem their FFM. It can thus be derived that due to the overestimation of the value of FFM, the choice of FFM as a payment method increases with rising VCO prices and increasing flight distances, indicating that the price is weaker when the payment is made with FFM rather than with money transfer.

Among the attributes examined, the offset provider (airline vs. NGO) is of the smallest relevance. For the scenario of a *short-haul* flight it was found that air travellers are willing to pay more if an NGO is the VCO provider. When considering the scenario of a long-haul flight, however, the calculated WTP could not clearly determine whether air travellers are also willing to pay more for an NGO to be the VCO provider. Nevertheless, it was found that air travellers who travel more than five times per year are 2.49 times more likely to choose an airline to be the VCO provider compared to air travellers who travel 1 – 5 times per year.

In summary, an increasing number of air travellers is aware of VCOs and willing to contribute to the mitigation of flight emissions. In order to be able to see this growing number reflected in increasing sales, airlines and those organisations offering VCOs need to make their products even more flexible and trustworthy. This means that, on the one hand, offers should vary according to the duration of the flight and, on the other hand, specifically tailored to customer segments, e.g. according to sexes, profession or even based on the flight frequency of air travellers. Moreover, air travellers should receive additional information about their voluntary payment in order to overcome possible mistrust.

Appendix

1. Screenshots of the survey questionnaire

Dear participant,

have you heard of CO2 compensations or Voluntary Carbon Offsets?
Nowadays, more and more airlines are dealing with the subject of those initiatives.

Every flight, depending on its length, produces a certain amount of CO2.
Voluntary Carbon Offsets allow individuals to invest in environmental projects that compensate the CO2 emissions related to their air travel.

In my research I would like to find out whether and when airline passengers are willing to contribute to such projects.

Completion of this survey will take approximately 10-12 minutes.

Your survey responses will be held strictly confidential and reported only in the aggregate.

Thank you in advance and kind regards,
Niklas Heck

Next

How old are you?

- ◯ below 18
- ◯ 18 - 35
- ◯ 35 - 50
- ◯ 50 - 70
- ◯ over 70

What is your gender?

- ◯ Male
- ◯ Female
- ◯ Transgender
- ◯ Prefer not to say

I am currently...

- ◯ Employee
- ◯ Self-employed
- ◯ Unemployed
- ◯ Student
- ◯ Retired

How many times a year do you book a flight (average number of return trips per year, based on last three years)?

- ◯ I did not fly at all
- ◯ 1 - 5 times per year
- ◯ 6 - 10 times per year
- ◯ More than 10 times per year

In case you indicated that you booked flights in the previous three years, most of your flights were...

- ◯ Short-haul (<3.000 km or <6 hours one way)
- ◯ Medium-haul (<6.000 km or <8 hours one way)
- ◯ Long-haul (>14.000 km or >8 hours one way)

Next

0% 100%

Imagine you are booking a **short-haul flight**. At the end of your booking process, you can voluntarily offset the emissions caused by your flight. The options shown on the following pages are available. Which one would you choose?

Next

0% 100%

Which option would you choose if you booked a **short-haul flight**?

(1 of 9)

You pay...	16€	4€	16€	
to offset... of the emissions caused by your flight	100% 	25% 	100% 	
You pay with...	Money	Money	Frequent Flyer Miles	NONE, I prefer not to offset.
Your contribution will be invested by...	an Airline	an Airline	a NGO	
Your contribution will be invested into...	a project of your choice	an unspecified project	an unspecified project	
	Select	Select	Select	Select

Next

Now, let's focus on a long-haul flight scenario.

Next

0% 100%

Which option would you choose if you booked a **long-haul flight**?

(1 of 9)

You pay...	80€	20€	80€	
to offset... of the emissions caused by your flight	100%	25%	100%	
				
You pay with...	Money	Money	Frequent Flyer Miles	NONE, I prefer not to offset.
Your contribution will be invested by...	an Airline	an Airline	a NGO	
Your contribution will be invested into...	a project of your choice	an unspecified project	an unspecified project	
	Select	Select	Select	Select

Next

(Optional)

Have you ever purchased a Voluntary Carbon Offset? If yes, why? If no, why not?

Next

0% 100%

Thank you very much for taking part in this survey.

In case of questions or suggestions, feel free to reach out to me at any time.

You can now close this tab.

universität wien

Niklas Heck
Business Administration
Contact: niklas.heck41@gmail.com

0% 100%

2. Demographic Information and Flight Behaviour of Respondents

Age -

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 35	113	80.1	80.1	80.1
	35 - 50	10	7.1	7.1	87.2
	50 - 70	17	12.1	12.1	99.3
	over 70	1	.7	.7	100.0
	Total	141	100.0	100.0	

Gender -

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	73	51.8	51.8	51.8
	Female	67	47.5	47.5	99.3
	Prefer not to say	1	.7	.7	100.0
	Total	141	100.0	100.0	

Employment -

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employee	78	55.3	55.3	55.3
	Self-employed	5	3.5	3.5	58.9
	A student	55	39.0	39.0	97.9
	Retired	3	2.1	2.1	100.0
	Total	141	100.0	100.0	

Frequency of Flights -

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	1.4	1.4	1.4
	1 - 5 times per year	98	69.5	69.5	70.9
	6 - 10 times per year	21	14.9	14.9	85.8
	More than 10 times per year	20	14.2	14.2	100.0
	Total	141	100.0	100.0	

Length of Flights -

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Short-haul	111	78.7	79.9	79.9
	Medium-haul	18	12.8	12.9	92.8
	Long-haul	10	7.1	7.2	100.0
	Total	139	98.6	100.0	
Missing	System	2	1.4		
Total		141	100.0		

Offset Past

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No Offset	64	45.4	45.4	45.4
	Offset	37	26.2	26.2	71.6
	No information	40	28.4	28.4	100.0
	Total	141	100.0	100.0	

3. Part-worth utilities obtained from Sawtooth

Label	Utility	Std Deviation	Lower 95% CI	Upper 95% CI
Price and Offset Amount				
EUR 16/100% Offset	-19,23	96,94	-35,23	-3,23
EUR 8/50% Offset	28,96	31,39	23,78	34,15
EUR 4/25% Offset	-9,73	85,53	-23,85	4,38
Method of Payment				
Money transfer	4,78	41,62	-2,09	11,65
Miles	-4,78	41,62	-11,65	2,09
Offset Provider				
Airline	-23,35	32,34	-28,69	-18,01
NGO	23,35	32,34	18,01	28,69
Projects				
Own Choice	45,04	37,44	38,86	51,22
Unspecified project	-45,04	37,44	-51,22	-38,86
None	-210,57	287,38	-258,00	-163,13

Label	Utility	Std Deviation	Lower 95% CI	Upper 95% CI
Price and Offset Amount				
EUR 80/100% Offset	-65,06	91,88	-80,22	-49,89
EUR 40/50% Offset	32,66	29,34	27,82	37,50
EUR 20/25% Offset	32,40	92,07	17,20	47,60
Method of Payment				
Money transfer	-8,67	36,59	-14,71	-2,64
Miles	8,67	36,59	2,64	14,71
Offset Provider				
Airline	-18,91	29,87	-23,84	-13,97
NGO	18,91	29,87	13,97	23,84
Projects				
Own Choice	46,27	29,62	41,38	51,16
Unspecified project	-46,27	29,62	-51,16	-41,38
None	-114,76	270,72	-159,44	-70,07

4. Results of Market Simulation obtained from Sawtooth

Short-haul scenario:

Age

Utility

Label	Total	18 - 35	35 - 50	50 - 70	over 70
100% Offset	-19,23	-25,18	-10,15	15,26	-23,90
50% Offset	28,96	29,25	28,47	26,82	37,72
25% Offset	-9,73	-4,07	-18,31	-42,08	-13,82
Money transfer	4,78	4,40	5,39	6,62	9,79
Miles	-4,78	-4,40	-5,39	-6,62	-9,79
Airline	-23,35	-22,56	-4,68	-35,71	-89,15
NGO	23,35	22,56	4,68	35,71	89,15
Own Choice	45,04	44,58	49,46	44,04	70,25
Unspecified project	-45,04	-44,58	-49,46	-44,04	-70,25
None	-210,57	-209,26	-106,11	-289,46	-61,87

Importance

Attribute	Total	18 - 35	35 - 50	50 - 70	over 70
Offset Price	42,55	42,75	42,56	42,86	15,41
Method of Payment	17,13	17,64	16,69	14,70	4,90
Offset Provider	15,94	15,33	16,03	18,29	44,57
Projects	24,37	24,28	24,73	24,15	35,12

Gender

Utility

Label	Total	Male	Female	Prefer not to say
100% Offset	-19,23	-17,49	-19,46	-130,59
50% Offset	28,96	25,85	32,22	37,94
25% Offset	-9,73	-8,36	-12,75	92,65
Money transfer	4,78	7,71	1,49	10,88
Miles	-4,78	-7,71	-1,49	-10,88
Airline	-23,35	-26,97	-19,55	-13,71
NGO	23,35	26,97	19,55	13,71
Own Choice	45,04	39,84	50,43	63,79
Unspecified project	-45,04	-39,84	-50,43	-63,79
None	-210,57	-213,62	-215,38	334,63

Importance

Attribute	Total	Male	Female	Prefer not to say
Offset Price	42,55	45,40	39,25	55,81
Method of Payment	17,13	15,57	19,00	5,44
Offset Provider	15,94	16,64	15,32	6,86
Projects	24,37	22,39	26,42	31,89

Employment

Utility

Label	Total	Employee	Self-employed	A student	Retired
100% Offset	-19,23	-26,21	44,70	-12,71	-63,73
50% Offset	28,96	30,54	25,08	26,14	46,15
25% Offset	-9,73	-4,33	-69,77	-13,43	17,58
Money transfer	4,78	2,25	15,83	7,19	7,90
Miles	-4,78	-2,25	-15,83	-7,19	-7,90
Airline	-23,35	-20,45	-59,01	-22,34	-57,78
NGO	23,35	20,45	59,01	22,34	57,78
Own Choice	45,04	49,30	34,78	38,62	69,11
Unspecified project	-45,04	-49,30	-34,78	-38,62	-69,11
None	-210,57	-174,98	-319,70	-271,32	159,82

Importance

Attribute	Total	Employee	Self-employed	A student	Retired
Offset Price	42,55	42,11	35,98	44,32	32,61
Method of Payment	17,13	16,90	17,12	18,18	3,95
Offset Provider	15,94	14,95	29,51	15,40	28,89
Projects	24,37	26,03	17,39	22,10	34,56

Frequency of Flights

Utility

Label	Total	Never	1 - 5 times per year	6 - 10 times per year	More than 10 times per year
100% Offset	-19,23	-39,22	-8,45	-7,59	-82,29
50% Offset	28,96	15,72	28,44	28,75	33,06
25% Offset	-9,73	23,50	-20,00	-21,16	49,23
Money transfer	4,78	46,22	7,06	-9,66	4,59
Miles	-4,78	-46,22	-7,06	9,66	-4,59
Airline	-23,35	-10,37	-27,47	-13,95	-14,30
NGO	23,35	10,37	27,47	13,95	14,30
Own Choice	45,04	12,89	45,24	53,17	38,76
Unspecified project	-45,04	-12,89	-45,24	-53,17	-38,76
None	-210,57	-316,98	-231,10	-195,38	-115,26

Importance

Attribute	Total	Never	1 - 5 times per year	6 - 10 times per year	More than 10 times per year
Offset Price	42,55	65,26	42,46	39,64	43,81
Method of Payment	17,13	23,11	17,08	16,85	17,11
Offset Provider	15,94	5,18	16,11	16,92	15,17
Projects	24,37	6,45	24,36	26,58	23,92

Length of Flights					
Utility					
Label	**Total**	**Short-haul**	**Medium-haul**	**Long-haul**	**Other**
100% Offset	-19,23	-25,71	13,16	-1,61	-39,22
50% Offset	28,96	31,46	19,47	20,98	15,72
25% Offset	-9,73	-5,75	-32,64	-19,36	23,50
Money transfer	4,78	1,21	19,98	8,69	46,22
Miles	-4,78	-1,21	-19,98	-8,69	-46,22
Airline	-23,35	-24,89	-23,52	-8,51	-10,37
NGO	23,35	24,89	23,52	8,51	10,37
Own Choice	45,04	45,90	40,43	50,26	12,89
Unspecified project	-45,04	-45,90	-40,43	-50,26	-12,89
None	-210,57	-203,36	-251,09	-196,36	-316,98

Importance					
Attribute	**Total**	**Short-haul**	**Medium-haul**	**Long-haul**	**Other**
Offset Price	42,55	42,14	43,47	40,90	65,26
Method of Payment	17,13	16,62	18,09	19,94	23,11
Offset Provider	15,94	16,17	16,96	13,69	5,18
Projects	24,37	25,07	21,48	25,48	6,45

Long-haul scenario:

Age

Utility

Label	Total	18 - 35	35 - 50	50 - 70	over 70
100% Offset	-65,06	-71,66	-52,08	-30,00	-45,44
50% Offset	32,66	32,66	34,52	32,18	22,66
25% Offset	32,40	39,00	17,56	-2,17	22,78
Money transfer	-8,67	-8,71	-14,64	-3,92	-25,64
Miles	8,67	8,71	14,64	3,92	25,64
Airline	-18,91	-15,31	-17,11	-40,22	-80,39
NGO	18,91	15,31	17,11	40,22	80,39
Own Choice	46,27	45,83	50,87	45,70	59,86
Unspecified project	-46,27	-45,83	-50,87	-45,70	-59,86
None	-114,76	-110,44	-70,81	-180,19	70,39

Importance

Attribute	Total	18 - 35	35 - 50	50 - 70	over 70
Offset Price	49,71	50,72	48,29	45,80	17,06
Method of Payment	14,10	14,94	11,32	10,25	12,82
Offset Provider	12,62	11,05	14,95	20,11	40,20
Projects	23,56	23,30	25,44	23,84	29,93

Gender

Utility

Label	Total	Male	Female	Prefer not to say
100% Offset	-65,06	-64,61	-64,44	-139,26
50% Offset	32,66	31,77	33,67	29,82
25% Offset	32,40	32,84	30,77	109,45
Money transfer	-8,67	-6,55	-11,00	-8,01
Miles	8,67	6,55	11,00	8,01
Airline	-18,91	-19,93	-17,91	-10,80
NGO	18,91	19,93	17,91	10,80
Own Choice	46,27	43,49	49,15	56,84
Unspecified project	-46,27	-43,49	-49,15	-56,84
None	-114,76	-117,54	-118,00	305,70

Importance

Attribute	Total	Male	Female	Prefer not to say
Offset Price	49,71	49,96	49,26	62,18
Method of Payment	14,10	14,58	13,73	4,01
Offset Provider	12,62	13,01	12,31	5,40
Projects	23,56	22,45	24,70	28,42

Employment

Utility

Label	Total	Employee	Self-employed	A student	Retired
100% Offset	-65,06	-72,95	-67,25	-52,40	-88,34
50% Offset	32,66	31,47	52,75	33,06	22,92
25% Offset	32,40	41,49	14,50	19,34	65,42
Money transfer	-8,67	-12,68	32,58	-6,81	-7,43
Miles	8,67	12,68	-32,58	6,81	7,43
Airline	-18,91	-15,90	-49,98	-18,47	-53,21
NGO	18,91	15,90	49,98	18,47	53,21
Own Choice	46,27	44,40	47,32	48,39	54,55
Unspecified project	-46,27	-44,40	-47,32	-48,39	-54,55
None	-114,76	-77,78	-181,50	-175,86	155,31

Importance

Attribute	Total	Employee	Self-employed	A student	Retired
Offset Price	49,71	53,03	31,07	47,32	38,44
Method of Payment	14,10	13,17	18,56	15,37	7,68
Offset Provider	12,62	11,49	24,99	12,34	26,60
Projects	23,56	22,31	25,37	24,97	27,28

Frequency of Flights

Utility

Label	Total	Never	1 - 5 times per year	6 - 10 times per year	More than 10 times per year
100% Offset	-65,06	-152,41	-56,23	-49,59	-115,83
50% Offset	32,66	24,34	31,22	39,58	33,26
25% Offset	32,40	128,06	25,01	10,00	82,56
Money transfer	-8,67	-4,80	-4,16	-30,94	-7,81
Miles	8,67	4,80	4,16	30,94	7,81
Airline	-18,91	-6,05	-23,73	-4,00	-12,21
NGO	18,91	6,05	23,73	4,00	12,21
Own Choice	46,27	48,91	45,52	53,37	42,27
Unspecified project	-46,27	-48,91	-45,52	-53,37	-42,27
None	-114,76	107,19	-143,18	-98,17	-15,11

Importance

Attribute	Total	Never	1 - 5 times per year	6 - 10 times per year	More than 10 times per year
Offset Price	49,71	70,12	49,37	45,24	54,06
Method of Payment	14,10	2,40	14,14	18,02	10,99
Offset Provider	12,62	3,02	13,13	10,06	13,81
Projects	23,56	24,46	23,37	26,68	21,14

Length of Flights					
Utility					
Label	**Total**	**Short-haul**	**Medium-haul**	**Long-haul**	**Other**
100% Offset	-65,06	-64,66	-62,16	-57,27	-152,41
50% Offset	32,66	32,87	28,75	38,97	24,34
25% Offset	32,40	31,78	33,41	18,30	128,06
Money transfer	-8,67	-10,12	2,97	-14,40	-4,80
Miles	8,67	10,12	-2,97	14,40	4,80
Airline	-18,91	-21,47	-10,98	-7,31	-6,05
NGO	18,91	21,47	10,98	7,31	6,05
Own Choice	46,27	46,67	37,35	57,41	48,91
Unspecified project	-46,27	-46,67	-37,35	-57,41	-48,91
None	-114,76	-113,75	-144,92	-116,04	107,19

Importance					
Attribute	**Total**	**Short-haul**	**Medium-haul**	**Long-haul**	**Other**
Offset Price	49,71	48,60	55,70	47,26	70,12
Method of Payment	14,10	14,17	14,16	15,62	2,40
Offset Provider	12,62	13,44	10,99	8,41	3,02
Projects	23,56	23,80	19,15	28,71	24,46

5. Phi-test

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Offset/no offset * Length of Flight	2538	100.0%	0	0.0%	2538	100.0%

*Offset/no offset * Length of Flight Crosstabulation*

Count

		Length of Flight		
		Short-haul	Long-haul	Total
Offset/no offset	Offset	1180	869	2049
	No offset	230	259	489
Total		1410	1128	2538

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	-.084	.000
	Cramer's V	.084	.000
N of Valid Cases		2538	

6. Chi-square test: Gender

***Offset Decision Short-haul** * **Gender** Crosstabulation*

Count

		GENDER		
		Male	Female	Total
Offset Decision Short-haul	Offset	479	520	999
	No offset	97	74	171
Total		576	594	1170

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.500[a]	1	.034		
Continuity Correction[b]	4.156	1	.041		
Likelihood Ratio	4.509	1	.034		
Fisher's Exact Test				.038	.021
Linear-by-Linear Association	4.497	1	.034		
N of Valid Cases	1170				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 84.18.

b. Computed only for a 2x2 table

Offset decision Long-haul* * *Gender *Crosstabulation*

Count

		GENDER		
		Male	Female	Total
Offset decision Long-haul	Offset	445	474	919
	No offset	131	120	251
Total		576	594	1170

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.121[a]	1	.290		
Continuity Correction[b]	.975	1	.323		
Likelihood Ratio	1.121	1	.290		
Fisher's Exact Test				.319	.162
Linear-by-Linear Association	1.120	1	.290		
N of Valid Cases	1170				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 123.57.

b. Computed only for a 2x2 table

Gender * Payment method Short-haul

Crosstabulation

Count

		PaymentMethod_Short-haul		
		FFM	Money transfer	Total
Gender	Male	28	36	64
	Female	31	35	66
Total		59	71	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.136[a]	1	.712		
Continuity Correction[b]	.037	1	.847		
Likelihood Ratio	.136	1	.712		
Fisher's Exact Test				.728	.424
Linear-by-Linear Association	.135	1	.713		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 29.05.

b. Computed only for a 2x2 table

Gender * Payment method Long-haul

Crosstabulation

Count

		PaymentMethod_Long-haul		
		FFM	Money transfer	Total
Gender	Male	43	21	64
	Female	45	21	66
Total		88	42	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.015[a]	1	.904		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.015	1	.904		
Fisher's Exact Test				1.000	.526
Linear-by-Linear Association	.015	1	.904		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 20.68.

b. Computed only for a 2x2 table

Gender * Offset Provider Short-haul

Crosstabulation

Count

		OffsetProvider_Short-haul		Total
		NGO	Airline	
Gender	Male	52	12	64
	Female	50	16	66
Total		102	28	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.580[a]	1	.446		
Continuity Correction[b]	.301	1	.584		
Likelihood Ratio	.582	1	.446		
Fisher's Exact Test				.524	.292
Linear-by-Linear Association	.576	1	.448		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.78.

b. Computed only for a 2x2 table

Gender * Offset Provider Long-haul

Crosstabulation

Count

		OffsetProvider_Long-haul		Total
		NGO	Airline	
Gender	Male	50	14	64
	Female	50	16	66
Total		100	30	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.103[a]	1	.749		
Continuity Correction[b]	.013	1	.911		
Likelihood Ratio	.103	1	.749		
Fisher's Exact Test				.836	.456
Linear-by-Linear Association	.102	1	.750		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.77.

b. Computed only for a 2x2 table

Gender * Project Type Short-haul

Crosstabulation

Count

		ProjectType_Short-haul		
		Unspecified project	Own choice	Total
Gender	Male	8	56	64
	Female	4	62	66
Total		12	118	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.608[a]	1	.205		
Continuity Correction[b]	.931	1	.335		
Likelihood Ratio	1.634	1	.201		
Fisher's Exact Test				.238	.168
Linear-by-Linear Association	1.596	1	.207		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.91.

b. Computed only for a 2x2 table

Gender * Project Type Long-haul

Crosstabulation

Count

		ProjectType_Long-haul		
		Unspecified project	Own choice	Total
Gender	Male	2	62	64
	Female	1	65	66
Total		3	127	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.374[a]	1	.541		
Continuity Correction[b]	.001	1	.978		
Likelihood Ratio	.380	1	.538		
Fisher's Exact Test				.616	.488
Linear-by-Linear Association	.371	1	.543		
N of Valid Cases	130				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.48.

b. Computed only for a 2x2 table

7. Chi-square test: Employment

Offset Decision Short-haul * Employment
Crosstabulation
Count

		Employment		
		Employee	Student	Total
Offset Decision Short-haul	Offset	567	432	999
	No offset	126	45	171
Total		693	477	1170

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	17.325[a]	1	.000		
Continuity Correction[b]	16.631	1	.000		
Likelihood Ratio	18.143	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	17.310	1	.000		
N of Valid Cases	1170				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 69.72.
b. Computed only for a 2x2 table

Offset decision Long-haul * Employment

Crosstabulation

Count

		Employment		
		Employee	Student	Total
Offset decision Long-haul	Offset	514	405	919
	No offset	179	72	251
Total		693	477	1170

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	19.323[a]	1	.000		
Continuity Correction[b]	18.692	1	.000		
Likelihood Ratio	19.959	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	19.307	1	.000		
N of Valid Cases	1170				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 102.33.

b. Computed only for a 2x2 table

Employment * Payment Method Short-haul

Crosstabulation

Count

		PaymentMethod_Short-haul		
		FFM	Money transfer	Total
Employment	Employee	35	42	77
	Student	24	29	53
Total		59	71	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.000[a]	1	.985		
Continuity Correction[b]	.000	1	1,000		
Likelihood Ratio	.000	1	.985		
Fisher's Exact Test				1.000	.564
Linear-by-Linear Association	.000	1	.985		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 24.05.

b. Computed only for a 2x2 table

Employment * Payment Method Long-haul

Crosstabulation

Count

		PaymentMethod_Long-haul		
		FFM	Money transfer	Total
Employment	Employee	56	21	77
	Student	32	21	53
Total		88	42	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.189[a]	1	.139		
Continuity Correction[b]	1.661	1	.197		
Likelihood Ratio	2.173	1	.140		
Fisher's Exact Test				.182	.099
Linear-by-Linear Association	2.172	1	.141		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 17.12.

b. Computed only for a 2x2 table

Employment * Offset Provider Short-haul

Crosstabulation

Count

		OffsetProvider_ Short-haul		
		NGO	Airline	Total
Employment	Employee	62	15	77
	Student	40	13	53
Total		102	28	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.473[a]	1	.491		
Continuity Correction[b]	.222	1	.638		
Likelihood Ratio	.469	1	.493		
Fisher's Exact Test				.521	.317
Linear-by-Linear Association	.470	1	.493		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.42.

b. Computed only for a 2x2 table

Employment * Offset Provider Long-haul

Crosstabulation

Count

		OffsetProvider_Long-haul		
		NGO	Airline	Total
Employment	Employee	59	18	77
	Student	41	12	53
Total		100	30	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.010[a]	1	.922		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.010	1	.922		
Fisher's Exact Test				1.000	.548
Linear-by-Linear Association	.009	1	.922		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 12.23.

b. Computed only for a 2x2 table

Employment * Project Type Short-haul

Crosstabulation

Count

		ProjectType_Short-haul		
		Unspecified project	Own choice	Total
Employment	Employee	6	71	77
	Student	6	47	53
Total		12	118	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.466[a]	1	.495		
Continuity Correction[b]	.140	1	.708		
Likelihood Ratio	.459	1	.498		
Fisher's Exact Test				.547	.350
Linear-by-Linear Association	.463	1	.496		
N of Valid Cases	130				

a. 1 cells (25,0%) have expected count less than 5. The minimum expected count is 4,89.

b. Computed only for a 2x2 table

Employment * Project Type Long-haul

Crosstabulation

Count

		ProjectType_Long-haul		
		Unspecified project	Own choice	Total
Employment	Employee	1	76	77
	Student	2	51	53
Total		3	127	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.853[a]	1	.356		
Continuity Correction[b]	.108	1	.742		
Likelihood Ratio	.837	1	.360		
Fisher's Exact Test				.567	.362
Linear-by-Linear Association	.846	1	.358		
N of Valid Cases	130				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.22.

b. Computed only for a 2x2 table

8. Chi-square test: Frequency of Flights

Offset Decision Short-haul * Frequency of Flights

Crosstabulation

Count

		Frequency of Flights		
		1 - 5 times per year	More than 5 times per year	Total
Offset Decision Short-haul	Offset	712	287	999
	No offset	98	73	171
Total		810	360	1170

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.360[a]	1	.000		
Continuity Correction[b]	12.713	1	.000		
Likelihood Ratio	12.747	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	13.349	1	.000		
N of Valid Cases	1170				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 52.62.

b. Computed only for a 2x2 table

Offset decision Long-haul * Frequency of Flights

Crosstabulation

Count

		Frequency of Flights		
		1 - 5 times per year	More than 5 times per year	Total
Offset decision Long-haul	Offset	660	259	919
	No offset	150	101	251
Total		810	360	1170

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	13.453[a]	1	.000		
Continuity Correction[b]	12.893	1	.000		
Likelihood Ratio	13.007	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	13.441	1	.000		
N of Valid Cases	1170				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 77.23.

b. Computed only for a 2x2 table

Frequency of Flights * Payment Method Short-haul

Crosstabulation

Count

		PaymentMethod_Short-haul		
		FFM	Money transfer	Total
Frequency Of Flights	1 - 5 times per year	39	51	90
	more than 5 times per year	20	20	40
Total		59	71	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.497[a]	1	.481		
Continuity Correction[b]	.264	1	.607		
Likelihood Ratio	.496	1	.481		
Fisher's Exact Test				.568	.303
Linear-by-Linear Association	.493	1	.483		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 18.15.

b. Computed only for a 2x2 table

Frequency of Flights * Payment Method Short-haul

Crosstabulation

Count

		PaymentMethod_Long-haul		
		FFM	Money transfer	Total
Frequency Of Flights	1 - 5 times per year	59	31	90
	more than 5 times per year	29	11	40
Total		88	42	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.611[a]	1	.435		
Continuity Correction[b]	.334	1	.563		
Likelihood Ratio	.621	1	.431		
Fisher's Exact Test				.543	.284
Linear-by-Linear Association	.606	1	.436		
N of Valid Cases	130				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 12,92.

b. Computed only for a 2x2 table

Frequency of Flights * Offset Provider Short-haul

Crosstabulation

Count

		OffsetProvider_Short-haul		
		NGO	Airline	Total
Frequency Of Flights	1 - 5 times per year	74	16	90
	more than 5 times per year	28	12	40
Total		102	28	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.448[a]	1	.118		
Continuity Correction[b]	1.778	1	.182		
Likelihood Ratio	2.351	1	.125		
Fisher's Exact Test				.164	.093
Linear-by-Linear Association	2.429	1	.119		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.62.

b. Computed only for a 2x2 table

Frequency of Flights * Offset Provider Long-haul

Crosstabulation

Count

		OffsetProvider_Long-haul		
		NGO	Airline	Total
Frequency Of Flights	1 - 5 times per year	74	16	90
	more than 5 times per year	26	14	40
Total		100	30	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.627[a]	1	.031		
Continuity Correction[b]	3.708	1	.054		
Likelihood Ratio	4.416	1	.036		
Fisher's Exact Test				.042	.029
Linear-by-Linear Association	4.591	1	.032		
N of Valid Cases	130				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.23.

b. Computed only for a 2x2 table

Frequency of Flights * Project Type Short-haul

Crosstabulation

Count

		ProjectType_Short-haul		
		Unspecified project	Own choice	Total
Frequency Of Flights	1 - 5 times per year	10	80	90
	more than 5 times per year	2	38	40
Total		12	118	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.234[a]	1	.267		
Continuity Correction[b]	.613	1	.434		
Likelihood Ratio	1.369	1	.242		
Fisher's Exact Test				.341	.222
Linear-by-Linear Association	1.225	1	.268		
N of Valid Cases	130				

a. 1 cells (25,0%) have expected count less than 5. The minimum expected count is 3,69.

b. Computed only for a 2x2 table

Frequency of Flights * Project Type Long-haul

Crosstabulation

Count

		ProjectType_Long-haul		
		Unspecified project	Own choice	Total
Frequency Of Flights	1 - 5 times per year	3	87	90
	more than 5 times per year	0	40	40
Total		3	127	130

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.365[a]	1	.243		
Continuity Correction[b]	.287	1	.592		
Likelihood Ratio	2.238	1	.135		
Fisher's Exact Test				.552	.328
Linear-by-Linear Association	1.354	1	.245		
N of Valid Cases	130				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .92.

b. Computed only for a 2x2 table

References

Air BP Limited. (2019). *What is sustainable aviation fuel (SAF) and why is it important? | News and views*. Air BP. Retrieved 1 February 2020, from https://www.bp.com/en/global/air-bp/news-and-views/sterling-card-newsletters/what-is-sustainable-aviation-fuel-saf-and-why-is-it-important.html

Akter, S., Brouwer, R., Brander, L., & van Beukering, P. (2009). Respondent uncertainty in a contingent market for carbon offsets. *Ecological Economics*, *68*(6), 1858–1863.

Allpress, J., Barlow, F., Brown, R., & Louis, W. (2010). Atoning for Colonial Injustices: Group-Based Shame and Guilt Motivate Support for Reparation. *International Journal of Conflict and Violence*, *4*, 77-78.

Alriksson, S., & Öberg, T. (2008). Conjoint analysis for environmental evaluation: A review of methods and applications. *Environmental Science and Pollution Research*, *15*(3), 244–257.

Altman, M. (2012). Behavioral Economics For Dummies. *John Wiley & Sons Canada, Ltd.,* 41-65.

Armstrong, T. (2019). The Human Odyssey: Navigating the Twelve Stages of Life. *Courier Dover Publications,* 1-368.

Babakhani, N., Ritchie, B. W., & Dolnicar, S. (2017). Improving carbon offsetting appeals in online airplane ticket purchasing: Testing new messages, and using new test methods. *Journal of Sustainable Tourism*, *25*(7), 955–969.

Babić, R. Š., Tatalović, M., & Bajić, J. (2017). Air Transport Competition Challenges.. *International Journal for Traffic and Transport Engineering*, *144-147*.

Bamberg, S. (2003). How Does Environmental Concern Influence Specific Environmentally Related Behaviors? A New Answer to an Old Question. *Journal of Environmental Psychology*, *23*, 21–32.

Basil, D. Z., Ridgway, N. M., & Basil, M. D. (2006). Guilt appeals: The mediating effect of responsibility. *Psychology and Marketing*, *23*(12), 1035–1054.

Basumallick, D., Ozdaryal, B., & Madamba-Brown, C. (2013). Perceived value of a mile. *Journal of Revenue and Pricing Management*, *12*(1), 8–15.

Bateman, I. J., Carson, R. T., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Özdemiroglu, E., Pearce, D. W., Sugden, R., & Swanson, J. (2004). Economic Valuation with Stated Preference Techniques: A Manual. *Ecological Economics*, *50*(1–2), 155–156.

Baumeister, R. F., Stillwell, A. M., & Heatherton, T. F. (1994). Guilt: An Interpersonal Approach. *Psychological Bulletin*, *115*, 245-267.

Baumeister, S. (2017). 'Each flight is different': Carbon emissions of selected flights in three geographical markets. *Transportation Research Part D: Transport and Environment*, *57*, 1–9.

Becken, S., & Mackey, B. (2017). What role for offsetting aviation greenhouse gas emissions in a deep-cut carbon world? *Journal of Air Transport Management*, *63*, 71–83.

Belobaba, P. P., Odoni, A., & Barnhart, C. (2016). *The global airline industry* (second edition.). *Chichester, U.K: Wiley,* 2-11.

Ben-Akiva, M., McFadden, D., & Train, K. (2019). Foundations of Stated Preference Elicitation: Consumer Behavior and Choice-based Conjoint Analysis. *Foundations and Trends® in Econometrics*, *10*(1–2), 1–144.

Bichler, A., & Trommsdorff, V. (2009). Präferenzmodelle bei der Conjointanalyse. In D. Baier & M. Brusch, *Conjointanalyse: Methoden, Anwendungen, Praxisbeispiele* (pp. 59–71). Springer Berlin Heidelberg.

Blamey, R. K., Bennett, J. W., Louviere, J. J., Morrison, M. D., & Rolfe, J. C. (2002). Attribute Causality in Environmental Choice Modelling. *Environmental and Resource Economics*, 167–186.

Blasch, J., & Farsi, M. (2014). Context effects and heterogeneity in voluntary carbon offsetting – a choice experiment in Switzerland. *Journal of Environmental Economics and Policy*, *3*(1), 1–24.

Boon, B. H., Schroten, A., & Kampman, B. (2007). Compensation schemes for air transport. In P. Peters, *Tourism and climate change mitigation: Methods, greenhouse gas reductions and policies* (pp. 77–90). NHTV Academic Studies.

Broderick, J. (2008). Voluntary carbon offsets: A contribution to sustainable tourism? *Sustainable Tourism Futures: Perspectives on Systems, Restructuring and Innovations*, 169–199.

Brouwer, R., Brander, L., & Van Beukering, P. (2008). "A convenient truth": Air travel passengers' willingness to pay to offset their CO2 emissions. *Climatic Change*, *90*(3), 299–313.

Carillo, A. (n.d.). *The role of voluntary carbon offsetting in a post-Paris world | The Gold Standard*. Retrieved 5 February 2020, Retrieved 5 February 2020, from https://www.goldstandard.org/blog-item/role-voluntary-carbon-offsetting-post-paris-world

Choi, A. S., & Ritchie, B. W. (2014). Willingness to pay for flying carbon neutral in Australia: An exploratory study of offsetter profiles. *Journal of Sustainable Tourism*, *22*(8), 1236–1256.

Choi, A. S., Ritchie, B. W., & Fielding, K. S. (2016). A Mediation Model of Air Travelers' Voluntary Climate Action. *Journal of Travel Research*, *55*(6), 709–723.

Chrzan, K., & Orme, B. (2000). An Overview and Comparison of Design Strategies for Choice-Based Conjoint Analysis. *Sawtooth Software, Inc.,* 1-19.

Climate Action Tracker. (2018). *Warming Projections Global Update*. Retrieved 24 February 2020, from https://climateactiontracker.org/documents/507/CAT_2018-12-11_Briefing_WarmingProjectionsGlobalUpdate_Dec2018.pdf

Climate Corporation. (n.d.). *Voluntary Carbon Market | Climate Corporation*. Retrieved 3 February 2020, from http://climatecorp.eu/the-co2-market/facts-figures/

Cowper-Smith, A., & de Grosbois, D. (2011). The adoption of corporate social responsibility practices in the airline industry. *Journal of Sustainable Tourism*, *19*(1), 59–77.

Damigos, D., & Kaliampakos, D. (2003). Environmental Economics and the Mining Industry: Monetary benefits of an abandoned quarry rehabilitation in Greece. *International Journal of Geosciences*, *44*, 356-362.

Davison, L., Littleford, C., & Ryley, T. (2014). Air travel attitudes and behaviours: The development of environment-based segments. *Journal of Air Transport Management*, *36*, 13–22.

Dickie, M., Gerking, S., & Goffe, W. L. (2007). Valuation of Non-Market Goods Using Computer-Assisted Surveys: A Comparison of Data Quality from Internet and RDD Samples, *Department of Economics, University of Central Florida, Orlando,* 1-36.

Diederich, J., & Goeschl, T. (2011). Willingness to Pay for Individual Greenhouse Gas Emissions Reductions: Evidence from a Large Field Experiment. *Working Papers 0517, University of Heidelberg, Department of Economics*, 1-32.

Doney, P., Cannon, J., & Mullen, M. (1998). Understanding the influence of national culture on the development of trust. *Acad. Manage. Rev.*, *23*, 601-620.

easyJet Airline Company Limited. (2019). *Resilient Focused Data Driven—Annual Report and Accounts 2019*.

Eijgelaar, E. (2011). Voluntary Carbon Offsets a Solution for Reducing Tourism Emissions? Assessment of Communication Aspects and Mitigation Potential. *European Journal Of Transport And Infrastructure Research, 11(3),* 281-296.

Elgaaïed-Gambier, L. (2012). Exploring the role of anticipated guilt on pro-environmental behavior - a suggested typology of residents in France based on their recycling patterns. *Journal of Consumer Marketing*, 29, 369-377.

European Commission. (2016a, November 23). *EU Emissions Trading System (EU ETS)* [Text]. Climate Action - European Commission. Retrieved 5 February 2020, from https://ec.europa.eu/clima/policies/ets_en

European Commission. (2016b, November 23). *Reducing emissions from aviation* [Text]. Climate Action - European Commission. Retrieved 5 February 2020, from https://ec.europa.eu/clima/policies/transport/aviation_en

European Commission. (2017). *Attitudes of European citizens towards the environment*. Retrieved 2 February 2020, from https://ec.europa.eu/environment/eurobarometers_en.htm

Field, A. (2013). Discovering statistics using IBM SPSS statistics: And sex and drugs and rock 'n' roll (4th edition). *Springer,* 45-89.

Freeman III, A. M., Herriges, J. A., & Kling, C. L. (2014). The Measurement of Environmental and Resource Values (Third Edition). *RFF Press*, 225-227.

Fukuyama, F. (1995). Trust: The social virtues and the creation of prosperity. *Free Press,* 24-26.

Gao, Y. (Lisa), & Mattila, A. S. (2019). The social influence of other consumers on consumers' reward donations. *International Journal of Hospitality Management*, *77*, 504–511.

Gensler, S., Hinz, O., Skiera, B., & Theysohn, S. (2012). Willingness-to-pay estimation with choice-based conjoint analysis: Addressing extreme response behavior with individually adapted designs. *European Journal of Operational Research*, *219*(2), 368–378.

Giorgino, F. C. (2019). Destination Green The Next Chapter. *ICAO,* 18-35.

Goodward, J., & Kelly, A. (2010). The bottom line on offsets. *World Resources Institute*, 1-2.

Gössling, S., Broderick, J., Upham, P., Ceron, J.-P., Dubois, G., Peeters, P., & Strasdas, W. (2007). Voluntary Carbon Offsetting Schemes for Aviation: Efficiency, Credibility and Sustainable Tourism. *Journal of Sustainable Tourism*, *15*(3), 223–248.

Gössling, S., Haglund, L., Kallgren, H., Revahl, M., & Hultman, J. (2009). Swedish air travellers and voluntary carbon offsets: Towards the co-creation of environmental value? *Current Issues in Tourism*, *12*(1), 1–19.

Graver, B., Zhang, K., & Rutherford, D. (2019). CO2 emissions from commercial aviation, 2018. *International Council on Clean Transportation*, 1-13.

Green, J. F. (2016, October). *The world is about to get tough on aviation emissions. Here's what you need to know*. Washington Post. Retrieved 5 February 2020, from https://www.washingtonpost.com/news/monkey-cage/wp/2016/10/14/the-world-is-about-to-get-tough-on-aviation-emissions-heres-what-you-need-to-know/

Green, P. E., Krieger, A. M., & Wind, Y. (Jerry). (2001). Thirty Years of Conjoint Analysis: Reflections and Prospects. *Interfaces*, *31*(3), 56–73.

Green, P. E., & Rao, V. R. (1971). Conjoint Measurement for Quantifying Judgmental Data. *Journal of Marketing Research*, *8*(3), 355–363.

Gregory, R., Lichtenstein, S., & Slovic, P. (2006). Valuing Environmental Resources: A Constructive Approach. In S. Lichtenstein & P. Slovic, *The Construction of Preference* (pp. 609–628). Cambridge University Press.

Gupta, S., & Ogden, D. T. (2009). To buy or not to buy? A social dilemma perspective on green buying. *Journal of Consumer Marketing*, *26*, 376-391.

Hagmann, C., Semeijn, J., & Vellenga, D. B. (2015). Exploring the green image of airlines: Passenger perceptions and airline choice. *Journal of Air Transport Management*, *43*, 37–45.

Haines, G. H., Howard, J. A., & Sheth, J. N. (1970). The Theory of Buyer Behavior. *Journal of the American Statistical Association*, *65*(331), 1406-1407.

Hamilton, T., Spengler, N., Blaess, F., Dibb, R., DeJonge, A., Freise, M., Ruff, K., Omona, J., Reichard, C., Stephenson, M., Martens, K., Burger, R., Owens, T., Pacheco-Vega, R., Sacharko, J., Groneberg, A., Lewis, D., A. Metelsky, B., Renz, D. O., … Thuemler, E. (2010). Nongovernmental Organizations, Definition and History. In H. K. Anheier & S. Toepler (Eds.), *International Encyclopedia of Civil Society* (pp. 1056–1062). Springer US.

Hamrick, K., & Brotto, L. (2017). State of European Markets 2017 Voluntary Carbon. *Ecosystem Marketplace*, 2-44.

Hamrick, K., & Gallant, M. (2018). Voluntary Carbon Markets Insights: 2018 Outlook and First Quarter Trends. *Ecosystem Marketplace*, 1-24.

Hasberg, K. S. (2019). Research note: Flight shame. *Department of Planning, Aalborg University Copenhagen*, 1-3.

Higham, J., Cohen, S. A., Cavaliere, C. T., Reis, A., & Finkler, W. (2016). Climate change, tourist air travel and radical emissions reduction. *Journal of Cleaner Production*, *111*, 336–347.

Higham, J. E. S., & Cohen, S. A. (2011). Canary in the coalmine: Norwegian attitudes towards climate change and extreme long-haul air travel to Aotearoa/New Zealand. *Tourism Management*, *32*(1), 98–105.

Hill, A. R. (2017). The CBC System for Choice-Based Conjoint Analysis. *Sawtooth Software, Inc.*, 2-28.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis. *The Journal of Environmental Education*, *18*(2), 1–8.

Holloway, J. C. (2004). Marketing for Tourism. *Prentice Hall*, 343-359.

Homburg, A., & Stolberg, A. (2006). Explaining pro-environmental behavior with a cognitive theory of stress. *Journal of Environmental Psychology*, *26*(1), 1–14.

Hooper, D. P., Daley, D. B., Preston, H., & Thomas, C. (2008). An Assessment of the Potential of Carbon Offset Schemes to Mitigate the Climate Change Implications of Future Growth of UK Aviation. *Centre for Air Transport and the Environment*, 4-88.

Huhmann, B. A., & Brotherton, T. P. (1997). A Content Analysis of Guilt Appeals in Popular Magazine Advertisements. *Journal of Advertising*, *26*, 35-45.

IATA. (2008). *Aviation carbon offset programmes.*

IATA. (2018). *Fact Sheet Climate Change.*

IATA. (2019a). *Annual Review 2019.*

IATA. (2019b). *CORSIA Factsheet.*

ICAO. (n.d.). *What is CORSIA and how does it work?* Retrieved 7 February 2020, from https://www.icao.int/environmental-protection/Pages/A39_CORSIA_FAQ2.aspx

ICAO. (2016). *On Board a Sustainable Future.*

ICAO. (2017). *Sustainable Aviation Fuels Guide.*

International Energy Agency. (2008*). Voluntary Carbon Offsets. IEA Greenhouse Gas R&D Programme,* 1-28.

Jansen, S. J. T., Coolen, H. C. C. H., & Goetgeluk, R. W. (Eds.). (2011). The Measurement and Analysis of Housing Preference and Choice. *Springer Netherlands,* 127-153.

Jiang, J.-C., Chen, C.-A., & Wang, C.-C. (2008). Knowledge and Trust in E-consumers' Online Shopping Behavior. *International Symposium on Electronic Commerce and Security, Guangzhou City*, 652-656.

Jones, N., Sophoulis, C. M., & Malesios, C. (2008). Economic valuation of coastal water quality and protest responses: A case study in Mitilini, Greece. *Journal of Socio-Economics*, *37(6)*, 2478-2491.

Keating, V. C., & Thrandardottir, E. (2017). NGOs, trust, and the accountability agenda. *The British Journal of Politics and International Relations*, *19*(1), 134–151.

Kim, Y., Yun, S., Lee, J., & Ko, E. (2016). How consumer knowledge shapes green consumption: An empirical study on voluntary carbon offsetting. *International Journal of Advertising*, *35*(1), 23–41.

Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, *8*(3), 239–260.

Kollmuss, A., & Bowell, B. (2007). Voluntary Offsets For Air-Travel Carbon Emissions. *Tufts Climate Initiative*, 1-53.

Kotchen, M. J., Landes, W., Kim, P., Christiansen, B., Hoffman, A. J., & Auerswald, P. (2009). Offsetting Green Guilt. *Stanford Social Innovation Review, 7, 26*-31.

Kugler, K., & Jones, W. H. (1992). On Conceptualizing and Assessing Guilt. *Journal of Personality and Social Psychology*, *62*, 318-327.

Lancaster, K. J. (1966). A New Approach to Consumer Theory. *The Journal of Political Economy*, *74*(2), 132–157.

Lee, D. S. (2018). International aviation and the Paris Agreement temperature goals. *Department for Transport, Manchester Metropolitan University, Manchester, UK,* 1-16.

Li, Y., Wang, Y., & Cui, Q. (2016). Has airline efficiency affected by the inclusion of aviation into European Union Emission Trading Scheme? Evidences from 22 airlines during 2008–2012. *Energy*, *96*, 8–22.

Lieder, M., Asif, F. M. A., Rashid, A., Mihelič, A., & Kotnik, S. (2018). A conjoint analysis of circular economy value propositions for consumers: Using "washing machines in Stockholm" as a case study. *Journal of Cleaner Production*, *172*, 264–273.

Liston-Heyes, C. (2002). Pie in the Sky? Real Versus Perceived Values of Air Miles. *Journal of Consumer Policy*, *25*(1), 1–27.

Löschel, A., Sturm, B., & Vogt, C. (2013). The demand for climate protection—Empirical evidence from Germany. *Economics Letters*, *118*(3), 415–418.

Louviere, J. J., Hensher, D. A., & Swait, J. D. (2000). Stated Choice Methods: Analysis and Applications. *Cambridge University Press*; nlebk.

Lu, J.-L., & Shon, Z. Y. (2012). Exploring airline passengers' willingness to pay for carbon offsets. *Transportation Research Part D Transport and Environment 17(2),* 124-128.

Luce, R. D., & Tukey, J. W. (1964). Simultaneous conjoint measurement: A new type of fundamental measurement. *Journal of Mathematical Psychology*, *1*(1), 1–27.

Macintosh, A., & Wallace, L. (2009). International aviation emissions to 2025: Can emissions be stabilised without restricting demand? *Energy Policy*, *37*(1), 264–273.

MacKerron, G. J., Egerton, C., Gaskell, C., Parpia, A., & Mourato, S. (2009). Willingness to pay for carbon offset certification and co-benefits among (high-)flying young adults in the UK. *Energy Policy*, *37*(4), 1372–1381.

Mair, J. (2011). Exploring air travellers' voluntary carbon-offsetting behaviour. *Journal of Sustainable Tourism*, *19*(2), 215–230.

Mair, J., & Wong, E. P. (2010). An Elicitation Study to Explore Attitudes towards Purchasing Carbon Offsets for Flights. In T. Hobart: *CAUTHE 2010: Tourism and Hospitality: Challenge the Limits* (pp. 925-943). University of Tasmania. School of Management

Mallett, R. K. (2012). Eco-guilt motivates eco-friendly behavior. *Ecopsychology*, *4*, 223-231.

Marta-Pedroso, C., Freitas, H., & Domingos, T. (2007). Testing for the survey mode effect on contingent valuation data quality: A case study of web based versus in-person interviews. *Ecological Economics*, *62*(3–4), 388–398.

Mayer, R., Ryley, T., & Gillingwater, D. (2012). Passenger perceptions of the green image associated with airlines. *Journal of Transport Geography*, *22*, 179–186.

McLennan, C. J., Becken, S., Battye, R., & So, K. K. F. (2014). Voluntary carbon offsetting: Who does it? *Tourism Management*, *45*, 194–198.

Miller, G. T. (2012). Living in the environment (17th ed.). *Brooks/Cole, Cengage Learning*, 44-48.

Mimouni-Chaabane, A., & Volle, P. (2010). Perceived benefits of loyalty programs: Scale development and implications for relational strategies. *Journal of Business Research*, *63*(1), 32–37.

Miyoshi, C., & Mason, K. J. (2009). The carbon emissions of selected airlines and aircraft types in three geographic markets. *Journal of Air Transport Management*, *15*(3), 138–147.

Monteith, M. J. (1993). Self-Regulation of Prejudiced Responses: Implications for Progress in Prejudice-Reduction Efforts. *Journal of Personality and Social Psychology*, *65(3)*, 469–485.

Moon, S. (2017). The influence of trust on environmental behavior: Evidence from South Korea. *International Review of Public Administration*, *22*(2), 123–137.

Mutschler, B. (2012). Klimaneutralität in der Unternehmenskommunikation: Grundlagen zu einer glaubwürdigen CO2-Kompensation. *Diplomica Verlag,* 7-25.

OECD. (1992). The Polluter-Pay Prinicple. *OECD,* 1-49.

Ofek, E., & Srinivasan, V. (2002). How Much Does the Market Value an Improvement in a Product Attribute? *Marketing Science*, *21*(4), 398–411.

Olsthoorn, X. (2001). Carbon dioxide emissions from international aviation: 1950–2050. *Journal of Air Transport Management*, *7*(2), 87–93.

Orme, Bryan. (2019). Getting Started with Conjoint Analysis: Strategies for Product Design and Pricing Research (Fourth Edition). *Research Publishers LLC,* 77-88.

Orme, Bryan. (2000). Hierarchical Bayes: Why All the Attention. *Sawtooth Software, Inc.*, 2-8.

Orme, Bryan. (2001). Assessing the Monetary Value of Attribute Levels with Conjoint Analysis: Warnings and Suggestions, *Sawtooth Software, Inc.,* 1-5.

Osburg, V.-S., Strack, M., & Toporowski, W. (2016). Consumer acceptance of Wood-Polymer Composites: A conjoint analytical approach with a focus on innovative and environmentally concerned consumers. *Journal of Cleaner Production*, *110*, 180–190.

Polonsky, M., & Garma, R. (2008). *Are Carbon Offsets Potentially the New 'Greenwash?'*. In Australia New Zealand Marketing Academy. Conference University of Western Sydney) & Spanjaard, Daniela & Denize, Sara M. (Sara Marion), 1962- & Sharma, Neeru & University of Western Sydney. School of Marketing (2008). Australia and New Zealand Marketing Academy Conference 2008. *Marketing : shifting the focus from mainstream to offbeat*. Promaco Conventions Pty Ltd for the ANZAM 2008 Conference

Polonsky, M. J., Garma, R., & Landreth Grau, S. (2011). Western consumers' understanding of carbon offsets and its relationship to behavior. *Asia Pacific Journal of Marketing and Logistics*, *23*(5), 583–603.

Populus. (2018). Trust in Charities, 2018; How the public views charities, what this means for the sector, and how trust can be increased. *Charity Commission for England and Wales,* 1-19.

Pretty, J. (2003). Social Capital and the Collective Management of Resources. *Science (Washington)*, *302*, 1912-1914.

Qantas Airways. (n.d.). *Qantas Future Planet*. Retrieved 25 June 2020, from https://www.qantasfutureplanet.com.au/#getinvolved

Ramus, C. A., & Killmer, A. B. C. (2007). Corporate greening through prosocial extrarole behaviours – a conceptual framework for employee motivation. *Business Strategy and the Environment*, *16*(8), 554–570.

Rao, V. R. (2014). Applied Conjoint Analysis. *Springer-Verlag Berlin*, 32-145.

Rees, J. H., Klug, S., & Bamberg, S. (2015). Guilty conscience: Motivating pro-environmental behavior by inducing negative moral emotions. *Climatic Change*, *130*(3), 439–452.

Rolfe, J., Bennett, J., & Louviere, J. (2000). Choice modelling and its potential application to tropical rainforest preservation. *Ecological Economics*, *35*(2), 289–302.

Rudež, H. N. (2010). Integration of Corporate Social Responsibility Into Loyalty Programs in the Tourism Industry. *Tourism and Hospitality Management*, *16*(1), 101-108.

Rydin, Y., & Pennington, M. (2000). Public Participation and Local Environmental Planning: The collective action problem and the potential of social capital. *Local Environment*, *5(2)*, 153-169.

Sawitri, D. R., Hadiyanto, H., & Hadi, S. P. (2015). Pro-environmental Behavior from a SocialCognitive Theory Perspective. *Procedia Environmental Sciences*, *23*, 27–33.

Sawtooth Software. (n.d.). *CBC Tutorial and Example*. Retrieved 14 March 2020, from https://www.sawtoothsoftware.com/help/lighthouse-studio/manual/cbctutorialandexample.html

Sawtooth Software. (2020). *All About Us*. Retrieved 22 June 2020, from https://sawtoothsoftware.com/about-us/our-story

Scheelhaase, J., Maertens, S., Grimme, W., & Jung, M. (2018). EU ETS versus CORSIA – A critical assessment of two approaches to limit air transport's CO 2

emissions by market-based measures. *Journal of Air Transport Management*, *67*, 55–62.

Schleicher, K. (1989). Beyond environmental education: The need for ecological awareness. *International Review of Education*, *35*(3), 257–281.

Segerstedt, A., & Grote, U. (2016). Increasing adoption of voluntary carbon offsets among tourists. *Journal of Sustainable Tourism*, *24*(11), 1541–1554.

Smith, A., & Sparks, L. (2009). Reward Redemption Behaviour in Retail Loyalty Schemes. *British Journal of Management*, *20*(2), 204–218.

Sønderskov, K. M. (2011). Explaining large-N cooperation: Generalized social trust and the social exchange heuristic. *Rationality and Society*, *23*, 51-74.

Staples, M. D., Malina, R., Suresh, P., Hileman, J. I., & Barrett, S. R. H. (2018). Aviation CO 2 emissions reductions from the use of alternative jet fuels. *Energy Policy*, *114*, 342–354.

Stern, P. C. (2000). New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues*, *56*(3), 407–424.

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral Emotions and Moral Behavior. *Annual Review of Psychology*, *58*, 345-372.

The World Bank. (2019, September). *WDI - Classifying countries by income*. Retrieved 18 April 2020, from https://datatopics.worldbank.org/world-development-indicators/stories/the-classification-of-countries-by-income.html

Transport & Environment. (2020). *Aviation in the ETS | Transport & Environment*. Retrieved 5 February 2020, from https://www.transportenvironment.org/what-we-do/flying-and-climate-change/aviation-ets

United Nations. (n.d.). *What is the Kyoto Protocol?* Retrieved 5 February 2020, from https://unfccc.int/kyoto_protocol

United Nations. (2015). *Paris Agreement*.

Urama, K. C., & Hodge, I. D. (2006). Are stated preferences convergent with revealed preferences? Empirical evidence from Nigeria. *Ecological Economics*, *59*(1), 24–37.

van Heek, J., Arning, K., & Ziefle, M. (2017). Reduce, reuse, recycle: Acceptance of CO 2 -utilization for plastic products. *Energy Policy*, *105*, 53–66.

Van Lange, P. A. M., Vugt, M. V., Meertens, R. M., & Ruiter, R. A. C. (1998). A Social Dilemma Analysis of Commuting Preferences: The Roles of Social Value Orientation and Trust 1. *Journal of Applied Social Psychology*, *28(9)*, 796-820.

Winkler, R. L. (2003). An Introduction to Bayesian Inference and Decision (Second Edition). *Probabilistic Publishing*. 1-452.

Wittink, D., Vriens, M., & Burhenne, W. (1992). Commercial Use of Conjoint Analysis in Europe. *Sawtooth Software, Inc.,* 1-18.

World Tourism Organization, & International Transport Forum (Eds.). (2019). Transport-related CO2 Emissions of the Tourism Sector – Modelling Results. *World Tourism Organization (UNWTO),* 11-49.

ZEIT ONLINE. (2019, June). Atmosfair: 40 Prozent mehr Spenden für CO2-Ausgleich. *Die Zeit*. Retrieved 31 July 2019, from https://www.zeit.de/wirtschaft/2019-06/co2-klimaschutzorganisation-atmosfair-spenden-kompensation-treibhausgasemission