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School of Transportation Sciences

Master of Transportation Sciences

Master's thesis

Choosing Train Travel over Flights for Long Distance Business Trips

Nadege Berinyuy Wanyu

Thesis presented in fulfillment of the requirements for the degree of Master of Transportation Sciences, specialization Traffic Safety

SUPERVISOR :

Prof. dr. Elke HERMANS

CO-SUPERVISOR :

dr. Evelien POLDERS



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PREFACE

The idea of researching the possibility of changing commuters' mode choice from plane to train travel for long distance business trips is motivated by the sustainable development goals which point out the need to protect our environment. This sustainability extends through all works of life and sustainable transportation is at the forefront. This study is aimed at evaluating the factors that attract long distance business travelers to take flights instead of trains and equally evaluate the minimum conditions under which these commuters consider trains as a viable alternative to flights for long distance business trips. This is all to get more people to travel sustainably. I am grateful for the University of Hasselt for providing a well thought out program of Transport Sciences: Traffic safety. I would also like to thank my master's thesis supervisors, Professor Elke Hermans and Dr. Evelien Polders for their patience and guidance. Their support made this thesis possible.

ABSTRACT

The main objective is to investigate the factors that can influence commuters to change modes from flights to train for long distance business trips. This is important because it aligns with the sustainable development goals which put more sustainable transportation at the forefront. This issue is very important because knowing the factors that can influence commuter mode choice and the reasons why commuters currently travel by plane and not by train can help improve train services and encourage more commuters to travel by train for long distance for business trips (i.e. > 300km). Trains are more sustainable than flights and so this aligns with the sustainable development goals. Currently, for long distance business trips, most commuters prefer to take flights instead of trains despite the high pollution and emissions. Therefore finding out the conditions under which commuters consider trains a viable alternative to flights is key. What factors then influence business commuters to choose train travel over flights for long distance trips? To answer this question, a literature review and survey were conducted and the results analyzed. The results of the literature review suggest that a lot of factors affect transport mode choice decisions such as attitude, perceptions, price, comfort, distance, time, business/leisure trips and delays associated with the transport mode. Literature goes further to suggest that most commuters are affected by price but at the end of the day, time saving/speed trumps price. The results of the survey suggest that time/duration or speed is the most important factor to commuters when deciding their mode choice for business trips and following this, most respondents of the survey indicated that they can consider trains as a viable alternative to flights if trains become high speed trains. This is indicative on the importance commuters place on time saving when travelling long distance for business trips. This is so much so that even if the price of plane tickets is further increased due to pollution charge, flights will still be the best considered option for long distance business trips. This means time/duration trumps cost and that transport cost is elastic across different income groups. What was common among a lot of the survey respondents was the fact that in most cases, their employer books their trips and decides their mode choice. This means in order to convince commuters to travel more by train rather than flights, these companies need to be convinced of sustainable transportation since they decide mode choice for their employees who travel for business purposes. This means that instead of concentrating interventions solely on business travelers, their places of employment should equally be targeted. Another key finding was the fact that most business travelers are unaware of the dangers of pollution and emissions from flights on the environment. The survey is indicative of the fact that this knowledge can impact mode choice to be more sustainable.

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CHAPTER ONE: INTRODUCTION

1.1. Background

Transportation is the key to development as it moves goods, services, people, and information from point A to B. Transportation enables travel between cities and countries. In recent decades, transport has grown rapidly, and it is expected that it will continue to grow rapidly in the future. However, since 2019 with the advent of the Covid-19 virus, there has been a significant reduction in transportation services which has stunted the previous rapid growth in transportation (Rivera, 2020). The rapid growth has resulted in a multitude of problems including severe traffic congestion and pollution, and the situation is expected to worsen even further in the future. This is because of the increasing levels of economic activities over recent years (WAKA, 2016). Transport and economic growth are intertwined as shown in the figure below;

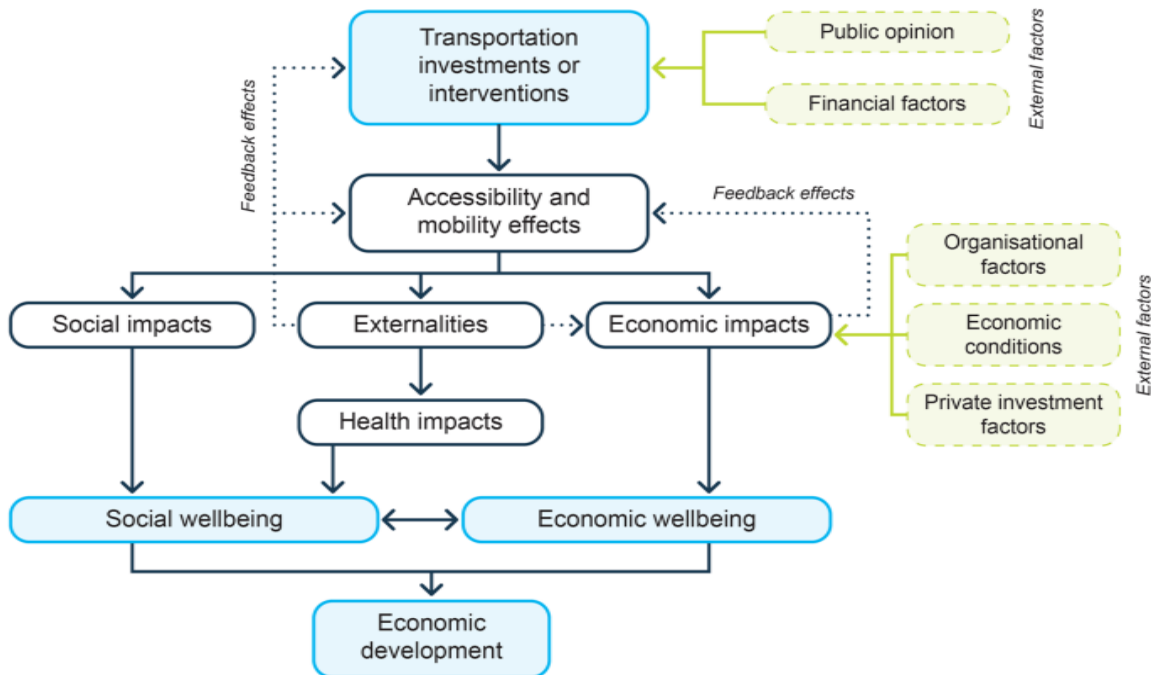


Figure 1: Transport and economic development – key connections. Source: (WAKA, 2016)

The figure above shows the relationship between transport interventions, funding, well-being and economic development. The impact of transport investments ‘ripple’ through the economy through changes in residential and industrial location, property prices, changes in the supply and demand for labor. Transport infrastructure impacts transport time and costs, and thus impacts the location of households and businesses. Firms transport products; businesses send their employees to meet with customers; people travel to work and for leisure pursuits. Upgrading transport access can increase productivity, and promote growth (WAKA, 2016).

At the start of the industrial revolution, the most popular means of transportation was canal shipping and rail transport. Telecommunications, air transport, road, maritime shipping were not yet available. With their development however, the economy has moved from industrial revolution followed by mass production to globalization.

Economic development has been impacted greatly by transport innovation. Every improvement in transport systems leads to an improvement in the global economy. This is represented in figure 2 below;

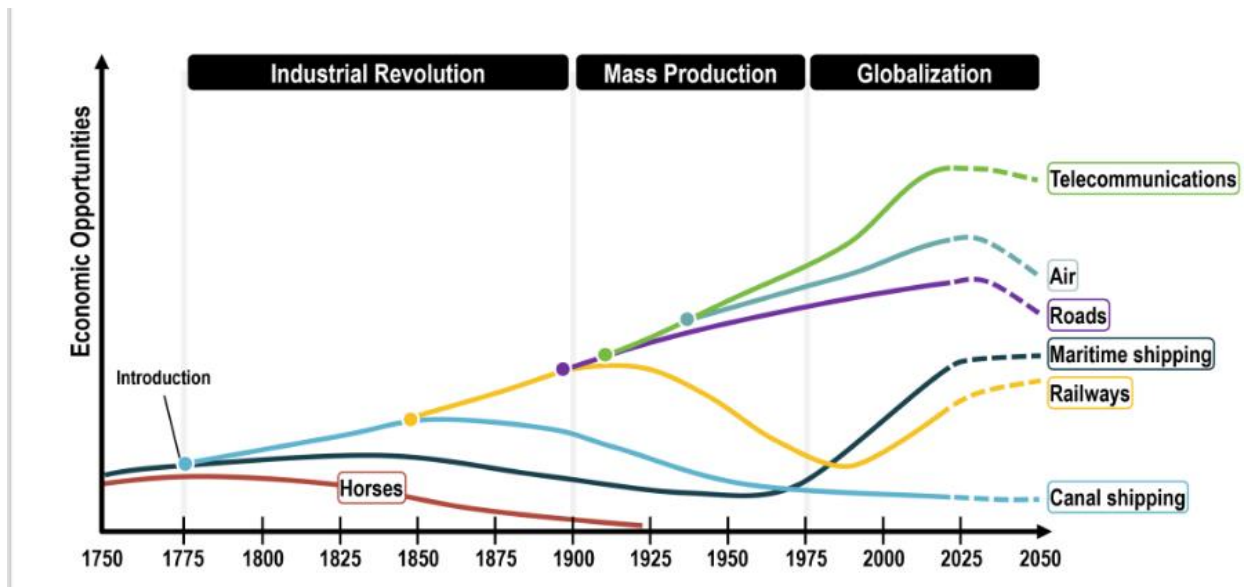


Figure 2: Evolution of transportation causing evolution of the world economy. Source: (Rodrigue, 2020)

Before the industrial revolution, economic activities were low due to low mobility capacity. The industrial revolution led to the development of inland canal systems, steamship services, and then railway systems. Passenger and freight transportation improved alongside production and consumption, while new markets and resources became available (Rodrigue, 2020).

The development of the mass production system relied on road transportation, particularly the automobile. Globalization in the 20th century led to joint synergy of maritime shipping, roadways, railways, air, and telecommunications. This improved transport systems and supply chain management. Economic opportunities became global in scale (Rodrigue, 2020).

With the development of telecommunications and information technologies, there is a higher level of management of production, consumption, distribution, and more efficient mobility of passengers.

There has been a lot of growth especially in air transport despite the negativities that come alongside this mode of transport. Apart from a few shock events (e.g., the 1979 oil shock, the Gulf War, 9/11 or the global financial crisis in 2008/9, Covid-19, Cop26), there has been a continuous growth in global air traffic passenger numbers since the 1950ies as shown in the figure below (Oxley & Jain, 2015).

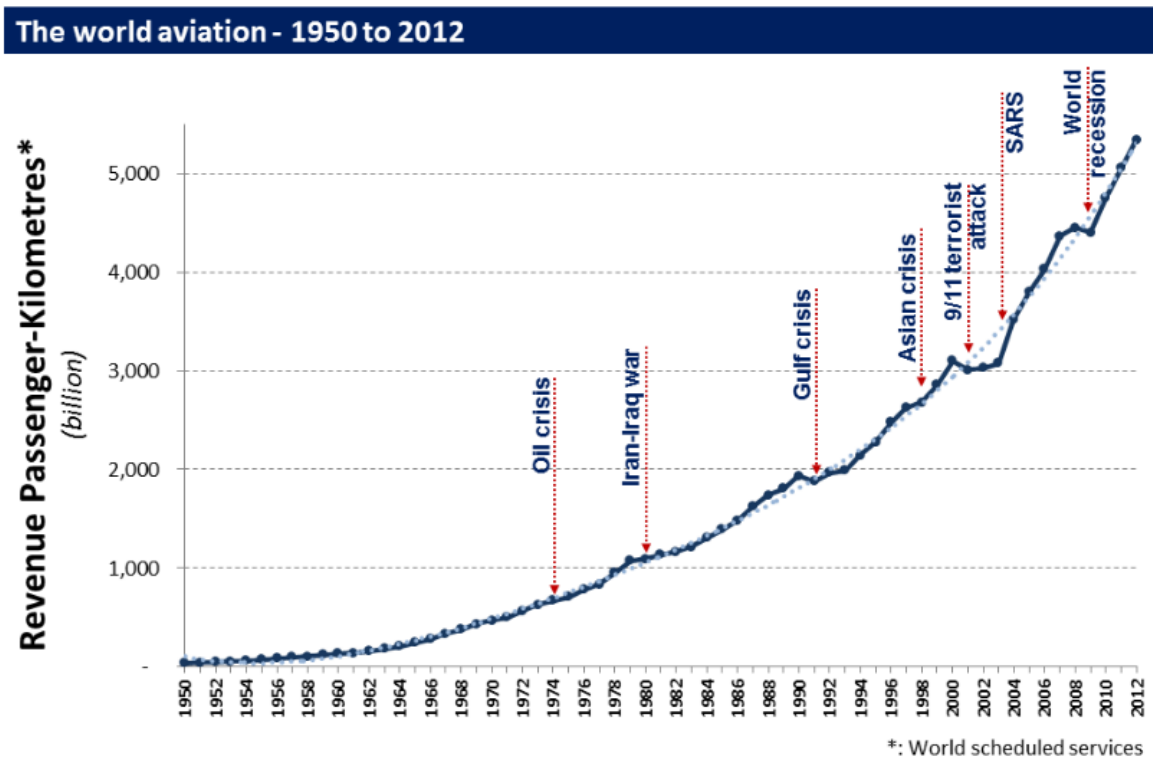


Figure 3: Increase in air traffic. Source: (Oxley & Jain, 2015).

With the rise in middle class economies, this global trend is expected to surge even further. Globally, passenger flight emissions account for 2–2.5% of global CO₂ emissions. While this global number may seem modest to some, passenger flight emission statistics for wealthy countries tend to change perspective (Facts and Figures., 2019). Assuming the aviation sector’s mitigation efforts remain less ambitious than other sectors, CO₂ emissions from passenger volumes could culminate in 22% of global CO₂ emissions by 2050 (Cames, Graichen, Siemons, & Cook, 2015). The solution the world can rely on is twofold: technological innovations and behavioral change. The focus of this thesis will be on behavioral change towards low-carbon transport modes such as train. This is because technological solutions such as the electrification of the aviation industry although on the rise, may take at least another decade before electric planes are ready for the commercial market (Berger, 2019). To reduce negativities of pollution due to flights, political discussions in several countries (e.g., Switzerland and Germany) on the introduction of CO₂ taxes on flight tickets aim at increasing flight relatively to train ticket prices. Substituting flights with train travel can significantly reduce transport-related CO₂ emissions as a train trip can save around 80–90% of CO₂ emissions compared to the same trip with a plane (Dällenbach, 2020).

Behavioral change in this case is central as it pertains to what extent consumers consider train trips as a viable alternative to flights. Most commuters consider flights as the best transport mode for medium and long-distance trips. A commuter is a person who travels some distance to work on a regular basis. The main factors that can influence travel mode choice for long distance commuters to use trains instead of flights

are equally important to gain insights on how to shift from flights to trains. The minimum conditions necessary to realize such a change need to be identified. The preference for flights is also an important aspect that should be examined so as to know how to make trains more attractive hence reducing air travel.

Previous research sheds light on the possibility to shift from flights to high-speed train (Gundelfinger-Casar & Coto-Millán, 2017). However, for this change to be possible, the role of social and psychological aspects of behavioral change must be examined to understand the minimum conditions necessary for commuters to be willing to change their travel mode from flights to trains. This is where this thesis differs from most previous studies. It aims at understanding the reasons why commuters choose a particular mode choice and the circumstances under which they will consider changing their travel modes and targets behavior change.

1.2. Plane and train Passenger Data

Rail and planes convey a lot of business commuters over long distances.

1.2.1. Covid-19 Impact on Long Distance Business Travel

The coronavirus outbreak changed the way humans travel, especially across long-distances. With ongoing closures and heavily restricted international borders, much of the world is still off limits to a large portion of the population - business travelers very much included. In fact, total air traffic decreased by 66% globally last year, according to the International Air Transport Association. Road and rail transport experienced a 30% drop in participation, when compared to 2019 levels (Brechemier, Hasenberg, & Zheng, 2021). While private sector travel including both leisure and visiting friends and family has somewhat rebounded over the last year, business travel is still slow to recover. In fact, demand for business travel, especially in Europe and by plane, is even expected to decline after Covid-19 restrictions are lifted, according to the latest research (Brechemier, Hasenberg, & Zheng, 2021). Further, no economic crisis post the Second World War has lasted this long. Recovery is uncertain, and according to a recent survey conducted by Didier Bréchemier, Jan-Philipp Hasenberg and Ron Zheng, 55% of respondents expect their post-crisis business travel to be at least 20% less than before (Brechemier, Hasenberg, & Zheng, 2021).

Upon the lifting of restrictions, European respondents expect a drop of 24% of before pandemic levels. In America, about 19-36% of business trips are expected to disappear, according to airline estimates (Brechemier, Hasenberg, & Zheng, 2021). This is because with the pandemic, many business trips are now conducted online through conference calls. Regardless of the region, business travelers from Europe, China, and the US remain skeptical about returning their prior travel volume once all Covid-19-related restrictions have been lifted (Brechemier, Hasenberg, & Zheng, 2021).

By 2024, the share of air travel across all travel modes will reduce by 8% when compared to 2019 levels. The road travel share will increase by 13%. For domestic business travel, this change will remain even in 2030 – more specifically, a 13% reduction in air travel and 4% reduction in train travel share as compared to 6% increase in road travel are expected. All told, air travel is expected to lose market share to both road and rail by 6% versus pre-Covid-19 levels. This will affect domestic business travel more than international travel (Brechemier, Hasenberg, & Zheng, 2021).

Figures from the European Union Tourism Trends Report shows that in 2016: Business and professional trips made up 15% of international tourists in EU destinations and 12% in extra-EU destinations all together. About 91.7 million international tourists visited Europe for business and professional reasons (77.1 million within the EU-28) (ETIAS, 2021). Global business and professional trips totaled 176 million (out of a total of 1,239 million). The Global Business Travel Association (GBTA) report shows that corporate spending in the form of business trips is particularly important in certain European countries (GBTA, 2021). Top beneficiaries in 2017 were (in USD):

- Germany: 72 million
- UK: 50 million
- France: 40 million

Even countries more heavily associated with summer holidays such as Spain equally benefit from professional trips: around 22 billion US dollars were spent on corporate travel in Spain in 2017. They are then expected to rebound to roughly 83% of this volume in 2022 and 2023 and reach pre-Covid-19 levels by 2025 (ETIAS, 2021). According to calculations by the Financial Times, CO2 emissions can be reduced by 120,000 tons if travel is reduced by 50%.

The coronavirus (Covid-19) pandemic hit the global business industry hard as the ability to travel was limited in order to reduce the spread of the virus. A survey in April 2021 revealed that 37 percent of respondents’ companies would love to resume domestic business travel. However, 10 percent of respondents believed in the resumption of international business trips within the same time span (López, 2022).

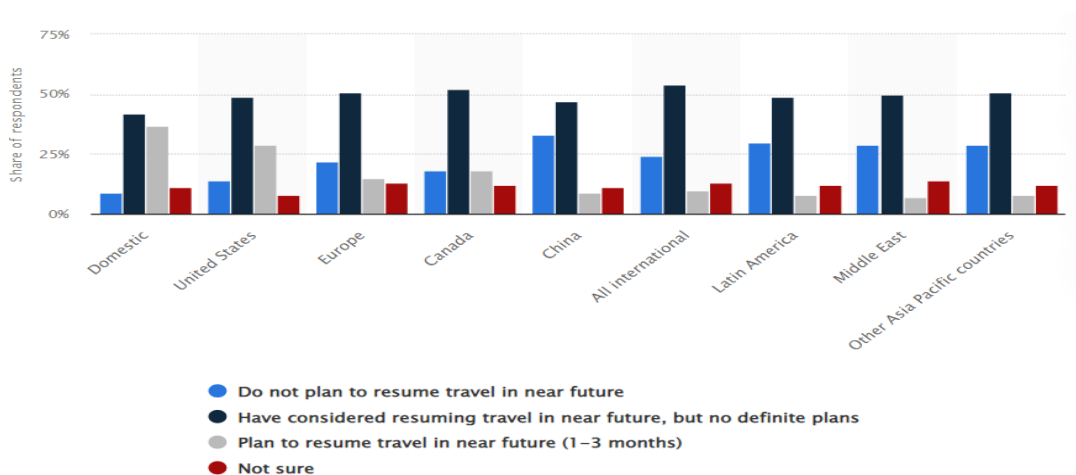


Figure 4: Resuming international business travel. (Source: (López, 2022))

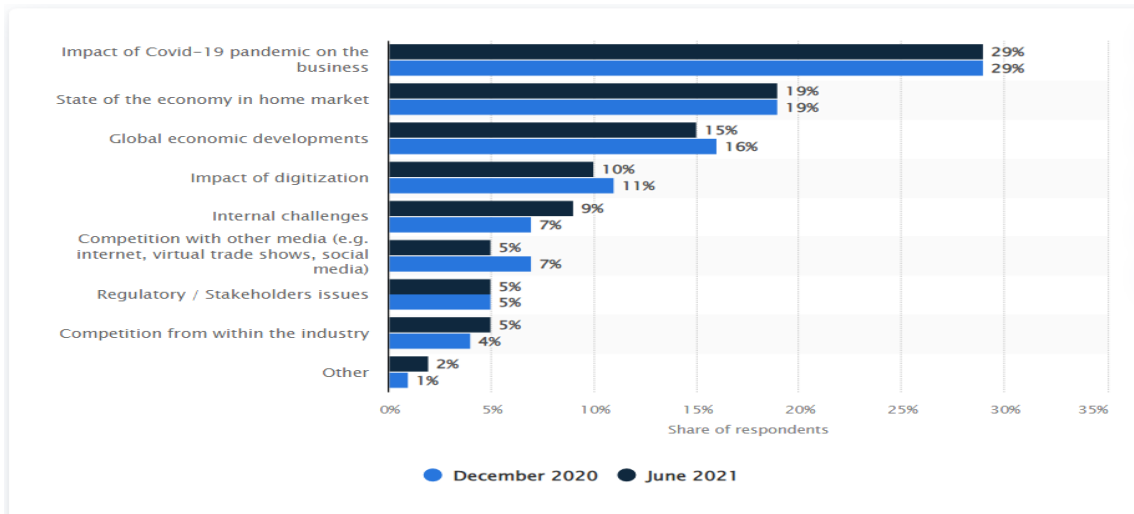


Figure 5: Most important issues facing the business industry worldwide. Source: (UFI, 2021)

Digitisation: implementation in North America and globally



Figure 6: Impacts of digitalization on business. Source: (UFI, 2021)

Figure 4 above shows evidence that a majority of businesses in most parts of the world plan on resuming their travel activities after the pandemic but also quite a remarkable number have no plans to resume. This is because of technological advancements that can replace business trips in some occasions. These trips with the advent of the pandemic have been replaced by conference calls and teleworking. From figure 5 above, it is evident that Covid-19 has had the most impact on the business industry in the year 2020 and 2021. This impact can also be found in the area of business trips. Figure 6 however shows a 54% change in

processes and workflows of companies into digital processes. This is in the form of conference calls and work from home. This is because of the impacts of Covid-19 on business travel.

1.2.2. Rail Passenger data

In 2019, 643 billion passenger kilometers were travelled on railways in Europe. Worldwide, passengers traveled over three-and-a-half trillion passenger kilometers on railway networks in that year (Salas, 2021). Across Europe, several national rail operators have been driven to seek government aid in order to overcome difficulties onset by the unprecedented Covid-19 crisis. In May 2020, the French rail operator SNCF experienced financial losses of approximately two billion euros (Salas, 2021). The economic situation of railways in the EU continues to show very little sign of improvement. The figure below shows clearly that reported monthly revenue losses since January 2021 have remained consistent (compared to 2019 pre-crisis times):

- 50% for PASSENGER services,
- 11% for FREIGHT services.

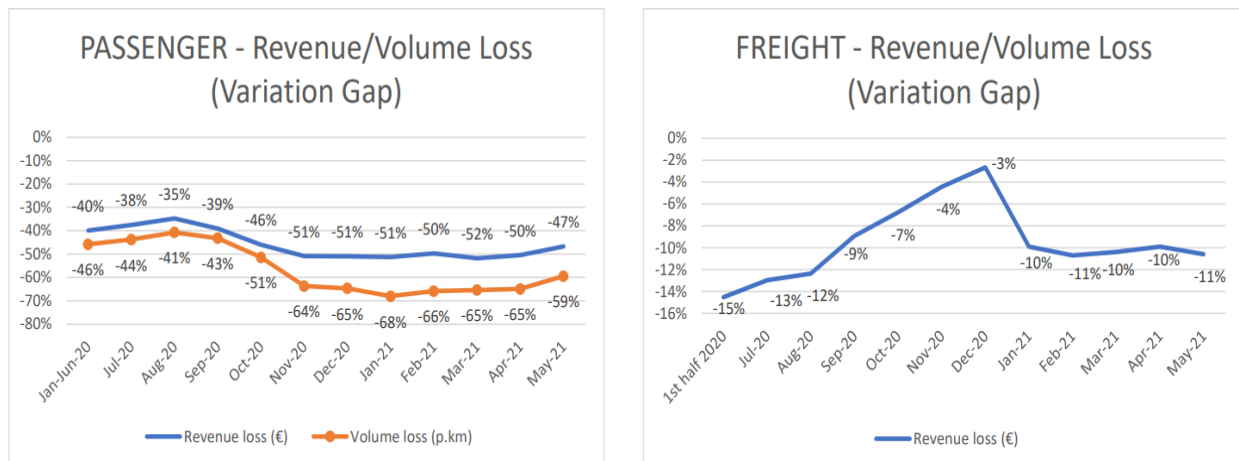


Figure 7: Passenger and freight rail volume loss due to Covid-19. Source: (Future Rail, 2021)

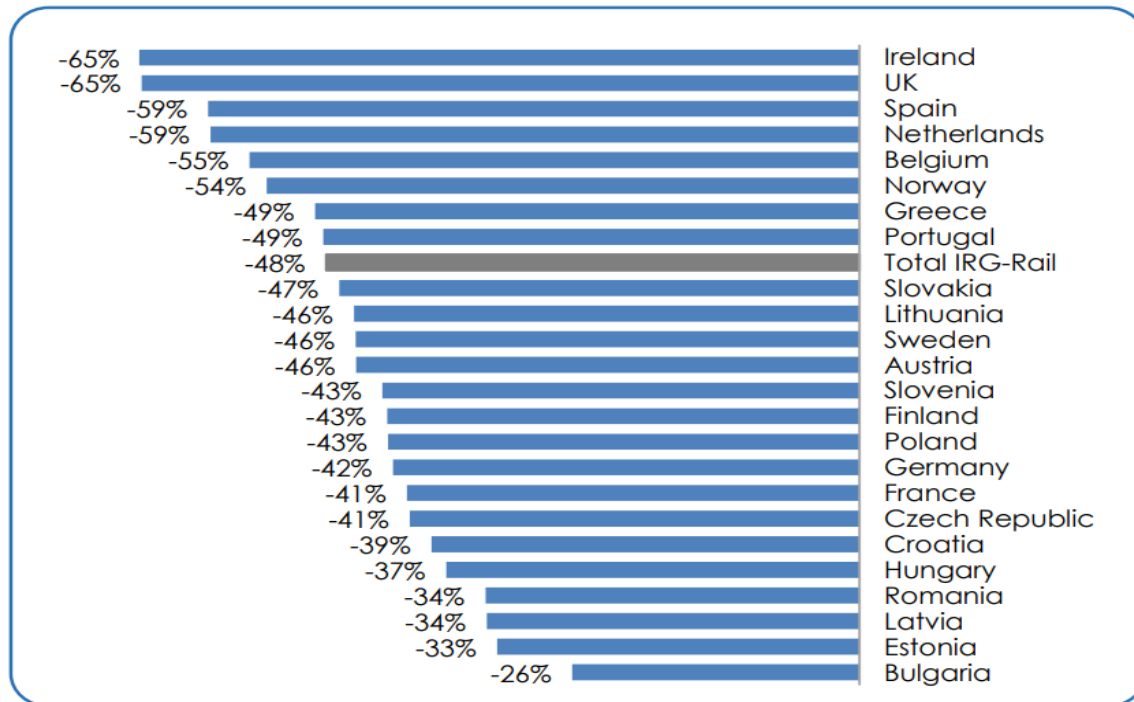


Figure 8: Change in passenger-km, comparison 2020/2019. Source: (IRG-Rail, 2021)

The figure above shows that passenger-km came down from 419 billion in 2019 to 217 billion in 2020 which was an average decrease of 48%, ranging from -26% to -65%. A total of 2.9 billion passenger train-km were recorded for the 25 countries which submitted data. This was an 11% reduction from the 3.2 billion passenger train-km in the previous year. This drop can be attributed to a reduced number of trains in many countries (IRG-Rail, 2021) due to Covid-19 restrictions.

1.2.3. Air Passenger Data

Since 1995, the world economy, measured in terms of gross domestic product (GDP), grew at 2.8 per cent annually while the world passenger air traffic (expressed in Revenue Passenger-Kilometers) increased at an average annual growth rate of 5.0 per cent (Facts and Figures., 2019). As for air transportation, the Covid-19 impact on world scheduled passenger traffic for year 2020 (estimated results), compared to 2019 levels (ICAO, 2022) amounts to:

- Overall reduction of 50% of seats offered by airlines
- A reduction of 2,703 million passengers (-60%)
- Approximately USD 372 billion loss in gross passenger revenues of airlines

In the year 2020/2021, the Covid-19 impact on world scheduled passenger traffic for year 2021 (preliminary estimates), compared to 2019 levels (ICAO, 2022) amounts to:

- Overall reduction of 40% of seats offered by airlines
- Overall reduction of 2,201 million passengers (-49%)
- Approximate loss of USD 324 billion in passenger operating revenues of airlines.

This is represented in the figure 4 and 5 below.

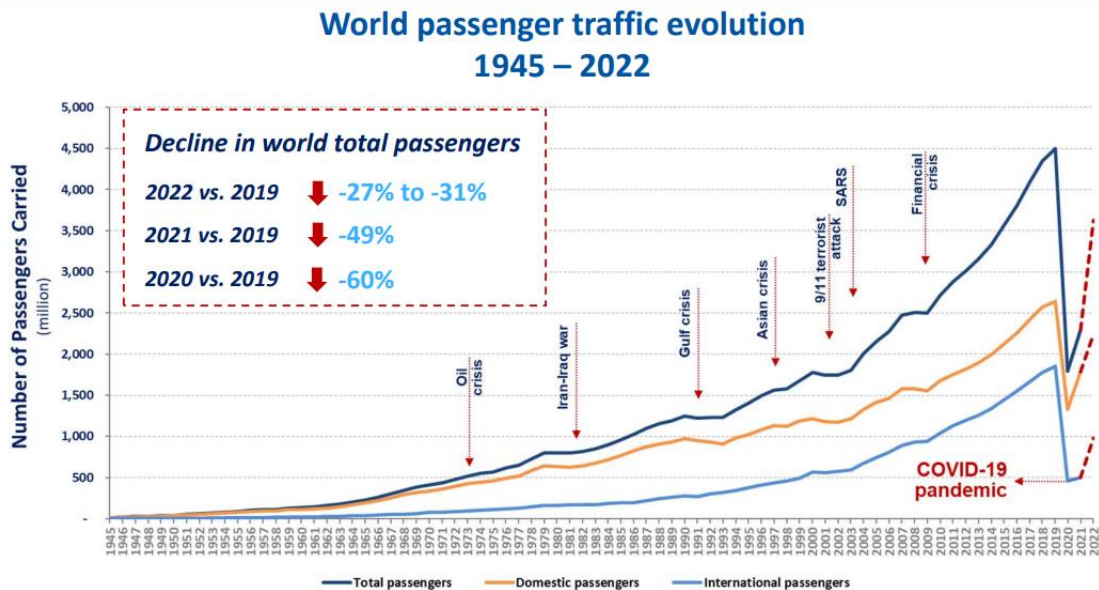


Figure 9: World passenger traffic evolution 1945 – 2022. Source: (ICAO, 2022)



Figure 10: Number of international passengers by region (2019-2020-2021, based on from/to State). Source: (ICAO, 2022)

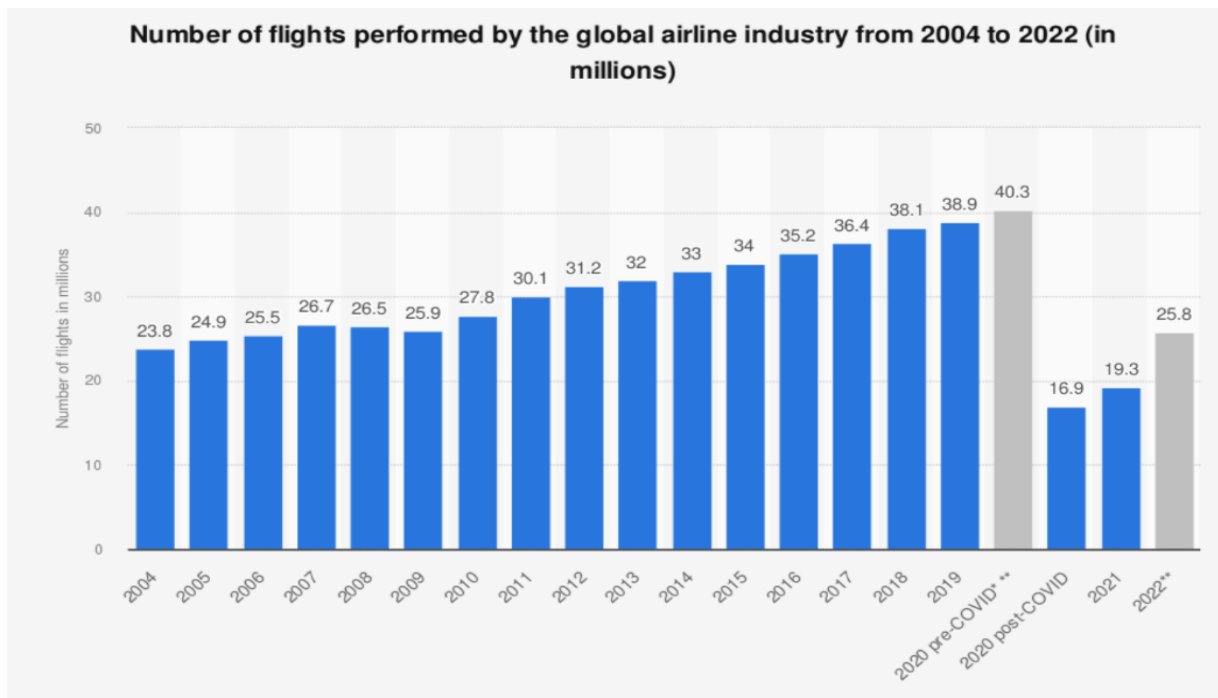


Figure 11: Number of flights performed by a global airline industry from 2004-2022. Source: (Mazareanu, 2021)

This figure above shows a great decline in flights post Covid-19 especially in the year 2020 with simultaneous supply shock and drop in demand. The impact of Covid-19 has already surpassed the 2003 SARS outbreak. SARS had a six month recovery which might not apply to today's situation (ICAO, 2022). In 2021, due to Covid-19, there was a 50 percent decrease in global air passenger traffic compared to 2019 (Mazareanu, 2021).

1.3. Statement of the Problem

Air services are of substantial importance to regional and remote businesses and communities. They provide freedom and opportunities, quick and comfortable travel options despite being environmentally non-viable due to their carbon emissions. In Switzerland, a global leader in per capita flight emissions, passenger flight emissions account for around 12–18% of national CO₂ emissions (Aviation Emissions, 2018). Due to the fact that it may take yet another decade before electric planes are in place, it is better to start reducing aircraft emissions. What better way is there to reduce these emissions than to use other modes that emit less like trains? The issue here now lies in getting commuters to switch from flights to trains. For this to happen, behavioral change is necessary. This behavioral change can be influenced by understanding the underlying reasons why commuters prefer flights over train travel, and what the minimum conditions are for them to consider switching from flights to train especially for long distance trips (at least 300km). The choice of mode is often dependent on the reason for the trip. (i.e., business or leisure trip). A previous study on commuter mode choice has focused on the application of external, tangible motivation (e.g., financial incentives or disincentives) to the exclusion of self-initiated, less tangible factors (e.g., commitment and self-monitoring techniques) (Raymond & Anne, 1995).

Currently, there are very few studies conducted on mode choice and changing modes from flights to train for long distance business trips (300km and more). The purpose of this study is to examine the reasons why commuters use either trains or planes to travel and the factors that can influence mode choice from flights to train while justifying the importance of this switch from the CO₂ emissions point of view. CO₂ emissions from passenger volumes could culminate to 22% of global CO₂ emissions by 2050 if this problem is not properly addressed and soon (Cames, Graichen, Siemons, & Cook, 2015). So far, the “flying shame” movement (e.g., #flygskam) has led to decreasing flight passenger numbers in Sweden since 2017 (Hoikkala & Magnusson, 2019) and in 2018, 18% of Swedes chose train over air travel. However, hypermobile lifestyles and Frequent Flyer Programs keep accelerating flight numbers (Tsui, 2017).

This research will examine areas for improvement and the underlying factors/motivators to further promote long distance sustainable travel by train instead of flights among commuters

1.4. Rationale or Justification of the Study

As will be seen in subsequent chapters, this research is aimed at making transportation more sustainable environmentally and human wise. A particularly effective strategy for minimizing transport-related CO₂ emissions is to substitute flights with train travel.

The main purpose of this study is therefore to examine the minimum conditions necessary to encourage commuters to switch from flights to train travel especially for long distance travel (300km and more). This is also to understand what influences commuters to prefer air to train travel.

If this study is successful, it will benefit the environment and us human beings. Equally, it will benefit train service providers as they will know the factors that can influence commuters to prefer trains over flights which in turn motivates them to improve their services. This improvement will benefit all commuters as they will enjoy better service quality. Demand will further surge which might lead to a reduction in the prices of train trips and further accelerate demand. Also, transport researchers will benefit from this study as it will help them to better understand commuters' mode choices and how to influence these mode choices. This study will reduce CO₂ pollution emissions and so benefit the world at large. A successful shift in commuter behavior towards a preference for train travel can bring about a faster rate of electrification to the aviation industry. According to the European Union aviation emissions account for about three per cent of the EU's total greenhouse gas emissions (European Commission, 2020).

This study is of utmost importance because it might provide a solution to the ever-rising pollution levels the world is facing which reduce quality of life as represented in figure 9 below. Figure 9 shows the results from a study that estimates regionally averaged changes in surface ozone due to past or future changes in anthropogenic precursor emissions based on 14 global chemistry transport models. Changes refer to ground-level ozone concentrations in 2000, expressed as parts per billion by volume (ppbv) (European Environment Agency, 2015).

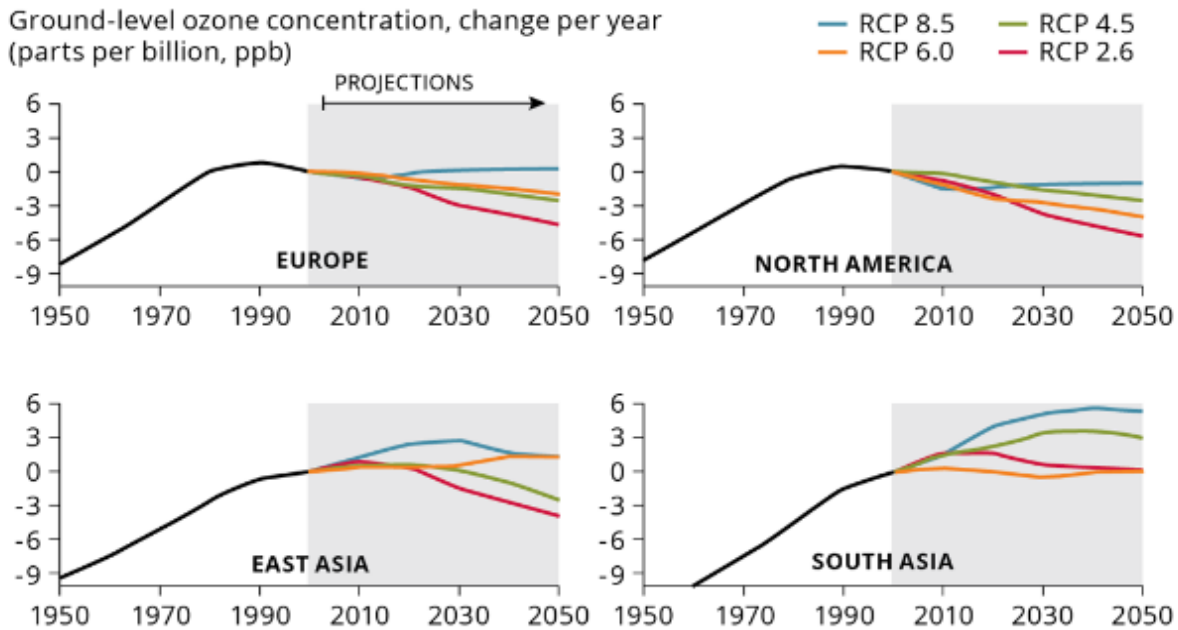


Figure 12: Historical and projected trends in ozone concentrations for Europe, North America, East and South Asia, 1950–2050. Source: (*European Environment Agency, 2015*).

It is therefore important to encourage sustainable transportation so as to reduce pollution. That is one of the main aims of this thesis. This goes is related to the sustainable development goal 11.2 and 13.

1.5. Research Questions

Although there are studies showing the possibility to switch from flights to high speed rail { (Gundelfinger-Casar & Coto-Millán, 2017) (Albalate, Bel, & Fageda, 2015)}, studies that shed light on the role played by the aspects of social and psychological behavioral change towards international railway travel and alternating from air travel to train travel are relatively limited. This is basically trying to understand the thoughts, feelings, and social factors that motivate commuters in their mode choice. The main question this research is focusing on, is what factors influence business commuters to choose train travel over flights for long distance trips? This thesis equally contributes to this research gap by addressing the following sub questions:

1. Why do long distance commuters prefer flights over travelling by train?
2. What are the main factors that can influence a more sustainable travel mode choice for long distance commuters?
3. Under what circumstances do long distance commuters consider train trips as a viable alternative to flights?

1.6. Statement of Hypothesis

This study aims at drawing conclusions on the following hypotheses with factors such as comfort level, price, value for money, availability, and time to name a few:

H1: *Commuters prefer flights because of the shorter net travel times of flights compared to trains.*

Most commuters already have the assumption that for long distance travel, flights are the fastest and so have made flying a habit and do not consider other options like trains. Often, comparisons between train and air travel are made using the same departure and arrival locations. Planes are the fastest mode when it comes to international, long-distance travel. This hypothesis therefore investigates to what extent this is true. Do commuters already assume without researching that flights are the fastest solution especially for long distance travel?

H2: *Familiarity with train travel will increase the possibility of taking trains instead of planes.*

Measures of habit can be better predictors of behavior and perceptions of behavioral control are guided by beliefs, which result in intentions and ultimately action (Ajzen, 1991). Most travelers make habitual mode choices which are equally automatic. People who use public transportation are also more likely to be more familiar with train travel and may still have the familiarity effect. Ownership of public transportation travel cards and a general familiarity with train travel, their schedules and stops increases the possibility of taking trains instead of flights. According to Kenyon and Lyons (2003), experience, and habits play an important role in mode choice and commuters unfamiliar with information sources need a higher planning effort and forethought with public transportation use, whereas car travel appeared psychologically more comfortable. According to this, information on long distance travel using trains can remove the barrier preventing the use of trains over flights. This means more people will travel more by train if they become more familiar with train travel. (Kenyon & Lyons, 2003), Hence, do commuters who are familiar with trains more often prefer trains for long distance business trips?

H3: *Previous long distance train travel increases the probability of further long-distance train travel.*

In this context, previous research has tested the effectiveness of offering a free one-month travel card on attitudes toward public transportation and on breaking car habits (Thøgersen & Møller, 2008). The study confirmed the expectation that, when offered a free month pass, car-drivers increased their use of public transport. However, their use of public transport falls back to the level of the control group after the promotion period, when participants have to pay the full fare again. It was concluded that when public transport (in the studied region) is offered for free, a significant number of car-drivers become enticed to at least try it and perhaps to even use it repeatedly. However, the experience does not seem to have made them revise their baseline evaluation of the attractiveness of public transport relative to the private car at the going rates. Travelling by train is comfortable and so long distance train travel will not pose discomforts. Commuters equally get to enjoy the beautiful countryside scenery and relax. This is an experience most people will want to keep repeating. Does previous long distance train travel increase the probability of further long-distance train travel?

H4: Sustainable environmental awareness and consideration for the negativities resulting from plane travel can increase train travel.

It has already been discussed that air travel contributes to the highest CO₂ emissions of 2–2.5% globally (Facts and Figures., 2019) and that if left unchecked, CO₂ emissions from passenger volumes could culminate in 22% of global CO₂ emissions by 2050 (Cames, Graichen, Siemons, & Cook, 2015). If this information is made public with campaigns and posters and on social media, some people will become more environmentally aware and will choose more sustainable travel modes such as a train. For instance, the “flying shame” movement (e.g., #flygskam) has led to decreasing flight passenger numbers in Sweden since 2017 (Hoikkala & Magnusson, 2019). This already shows that if sustainable awareness is created, behavioral change to train travel will increase. So, do commuters who are aware of the negative effects of flight emissions prefer to travel by train?

1.7. Objectives of the Study

Over the last few decades, there has been a rapid growth in transportation and this growth is ever on the rise. This study has as main objective to investigate the factors that can influence commuters to change modes from flights to train for long distance business trips. This is due to the high levels of CO₂ emissions from flights. This is to be done by examining the minimal conditions necessary for commuters to be willing to change modes from flights to train while analyzing how long-distance business trips impact mode choice.

The specific objectives include the following:

1. To analyze why long-distance commuters, prefer certain modes of transport within the Schengen area.
2. To find out if commuters consider train trips as a viable alternative to flights in the context of long distance business trips.
3. To verify the main factors that can influence travel mode choice for long distance business trips and change commuter behavior to use trains instead of flights.
4. To examine the minimum conditions necessary to affect such a change.
5. To create awareness about the negativities of CO₂ emissions on the environment and educate on more sustainable modes of transport.
6. To provide further research opportunities for behavior change towards more sustainable transport modes such as promoting behavioral change towards sustainable transport and active transport.

1.8. Scope of the Study

This study is limited first to long distance travelers who have a preference for flights over train, those who from time to time use trains instead of taking flights and those who often use trains instead of flying. The study area will be the Schengen area where travel restrictions are easy and traveling from one country to another within the Schengen area is done without border controls.

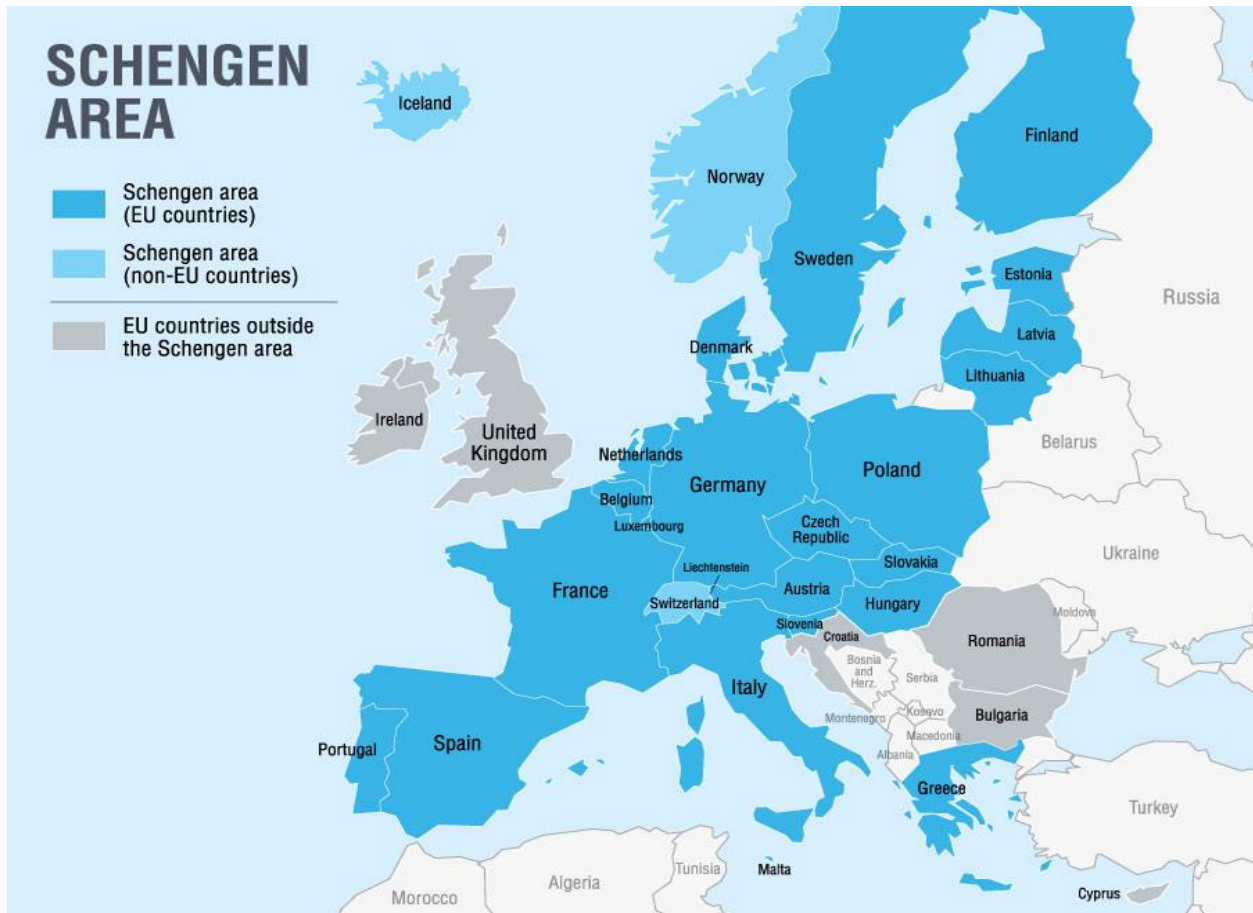


Figure 13: Schengen area. Source: (ETIAS, 2019)

Figure 10 above shows the main area of focus of this thesis. The target population can be from any one of these countries travelling for business purposes for a distance of at least 300km.

CHAPTER TWO: LITERATURE REVIEW

In this chapter, why people choose flights over trains for business trips will be examined with a focus on factors that affect this choice such as price, time, comfort, accessibility, familiarity, prestige, risk and uncertainty associated with delays. One central literature stream for understanding why people choose the train over the plane focuses on the effect of high-speed rail on air transport and the competition between both modes. The interaction between high-speed rail and air travel has received worldwide attention. This interaction has led to mode substitution, induced demand, and traffic distribution. Generally, this research has relied on aggregated data of cities or city-pairs. The factors considered included total travel time, GDP, the population of cities connected by sample lines, the hub strategy of airports, and the location of airports and HST stations in cities. It has been concluded that travel time plays an important role in passengers' mode choices (Chen, Wang, & Jiang, 2019).

In the paragraphs that follow, literature related to traveling by plane, train and even cars and buses will be seen. This literature study is not limited to train and planes only because these are not final destination modes. Travelers often use other modes in order to access the train station or airport. It is therefore important to also examine the factors affecting these other transport modes.

2.1. Theories of Transport Mode Choice

The dominant theory in the transport field is Random Utility Maximization Theory (RUM), which assumes rational behavior. Research has found evidence that violates this 'rational' assumption of decision making. Utility maximization is not the priority for decision makers, other psychological components (e.g., attitude, personality, and belief) are also important and significantly influence people's choices, especially when risk and uncertainty are involved. This then brings forth the Prospect Theory. The 'rational' assumption has also been criticized by transportation researchers such as (Hensher, John, & Li, 2010). RUM assumes that the individual's choice is made under certainty (Preston, Wall, Batley, Ibanez, & Shires, 2009), which is often not possible given that variability in key attribute drivers such as travel, crowding and arriving on time, is embedded in many travel systems. Given the limitation of RUM, a growing number of travel behavior studies have investigated other behavioral paradigms such as Expected Utility Theory, Rank-Dependent Utility Theory and Prospect Theory.

John, Graham, Richard, Nicolás, & Jeremy, (2009) examine the impact of delays on passenger railways, with specific reference to the national rail network in Great Britain. The paper distinguishes between punctuality (trains running late) and reliability (trains canceled). The objective was to develop a better understanding of the social costs of delay to passenger (and freight) trains and to establish delay cost values for different train types. Some key causes of delays in trains were identified and include operator causes (e.g., train faults and shortage of crew); network infrastructure causes (e.g., track and signaling faults); and external causes (e.g., suicides, vandalism, or extreme weather). The total travel time for a journey (T) depends on the start time from home (th), a fixed free flow travel time (Tf), an extra travel time caused by congestion and dependent on th [$Tx(th)$], and a travel time variability term ($Tr(th)$) dependent on th . Hence $T = Tf + Tx(th) + Tr(th)$. Therefore, a late arrival will occur if $th + Tf + Tx(th) + Tr(th) > PAT$. In practice,

it is unlikely that travelers can calculate the probabilities of outcomes for all possible travel options to arrive at their optimal expected utility. This led to the consideration of a schedule utility function: Each passenger will have a particular relationship between his or her utility and the lateness of the train service. It was concluded that rail passengers value delay, but it is difficult to generalize because of differences in trip distance, market segment, ticket type, and journey purpose. Values also seem sensitive to model specification, with the inclusion of dispersion measures as well as measures of central tendency particularly important, as well as the specification of the journey time and lateness variables. There is some reason to believe a modeling approach that estimates the reliability premium may give different results to the more traditional schedule utility approach (Preston, Wall, Batley, Ibanez, & Shires, 2009).

IATA (2004) examines possibilities for using trains instead of flights. Reducing access time to train stations will increase the number of people taking trains instead of flights. The very first High-Speed Rail between two European cities, Paris, and Lyon, began operations in 1981 and its high connection reduced flights by 30 to 15 percent (Park & Ha, 2006). This showed the possibility for competition between air transport and trains and so it is indeed possible to change commuter behavior towards train travel instead of air travel. González-Savignat (2004) examined how the High-Speed Rail connection between Barcelona and Madrid (Spain) has affected air travel between these regions using stated preference techniques and a binomial logit model. The model considers fares and travel time to evaluate passenger behavior. The results show that business and leisure trips offer different mode choice decisions. Total travel time is equally seen as important. Time savings are valued higher for business and other non-leisure trips and this increases at lower levels of comfort. Even under the least favorable conditions for the airlines (significant delays due to over-scheduled flights, and increments in waiting and access times), the High-Speed Train (HST) market share would not exceed 35% (González-Savignat, 2004). So, although trains drive at higher speeds, they still cannot compare their level of service to that provided by planes in terms of comfort. Equally, their speeds are still lower than those of planes. These results cast doubts on the competition that HSTs can exert in markets characterized by high-frequency air services.

Ivaldi and Vibes (2005) instead of stated or desired techniques used simulation technologies to investigate inter- and intramodal competition in the Cologne-Berlin passenger market. The model used is based on the nested logit model. The selected model examined, frequency, average fares, speed, and capacity as explanatory variables. Business and leisure trips are then distinguished. Their findings show a competition between aviation and train travel modes and this means there is a possibility to prefer one instead of the other and alternate between both modes. They concluded that evaluating the effectiveness of competition on a particular market of transport services must consider travelers, all modes and all firms so as to define relevant markets (Ivaldi & Vibes, 2005).

Empirical research in this field is given in (Pels, Nijkamp, & Rietveld, 2000), (Hess & Polak, 2005), and (Hess S. , 2005). They analyzed the airport access mode choice of passengers departing from the San Francisco Bay Area, using a nested logit model. They consider leisure and business passengers with separate models. The models' explanatory variables are average flight frequency, average fare, access time, and access costs. The conclusion by (Pels, Nijkamp, & Rietveld, 2000) is that accessibility, time and flight frequency are the most important characteristics in air travel mode choice. Commuters travelling for

business value time and accessibility more than leisure commuters, while leisure travelers consider prices more than business travelers.

Suzuki (2007) extends the analysis of (Pels, Nijkamp, & Rietveld, 2003) with the use of a two-step nested logit model. The model assumes that a traveler first eliminates choice alternatives that do not meet his/her minimum acceptable standards (first step), and then chooses the utility-maximizing alternative (second step). According to the findings, the “two-step” choice model can suit the observed data more than the “one-step” choice models. Travelers may use the “two-step” decision process for airline choices, but not for airport choices. The study is limited in its assumption of homogeneity of travelers with respect to minimum acceptable standards. The model assumes that travelers with the same choice situation must have identical acceptable standards in all attributes and thereby disregards data variance. The results obtained were largely like the studies discussed above (Suzuki, 2007).

According, (Ishii, Jun, & Van Dender, 2009) the dataset proposed by (Pels, Nijkamp, & Rietveld, 2003) to estimate a conditional and mixed logit model for business and leisure passenger airport-airline choice in the San Francisco Bay Area–Greater Los Angeles passenger market is very useful. They arrived to the conclusion that competition between air travel and other modes is due to non-price characteristics, such as flight frequencies, access time, and average departure and arrival delays.

Gao, Frejinger, & Ben-Akiva,(2010) applied discrete choice modeling to examine route choice, where utility functions are nonlinear. This was based on the theory of cumulative prospect. Attitudes toward risk were captured through a changeable message sign providing real-time travel information under traffic congestion (Gao, Frejinger, & Ben-Akiva, 2010). An overview of the prospect theory using studies in the fields of psychology and behavioral economics was provided by (Li & Hensher, 2010), where travel behaviors were identified. These were typically behaviors that satisfy the prospect theory or cumulative prospect theory conditions within a mixed multinomial logit framework, (Hensher & Li, 2012) applied rank-dependent utility models and examined commuter route choices that identify risk attitudes of travelers and their willingness to pay for travel time (Li & Hensher, 2013). Using the Mixed Multinomial Logit model, Li and Hensher found significant heterogeneity in the travel time parameter, based on a Rank- 19 Dependent Utility framework. Over the past decade, the idea of Prospect theory (PT) in the contexts of route choice and departure time choice has become quite popular in transportation studies (Hensher & Li, 2012). Prospect theory differs from the Utility theory in that it allows for the fact that individuals may choose a decision which doesn't necessarily maximize utility because they place other considerations above utility. By contrasting PT studies in psychology and behavioral economics, where Prospect Theory was originally established and further developed, it was seen that most reviewed transport PT studies fail to properly address all key elements of PT such as the fact that losses are felt heavier than gains. They then went ahead to extend the rank-dependent expected utility model to investigate unobserved individual heterogeneity in preferences, risk attitudes, and beliefs in the context of travel time and travel time variability. Given the advantages of PT in understanding behavior towards risk, Li and Hensher recommend that PT should be incorporated in traveler behavior studies as a supplement (Hensher & Li, 2012).

Lyons and Urry (2005), in their transport appraisal found that, savings in travel time are considered very beneficial by commuters and is sometimes used to justify often-enormous financial costs. This assumes that

travel time is unproductive, is regarded as wasted time in-between ‘real’ activities and should be minimized. In turn, less of the individual’s travel time budget is used, enabling more travel, or encouraging greater use of modes that may enable en-route activities to be undertaken. Travel demand when analyzed considers travel time and activity time as separate. This division between activities and travelling, and between activity time and travel time, has implications for future levels of mobility, for the modal distribution of travel and for the analysis of travelling within the information age. This paper did not provide answers but rather raised some important new questions (notably in relation to transport appraisal policy). The paper believes travel time to be a paramount factor to be considered in transport policies and appraisals (Lyons & Urry, 2005).

2.2. Factors affecting Transport Mode Choice

2.2.1. Comfort

To most commuters, comfort is an important aspect when choosing a mode of transport. Most studies have applied discrete choice models as a basic characteristic with the stated preference for air travel being due to its comfort and other attributes. This stated preference is now very popular when investigating travel behavior and mode choice { (Collin, Rose, & Hess, 2012), (Seelhorst & Liu, 2015), (Wen, Chen, & Fu, 2014)}.

For example, Anderson, Baggett, & Widener, (2009) identified elements influencing customer satisfaction for air passenger travel, including physical attributes of the service (e.g., food and personal space), employee-customer contacts (e.g., with flight attendants and gate agents), and operating performance (e.g., flight timeliness), which all make air travel to trump over train. To change commuter behavior to prefer trains as an alternative to flights, these comfort factors must be considered by train service providers (Anderson, Baggett, & Widener, 2009).

Juan and Fabiano (2013) focused on the dynamic factors that affect comfort in public transportation such as the effects of vibration during movement. Their comfort index is based on root mean square of weighted acceleration data (Castellanos, & Fruett, 2013). Lin et al. (2010) measured comfort with smart phone sensing. This system collects data from smart phones and transportation vehicles to provide comfort statistics useful in comparing different vehicles.

Bodini et al. (2013) considered comfort by looking at the effects of road infrastructure (pedestrian crossing, culvert, roundabout etc.) on the comfort level of standing passengers in public transportation. Their study provides an easy comparison of vehicles’ comfort level and the ability to keep track of vehicles’ and roads’ maintenance (Bodini, Lancini, Pasinetti, & Vetturi., 2013). The most common reasons of dissatisfaction in the public transportation system are crowdedness of vehicles and working condition of the heating system. A lack of coordination in public transport also impacts passenger satisfaction. This reduces the preference for public transport.

Palma et al. (2014) came up with a measure for crowdedness. They examined cases with one available seat, and no available seat but with no overcrowdings. They also examined a situation with a lot of standing

passengers in an overcrowded vehicle. Discomfort was considered by the number of seats and standing passengers (Palma, Kilani, & Proost, 2013). Qin (2014) continued the study of Palma et al. (2013). Their measure of crowdedness was with the use of a load factor and how many passenger stood per square meters. Once the threshold value is exceeded (more than 4 passengers per square metre), cost function takes an exponential form to represent the discomfort resulted by over capacitation.

2.2.2. Travel Time Perceptions

Hensher, John, & Li, (2010) examine modelling frameworks and empirical measurement paradigms used to obtain willingness to pay (WTP) for improved travel time reliability, suggesting new directions for ongoing research. It is increasingly recognized that travel time reliability, and its valuation, is important to travelers', and hence should get more emphasis in transport policy and performance management. The travel time must therefore be included in forecasting and appraisal studies. Three types of empirical models designed to capture travel time reliability (i.e., the mean-variance model, the scheduling model, and the mean lateness model) are presented. Associated theoretical issues, experiment design, and practical applications are equally included. Travel time variability is a characteristic of any transport system, which has a significant impact on travelers' decision making. The paper goes further to present new evidence on the value of reliability and scheduling costs. Unlike previous studies which focus on commuters, this study considers both commuters and non-commuters. The difference in the behavioral responses between these two groups are then highlighted. Disutility faced with early arrival is higher than arriving later for non-commuters; unlike commuters who will rather pay more than to arrive late (Hensher, John , & Li, 2010).

In designing transport policies, a cost benefit analysis is an important point to consider. Time is an unproductive opportunity cost of a trip. Usually, travel time has an intrinsic value and diverges from the mere monetary assessment of time as cost. { (Lyons & Urry, 2005) (Jain & Lyons, 2008)}. Other studies however, suggest that travel time is useful for work purpose (Fowkes, 2001). According to (Lyons & Urry, 2005) time is so important especially with the dawn of this information age that the time spent on a trip influences mode choice.

Travel time and cost affect mode choice decisions. Regarding trip attributes, (Stradling, 2002) asserted that saving money, time, and effort are the underlying aspects that can help attract travelers to ride public transport. With commuting trips, time, cost, and transit rank higher than with shopping or leisure trips especially when commuting is a daily routine activity.

Regarding the trip attributes, travel time of different modes were identified as significant predictors of mode choice. Longer travel time when taking transit compared to driving reduces the odds of taking transit (Cervero, 2002). Also, Collins and Chambers (2005) reported that the travelers' preference of transit decreases as the travel time when taking transit exceeds more than 1.5 times of driving (Collins & Chambers, 2005). Frank et al. (2008) found transit riders to be very sensitive to travel time compared to price. Based on these findings, Frank et al. (2008) implied that transit ridership could be increased by enhancing the competency of transit travel time, while insisting that reduction in driving time may offset the impact of transit improvements (Frank, Bradley, Kavage, Chapman, & Lawton, 2008).

Besides, a recent study by (Chakrabarti, 2017) implied that travelers are influenced by the ratio of transit and auto travel time. This is indicating that lower travel time savings via driving would induce people to ride transit. Meanwhile, Limtanakool et al. (2006) considered both the absolute and relative difference in travel time between rail and car. Their premise was that the impact of travel time ratio (i.e. relative difference) on mode choice would be different by the travel time gap (i.e. absolute difference). They also insisted that the difference in travel time between car and transit affects commuting trips more than the importance of the trip such as business or leisure (Limtanakool, Dijst, & Schwanen, 2006).

2.2.3. Business and Leisure Trips

The trip purpose greatly influences travel mode choice and decides whether a commuter will prefer a train over a plane. Traveling in a business context tends to be more time-sensitive compared to travel for leisure purposes and makes the commuter to choose the mode considered as the fastest (Mackie, Jara-Díaz, & Fowkes, 2001). With the advent of the digital age, revolutionizing existing travel modes brings out the benefits of travel time in travel mode choice (Wardman & Lyons, 2016). They equally see this trend on the rise with respect to where and when business takes place.

2.2.4. Risk and Uncertainty Associated With Delays

Whether flights or trains, they all experience delays in schedules which lead to customer dissatisfaction. However, flight delays are at times just as frequent as train delays. Mode choice then involves risk and uncertainty associated with these delay possibilities which leads to most commuters choosing the least likely mode to experience delays.

Author	Location	Disruption Type	Disrupted Mode	Data Used	Findings
Blumstein and Miller (1983)	Pittsburgh, US	Strike	Bus	Traffic and occupancy counts	- congestion increased due to more pickup/drop trips in the CBD - captive riders worst affected due to disruption
Lo and Hall (2006)	Los Angeles, US	Strike	Multiple PT modes	Loop detectors	- traffic speeds reduced by 20% on highways during the disruption - duration of rush period increased by around 200%
van Exel and Rietveld (2009)	Netherlands	Strike (national)	Rail	Before & after surveys	- young and females are less likely to switch to car during disruptions
Pnevmatikou et al. (2015)	Athens, Greece	Partial closure due to renovation	Metrorail	RP/SP	- propensity to shift to cars and buses depends on traveler's available income
Lin et al. (2016b)	Toronto, Canada	Closure (hypothetical)	Rail	RP/SP	- while weather effects mode choice, type of disruption does not - providing information can reduce overcrowding at stations and commuter anxiety
Currie and Muir (2017)	Melbourne, Australia	Closure (hypothetical)	Rail	Perception and behavior surveys	- 68% travelers chose to use replacement bus - 28% chose other transport options like local PT, pickups, etc.
Ministry of Transport (2013)	Wellington, New Zealand	Closure (due to weather)	Rail	Surveys, traffic counts	- morning peak got extended by two hours - 11% changed departure time or mode in long term
Zhu et al. (2011)	Minnesota, US	Bridge collapse	Cars and buses	Surveys	- psychological factors lead to reluctance in using the bridge after reconstruction - gender and proximity to site affect traveler behavior

Table 1: Previous Studies on Service Disruption (sorted by Disruption Type). Source: (Saxena , Rashidi , & Auld)

Travelers react differently to a canceled and delayed public transport service. At times commuters will rather wait for delayed transportation instead of finding another solution and this is also the case under the canceled scenario.

2.2.5. Travel costs

Travel cost difference between modes is also reported to affect mode choice decisions. Lower public transport costs will make more people to use public transport implying that provision of promotional low-price transit fares could help abandon car using habits. Also, a recent study on commuters' mode choice in Atlanta showed that providing free transit could encourage transit use (Ghimire & Lancelin, 2019). In addition, a transport fare being elastic for different traveler types and income groups affects travel costs. High income groups have the highest elasticity, meaning that high income groups have an alternative to choose, namely private transportation. Meanwhile, (Asensio, 2002) showed that altering travel cost is a weaker policy intervention tool compared to modifying travel times. This means in most cases, travel times is prioritized over travel costs by commuters. Similarly, (De Witte, et al., 2006) argued that making public transportation free does not have much of an effect on travel behavior towards public transport. Even with

the findings, travel cost is not usually accounted for when modeling transport mode choice. This is due to the fact that the cost of transit modes are usually the same within a limited study area (Chakrabarti, 2017). This is because private transportation offers freedom and flexibility. Public transportation has fixed-route and fixed-schedule which at times are inconvenient to a commuter. It is therefore natural that private vehicles will win over public transport in a large number of circumstances (Chakrabarti, 2017).

Travel costs also play a role in modal choice because consumers are sensitive to changes in price, but this also depends on the purpose of the trip. If a public transport pass is owned, public transport use will increase (Kim & Ulfarsson, 2008) and car use will decrease. Public transport use is however sensitive to increases in public transport fares (Vega & Reynolds-Feighan, 2009). If public transport costs less, people are most likely to prefer it to driving. However, studies about improving public transport indicate that only a limited share of car drivers would want public transport to be made less expensive in order to use it (De Witte, et al., 2006).

2.2.6. Availability/ Accessibility

The residential location affects transport mode choice. This is because it impacts activities and travel mode choice and patterns (De Vos, Schwanen, Van Acker, & Witlox, 2013). In suburban neighborhoods, many transport modes are accessible within an available time. These areas have better transport infrastructures and this reduces the budget needed when travelling by car compared to travelling with slower modes (Lenntorp, 1976). However, this might not be the case in dense, mixed-use neighborhoods where all kinds of services and facilities are nearby and easily accessible on foot, by bike or with public transit. This reduces the advantages of owning a car (Karsten, 2003). Residents of urban neighborhoods travel less by car than people living in suburban neighborhoods, due to differences in density, diversity and design (Chen, Gong, & Paaswell R, 2008).

People with a preference for cars prefer to live in suburban neighborhoods due to better car accessibility. According to many studies, accounting for residential self-selection tends to attenuate the effects of the built environment on travel (Cao, Mokhtarian, & Handy, 2009).

Studies in the San Francisco Bay Area (Schwanen & Mokhtarian, 2004), in Flanders, Belgium (De Vos, Schwanen, Van Acker, & Witlox, 2013) and in Brisbane, Australia (Kamruzzaman, Baker, Washington, & Turrell, 2013) found out that a lot of people do not live in their preferred neighborhoods (residential dissonance). Hence they can face difficulties in travelling with their preferred travel mode. The built environment (both in urban and suburban neighborhoods) can impact travel mode choice. Those in urban areas will however use other transportation modes due to traffic congestion in neighborhoods (De Vos, Schwanen, Van Acker, & Witlox, 2013).

It can therefore be concluded that there is a relation between mode choice and travel satisfaction for leisure trips (with travel-related attitudes and the built environment as explanatory variables) of residents in urban and suburban neighborhoods (De Vos, Patricia, Schwanen, Van Acker, & Witlox, 2016)

2.2.7. Safety

Traffic safety is how likely traffic accidents occur. Perceived traffic safety is a commuter's likelihood to perceive a traffic outcome that is accident-free (i.e., avoiding traffic accident and crash). It varies from person to person based on their background (information and experience) and how they deal with risks

(Salonen, 2018). According to Salonen (2018) men are more traffic safety aware technologically, with better in-vehicle security, and emergency management than women (Salonen, 2018). This is contradictory to most road safety literature which see men as less safety aware than women. Bordagaray et al. confirmed that young adults (aged 34 years or below) perceive traffic safety as less important than older people do (Guliani, Mitra, Buliung, Larsen, & Faulkner, 2015).

Molin et al. (2017), examined the perception of safety in air passenger transport. Various airlines and route attributes were varied to examine how these attributes affected safety perception. A 7-point rating scale was used to administer the responses, of which the endpoints were labeled as 1 = very unsafe and 7 = very safe (Molin, Blangé, Cats, & Chorus, 2017). Another experiment was then carried out where safety perception was included as an attribute and varied in the levels 1, 4, and 7 that corresponded to the levels of the same 7-point rating scale. Regular attributes like costs and time were used to determine the trade-offs of safety perception with costs and time. Safety perception is not seen as a personality trait unlike attitudes. It is rather seen as a function of more basic attributes, hence, its score depends on the levels of those attributes and therefore may vary from situation to situation. Personal characteristics can influence the perception score and how perception influences choice (Molin, Blangé, Cats, & Chorus, 2017). The results showed that the objective airline safety index impacts the safety perception of a flight. An airline safety index for airlines is unavailable. The findings are however indicative that such an index would be important to younger passengers. Older passengers perceive safety differently. Safety perception is also determined by the airlines' involvement in accidents with fatalities especially passengers that have been involved in (near) airplane accidents (Molin, Blangé, Cats, & Chorus, 2017). Also, bad weather conditions affect safety perception, as well as flying over conflict areas. However, planes flying over water have only a limited impact.

As for train stations, lighting, visibility and open environment has been found to be important for the perception of safety. Isolated stations are considered unsafe while those that are integrated by other activities are considered safer (Ceccato, Langefors, & Näsman, 2021). Ceccato (2013) saw that metro stations are considered safer when reachable by walking paths from homes. Shops such as an open café, kiosk, that keep these areas busy and create visibility and natural surveillance increase perceived safety (Ceccato, V, 2013). Women have lower disutility of walking in open environments where the chance was higher of detecting potential threats, being seen by others, and being able to escape, than in more closed environments (Börjesson, 2012). Kim (2021), notes: when the light is dim and things are not seen clearly, and you are afraid, it is possible to imagine things, increasing fear; light therefore impacts people's sense of control (Kim H. , 2021). Physical environmental features that limit possibilities to escape cause fear. The absence of basic amenities, such as benches and shelters at the station, make its surroundings to be perceived as insecure. The basic amenities are more important for longer waits than shorter ones (Fan, Guthrie, & Levinson, 2016). Security guards increase safety and are a desired improvement. People in authority affect women's feelings of safety by reassuring them of potential help and by deterring potential criminal activities (Kim H. , 2021).

The environment affects people's safety perceptions. Intersection density and the presence of major road crossings en-route were found to affect the individual's perception of safety, such as the fear of collision (Guliani, Mitra, Buliung, Larsen, & Faulkner, 2015). Safety is also associated with heavy traffic flow on streets. The perception of traffic safety may significantly affect mode choice decision (Zhang, Zhang, Gan, Li, & Rhodes, 2019). According to the TPB model, perceived difficulty or ease of performing a behavior,

is a socio-cognitive factor determining the individual's behavioral intention (Ajzen, 1991). The elements shaping travel behavior are activity locations, transport resistances, needs, opportunities, and abilities. Travel resistance consists of time, money, and other non-monetary costs, such as the perceived risk of traffic which can reduce the use of a type of transport mode (Schepers, Hagenzieker, Methorst, Van Wee, & Wegman, 2014).

Safety perceptions are complex because they differ from one city to another and change with the environment, the characteristics of individuals and the selected mode of travel, among other factors. Chataway et al. (2014) indicated that cyclists in Copenhagen compared to those in Brisbane perceive certain infrastructures as insecure. Even perceptions of others about safety can be important (Chataway, Kaplan, Nielsen, & Prato, 2014).

2.2.8. Perceptions and Experiences

Sentiment is an emotion attached to an object due to interaction with the said object. Affect is either of positive valence (joy, satisfaction, pleasure) or negative valence (shame, embarrassment, anger, fear, frustration) (Resnick, 2012). This is directly linked to perceptions. Sentiment in travel mode affects behavior towards that mode especially when the emotion provoked is intensely negative (Liz , Joyce, & Mick , 2016). According to (Rozin, Millman , & Nemeroff, 1986) when a consumer attaches emotion to a decision, it influences the desirability of the target product and it becomes difficult to detach. Consumer's experiences with a particular product or service could create temporal or lasting emotional attachment or detachment towards the products or service, which could influence behavior (Liz , Joyce, & Mick , 2016). Ariely (2008) submits that affect offers a possible explanation for consumer judgments, such as the zero price effect on consumers (Ariely, 2008).

In transport, the rational choice theory suggests that the decision-maker evaluates the economic satisfaction of their choice set and selects the mode with the highest economic satisfaction (Aloulou, 2018). However, Metcalfe and Dolan, thought that consumers aside from the economic satisfaction, set their choice emotionally. When perceived emotional satisfaction is more than the economic satisfaction attached to the use of an alternate product, the decision-maker selects the alternative with the largest emotional satisfaction, contrary to logic (Metcalfe & Dolan, 2012). Elster (1998) investigated the role of emotion in decision making when rationality seems ignored and postulated that emotion to be treated as psychic cost in a utility function similar to other cost variables (Elster, 1998).

A traveler might prefer using a particular mode of travel for several reasons, including economic and environmental. However, any negative emotional encounter with such travel mode could impact on the traveler's loyalty to the mode. Morris and Guerra (2015) investigated the effect of trip duration during travel on travelers' emotion by comparing commuter satisfaction across three modes of transportation Car, Non-motorized transport (NMT) and Public transportation. The results proved that long commuting trips significantly impact travelers emotionally and degrade the mood of commuters (Morris & Guerra, 2015).

Equally, behavioral science suggests that the human memory of experiences is governed by the most intense 'peak' moments and final impressions in a chain of events (Kahneman D. , 2013). Information that stands out and seems relevant affects human decision-making. Human behavior is believed to be influenced by what comes to mind when options are being evaluated for decision making. It is proposed that any

prominent (desirable or undesirable) user experience with a travel mode can have a disproportionate influence on behavior. For instance, any encounter of provocation experienced by a passenger on a bus could have a profound consequence on their future travel behavior and consequently affecting mode choice.

From the above studies, it can be said that that travelers' emotional attachment to travel modes, and undesirable experiences can influence their transport mode choice. The problem arises with finding the right variable responsible for the choice models. Following this train of thought, (Augustus , Wafaa , & Achille , 2020) sought to examine the relationship between positive and negative user valence and transport mode choice behavior. Latent attitudes 'affect' and 'salience' were integrated into transport mode choice models using the framework of integrated choice and latent variable modelling and simultaneous maximum likelihood estimation methods. The results have showed that the observed modal attributes, trip characteristics and individual socio-demographic variables have a significant effect on travel behavior. Similarly, the result also indicated that underlying attitudes and perceptions influence the choice of transport mode.

2.2.9. Attitudes

Attitude can be defined as “global and relatively stable evaluations that people do about persons, things or ideas” (Morales, Moya, Gaviria, & Cuadrado, 2007). Travel-related attitudes are usually connected to preferences for destinations, routes, activities, and modes of transport. A more general understanding of travel-related attitudes may also correlate with the individual's beliefs (e.g., environmentalism) (Tran, Yamamoto, Sato, Miwa, & Morikawa, 2020). Some behavior theories, such as the theory of reasoned action (TRA) and its extension, namely the TPB, emphasized that the individual's travel behavior is significantly influenced by attitudes. In TRA and TPB models, attitude is a predictor of the individual's behavioral intention, which is a predictor of behaviors (Ajzen, 1991).

Travel behavior recognizes the fact that an individual's attitude toward travel modes affects mode choice. It was found that a good attitude toward transit can predict transit use. Equally, specific attitudes toward cars and buses and how such attitudes affect mode choice. Attitude towards a mode of transport affects its utility. Through a qualitative study in Porto (Portugal), (Beirão & Sarsfield Cabral, 2007) demonstrated the significant role of attitude in influencing the mode switch (from the car and public transit) for commuters. They suggested that improving the levels or images of public transit services could be effective to attract occasional public transport users and car users. People who prefer cars to public transport tend to travel by car. In addition to the specific attitude toward the travel mode, the travel behavior effects of general attitudes with a broad concept have been studied. For example, a positive attitude toward physical activity promotes bicycling and walking behaviors However, studies on the effect of traffic safety and attitude toward mode choice are still scarce in terms of the specific condition of feeder trips. Previous studies have mostly investigated mode choice for general trips but paid limited attention to the first- and last-mile trips. Therefore, more sophisticated analyses are indispensable to explore the associations between traffic safety, attitude, and feeder mode choice.

2.2.10. Covid-19 pandemic

The ongoing Covid-19 pandemic has a huge effect on transport mode choice. Several studies have investigated the change in travel patterns due to the pandemic. For example, (Yilmazkuday, 2020) reported that restricting inter-county travel can reduce Covid-19 weekly cases and deaths as much as by 139,503 and 23,445, respectively in the United States. Due to Covid-19, there have been a lot of travel restrictions and bans. These restrictions were on all modes of transport even active modes (de Bruin, et al., 2020) to limit the people's movement to reduce the number of Coronavirus infections. With time, measures such as socioeconomic restrictions, physical distancing, and hygiene measures were also put in place and all of this has a huge effect on transportation. This limits travel options for the people with respect to making their travel-related choices (de Bruin, et al., 2020).

The travel restrictions and lockdown have influenced travel mode choice behavior. It has also been argued that such travel behavior changes could last for long in the post-Covid-19 world as well (Musselwhite, Avineri, & Susilo, 2020). Transportation has been affected globally with a reduction in the number of trips especially public transport trips (Anderson, Heesterbeek, Klinkenberg, & Hollingsworth, 2020).

During Covid-19 pandemic, there was a reduction in the use of public transport to private vehicles which are seen as safer compared to the public transit during a pandemic (Abdullah, Dias, Muley, & Shahin, 2020). However, according to (Litman, 2020), this is only a temporary shift. Traveling by car would not be a preferred option for long due to its expensive character in comparison to other available modes, and people avoid getting infected might shift to active transportation such cycling and walking. (Woodcock, et al., 2020). This is a good thing because of the environmental and health benefits of active transport.

2.3. Conclusion on Literature Review

Literature on the factors affecting transport mode is varied but all agree on the fact that most travelers put speed above all other factors affecting their mode choice. Price and comfort are also seen as important. For long distance trips, the factors are valued differently depending on the type of trip (business or leisure). With business trips, the speed of the mode is considered to be more important than the price of its tickets. This means most business travelers will prefer to spend more and travel fast than save money and spend more time on the trip. This is not the case with leisure trips where cost is perceived as very important. Literature also indicates that more often than not, the choice of a transport mode becomes habitual based on attitude and perception of the mode choice. The literature examined other modes of transport as well, not just train and plane but also bus and car. This is because trains and planes are not door-to-door modes. A commuter will need to travel from home by another mode before getting to the airport or train station and upon arrival, will equally use another mode from the airport or train station, to the final destination. This makes factors affecting these other modes important as well.

CHAPTER THREE: METHODOLOGY

The methodological aspects of this research will be considered in this chapter. This study has as main objective to investigate the reasons for commuter mode choice and the willingness to change modes from flights to train travel. This is to be done by examining the minimal conditions necessary for commuters to be willing to change modes from flights to train. This chapter will discuss how data will be collected and analyzed data samples will be defined and questionnaire formulation guidelines stated.

3.1. Research Strategy

To meet the stated objective, the intention is to conduct a survey study for long distance commuters travelling for the purpose of business trips. However, due to the current Covid-19 crisis, conducting survey might prove to be difficult due to Covid-19 and carrying out the survey online will be ideal. The survey will be conducted using “Qualtrics” offered by UHasselT. The survey will mainly comprise of multiple-choice questions and statements. These questions will be mainly closed and open ended questions.

The first part of the survey will focus on comparing long distance flight travel and train travel. The theories that serve as background for this are the Transtheoretical Model (TTM) and the Self-Determination Theory (SDT) (see sections 3.3 and 3.4). This is because they deal with behavioural change and we are trying to change commuters’ behaviour to favour train travel as an alternative for flights. The reasons why commuters already travel by particular modes of transport will be investigated so that it will be easier to implement the minimum conditions necessary for said commuters to change their travel mode from flights to train travel.

The next part will focus on the minimal conditions necessary for commuters to change modes of transport from flights to train for long distance trips(>300km). Their willingness to also change these modes will be examined.

The survey was divided into six segments; general questions, questions on long distance trips, questions about certain hypothesis, questions are on social and psychological factors affecting travel, questions on environmental sustainability and questions on general characteristics (see appendix 1).

The analysis of the results from the online survey will be analysed with the software program SPSS.

3.2. Research population

From the objective of the study, the study is aimed at identifying the determining factors for the mode choice from flights to train especially for long distance business trips. To qualify to answer the survey, the following conditions must be met:

- Must have travelled long distance (300km or longer) since 2018 by plane or train for business purposes.
- Must be at least 18 years old.

The participants will be selected by means of a convenience sampling. Recruiting of participants will be based on the personal contacts of the researcher. A QR code for the survey was distributed in Brussels Airport and Brussels Midi train stations. Data was also collected through linked-In, WhatsApp, and other professional acquaintances.

3.3. Self-Determination Theory (SDT).

Questions targeting behavioural change will be included in the survey and hence the need for this model. These questions will focus on determining the motivation of commuters towards their mode choice preferences. Developed by (Ryan & Deci, 2000), the ownership of a particular behaviour is influenced by the quality of motivation and the degree of regulation over a motivation. The quality of motivation is essential; within the SDT, it is not the "amount" of motivation but the "type" of motivation that is important for pursuing sustainable behavioural change. What motivates commuters to use flights instead of trains? And what can motivate a change from flights to trains? In general, three main types of motivation can be distinguished (Howard, Bureau, & Gagné, 2017)

- Extrinsic motivation: This is the motivation to perform a certain behaviour determined from an external factor.
- Intrinsic motivation: It is the motivation to perform certain behaviours which are determined by the individual.
- Amotivation: This is the lack of motivation to perform certain behaviours.

In addition to distinguishing different types of motivation, the degree of regulation over a motivation is also central to the SDT. The degree of regulation describes the (different) reasons for having a certain motivation (Ryan & Deci, 2000).For extrinsic motivation four types of regulation can be distinguished, for intrinsic motivation one type of regulation applies (Howard, Bureau, & Gagné, 2017):

- External regulation: avoiding a punishment or obtaining a reward as a reason to engage in extrinsically motivated behaviour.
- Internalized regulation: avoiding negative feelings or obtaining positive feelings as a reason for exhibiting extrinsically motivated behaviour.
- Identified regulation: deeming or valuing personal importance as a reason for exhibiting extrinsically motivated behaviour.
- Integrated regulation: considering a part of one's identity as a reason for engaging in extrinsically motivated behaviour.
- Intrinsic regulation: having the completely autonomous decision to engage in intrinsically motivated behaviour.

3.4. Transtheoretical Model

The Trans theoretical Model (TTM) is a theoretical model, developed by (Prochaska & DiClemente, 1982), which states that behavioural change is accomplished by passing through various behavioural change stages over time. Motivation is the most important factor for behaviour change.

This model will be used in the survey to determine at what stage of behavioural change commuters consider switching from air to train travel. This will equally be used to determine the willingness of commuters to change their transport modes from flights to train travel for long distance business trips.

The following behaviour change phases are distinguished:

- **Precontemplation:** It is the phase where an individual does not foresee any behaviour change within six months.
- **Contemplation:** in this stage, an individual does foresee a change in behaviour within six months.
- **Preparation (preparation/planning):** This is the phase in which an individual tries to change behaviour within one month.
- **Action:** In this phase an individual has adopted actions of the desired, changed behaviour.
- **Maintenance:** The phase where an individual is still performing the desired, changed behaviour after six months, and the behaviour appears to have become habitual.

Nowadays, two other behavioural change phases are mentioned as additions to the model ((Prochaska, Redding, & Evers, 2015); these are:

- **Termination:** In this phase, an individual has fully adopted a behavioral change for at least 5 years and does not relapse into previously exhibited (undesirable) behaviors.
- **Relapse:** It is the phase where an individual relapses to previously exhibit (undesirable) behavior.

It is indicated in (Diclemente; & Velasquez, 2002) that motivation is the most important factor for successfully going through the different phases of behaviour change. This motivation is under the influence of three motivational constructs: the decision balance, self-efficacy and so-called POCs (Processes of Change). These three constructs are explained by (Prochaska, Redding, & Evers, 2015).

The decision balance is the first motivational construct that plays into the motivation to perform a certain behaviour. The decision balance involves the personal trade-off between the pros and cons of performing a particular behaviour; the cost/effort of performing the behaviour and the benefits of the behaviour are compared.

Self-efficacy is about the confidence in one's own ability to perform a particular behaviour, even in situations where performing this behaviour is more difficult. In most cases self-efficacy is high when one is in the maintenance phase.

The POCs, freely translated change processes, play a major role in the TTM for going through the behavioural phases. Essential is the idea that per phase interventions can be applied to reduce resistance

towards a behavioural change, and thus a further phase towards the desired behavioural change can be achieved

Over the years, the research and application of TTM has expanded to multiple (mental) health behaviours (Prochaska, Redding, & Evers, 2015). In recent years, several studies and applications have shown promise for the model's usefulness in the field of traffic and transportation (Davy , et al., 2016) and (Biehl, Ermagun, & Stathopoulos, 2018).

Two limitations of the TTM are that the motivations of adapting to desired behaviour cannot be explained. In addition, the TTM cannot identify the underlying (psychological) mechanisms in maintaining a certain behaviour (Davy , et al., 2016). As a motivational theory, the Self-Determination Theory (SDT) can provide insight into motivations and underlying mechanisms. Indeed, the SDT distinguishes between differences in motivation. It is expected that the degree of motivation changes as one moves through a further behavioural stage toward the desired behaviour.

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION

The survey had a total of 96 responses but unfortunately only 49 of those responses were complete. The survey measures the factors that influence business commuters to choose train travel over flights for long distance trips. The survey shows that most people travelling for business trips are employed. And that the main factor that makes long distance business commuters to prefer flights to trains is the speed of the planes. Travel speed is also the biggest motivation for the majority of respondents to switch from travelling by plane to train. If they could travel by high speed trains, most respondents who travel by plane will reconsider trains. The respondents who already travel by train do so mostly because of the low cost of train tickets compared to flights and also due to the availability and accessibility of trains. At the end of the day, the purpose of the survey is to find out why do long distance commuters prefer flights over travelling by train? And what are the main factors that can influence a more sustainable travel mode choice for long distance commuters? Under what circumstances do long distance commuters consider train trips as a viable alternative to flights will also be investigated?

See appendix 2 for detailed tables and graphs on the descriptive statistics.

4.1. Data Analysis.

4.1.1. Descriptive statistical analysis of socio-demographics, business trips and mode use.

Variable	Description	Frequency	Percentage (%)
Gender	Male	24	49.0
	Female	21	42.9
	Non-binary / third gender	3	6.1
	Prefer not to say	1	2.0
	Total	49	100.0
Age	62-52	5	10.2
	51-42	4	8.2
	41-32	27	55.1
	31-22	12	24.5
	21	1	2.0

	Total	49	100.0
Level of education	Basic Education	8	16.3
	Secondary education	14	28.6
	Bachelors	22	44.9
	Masters	5	10.2
	Total	49	100.0
How many hours do you spend per week on your profession?	Maximum 19 hours	9	18.4
	20-39 hours	14	28.6
	40-59 hours	20	40.8
	60 hours or more	6	12.2
	Total	49	100.0
Approximately how many business trips did you make in a year before Covid-19?	0 trips	1	2.0
	1-5 trips	30	61.2
	6-10 trips	15	30.7
	11-15 trips	3	6.1
	Total	49	100.0
Approximately how many business trips do you make in a year during this Covid-19 pandemic?	0 trips	7	14.3
	1-5 trips	36	73.5
	6-10 trips	4	8.1
	11-15 trips	1	2.0
	16-20 trips	1	2.0

Variable	Description	Frequency	Percentage (%)
	Total	49	100.0
What sort of business trips did you make pre Covid-19?	National	15	30.6
	International	11	22.4
	Both	23	46.9
	Total	49	100.0
What sort of business trips do you now make during Covid-19?	National	21	42.9
	International	12	24.5
	Both	16	32.7
	Total	49	100.0
How do you travel for business trips?	Train	24	27.9
	Plane	34	39.5
	Car	26	30.2
	Others	2	2.3
	Total	86	100.0
On average, approximately which distance do you travel for a business trip?	Less than 100km	9	18.4
	100-200km	8	16.3
	200-300km	6	12.2
	300-400km	5	10.2
	400-500km	6	12.2
	more than 500km	15	30.6
	Total	49	100.0

Variable	Description	Frequency	Percentage (%)
On average, approximately how many hours do you travel for a business trip?	Less than 1hour	5	10.2
	1-2 hours	10	20.4
	2-3 hours	10	20.4
	3-4 hours	6	12.2
	4-5 hours	7	14.3
	More than 5 hours	11	22.4
	Total	49	100.0
My reason for travel (business vs. for leisure purposes) affects my mode choice	Yes	22	44.9
	Sometimes	20	40.8
	No	7	14.3
	Total	49	100.0
When travelling for international business trips, I use	train	1	8.3
	flight	11	91.7
	Total	12	100.0
When travelling for national business trips, I use	Train	6	30
	Flight	5	25
	Car	8	40
	Others	1	5
	Total	20	100.0
For long distance business trips (≥ 300 km) I travel by	Train	22	32.8
	Plane	32	47.8
	Car	13	19.4
	Total	67	100.0

Variable	Description	Frequency	Percentage (%)
For some long distance business trips (≥ 300 km), I travel by train because of	Comfort	4	9.8
	Speed	5	12.2
	Price	9	22.0
	Safety	4	9.8
	Convenience	6	14.6
	My company books my trips	7	17.1
	Availability	6	14.6
	Total	41	100.0
For some long distance business trips, I take trains instead of the plane because	Trains are more comfortable	3	10.3
	Trains are cheaper	9	31.0
	Trains are safer	1	3.4
	My company books my business trips and decides on my mode and means of transport	5	17.2
	Trains depart and arrive in the city center	4	13.8
	Because I always take trains	5	17.2
	Trains have fewer delays than planes	2	6.9
	Total	29	100.0
For some long distance business trips(≥ 300 kms) , I would consider taking the train instead of flying if trains are high speed trains	Yes	10	66.7
	Sometimes	4	26.7
	No	1	6.7
	Total	15	100.0

Variable	Description	Frequency	Percentage (%)
For some long distance business trips, I am discouraged from taking planes because of	Cost	10	55.6
	Speed	1	5.6
	Comfort	1	5.6
	Delays	6	33.3
	Total	18	100.0
I travel by plane because	My company books my business trips and decides on my mode and means of transport	18	15.1
	Accessibility	13	10.9
	Safety	18	15.1
	Price	9	7.6
	Speed	34	28.6
	Comfort	27	22.7
	Total	119	100.0
I take flights instead of the trains	Flights are cheaper	7	6.4
	Flights are more comfortable	23	20.9
	Flights have fewer delays than trains	11	10.0
	Flights are safer	11	10.0
	Flights are faster than trains	30	27.3
	Because I have always taken flights	10	9.1
	My company books my business trips and decides on my mode and means of transport	18	16.4
	Total	110	100.0

Variable	Description	Frequency	Percentage (%)
Do you belong to a Frequent Flyer Program?	Yes	15	30.6
	No	23	46.9
	I don't know	11	22.4
	Total	49	100.0

Table 14: Descriptive statistical analysis of valid samples

Out of the 49 respondents, 45 are employed while 4 are not. Most respondents spend 40-59 hours a week on their profession (40.8%) while only 12.2% spend above 60 hours a week on their profession. It is evident that most people make both international and national business trips (46.9%) followed by respondents who only make national trips (30.6%).

The trend during the Covid-19 pandemic shows people making more national than both national and international trips probably due to the Covid-19 lockdown and travel restrictions. Both international and national business trips have reduced from 46.9% to 32.9%. The national trips have increased from 30.6% before Covid-19 to 42.9%. For business trips, most respondents (39.5%) travel by plane followed by car and then train. Two respondents indicated that they travel by other means which are ship and bus.

Most respondents travel more than 500km and others less than 100km. Most respondents (22.4%) spend more than 5 hours on business trips followed by 1-2 (20.4%) hours and 2-3 hours (20.4%). In most instances, mode choice is determined by the reason for travel. This is true for 44.9% of the cases and partially true 40.8% of the cases.

Most international business trips are flights (91.7%). For national business trips, most long distance business travelers prefer to travel by car followed by train. One respondent mentioned the ship as another option.

For long distance business trips (≥ 300 km), 47.8% of the respondents travel by plane, while 32.8% travel by train and only 19.4% travel by car. None indicated that they travel by other modes/means of transport. Most respondents travelling by train do so due the lower price of trains compared to flights while factors such as comfort and safety are the least important factors considered in train travel. The preference of trains over flights is due to the fact that trains are cheaper than flights followed by the fact that most business travelers have their trips booked by their companies and equally because they have always taken the train.

From the responses, most people travelling long distance for business trips will consider switching from flights to trains if they could travel by means of high speed. Only 6.7% of the respondents will not consider

switching to trains even if they are high speed. As concerns plane travel, what discourages most long distance business travelers is the delay of planes followed by the cost. Factors such as speed and comfort are not an issue. As for the reasons business travelers take flights, it is due to the speed of flight, comfort and also because their companies book their trips. Cost is also important.

As for the reasons why business travelers prefer flights to trains, the speed of flights compared to trains comes first followed by comfort and the price of flights. 30.6% of business travelers traveling by flights belong to a frequency flyer program while the majority; 46.6% do not belong to this program.

4.1.2. Descriptive analysis on transport mode choice versus sustainability of the environment

What is your opinion on the following;	Yes	No
I would like my mode choice to be environmentally sustainable	85.7%	14.3%
I try to be environmentally sustainable because the benefits to the environment are important to me	71.4%	28.6%
I do not see the benefit of having a sustainable environment.	28.6%	71.4%
I think it is a waste of time to focus on sustainability in transportation	22.4%	77.6%
I consider environmental sustainability in my mode choice because others (friends / family / partner / work giver) would disapprove if I did not.	40.8%	59.2%

Table 2: Descriptive analysis for valid samples related to transport mode choice versus sustainability of the environment.

Most respondents show a positive attitude towards environmental sustainability and would love their transport mode choice to be environmentally sustainable. And this choice is due to the important benefits of having a sustainable environment. 71.4% of the respondents see the benefits of environmental sustainability while only 22.4% think focusing on environmental sustainability is a waste of time. When it comes to how family, friends and work givers affect environmental sustainability and mode choice, a majority of the respondents (59.2%) do not consider these third parties in their decision.

Variable	Description	Frequency	Percentage (%)
Which mode of transport do you consider more sustainable for international business travel?	Trains	9	18.4
	Flights	27	55.1
	They are equally sustainable	13	26.5
	Total	49	100.0
Which mode of transport do you consider more sustainable for national business travel?	Trains	24	49.0
	Flights	14	28.6
	They are equally sustainable	11	22.4
	Total	49	100.0
I consider pollution and emissions before I choose my travel mode for long distance business trips	Yes	8	16.3
	Sometimes	17	34.7
	No	24	49.0
	Total	49	100
Due to large CO2 emissions from flights, consider CO2 taxes are included in flight tickets resulting in an increased cost of flights compared to the train ticket prices. I prefer to travel for long distance business trips (≥ 300 kms) by	flight	16	47.1
	train	16	47.1
	car	2	5.9
	Total	34	100.0
Knowing that flights pollute the environment more than trains, I am willing to change my travel mode from flights to trains for long distance business trips (≥ 300 kms)	Flight	7	20.6
	Train	21	61.8
	Car	6	17.6
	Total	34	100.0

Table 3: Descriptive analysis for valid samples related to transport mode choice versus sustainability of the environment

For internal business travel, business travelers (55.1%) consider flights as more sustainable while 26.5% of the respondents consider both flights and trains as equally sustainable. For national business trips, 49% of the respondents consider trains as more sustainable while 22.4% consider both trains and flights as equally sustainable. Most business travelers (49%) do not consider pollution in their mode choice while 34.7% sometimes consider it and only 16.35 of the respondents consider pollution when choosing their mode for long distance business trips. If a pollution charge increases the cost of flights through an increase in the prices of plane tickets compared to train tickets, 47.1% of the respondents will still choose to travel by flights and the same number by train while only 5.9% will prefer to travel by car. Previously, for long distance business trips, 47.8% of the respondents indicated that they travel by plane. This means with an increase in the cost of train tickets, there is a 0.7 reduction in the number of respondents traveling by plane. With the knowledge that flights are less sustainable than trains, 61.8% of long distance business travelers will consider traveling by train.

4.1.3. Hypothesis testing

This research aims at finding evidence to support certain assumptions.

For long distance business trips (≥ 300 kms), I prefer flights because of the shorter net travel times of flights compared to trains.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	29	82.9	82.9	82.9
	No	6	17.1	17.1	100.0
	Total	35	100.0	100.0	

Table 4: For long distance business trips (≥ 300 kms), I prefer flights because of the shorter net travel times of flights compared to trains.

For long distance business trips (≥ 300 kms) , I prefer flights because of the shorter net travel times of flights compared to trains.

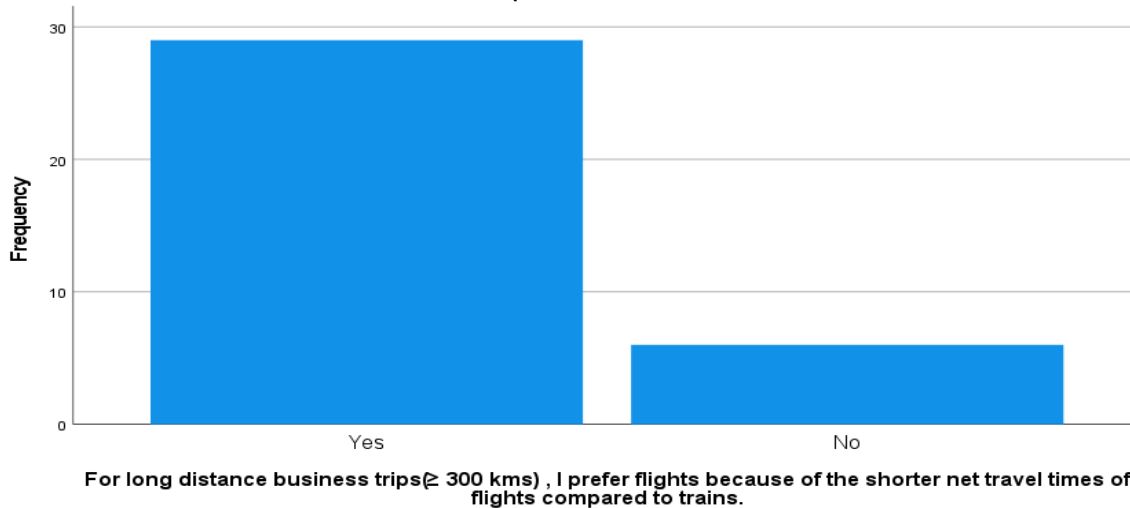


Figure 15: For long distance business trips (≥ 300 kms), I prefer flights because of the shorter net travel times of flights compared to trains.

Most respondents (29 out of 35) prefer flights because of their shorter net travel times compared to trains. This makes speed a very important determinant in transport mode choice. The speed of planes has been indicated previously as the most considered factor by commuters travelling by flight for long distance business trips.

If I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	19	79.2	79.2	79.2
	No	5	20.8	20.8	100.0
	Total	24	100.0	100.0	

Table 5: If I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit

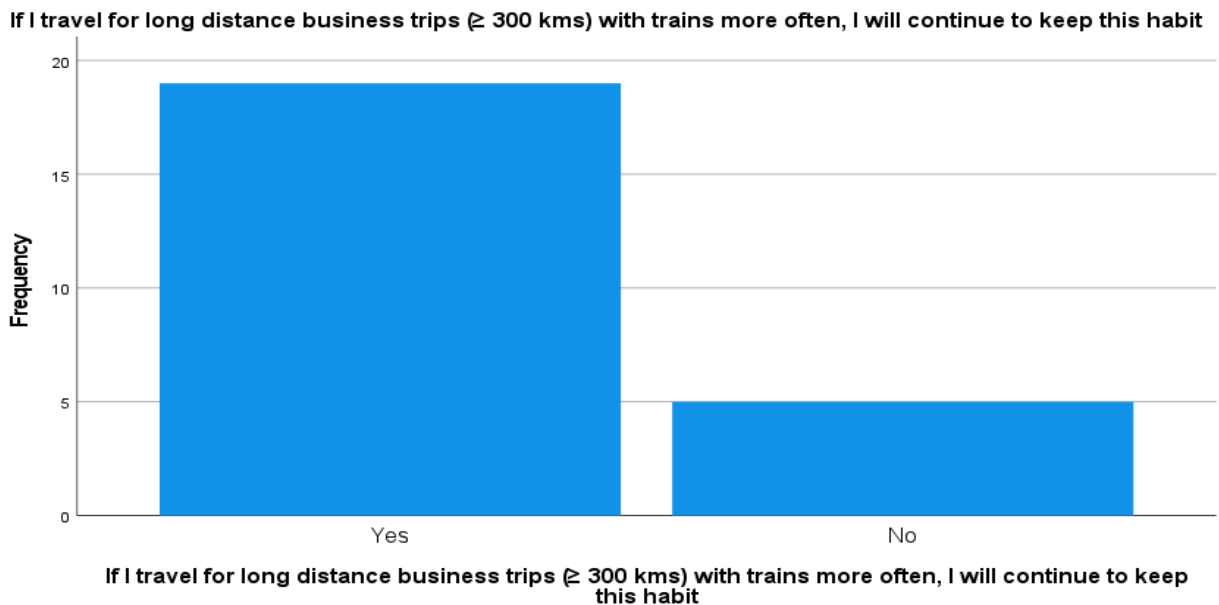


Figure 16: If I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit.

The figure above indicates that travelling long distance for business trips with trains more often will make 19 out of the 24 respondents to continue travelling by train. Most respondents stick to their habits and travel by particular modes because they are used to doing so. This is related to most respondents answering that they travel by train/plane because they have done so in the past and hence it has become habitual.

I do not travel by train for long distance business trips because I am accustomed to flights.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	25	73.5	73.5	73.5
	No	9	26.5	26.5	100.0
	Total	34	100.0	100.0	

Table 6: I do not travel by train for long distance business trips because I am accustomed to flights.

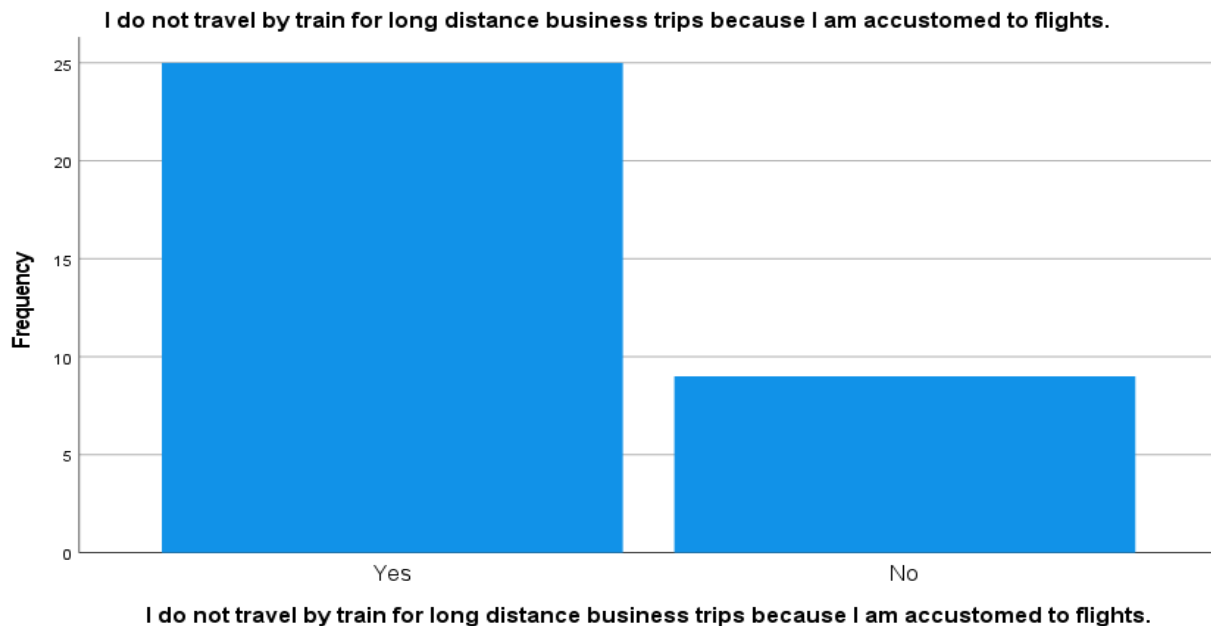


Figure 17: I do not travel by train for long distance business trips because I am accustomed to flights.

The figure above indicates that due to being accustomed to flights, 25 of the 34 respondents do not travel by train. This confirms the fact that most respondents have developed certain habits and attitudes and maintain these habits. This is confirmed by literature studies which shed a light on the importance of attitudes on transport mode choice.

Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	19	79.2	79.2	79.2
	No	5	20.8	20.8	100.0
	Total	24	100.0	100.0	

Table 7: Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future

Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future

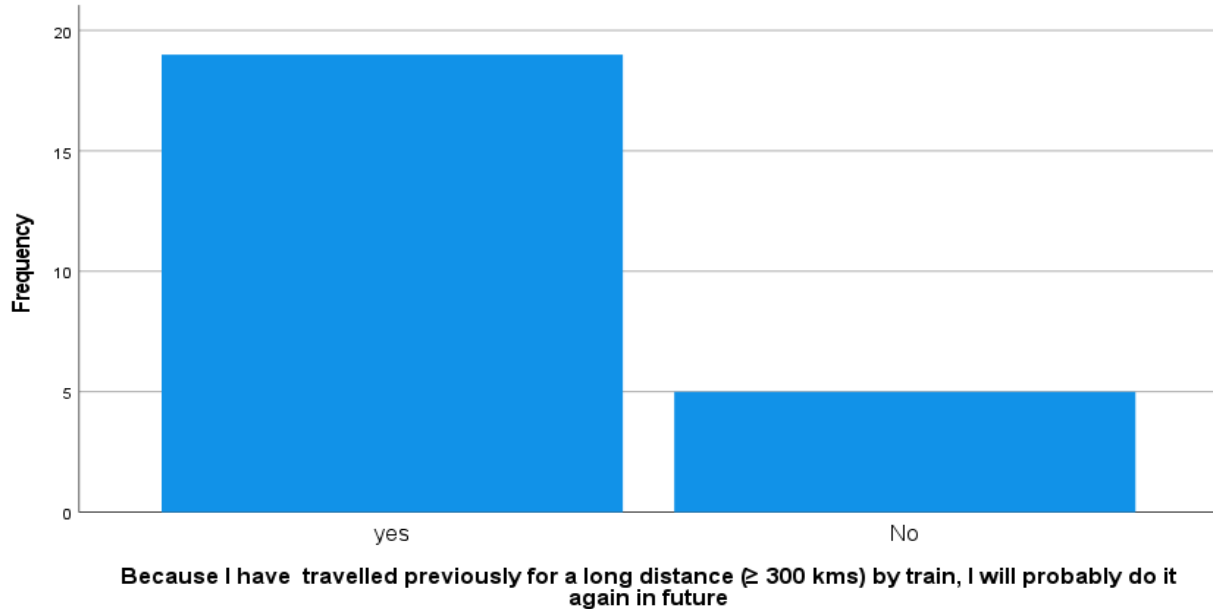


Figure 18: Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future

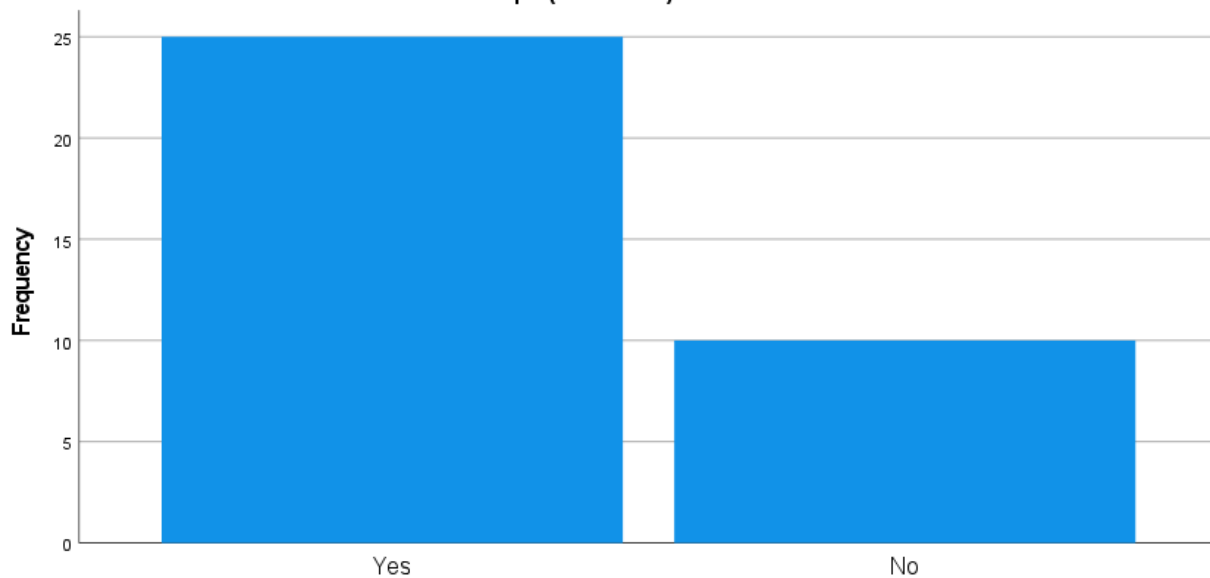
The figure above indicates that due to previous long distance travel by train, 19 of the 24 respondents will likely travel by train again in future. If more people can be convinced to travel by train, they will likely keep doing so in future. This is in line with previous responses indicating the choice for a particular travel mode based on previous travel with said mode.

I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	25	71.4	71.4	71.4
	No	10	28.6	28.6	100.0
	Total	35	100.0	100.0	

Table 8: I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future

I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future



I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future

Figure 19: I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future.

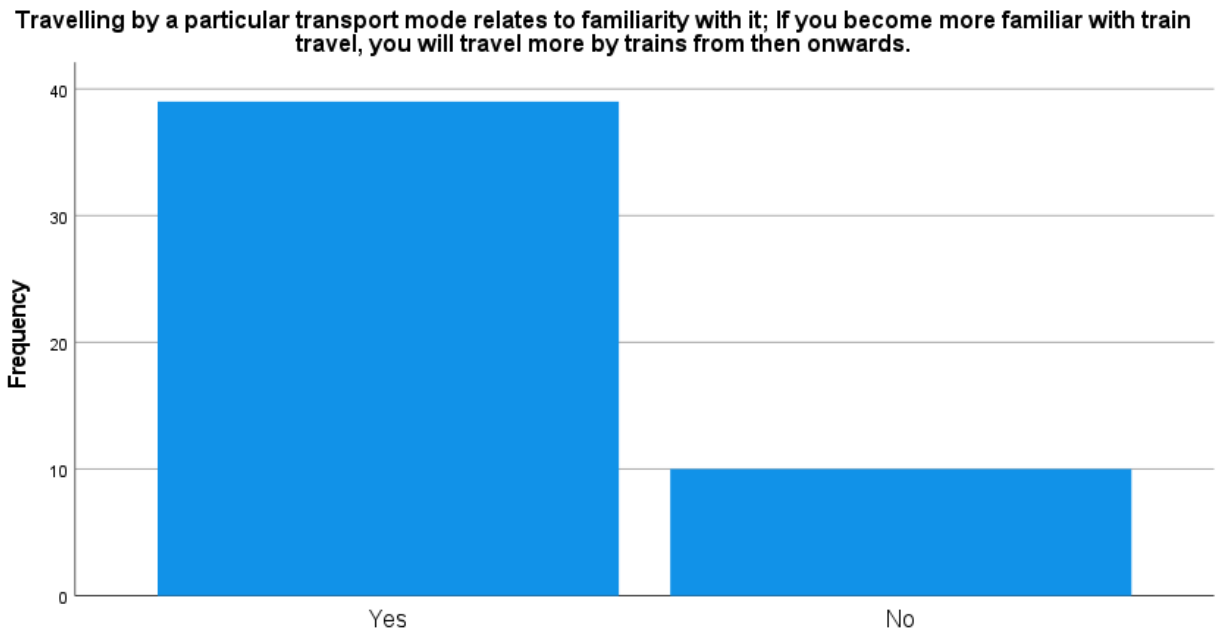
According to the above figure, being aware of the negativities resulting from plane travel will make 25 of the 35 respondents to consider trains as an alternative for planes for long distance business trips. Some of the long distance business travelers are unaware of the negativities resulting from plane travel. If more awareness on environmental sustainability is created, more people will travel by train compared to flights.

Travelling by a particular transport mode relates to familiarity with it; If you become more familiar with train travel, you will travel more by trains from then onwards.

	Frequency	Percent	Valid Percent	Cumulative Percent
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Valid	Yes	39	79.6	79.6	79.6
	No	10	20.4	20.4	100.0
	Total	49	100.0	100.0	

Table 9: Travelling by a particular transport mode relates to familiarity with it; if you become more familiar with train travel, you will travel more by trains from then onwards.



Travelling by a particular transport mode relates to familiarity with it; if you become more familiar with train travel, you will travel more by trains from then onwards.

Figure 20: Travelling by a particular transport mode relates to familiarity with it; if you become more familiar with train travel, you will travel more by trains from then onwards.

In order to travel by a particular mode of transport, familiarity is important. 39 of the 49 respondents indicated that if they become more familiar with trains, they will travel more by train from then onwards. Familiarity is closely linked with developing habits and feeling safe and comfortable. This is evident from the figure above. There is a recurring importance cast on attitude and habits developed due to familiarity with a mode choice.

4.1.4. Social and psychological factors affecting travel

For long distance business trips (≥ 300 kms)	Yes	No
My travel mode choice is influenced by friends / family / partner / work giver	61.2%	38.8%
My travel mode choice is influenced by my own personal reasons	75.5%	24.5%
Nothing and no one influences my travel mode choice	36.7%	63.3%

Table 10: Social and psychological factors affecting travel

This part of the survey focused on the theories of behavioral change. From the table above, extrinsic motivation is seen to be a very important kind of motivation in transport mode choice. 61.2% of the respondents are extrinsically motivated in their transport mode choice decisions. As for motivation to choose a transport mode determined by the respondent himself, this is the most important (75.5%). At the end of the day, intrinsic motivation surpasses extrinsic motivation. Amotivation however, is only 36.7%. This is to say that most respondents that intrinsic motivation is more important than extrinsic motivation with relation to transport mode choice.

For long distance business trips (≥ 300 kms) ,	Yes	No
I will change my transport mode if there is a reward for change or punishment if I do not change	71.4%	28.6%
I feel better when I travel through a more sustainable transport mode	61.2%	38.8%
I consider sustainability in my mode choice because people look up to me.	42.9%	57.1%
I will change my transport mode choice because I realize the dangers of pollution.	65.3%	34.7%

Table 11: Types of behavioral motivation.

According to the table above, external regulation is a very important factor as 71.4% of the respondents will change their mode choice to a more sustainable one provided there is a reward for a modification or punishment for lack of change. As for internalized regulation, 61.2% of the respondents feel better when travelling through sustainable transport modes. Integrated regulation makes people to be sustainable because others look up to them and this makes 65.3% of the respondents to change their mode choice and become more sustainable due to the dangers of pollution (Intrinsic regulation). External regulation in this case is the most important type of motivation considered for transport mode choice.

Stages of behavior Change	For long distance business trips (≥ 300 kms),	Yes	No
Contemplation	I have never considered changing my transport mode before	53.1%	46.9%
Preparation	I have already decided to change my transport mode	38.8%	61.2%
Action	I have changed my transport mode before	42.9%	57.1%
Maintenance	I have continued with the changed mode of travel successful	30.6%	69.4%
Relapse	I changed my mode of travel but was unsuccessful in sticking to the new mode	34.7%	65.3%

Table 12: Stages of behavioural change.

To determine at what stage of behavioural change commuters consider switching from air to train travel, the stages of behavioural change of the respondents are important. These questions equally determine the willingness of commuters to change their transport modes from flights to train travel for long distance business trips. The table above indicates that 53.1% of the respondents have never contemplated transport mode change. The majority have not decided to change their mode choice. Only 38.85 of the respondents have made this decision before (Preparation). Due to this lack of preparation by most of the respondents, most of them have equally taken no actions to change their mode choice (Action). This lack of action is again followed by a lack of maintenance as only 30.6% of the respondents have successfully changed their travel modes. Even after changing mode choice successfully, 34.7% of the respondents relapsed.

4.1.5. Sub Group Analysis

This analysis will be done mainly to see the differences between train and plane travellers with respect to certain survey responses and how these responses relate to sustainability.

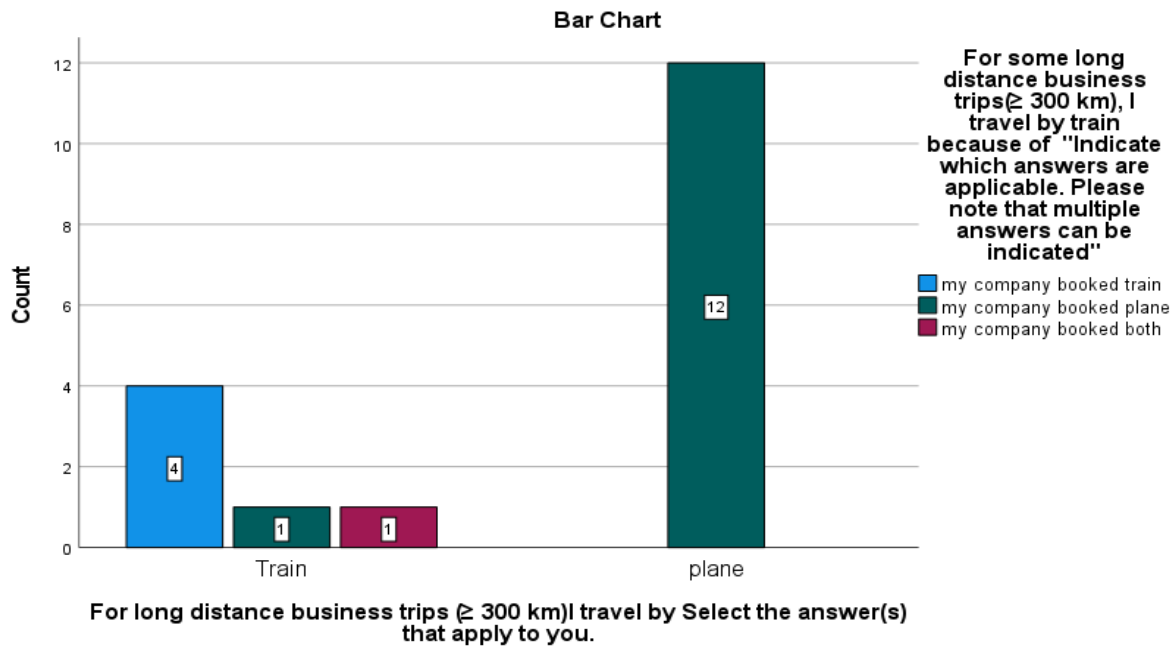


Figure 21: I travel by plane/train because my company books my trips.

Figure 21 above shows a tradeoff between train and plane and employers booking business trips. On the x-axis, the selected trips are indicated which are train and plane. According to the figure, 12 long distance business travelers who normally travel by plane for long distance business trips (≥ 300 km), travel by plane because their employers booked their business trips and decides their mode choice. As for those who usually travel by train for long distance business trips (≥ 300 km), 4 of them travel by train because their employer books their trips, while 1 travels by plane and 1 travels by both plane and train. It is interesting to note that those who normally travel by plane, even when their trips are booked by their employers, it is still by plane. The respondents travelling by plane in this case surpass those by train.

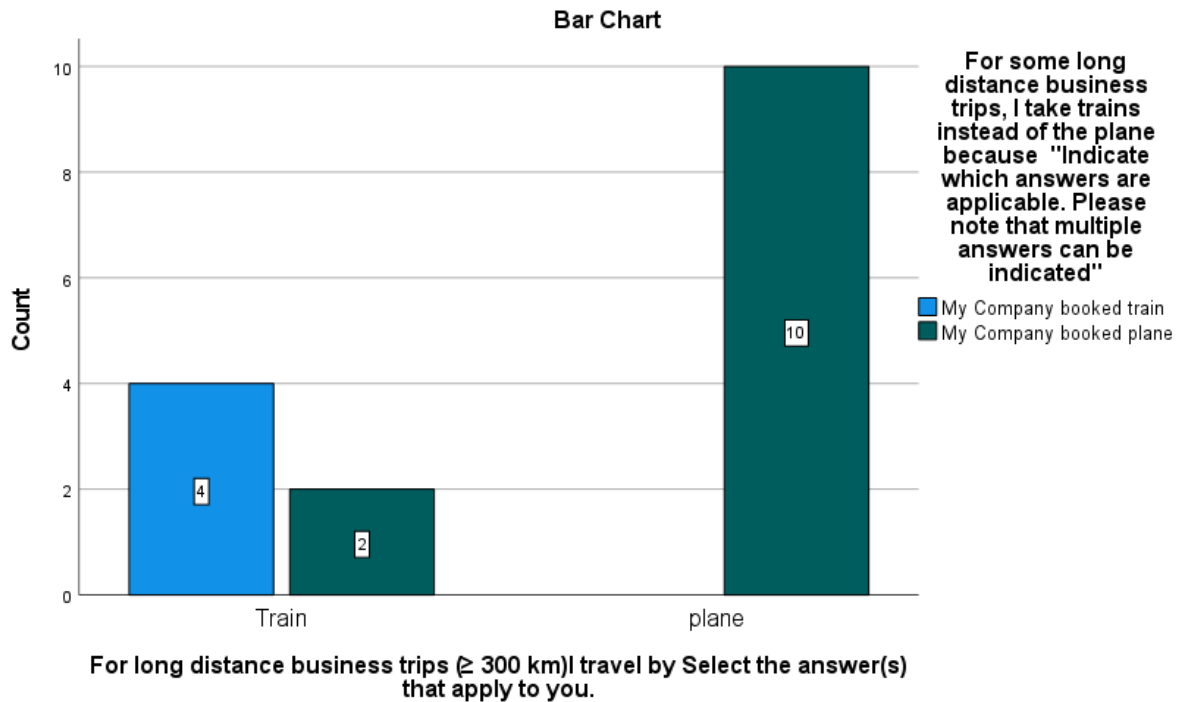


Figure 22: I travel by plane/train instead of train/plane because my company books my trips.

The figure above indicates the number of people travelling by trains instead of planes and by planes instead of trains solely because their trips are booked by their employers. 10 people who normally travel by plane maintain this mode. As for those who normally travel by train for long distance business trips, when their trips are booked by their employers, 4 maintain their travel by train while 2 now travel by plane. It is again evident that those traveling by planes' employers have not considered booking trains.

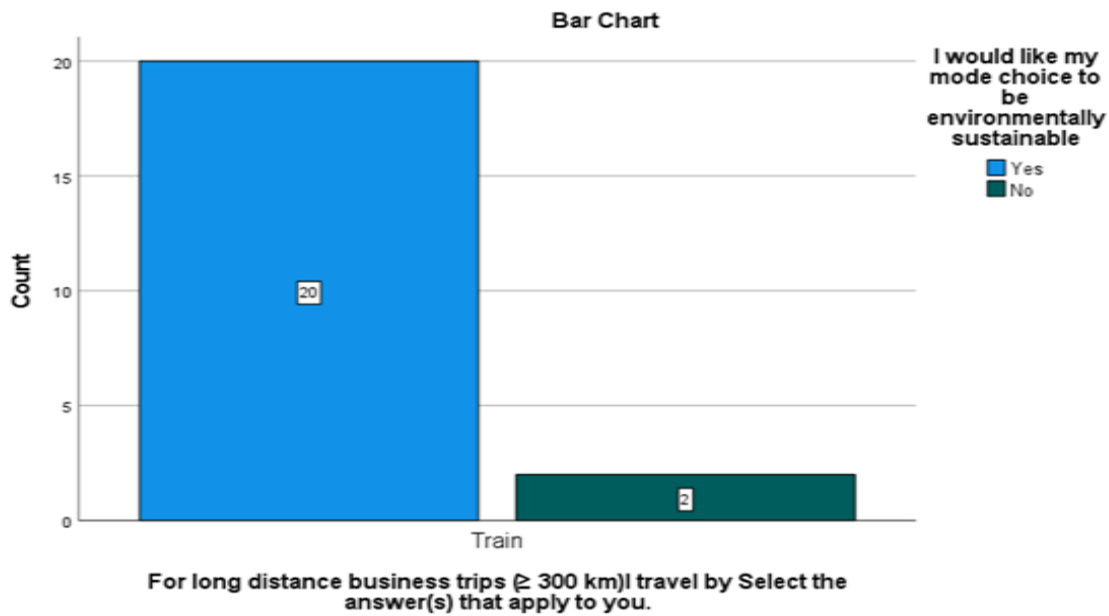


Figure 23: Train travelers and environmental sustainability.

According to the above figure, 20 of the respondents who travel by train for long distance business trips (≥ 300 km) indicated that they will love their mode choice to be environmentally friendly.

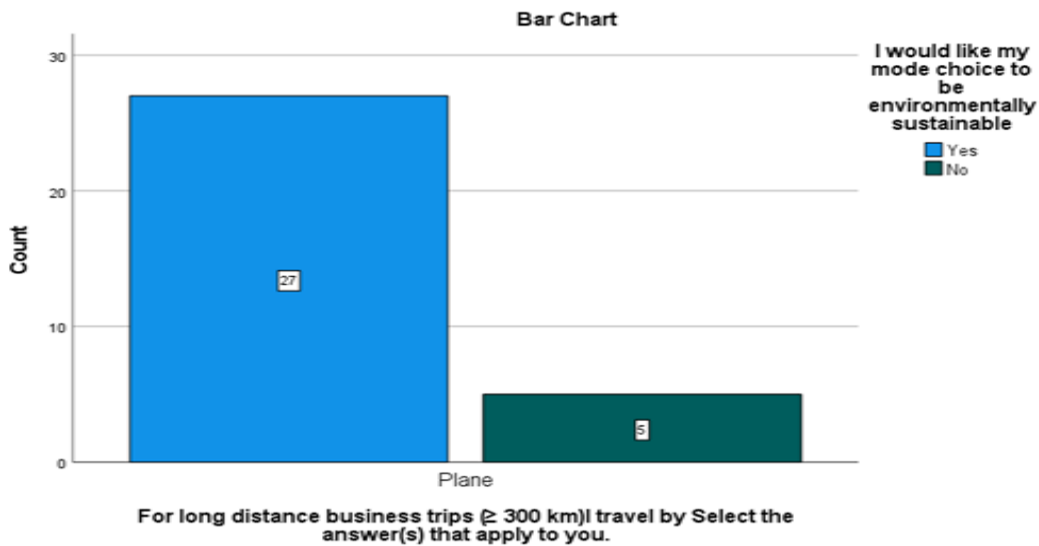


Figure 24: Plane travelers and environmental sustainability.

The figure shows that 27 respondents who travel by plane for long distance business trips (≥ 300 km) will love their mode choice to be environmentally friendly.

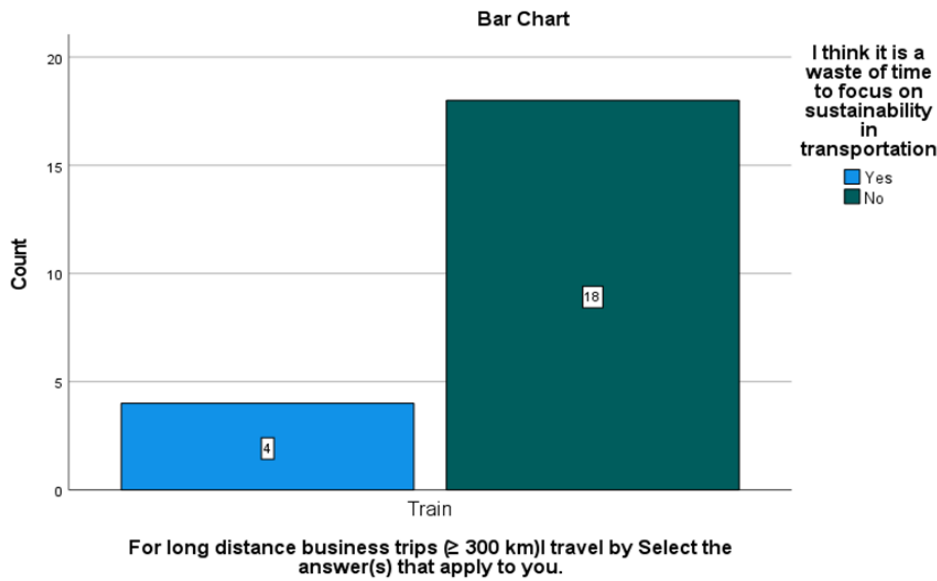


Figure 25: Train travelers versus thinking of environmental sustainability as a waste of time.

According to the graph above, 18 out of 22 respondents who travel by train for long distance business trips (≥ 300 km) think it is important to focus on environmental sustainability.

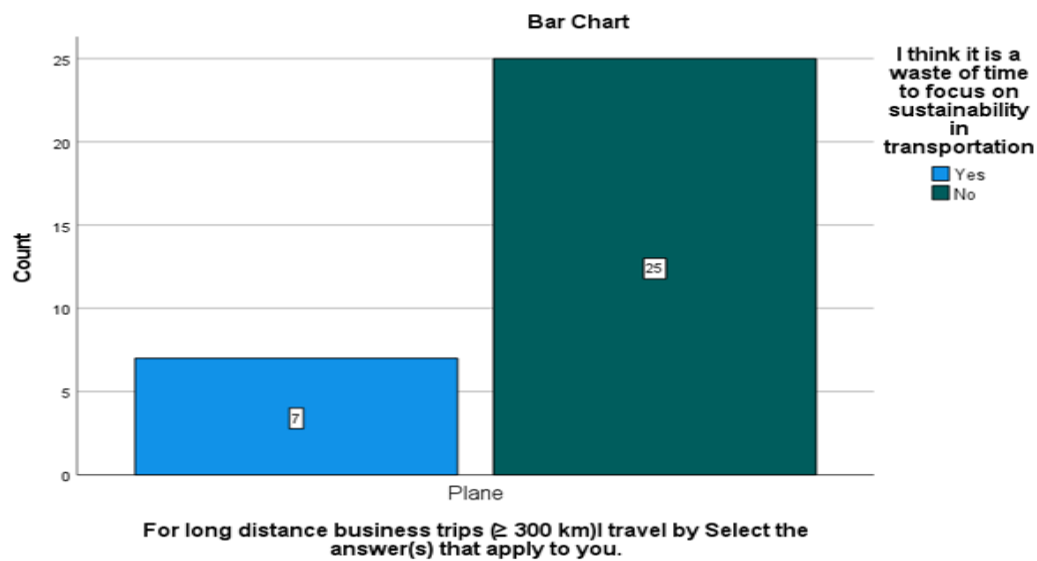


Figure 26: Plane travelers versus thinking of environmental sustainability as a waste of time.

The figure indicates that 25 of the 32 people traveling by plane for long distance business trips (≥ 300 km) do not see the focus on environmental sustainability as a waste of time.

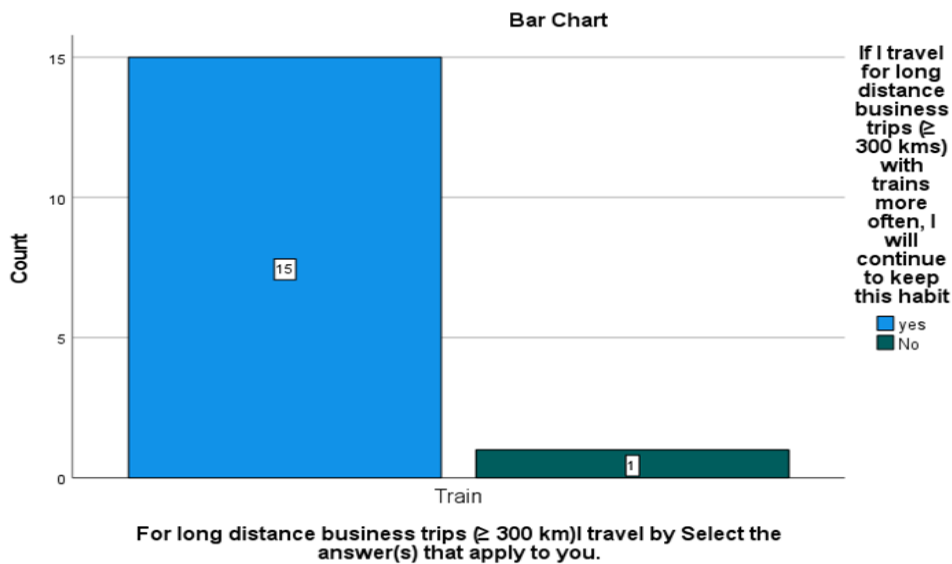


Figure 27: Train travelers versus if I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit.

This figure indicates that off the 16 train travelers, 15 indicate that they will keep the habit of train travel if they travel by trains more often for long distance business trips (≥ 300 kms).

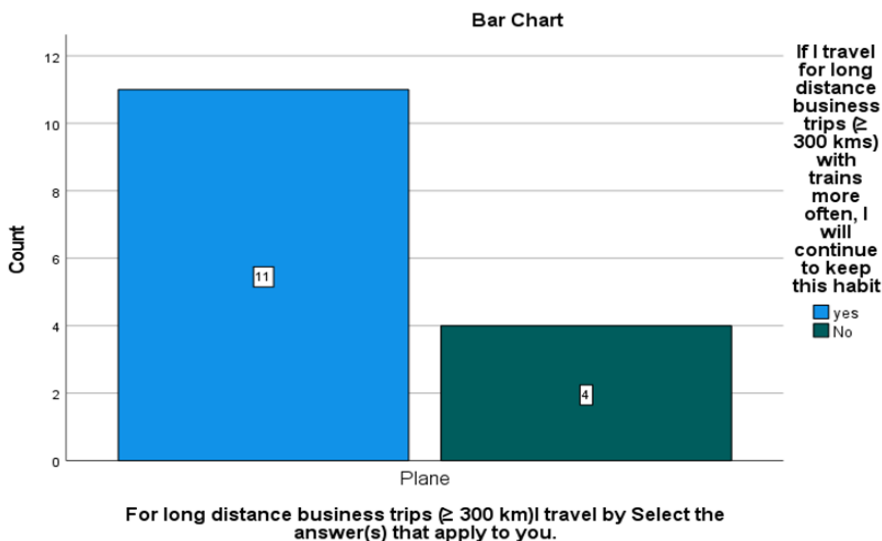


Figure 28: Plane travelers versus if I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit.

It is evident from the figure that 11 out of the 15 plane travelers will continue to keep the habit of traveling by train if they travel by trains more often. This is despite the fact that they currently travel by plane.

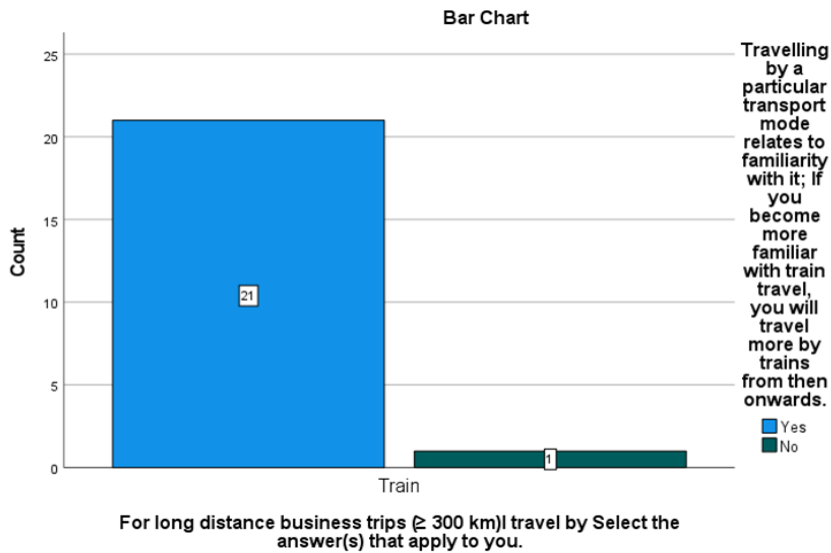


Figure 29: Train travelers and familiarity with a particular travel mode.

According to the graph above, 21 out of 22 train travelers agree that traveling by a particular transport mode relates to familiarity with it.

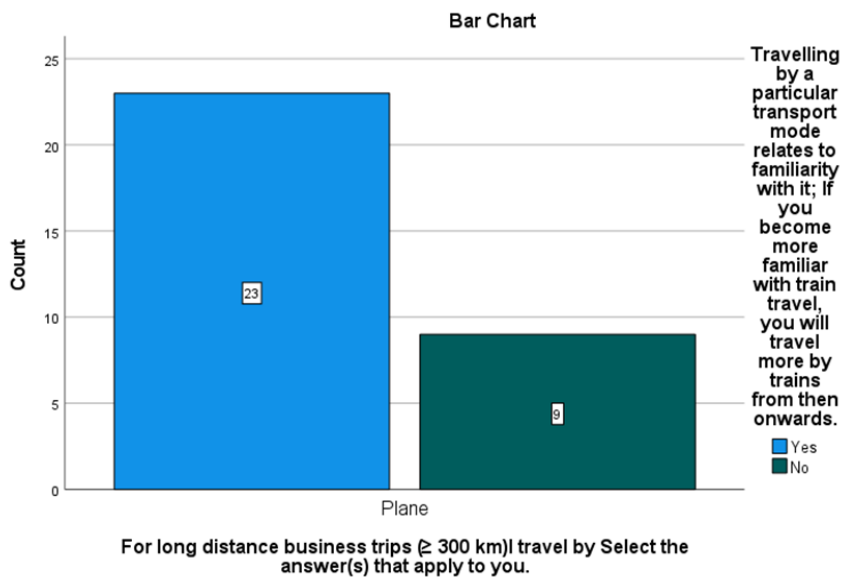


Figure 30: Plane travelers and familiarity with a particular travel mode.

Evidence from the figure above indicated that 23 of the 32 respondents who travel by plane indicate that traveling by a particular transport mode relates to familiarity with it.

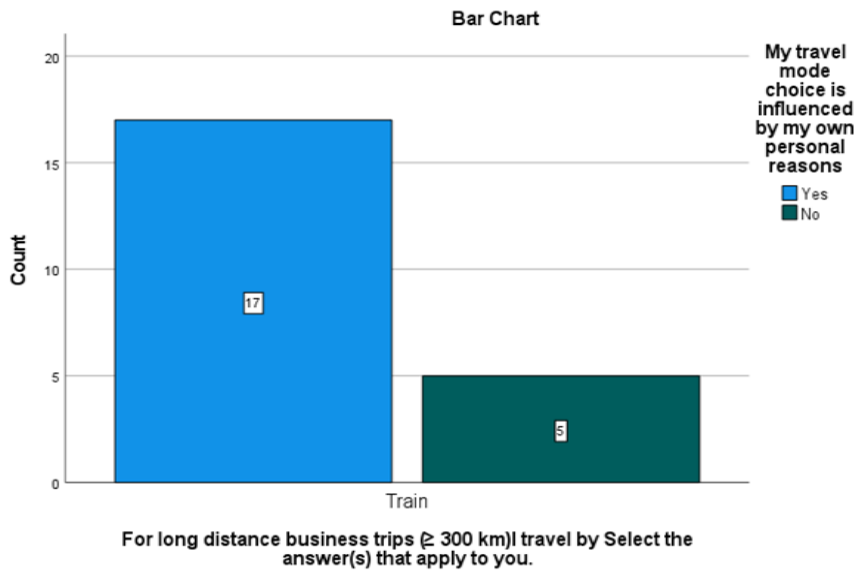


Figure 31: Intrinsic motivation of train travelers.

Intrinsic motivation is the most important type of motivation and 17 train respondents out of 22 are intrinsically motivated.

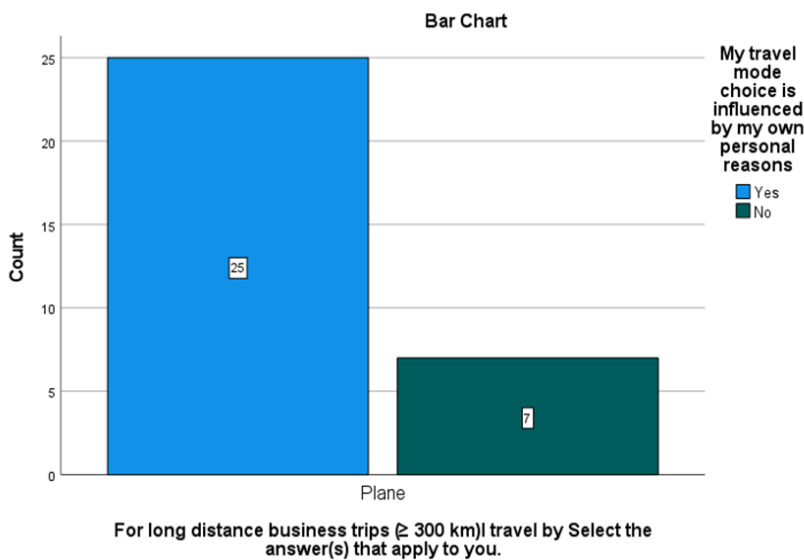


Figure 32: Intrinsic motivation of plane travelers.

It is very important to have personal reasons influence travel mode choice and this is the case with 25 of the 32 train travelers.

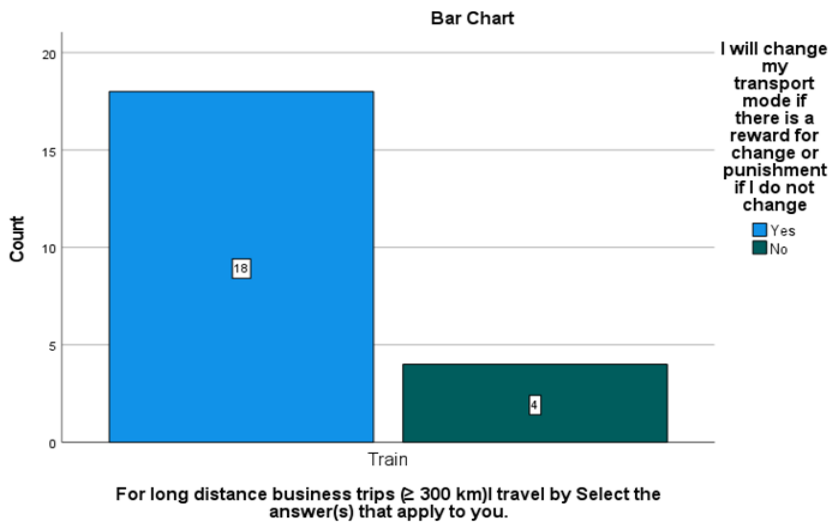


Figure 33: External regulation of train travelers.

The graph above indicates that reward for change and punishment for lack of change will greatly influence train travelers in their mode choice. 18 of the 22 train travelers will change their travel mode for a reward or to avoid punishment.

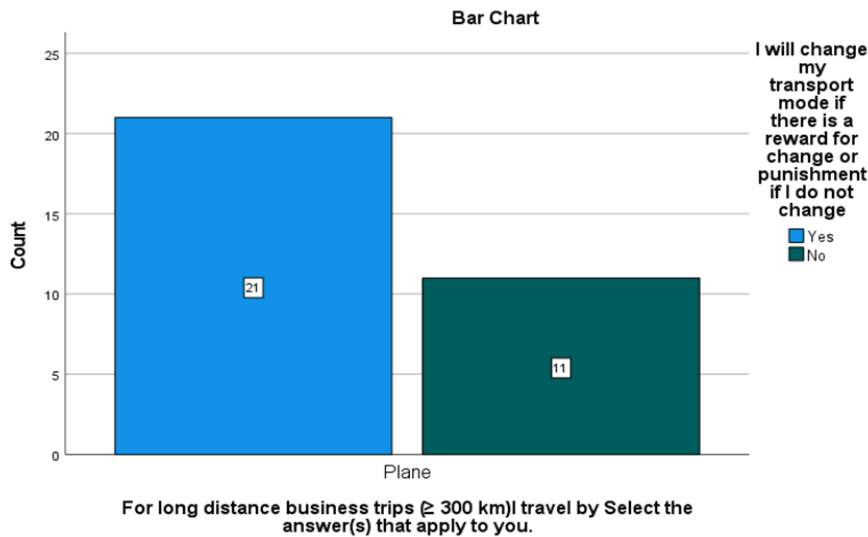


Figure 34: External regulation of plane travelers.

From the figure above, 21 of the 32 plane travelers will change their mode choice to avoid punishment or to receive a reward.

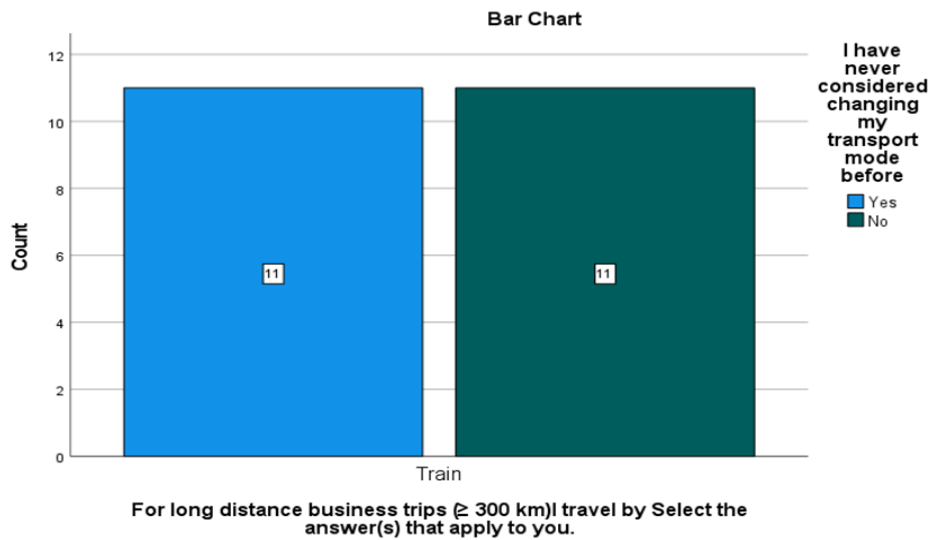


Figure 35: Contemplation of mode choice by train travelers.

Of the 22 train travelers, 11 have contemplated mode choice change from train to another mode for long distance business trips (≥ 300 kms).

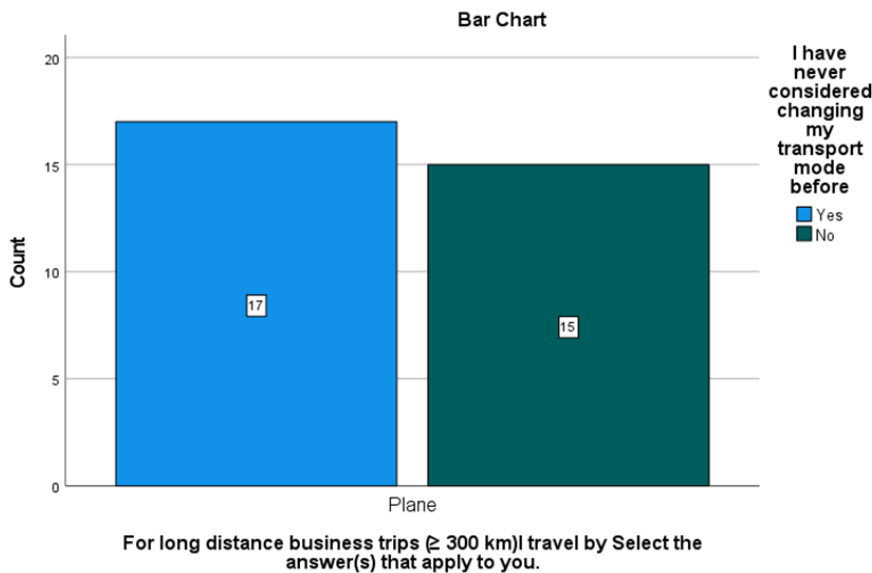


Figure 36: Contemplation of mode choice by plane travelers.

The figure above indicates that 17 of the 32 respondents who travel by plane for long distance business trips (≥ 300 kms) have never contemplated changing their travel mode for these business trips.

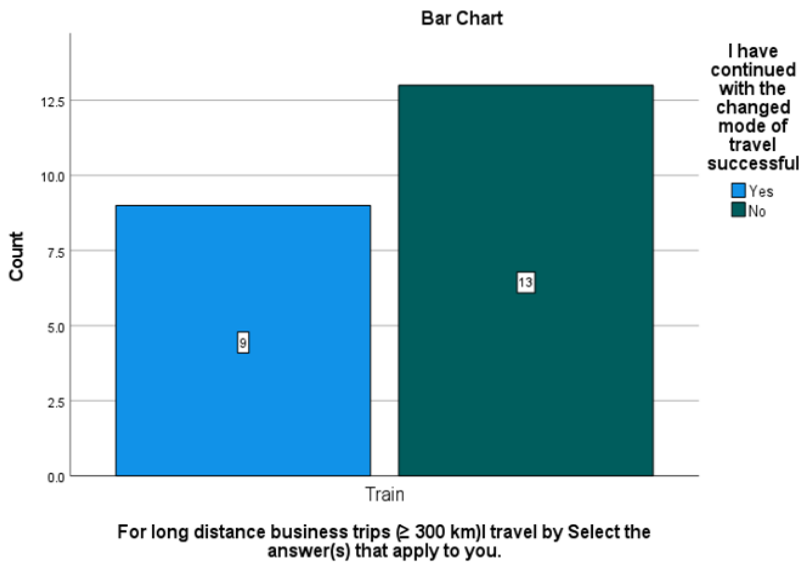


Figure 37: Maintenance of mode choice after change by train travelers.

Out of the 22 train travelers, 13 could not maintain the new travel mode after the change. This might be due to lack of preparation.

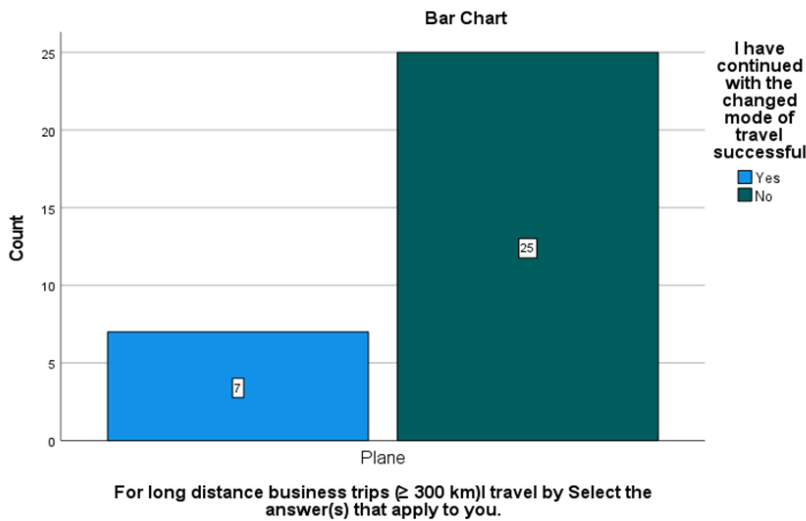


Figure 38: Maintenance of mode choice after change by plane travelers.

After a change in mode choice by plane travelers, only 7 of these respondents out of 32 continued with the change in mode. The other 25 could not stick to the new mode and probably relapsed.

4.2. Discussion.

Although there are studies showing the possibility to switch from flights to high speed rail { (Gundelfinger-Casar & Coto-Millán, 2017) (Albalate, Bel, & Fageda, 2015)}, studies that shed light on the role played by the aspects of social and psychological behavioral change towards international railway travel and alternating from air travel to train travel are relatively limited. This research is basically trying to understand the thoughts, feelings, and social factors that motivate commuters in their mode choice.

4.2.1. What factors influence business commuters to choose train travel over flights for long distance trips?

According to the survey results, the most important factors affecting mode choice are time/duration, in order words, speed is very important to long distance business travelers. Most of these commuters spend 40-59 hours on their jobs weekly. Before Covid-19, most respondents made 1-5 business trips in a year and during this Covid-19 pandemic, less than 1-6 business trips are made a year. However, some respondents stopped making business trips all together probably due to the travel restrictions that came with the advent of the pandemic. These restrictions were on all modes of transport even active modes (de Bruin, et al., 2020). This equally affected the types of business trips the respondents made. Before Covid-19, most respondents made both international and national trips but this reduced during the pandemic. Even the number of national trips reduced. With time, measures such as socioeconomic restrictions, physical distancing, and hygiene measures were also put in place and all of these have a huge impact on transportation. This limits travel options for the people with respect to making their travel-related choices (de Bruin, et al., 2020).

Mode choice for long distance business trips is highly dependent on the reason for travel and these business trips are done by plane, train, car and at times a combination of modes. The trip purpose greatly influences travel mode choice and decides whether a commuter will prefer a train over a plane. Traveling in a business context tends to be more time-sensitive compared to travel for leisure purposes and makes the commuter to choose the mode considered as the fastest (Mackie, Jara-Díaz, & Fowkes, 2001). González-Savignat (2004) examined how the High-Speed Rail connection between Barcelona and Madrid (Spain) concluded that business and leisure trips offer different mode choice decisions.

In mode choice however, more respondents travel by car compared to train. Most of the respondents travel a fairly long distance greater than 500km for business trips. This might be a reason towards the preference of cars over trains. Collins and Chambers (2005) reported that the travelers' preference of transit decreases as the travel time when taking transit exceeds more than 1.5 times the in-vehicle time (Collins & Chambers, 2005). However, when travelling for international business trips, cars are not used although ship and car were indicated as an option by some respondents. This is probably as a mode to get to the airport or train station.

When travelling for a distance greater than 300km, most respondents show a preference towards flights (32 respondents) over taking the train (22 respondents). For those who however still take the train, they do so for a number of reasons but primarily because of the (cheaper) price of train tickets, because their trips are booked by their companies and also due to the availability of trains. According to previous research, residential location affects transport mode choice because it affects a persons' mobility, since it constrains their activity and travel patterns in space and time, affecting possible destinations' accessibility (De Vos , Schwanen , Van Acker , & Witlox , 2013). This means proximity to a train station can influence mode choice towards taking the train. When it comes to travel costs in the form of prices of train tickets, (Kim & Ulfarsson, 2008) maintain that travel cost is important because consumers are sensitive to changes in price, but this also depends on the purpose of the trip. If a public transport pass is owned, public transport use will increase and car use will decrease. Public transport use is however sensitive to increases in public transport fares (Vega & Reynolds-Feighan, 2009). If public transport costs less, people are most likely to prefer it to driving. In Belgium for instance, it is easy to own a public transport car that combines both train and bus travel. Trains being cheaper than planes is equally the reason why those taking the train for these greater than 300km trips are doing so. They also maintained that they take the train because their trips are booked by their work places. However, another pertinent reason for taking the train over flights is because of attitudes. Most of these respondents have always taken the train and so they have maintained this habit. Some behavioral theories, such as the theory of reasoned action (TRA) emphasize that the individual's travel behavior is significantly influenced by attitudes (Ajzen, 1991). (Beirão & Sarsfield Cabral, 2007) Suggested that improving the levels or images of public transit services could be effective to attract occasional public transport users and car users. Therefore improving the image levels of trains can lead to a more positive attitude towards trains.

When it comes to preferring train over flights for long distance trips, most respondents indicated that this decision can be influenced towards trains if trains become high speed. Travelling by planes in most cases is more expensive than train travel but due to the need to save time, most long distance business travelers still take the plane according to the survey conducted. Transport fare is elastic for different traveler types and income groups which affects travel costs (Asensio, 2002). This shows that altering travel cost is a weaker policy intervention tool compared to modifying travel times. This means in most cases, travel times is prioritized over travel costs by commuters as is the case here. Travel cost has not always been considered for modeling mode choice since the cost of transit modes usually does not vary within a limited study area (Chakrabarti, 2017). The study also implied that lower travel time savings via driving would induce people to ride transit. Meanwhile, Limtanakool et al. (2006) considered both the absolute and relative difference in travel time between rail and car. Their premise was that the impact of travel time ratio (i.e. relative difference) on mode choice would be different by the travel time gap (i.e. absolute difference). They also insisted that the difference in travel time between car and transit affects commuting trips more than other purposes such as business or leisure (Limtanakool, Dijst, & Schwanen, 2006). This all goes to show the high value placed on travel time or speed by commuters. Time is an unproductive opportunity cost of a trip. Usually, travel time has an intrinsic value and diverges from the mere monetary assessment of time as cost (Lyons & Urry, 2005).

According to the survey, commuters travelling by plane, they do so primarily due to safety and because their trips are booked by the companies where they work. Price is the least reason why they travel by plane. Regarding trip attributes, (Stradling, 2002) asserted that saving money, time, and effort are the underlying aspects that can help attract travelers to a particular mode. Most companies in booking business trips have scheduled conferences and business meetings and in such case, travel time saving is paramount. This is probably the motivation of most companies when booking flights for business trips. Perceived traffic safety refers to individuals' perceived likelihood of an accident-free traffic outcome (i.e., avoiding traffic accident and crash). It varies from person to person based on their background (information and experience) and how they deal with risks (Salonen, 2018). This means each commuter perceives safety differently.

For some distance trips greater than 300km, 10 out of 15 respondents already travelling by plane will consider switching to train travel if trains are faster than they currently are. Anderson, Baggett, & Widener, (2009) identified elements influencing customer satisfaction for air passenger travel, including physical attributes of the service (e.g., food and personal space), employee-customer contacts (e.g., with flight attendants and gate agents), and operating performance (e.g., flight timeliness), which all make air travel to trump over train. To change commuter behavior to prefer trains as an alternative to flights, these comfort factors must be considered by train service providers (Anderson, Baggett, & Widener, 2009). It is not a coincidence that comfort and speed are dominant in the preference for flights over trains. Time savings are valued higher for business and other non-leisure trips and this increases at lower levels of comfort. Even under the least favorable conditions for the airlines (significant delays due to over-scheduled flights, and increments in waiting and access times), the High-Speed Train (HST) market share would not exceed 35% (González-Savignat, 2004). So, although trains drive at higher speeds, they still cannot compare their level of service to that provided by planes in terms of comfort. Equally, their speeds are still lower than those of planes. These results cast doubts on the competition that HSTs can exert in markets characterized by high-frequency air services.

This loyalty to air travel over train travel is not exactly because of belonging to a frequency flyer program as most of the respondents do not belong to any such program. This loyalty can then be interpreted to be due to other factors that have been seen to be dominant in the preference for air over train travel. One of which is speed/time and comfort. Whether train or air travel, most respondents have little choice in their travel means as their tickets are booked by their places of work.

4.2.2. Why do long distance commuters prefer flights over travelling by train?

According to the survey, most commuters prefer flights to trains because of; time, comfort, trips booked by their companies, safety, because flights have fewer delays than trains, because they have always taken flights and lastly because of cost. These factors have been listed chronologically with time being most important and costs the least considered factor.

Time savings are valued higher for business and other non-leisure trips and this increases at lower levels of comfort (González-Savignat, 2004). This to say how valuable time is to business travelers according to IATA (2004) which examines possibilities for using trains instead of flights. Reducing access time to train stations will increase the number of people taking trains instead of flights. Lyons and Urry (2005), in their transport appraisal found that, savings in travel time is considered very beneficial by commuters and is sometimes used to justify often-enormous financial costs as is the case with travelling by air despite the higher prices of plane tickets compared to train tickets in most cases. This explains why cost is the least considered factor for air transport business travelers. Time saving trumps costs. And this is why most companies book flights as the travel means for their workers to use for long distance business trips. This means in most cases, that travel times are prioritized over travel costs by commuters. (De Witte, et al., 2006) Travel cost has not always been considered for modeling mode choice since the cost of transit modes usually does not vary within a limited study area (Chakrabarti, 2017). This goes to confirm why those respondents travelling by air transport are unaffected by its high costs.

Comfort comes second as a reason why commuters prefer flights over train travel. To most commuters, comfort is an important aspect when choosing a mode of transport. Most studies have applied discrete choice models as a basic characteristic with the stated preference for air travel being due to its comfort and other attributes. This stated preference is now very popular when investigating travel behavior and mode choice as confirmed by this survey { (Collin, Rose, & Hess, 2012), (Seelhorst & Liu, 2015), (Wen, Chen, & Fu, 2014)}. Bodini et al. (2013) considered comfort by looking at the vehicles' comfort level and the ability to keep track of vehicles' and roads' maintenance (Bodini, Lancini, Pasinetti, & Vetturi, 2013).

Most of these respondents have always taken flights and so they have kept the habit. This could be due to the image and their perceptions of air travel. If the perceived emotional satisfaction or psychic benefit of one product is found higher than the economic satisfaction of using alternate product then subject to economic limitations, the decision-maker will select the choice with the highest emotional satisfaction, contrary to logic (Metcalf & Dolan, 2012). Elster (1998) investigated the role of emotion in decision making when rationality seems ignored and postulated emotion to be treated as psychic cost in a utility function similar to other cost variables (Elster, 1998). This could lead to an individual's continual use of a particular mode which then becomes habitual. Attitude towards a mode of transport affects its utility. Through a qualitative study in Porto (Portugal), (Beirão & Sarsfield Cabral, 2007) demonstrated the significant role of attitude in influencing the mode switch (from the car and public transit) for commuters. This attitude equally influences the preference for survey respondents' preference towards flights.

4.2.3. What are the main factors that can influence a more sustainable travel mode choice for long distance commuters?

When it comes to sustainability, 27 out of 49 respondents consider flights as more sustainable for international trips and trains more sustainable for national business trips. 24 out of these 49 respondents do not even consider sustainability in their mode choice. As for the factors influencing this decision, if the

price of plane tickets is increased, the number of people travelling by plane will reduce but not significantly. However, informing these respondents of the environmental negativities resulting from flights changes their views and leads to a shift towards train travel. At the end of the day, the most important factors affecting this is attitude, image and perceptions. Creating awareness could help shift commuters towards train travel by changing their attitudes in favor of train travel. (Beirão & Sarsfield Cabral, 2007) demonstrated the significant role of attitude in influencing the mode switch (from the car and public transit) for commuters.

In gaining awareness about the negativities resulting from plane travel, 25 out of 35 respondents indicated that they will consider train travel as an option for long distance business trips. According to (Augustus , Wafaa , & Achille , 2020) trip characteristics and individual socio-demographic variables have a significant effect on travel behavior. This is true in the cases where respondents choose to be sustainable because others will disapprove if they are not and because they consider the benefits of a sustainable environment important to them. Similarly, the result also indicated that underlying attitudes and perceptions influence the choice of transport mode.

According to (Kahneman D. , 2013) information that stands out and seems relevant affects human decision-making. Human behavior is believed to be influenced by what comes to mind when options are being evaluated for decision making. It is proposed that any prominent (desirable or undesirable) user experience with a travel mode can have a disproportionate influence on behavior. Respondents (21 out of 34) indicated that they will travel by train upon gaining knowledge about the fact that flights pollute the environment more than planes. This means passing across information about the benefits of sustainability can help shift the respondents towards sustainable mode choices.

4.2.4. Under what circumstances do long distance commuters consider train trips as a viable alternative to flights?

There is only one circumstance under which respondents consider trains as an alternative to flights. This is if regular trains are replaced with high speed trains. Commuters according to the survey will also consider switching from plane to train travel upon the realization that flights pollute the environment more than trains. This preference for trains over planes also occurs indirectly in instances where employers book trips for the respondents, thereby deciding their mode choice. Even under the least favorable conditions for the airlines (significant delays due to over-scheduled flights, and increments in waiting and access times), the High-Speed Train (HST) market share would not exceed 35% (González-Savignat, 2004). This means high speed trains offer competition to flights but not absolute competition. Conclusively, employers can make train trips a viable alternative to flights, as well as trains becoming high speed trains alongside knowledge that flights pollute the environment more than trains.

4.2.5. Discussion on the hypothesis

The study aims to test certain hypothesis.

H1: *Commuters prefer flights because of the shorter net travel times of flights compared to trains.*

Most commuters already have the assumption that for long distance travel, flights are faster and so have made flying a habit and do not consider other options like trains. Often, comparisons between train and air travel are made using the same departure and arrival locations. Planes are the fastest mode when it comes to international, long-distance travel. This hypothesis is proven true because most respondents prefer flights due to their shorter net travel times. Time savings are valued higher for business and other non-leisure trips and this increases at lower levels of comfort (González-Savignat, 2004).

H2: *Familiarity with train travel will increase the possibility of taking trains instead of planes.*

Measures of habit can be better predictors of behavior and, which result in intentions and ultimately action (Ajzen, 1991). Most travelers make habitual mode choices which are equally automatic. This means more people will shift to the use of trains if they become familiar with it and will feel more at ease with it the more, they travel by train (Kenyon & Lyons, 2003). This survey proved this to be true when the respondents (19 out of 24) travelling by plane indicated that if they travel more by train they will indeed keep this habit. This is indeed true because 25 out of 34 respondents indicated that they do not travel by train because of familiarity with plane travel.

H3: *Previous long distance train travel increases the probability of further long-distance train travel.*

Does previous long distance train travel increase the probability of further long-distance train travel? Yes. Most respondents (19 out of 24) positively responded to this indicated that they will travel by train in the future because they have done so in the past. Consumer's experiences with a particular product or service could create temporal or lasting emotional attachment or detachment towards the products or service, which could influence behavior (Liz , Joyce, & Mick , 2016). So if the respondents experience travel by train, it could lead to lasting emotional attachment. This means they are attached to flights. If attachment can be developed for train travel, then more respondents will travel by train for long distance business trips.

H4: *Sustainable environmental awareness and consideration for the negativities resulting from plane travel can increase train travel.*

It has already been discussed that air travel contributes to the highest CO₂ emissions. “Flying shame” movement (e.g., #flygskam) has led to decreasing flight passenger numbers in Sweden since 2017 (Hoikkala & Magnusson, 2019). So, do commuters who are aware of the negative effects of flight emissions

prefer to travel by train? Yes. Most commuters (25 out of 35) responded that this awareness will make them consider travelling by trains which are a more sustainable option.

4.2.6. Comparison between plane and train travelers

There are certain similarities and differences between the respondents who travel by plane and those who travel by plane for long distance business trips (≥ 300 kms). When it comes to trips booked by employers, it is noticeable that respondents who originally travel by plane for long distance business trips (≥ 300 kms) still do so when their employers book their trips. They equally travel by plane instead of trains for this reason. There is no instance in the survey where a respondent who originally travels by plane travels by train for long distance business trips (≥ 300 kms) because his/her employer booked the trip. This is not the case with train travelers who although they originally travel by train for long distance business trips (≥ 300 kms) still do so and equally travel by plane when their employers book their business trips.

As for environmental sustainability comparisons, both train and plane travelers will love their travel mode choice to be environmentally sustainable. When it comes to seeing environmental sustainability as a waste of time, 18% of train travelers agree that it is indeed a waste of time while 22% of plane travelers equally see environmental sustainability as a waste of time.

As for the thought that for long distance business trips (≥ 300 kms), traveling with trains more often, will make the business traveler to continue to keep this habit, 94% of train travelers agree while 73% of plane travelers agree. The number of train travelers who agree is more than plane travelers. This is probably a confirmation of this statement and they probably travel by train because they have previously done so. As for familiarity with train travel leading to more train travel, 95% of the train travelers agree while 72% of plane travelers also agree. This number is obviously less for plane travelers seeing as they mostly travel by plane and not train for long distance business trips (≥ 300 kms). Consumer's experiences with a particular product or service could create temporal or lasting emotional attachment or detachment which could influence behavior (Liz , Joyce, & Mick , 2016).

When it comes to the types of motivation, 77% of train travelers are intrinsically motivated in their mode choice and are influenced by personal reasons in their mode choice decisions. As for the intrinsic motivation of the respondents who travel by plane for long distance business trips (≥ 300 kms), it is 71%. This is less than for train travelers. This might be because those traveling by plane do so for prestige and class and not personal reasons. Another type of motivation is external regulation which is 82% for train travelers and 66% for plane travelers. This means more train travelers will change their mode choice for a reward or to avoid punishment than plane travelers. The quality of motivation is essential; not the "amount" of motivation but the "type" of motivation that is important for pursuing sustainable behavioural change (Howard, Bureau, & Gagné, 2017). Intrinsic motivation is the most important type of motivation so it is a good sign that train travellers are more intrinsically motivated than plane travellers for long distance business trips. According to (Prochaska, Redding, & Evers, 2015), the constructs of motivation are equally important. The survey indicates that the decision balance of train travellers is stronger than that of plane travellers which indicated the stronger motivation of train travellers.

The decision balance involves the personal trade-off between the pros and cons of performing a particular behaviour; the cost/effort of performing the behaviour and the benefits of the behaviour are compared.

From motivation, comes behavior change. In order to change behavior, there has to be contemplation of this change. 50% of train travelers have considered changing their mode choice while 53% of plane long distance business travelers have considered changing their mode choice before. This might be because they now realize the importance of environmental sustainability and the pollution of planes. Both way, this is good and a positive move towards traveling less by planes and more by trains because trains are more sustainable. Contemplation can lead to change but if this change is not maintained, then it is pointless. Maintaining a behavior change is difficult. Only 41% of train travelers who have changed their travel mode for long business (≥ 300 kms) have maintained this change. This is good because it is not advisable for train travelers to change to car or planes for long distance business trips as trains are more sustainable environmentally. As for the respondents who travel by plane, only 22% changed and maintained the change in their travel modes for long distance business trips (≥ 300 kms). This percentage although small, is still a win because behavior change is complex and takes time.

4.3. Limitations of the study

The study is limited by the following:

The sample size is very small. The questionnaire was distributed only for three weeks and most respondents did not complete the questionnaire. The study areas is the Schengen area and so this is indeed a small sample size which will make concluding and generalizations difficult.

Also, this study is limited in its hypothesis testing. Usually testing hypothesis is a thorough process involving statistical testing with development of models and appropriate sample sizes. This study however tested its hypothesis with yes or no questions. This just scratches the surface of the survey.

With the small sample size, there is a limit to the types of analysis that can be done. Analysis such as regression and correlation will provide inconclusive results due to the small sample size.

Equally, concluding on behavior change based on survey results will be far-fetched because behavior change requires time. Contemplation takes at least 6 months and preparation is done within a month while relapse only comes after 5 years. The survey cannot therefore quantify these stages of behavior change adequately and perhaps the respondents equally had no knowledge of this time frame and hence did not consider the time frame in their responses to questions related to behavior change.

CHAPTER FIVE: CONCLUSION

This thesis contributes to Sustainable Development Goal 12 on sustainable consumption and production (ending fossil fuel subsidies). Examining the minimal conditions necessary for commuters to be willing to change modes from flights to train while analyzing how long-distance business trips impact mode choice is the end game. This study provides the factors that influence commuter mode choice for long distance business trips and the most important of this factors is time/duration or speed. Long distance business trips impacts mode choice because these trips are more time-sensitive (Mackie, Jara-Díaz, & Fowkes, 2001). Basically, travel time is considered as more important than cost. Travel cost is least considered by plane travelers and in most cases, travel times are prioritized over travel costs by commuters. (De Witte, et al., 2006) Regarding trip attributes, (Stradling, 2002) asserted that saving money, time, and effort are the underlying aspects that can help attract travelers to a particular mode. Basically, time is highly valued because “time is indeed money.”

This thesis research (by means of a survey among 49 long distance business travelers) came to the conclusion that when it comes to changing the opinions of the respondents travelling by plane so that they should consider train travel as a viable option, most (10 out of 15) respondents showed a positive attitude towards high speed trains. And they also indicated that their current travel by air is because of familiarity with air travel (25 out of 34 respondents). These respondents have a high perception of air travel probably due to its high level of comfort. Developed by (Ryan & Deci, 2000), the ownership of a particular behaviour is influenced by the quality of motivation and the degree of regulation over a motivation. The quality of motivation is essential; within the self-determination theory, it is not the "amount" of motivation but the "type" of motivation that is important for pursuing sustainable behaviour change. Intrinsic motivation is a more effective long-term method for achieving goals. Most of the respondents are intrinsically motivated in their various mode choice which means their attitude towards these modes are deeply rooted and not very much affected by third parties. Changing their perceptions and making them switch modes will take time. External regulation is responded to positively. Most respondents will change their transport modes if a reward or punishment is attached to this change or lack of change.

The Trans theoretical Model (TTM) (Prochaska & DiClemente, 1982), states that behaviour change is accomplished by passing through various behaviour change stages over time. Currently, most the respondents of the survey have never contemplated a behaviour change through mode change, they have never attempted and have hence never prepared for such a change nor taken action towards this change talk less of having a relapse. This means changing mode choice through behaviour change will be a long term process which if successful, will likely stick because most respondents are intrinsically motivated.

The minimum conditions necessary to effect a change from flights to train travel is if trains are made high speed and is only direct condition to make plane travelers see that trains are a viable alternative to flights. This is because the most important factor influencing commuter mode choice is time/trip duration. Equally, employers can make train trips a viable alternative to flights, because most employers decide the mode

choice for these business travelers. Again, knowledge that flights pollute the environment more than trains can make 21 out of 34 respondents to choose trains as a viable alternative to flights.

The survey is indicative of the fact that there is possibility even though small, of changing the perspective of the respondents who travel by plane because they indicated their considerations of environmental sustainability and some have even tried to change their travel mode and are successful in maintaining the change. This means with patience and in due time, the use of trains for long distance business trips instead of planes might be the norm. The decision balance which is the most important motivational construct is greater for train travelers than plane travelers. This means changing the behavior of plane travelers will be easier than changing the behavior of train travelers. This is a good thing which says more plane travelers can be dragged towards train travel by being made to see the importance of environmental sustainability.

This study met all its objectives of examining the conditions under which commuters consider trains as a viable alternative to flight (speed), which is the same as the main factor affecting commuter mode choice alongside the fact that trips are booked by the places of work. Another objective was to determine why commuters prefer certain mode choices and the answer still remains time/ trip duration.

The findings of this thesis are important because now, the importance that time saving plays in transport mode choice for business trips is clear. It is evident that to change commuter behaviour and convince them to switch from flights to trains, trains need to improve their speeds and comfort levels. Equally, it is important to target this goal at the level of companies. They book trips and decide on the mode choice for their employees. If the importance of environmental sustainability can be made evident to them, they might be convinced to plan and book more sustainable long distance business trips. Again, more efforts should be directed towards creating awareness about the pollution caused by planes. The study proved that knowing the negativities resulting from plane travel can push plane travellers towards train travel.

Attaining the SDGs is an important objective and this can be easier by switching from plane to train travel. This is because sustainable transport will enable the implementation of nearly all the SDGs through inter-linkage impacts. Access to sustainable transport should therefore be at the forefront of the SDGs.

CHAPTER SIX: PRACTICAL RECOMMENDATIONS AND FUTURE RESEARCH

6.1. Practical Recommendations

It will be good to create more information and awareness campaigns on the importance of sustainability and the sustainable transport modes. These campaigns should not only be directed at individuals but equally directed to companies and places of employment. This is because in most cases, they are responsible for booking these business trips and deciding the transport mode choice of their employees. If these companies can choose more sustainable modes, more of these business travelers will travel more sustainably. According to (Kahneman D. , 2013) information that stands out and seems relevant affects human decision-making.

Target specific behaviors can be addressed one at a time. This can be done by organizing discounts and free tours on trains. If some of these business travelers can be convinced to travel by train even once, if the experience is pleasant and safe, they will likely travel more by train. Lighting, visibility and open environment has been found to be important for the perception of safety (Ceccato, Langefors, & Näsman, 2021). Travelers' emotional attachment to travel modes, and undesirable experiences can influence their transport mode choice (Augustus , Wafaa , & Achille , 2020).

It will also be useful to improve on the speed of trains and make them high speed trains. This is because respondents indicated that they will only consider switching from flights to train travel if trains are made into high speed trains. According to (Lyons & Urry, 2005) time is so important especially with the dawn of this information age that the time spent on a trip influences mode choice. The very first High-Speed Rail between two European cities, Paris, and Lyon, began operations in 1981 and its high connection reduced flights by 30 to 15 percent (Park & Ha, 2006). This showed the possibility for competition between air transport and trains and so it is indeed possible to change commuter behavior towards train travel instead of air travel.

Trains equally have to improve their level of services and comfort even if they are high speed. This is because González-Savignat (2004) concluded that even under the least favorable conditions for the airlines (significant delays due to over-scheduled flights, and increments in waiting and access times), the High-Speed Train (HST) market share would not exceed 35% (González-Savignat, 2004). So, although trains drive at higher speeds, they still cannot compare their level of service to that provided by planes in terms of comfort.

The trend that the Covid-19 pandemic made evident which is online business conferences instead of business travel should be maintained even after the pandemic. This is not only time saving, but also cost saving. Lyons and Urry (2005), in their transport appraisal found that, savings in travel time is considered

very beneficial by commuters and is sometimes used to justify often-enormous financial costs. This will be shooting two birds with one stone. According to (Stradling, 2002) saving money, time, and effort are the underlying aspects that can help attract travelers to ride public transport. With this in mind, companies and places that employ business travelers can be made to see just how advantageous online business conferences are.

6.2. Further Research

The following messages could offer a useful guide to those interested in offering their contribution to encouraging more commuters to travel by train and switch from taking flights.

Literature studies and the survey showed that even though high speed trains can change mode choice from flights to trains, this is not absolute as some commuters will still travel by plane even if high speed trains are made available, plane tickets increased and knowledge on sustainability was made available and common with the negativities resulting from plane travel. This means no matter what, their loyalty is to flights. Perhaps more research can be conducted to see why there is such deep rooted loyalty to taking flights. Does it have anything to do with prestige? Or is it due to previous bad transport experiences?

Equally, further research should be aimed behavioral change because according to this research, most commuters are intrinsically motivated in their mode choice and such motivation is difficult to change. Making these commuters change their mode choice will require not only improvement in train services, but also a change in their behavior because attitude has been seen to be a very important factor in commuter mode choice.

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APPENDICES

Appendix 1: Survey Questionnaire.

Choosing Train Travel over Flights for Long Distance Business Trips

Start of Block: Default Question Block

Dear Sir/Madam, thank you in advance for your time. My name is Nadege Berinyuy Wanyu, (nadege.wanyu@student.uhasselt.be) a master of Transportation Sciences student at UHasselt, Belgium. I am currently working on my master's thesis to successfully complete the program. This survey is linked on the topic of: Train Travel versus Flights for Long Distance Business Trips The survey consists mainly of multiple choice questions. It will take no more than 10 minutes of your time. The answers will be treated confidentially and used exclusively for scientific purposes. Your anonymity is guaranteed. Before you decide to participate further in the survey, you will be asked to give your consent about the following information: - I declare that I have been informed about the nature, purpose, duration, possible benefits and risks of the study and that I know what is expected of me. - I was able to ask any questions that came to mind and I received clear answers to my questions - I understand that my participation in this study is voluntary and that I am free to discontinue my participation in this study. - I understand that data about me will be collected during my participation in this study and that the researchers will ensure the confidentiality of these data in accordance with the relevant Belgian legislation. - I consent to the processing of my personal data according to the modalities described in the information sheet. I also consent to the transfer to and processing of my coded data, which will be kept for 5 years after the end of this study. - I give "informed consent" in response to the information described. By completing the "I agree to participate in the study" option, you are indicating that you have read and consent to the information described above. If you do not give your consent with regard to the information described above, please fill out the option "I do not agree to participate in the study". Then you do not need to complete the survey further.

Q1 Do you agree or not to participate in the survey?

- "I agree to participate in the study" (1)
- "I do not agree to participate in the study". (2)

Skip To: End of Survey If Do you agree or not to participate in the survey? = "I do not agree to participate in the study".

Skip To: Q2 If Do you agree or not to participate in the survey? = "I agree to participate in the study"

Q2 To qualify to answer the survey, I must meet the following conditions

- I have travelled for business purposes in the past, more specifically, I made at least 1 long distance trip (300km or longer) since 2018 by plane or train and I am at least 18 years old. (1)
- I do not meet the conditions (3)

Skip To: End of Survey If To qualify to answer the survey, I must meet the following conditions = I do not meet the conditions

Q3 Are you currently employed?

- Yes (1)
- No (2)

Skip To: Q5 If Are you currently employed? = No

Q4 How many hours do you spend per week on your profession?

- Maximum 19 hours (1)
 - 20-39 hours (2)
 - 40-59 hours (3)
 - 60 hours or more (4)
-

Q5 Approximately how many business trips did you make in a year before covid-19?

Q6 Approximately how many business trips do you make now during covid-19?

Q7 What sort of business trips did you make pre covid-19?

- National (1)
- International (2)
- Both (3)

Q8 What sort of business trips do you now make during covid-19?

- National (1)
- International (2)
- Both (3)

Q9 How do you travel for business trips? "Indicate which answers are applicable. Please note that multiple answers can be indicated"

By train (1)

By plane (2)

By car (3)

Others, please indicate (8) _____

Q10 On average, approximately which distance do you travel for a business trip?

Less than 100km (1)

100-200km (2)

200-300km (3)

300-400km (4)

400-500km (5)

more than 500km (6)

Q11 On average, approximately how many hours do you travel for a business trip?

- Less than 1hour (1)
 - 1-2 hours (2)
 - 2-3 hours (3)
 - 3-4 hours (4)
 - 4-5 hours (5)
 - More than 5 hours (6)
-

Q12 My reason for travel (business vs. for leisure purposes) affects my mode choice

- Yes (1)
 - sometimes (2)
 - No (3)
-

Display This Question:

If What sort of business trips do you now make during covid-19? = International

Q13

When travelling for international business trips, I prefer, "Indicate which answers are applicable. Please note that multiple answers can be indicated"

Train (1)

Flight (2)

Car (4)

Others, please indicate (8) _____

Display This Question:

If What sort of business trips do you now make during covid-19? = National

Q14 When travelling for national business trips, I use, "Indicate which answers are applicable. Please note that multiple answers can be indicated"

Train (1)

Flight (2)

Car (4)

Others, please indicate (8) _____

Q16 When choosing my travel mode for business trips, I consider the following factors; Rank the factors below on a scale of 1-7, 1 being the most important factor and 7 the least important.

- _____ Time/duration (1)
- _____ Safety (2)
- _____ Availability (3)
- _____ Cost (4)
- _____ Distance (5)
- _____ Sustainability (6)
- _____ Comfort (8)

End of Block: Default Question Block

Start of Block: These questions are on long distance business trips (at least 300 kms).

Q17 For long distance business trips (≥ 300 km) I travel by
Select the answer(s) that apply to you.

- Train (1)
- plane (2)
- Car (4)
- Others, please indicate (8) _____

Skip To: Q22 If For long distance business trips (≥ 300 km) I travel by Select the answer(s) that apply to you. = plane

Q18 For some long distance business trips (≥ 300 km), I travel by train because of "Indicate which answers are applicable. Please note that multiple answers can be indicated"

- Comfort (1)
- Speed (2)
- Price (3)
- Safety (4)
- Availability (5)
- Convenience (6)
- My company books my business trips and decides on my mode and means of transport (7)

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By train*

Q19 For some long distance business trips, I take trains instead of the plane because "Indicate which answers are applicable. Please note that multiple answers can be indicated"

- Trains are cheaper (1)
 - Trains are more comfortable (2)
 - Trains have fewer delays than planes (3)
 - Trains are safer (4)
 - Because I always take trains (5)
 - Trains depart and arrive in the city center (6)
 - My company books my business trips and decides on my mode and means of transport (7)
-

Q20 For some long distance business trips(≥ 300 kms) , I would consider taking the train instead of flying if trains are high speed trains

- Yes (1)
 - Sometimes (2)
 - No (3)
-

Display This Question:

If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu... = By train

Q21 For some long distance business trips, I am discouraged from taking planes because of "Indicate which answers are applicable. Please note that multiple answers can be indicated"

The number of transfers (1)

Cost (2)

Speed (3)

Comfort (4)

Delays (5)

Time (6)

Q22 For some long distance business trips, I travel by plane because of "Indicate which answers are applicable. Please note that multiple answers can be indicated"

Comfort (1)

Speed (2)

Price (3)

Safety (4)

Accessibility (5)

My company books my business trips and decides on my mode and means of transport (6)

Q23 For some long distance business trips, I take flights instead of the train because "Indicate which answers are applicable. Please note that multiple answers can be indicated"

- Flights are cheaper (1)
 - Flights are more comfortable (2)
 - Flights have fewer delays than trains (3)
 - Flights are safer (4)
 - Because I have always taken flights (5)
 - Flights are faster than trains (6)
 - My company books my business trips and decides on my mode and means of transport (7)
-

Q24 Do you belong to a Frequent Flyer Program?

- Yes (1)
- No (2)
- I don't know (3)

End of Block: These questions are on long distance business trips (at least 300 kms).

Start of Block: These set of questions is about sustainability of the environment

Q25 Sustainable Transportation refers to any means of transportation that is 'green' and has low impact on the environment

	What is your opinion on the following;	
	Yes (1)	No (2)
I would like my mode choice to be environmentally sustainable (1)	<input type="radio"/>	<input type="radio"/>
I try to be environmentally sustainable because the benefits to the environment are important to me (2)	<input type="radio"/>	<input type="radio"/>
I do not see the benefit of having a sustainable environment. (3)	<input type="radio"/>	<input type="radio"/>
I think it is a waste of time to focus on sustainability in transportation (4)	<input type="radio"/>	<input type="radio"/>
I consider environmental sustainability in my mode choice because others (friends / family / partner / work giver) would disapprove if I did not. (5)	<input type="radio"/>	<input type="radio"/>

Q25 Which mode of transport do you consider more sustainable for international business travel?

- Trains (1)
- Flights (2)
- They are equally sustainable (4)

Q26 Which mode of transport do you consider more sustainable for national business travel?

- Trains (1)
 - Flights (2)
 - They are equally sustainable (3)
-

Q27 I consider pollution and emissions before I choose my travel mode for long distance business trips

- Yes (1)
 - Sometimes (2)
 - No (3)
-

Display This Question:

If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu... = By plane

Q28 Globally, passenger air flights account for about 2-2.5% of carbon dioxide emissions globally. CO2 emissions from passenger volumes could culminate in 22% of global CO2 emissions by 2050. With this new information, I prefer to travel for future long distance (≥ 300 km) business travel by

- Flights (1)
- Train (2)
- Car (4)
- Others, please indicate (5) _____



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Page Break

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By plane*

Q29 Due to large CO₂ emissions from flights, consider CO₂ taxes are included in flight tickets resulting in an increased cost of flights compared to the train ticket prices. I prefer to travel for long distance business trips (≥ 300 kms) by

- Flights (1)
- Trains (2)
- Car (4)
- Others, please indicate (5)

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By plane*

Q30 Knowing that flights pollute the environment more than trains, I am willing to change my travel mode from flights to trains for long distance business trips (≥ 300 kms)

- Yes (1)
- Sometimes (2)
- No (3)

End of Block: These set of questions is about sustainability of the environment

Start of Block: Please judge the following statements and indicate if you agree or not.

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By plane*

Q31 For long distance business trips(≥ 300 kms) , I prefer flights because of the shorter net travel times of flights compared to trains.

Yes (1)

No (3)

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By train*

Q32 If I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit

Yes (4)

No (5)

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By plane*

Q33 I do not travel by train for long distance business trips because I am accustomed to flights.

Yes (4)

No (5)

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By train*

Q34 Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future

- Yes (4)
- No (5)

Display This Question:

*If How do you travel for business trips? "Indicate which answers are applicable. Please note that mu...
= By plane*

Q35 I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future

- Yes (4)
- No (5)

Q36 Travelling by a particular transport mode relates to familiarity with it; If you become more familiar with train travel, you will travel more by trains from then onwards.

- Yes (4)
- No (5)

End of Block: Please judge the following statements and indicate if you agree or not.

Start of Block: These set of questions are on social and psychological factors affecting travel

Q37 For long distance business trips(≥ 300 kms) ,

	Select Yes or No	
	Yes (1)	No (2)
My travel mode choice is influenced by friends / family / partner / work giver (1)	<input type="radio"/>	<input type="radio"/>
My travel mode choice is influenced by my own personal reasons (2)	<input type="radio"/>	<input type="radio"/>
Nothing and no one influences my travel mode choice (3)	<input type="radio"/>	<input type="radio"/>

Q38 For long distance business trips (≥ 300 kms) ,

	Select yes or no	
	Yes (1)	No (2)
I will change my transport mode if there is a reward for change or punishment if I do not change (1)	<input type="radio"/>	<input type="radio"/>
I feel better when I travel through a more sustainable transport mode (2)	<input type="radio"/>	<input type="radio"/>
I consider sustainability in my mode choice because people look up to me. (3)	<input type="radio"/>	<input type="radio"/>
I will change my transport mode choice because I realize the dangers of pollution. (4)	<input type="radio"/>	<input type="radio"/>

Q39 For long distance business trips (≥ 300 kms),

	Click to write Column 1	
	Yes (1)	No (2)
I have never considered changing my transport mode before (1)	<input type="radio"/>	<input type="radio"/>
I have already decided to change my transport mode (2)	<input type="radio"/>	<input type="radio"/>
I have changed my transport mode before (3)	<input type="radio"/>	<input type="radio"/>
I have continued with the changed mode of travel successful (4)	<input type="radio"/>	<input type="radio"/>
I changed my mode of travel but was unsuccessful in sticking to the new mode (5)	<input type="radio"/>	<input type="radio"/>

End of Block: These set of questions are on social and psychological factors affecting travel

Start of Block: To end, a number of personal characteristics are being questioned

Q40 What is your gender?

- Male (1)
- Female (2)
- Non-binary / third gender (3)
- Prefer not to say (4)



Q41 What is your year of birth? For example 1987



Q42 what is your highest level of education

- Basic Education (1)
- Secondary education (2)
- Bachelors (3)
- Masters (4)
- Others, Please indicate (5) _____



Q43 Do you have any further comments about this survey or is there anything else you would like to say?



Q44 If you want to be informed about the results of the research, please fill in your e-mail address below.

End of Block: To end, a number of personal characteristics are being questioned



Appendix 2: Descriptive Data Analysis

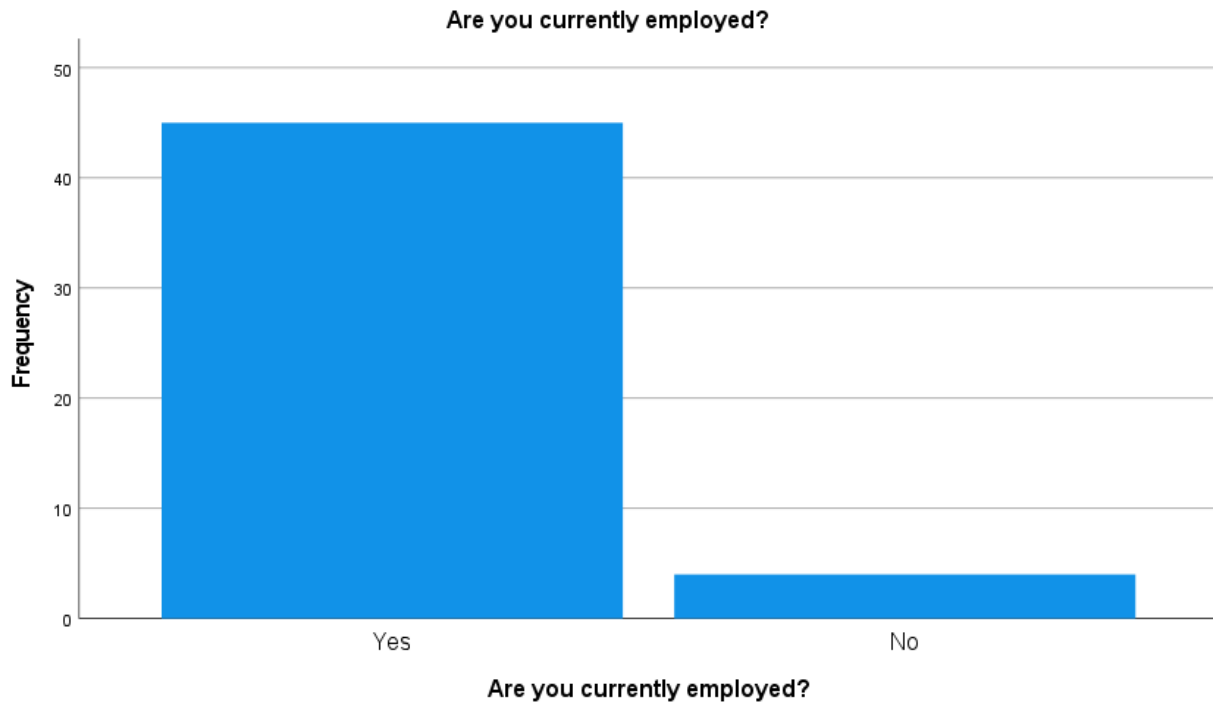
The data was collected by means of a questionnaire distributed over a period of three weeks. In order to qualify to answer the questionnaire, the respondents needed to have travelled for business purposes in the past, more specifically, a long distance trip (300km or longer) since 2018 by plane or train. Equally, the respondents had to be at least 18 years old.

The survey was divided into six segments; general questions, questions on long distance trips, questions about certain hypothesis, questions on social and psychological factors affecting travel, questions on environmental sustainability and questions on general characteristics.

Descriptive Statistical Analysis

Are you currently employed?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	45	91.8	91.8	91.8
	No	4	8.2	8.2	100.0
	Total	49	100.0	100.0	



Out of the 49 respondents, 45 are employed while 4 are not.

How many hours do you spend per week on your profession?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Maximum 19 hours	9	18.4	18.4	18.4
	20-39 hours	14	28.6	28.6	46.9
	40-59 hours	20	40.8	40.8	87.8
	60 hours or more	6	12.2	12.2	100.0
	Total	49	100.0	100.0	

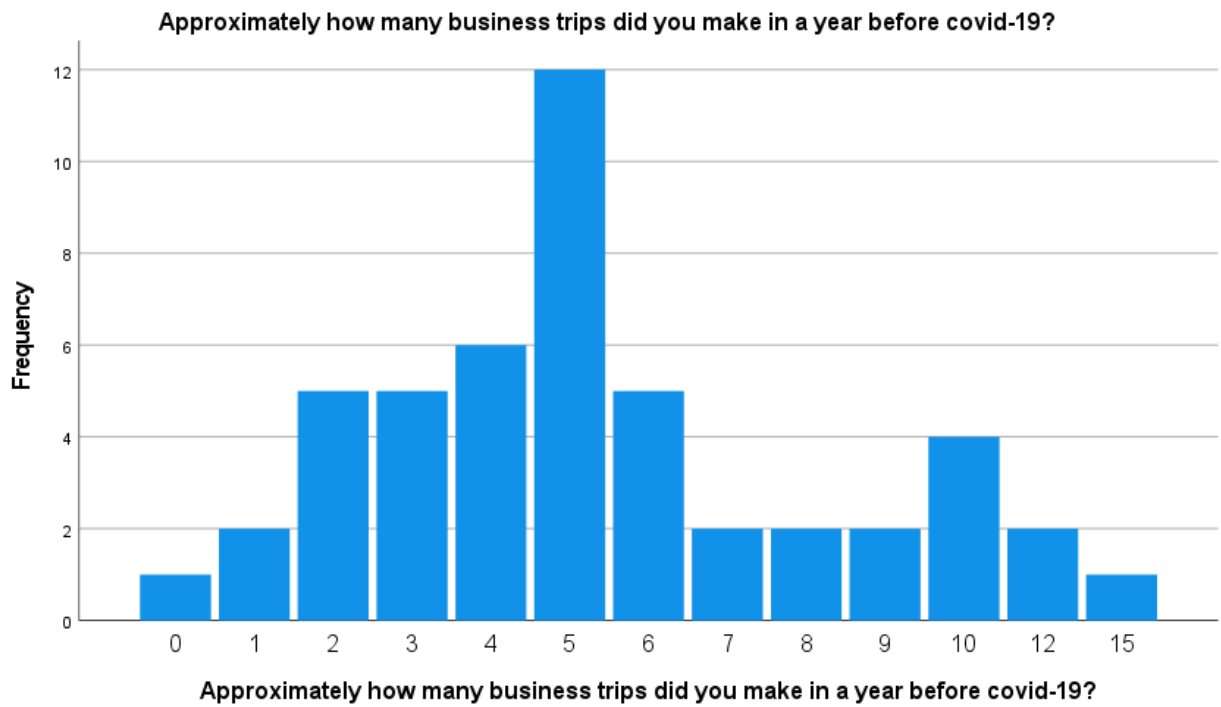


Most respondents spend 40-59 hours a week on their profession (40.8%) while only 12.2% spend above 60 hours a week on their profession.

Approximately how many business trips did you make in a year before covid-19?

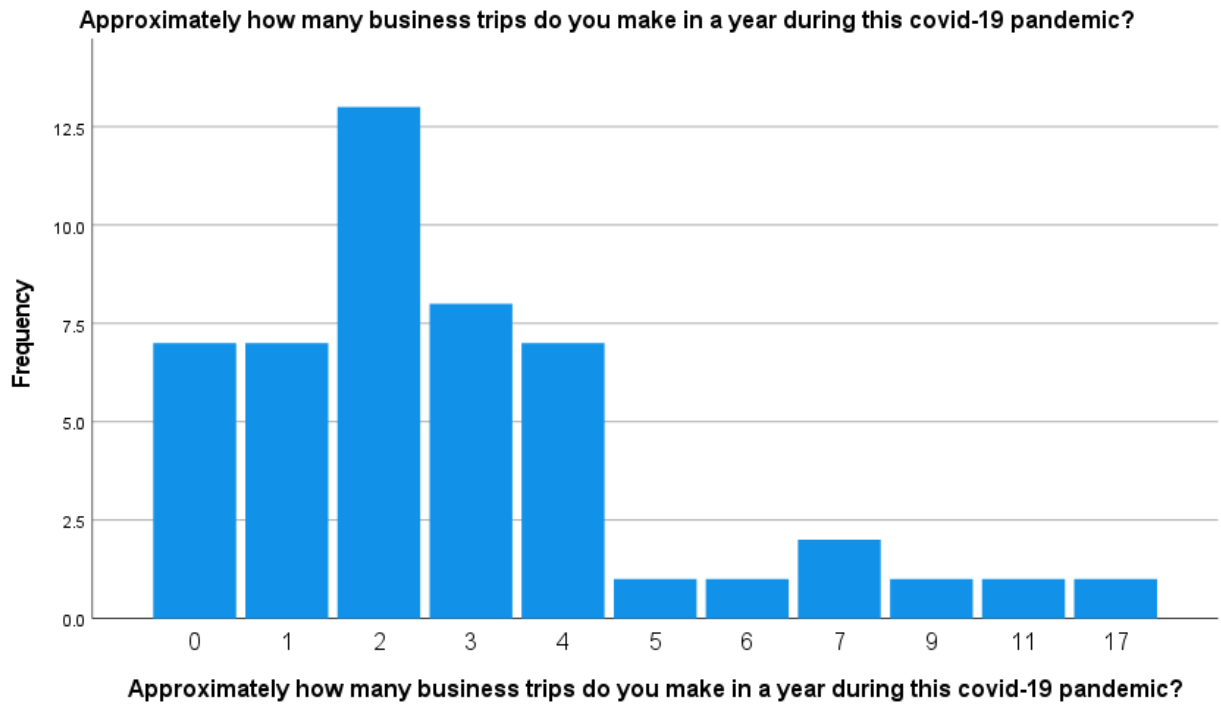
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	2.0	2.0	2.0
	1	2	4.1	4.1	6.1
	2	5	10.2	10.2	16.3
	3	5	10.2	10.2	26.5
	4	6	12.2	12.2	38.8

5	12	24.5	24.5	63.3
6	5	10.2	10.2	73.5
7	2	4.1	4.1	77.6
8	2	4.1	4.1	81.6
9	2	4.1	4.1	85.7
10	4	8.2	8.2	93.9
12	2	4.1	4.1	98.0
15	1	2.0	2.0	100.0
Total	49	100.0	100.0	



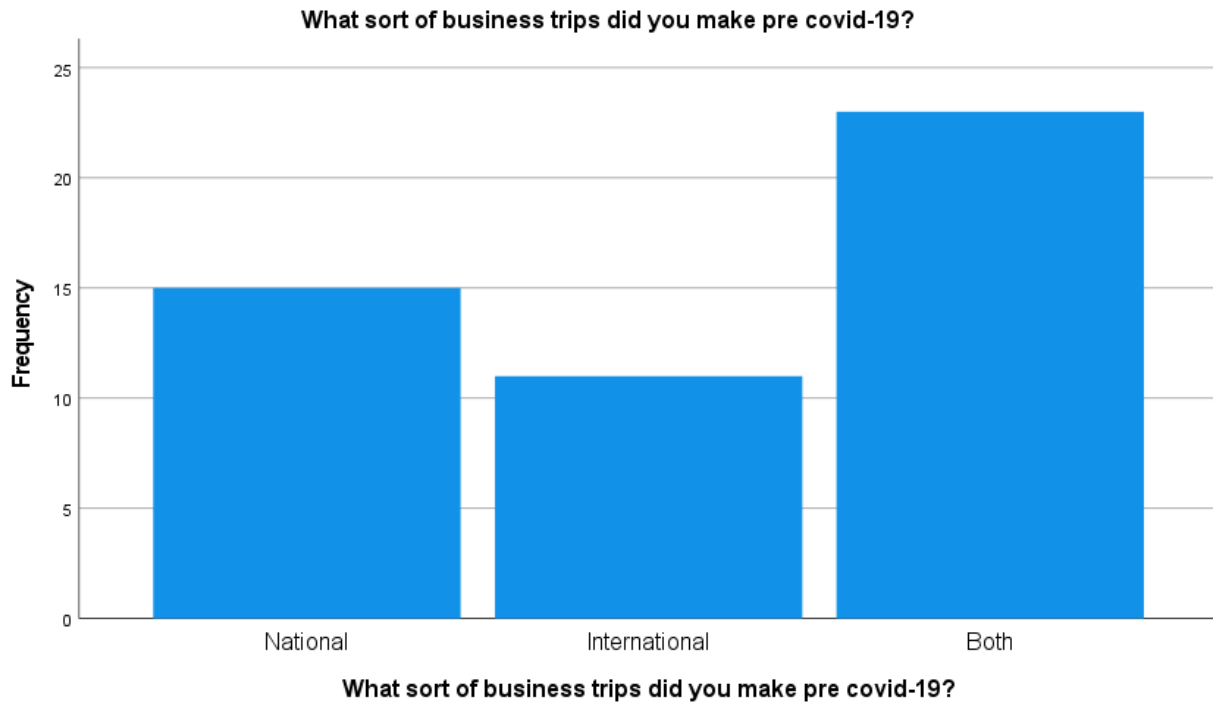
Approximately how many business trips do you make in a year during this covid-19 pandemic?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	7	14.3	14.3	14.3
	1	7	14.3	14.3	28.6
	2	13	26.5	26.5	55.1
	3	8	16.3	16.3	71.4
	4	7	14.3	14.3	85.7
	5	1	2.0	2.0	87.8
	6	1	2.0	2.0	89.8
	7	2	4.1	4.1	93.9
	9	1	2.0	2.0	95.9
	11	1	2.0	2.0	98.0
	17	1	2.0	2.0	100.0
	Total	49	100.0	100.0	



What sort of business trips did you make pre covid-19?

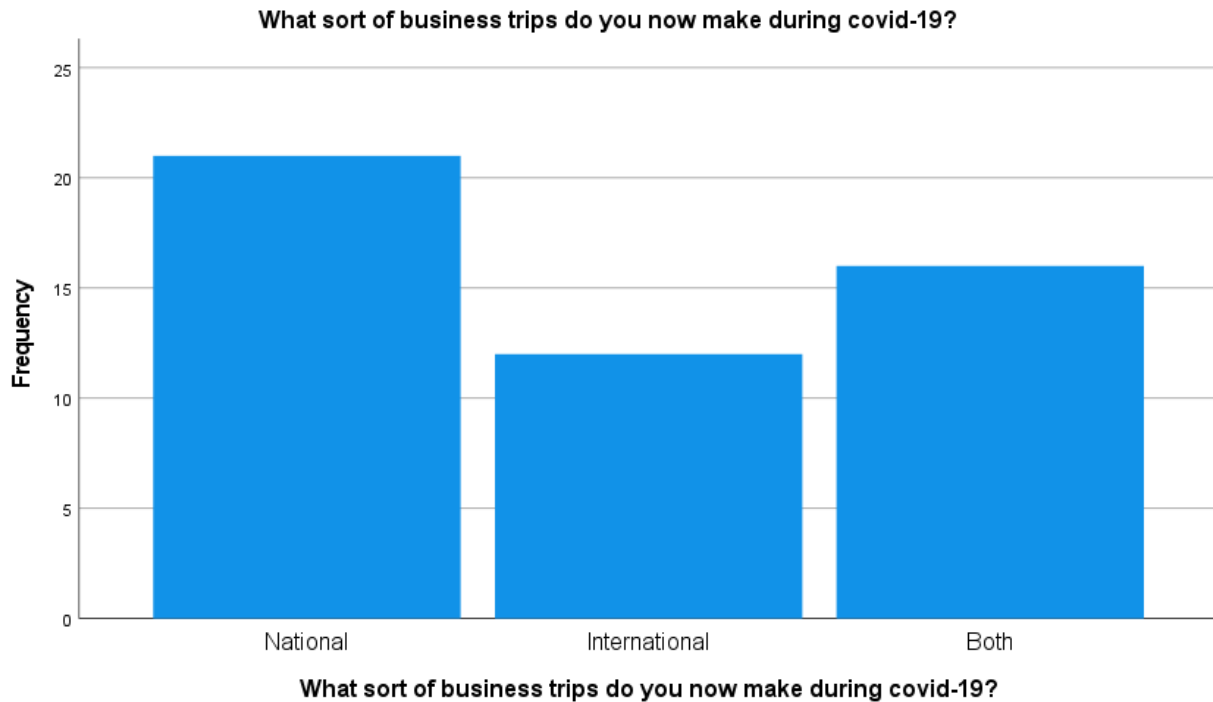
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	National	15	30.6	30.6	30.6
	International	11	22.4	22.4	53.1
	Both	23	46.9	46.9	100.0
	Total	49	100.0	100.0	



From the bar chart, it is evident that most people make both international and national business trips (46.9%) followed by national trips (30.6%).

What sort of business trips do you now make during covid-19?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	National	21	42.9	42.9	42.9
	International	12	24.5	24.5	67.3
	Both	16	32.7	32.7	100.0
	Total	49	100.0	100.0	



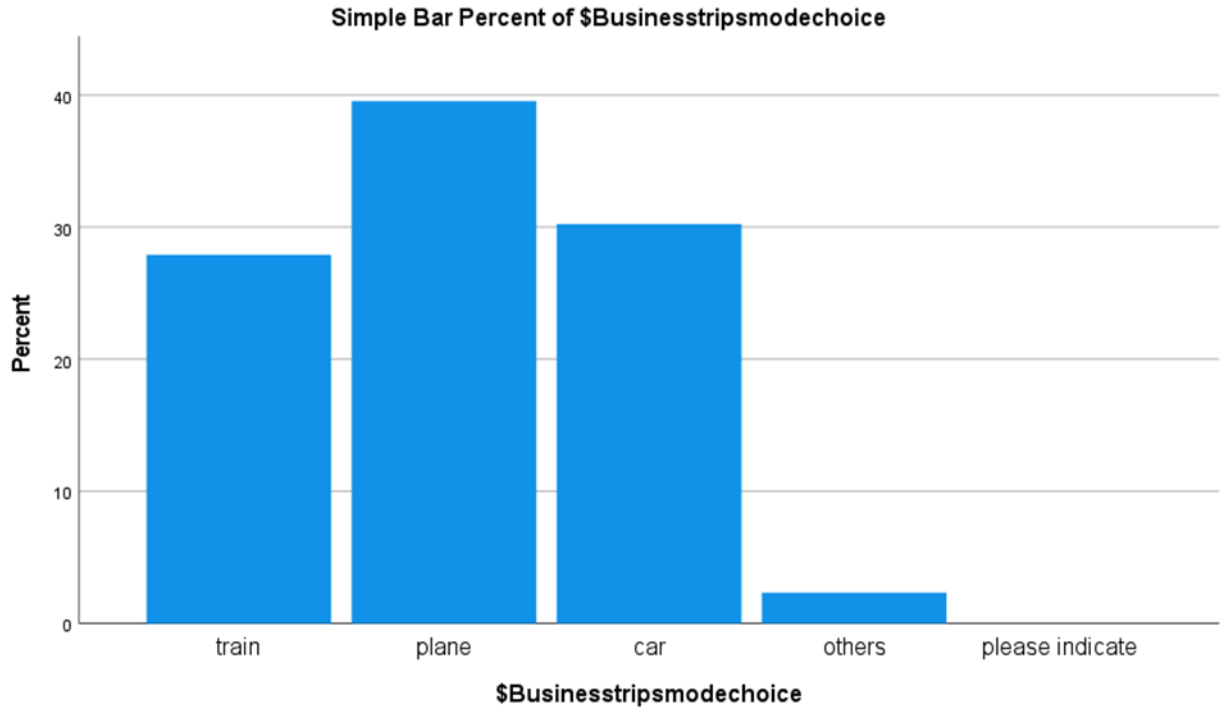
The trend during the covid-19 pandemic shows people making more national than both national and international trips probably due to the covid-19 lockdown and travel restrictions. Both international and national business trips have reduced from 46.9% to 32.9%. Whereas the national trips have increased from 30.6% before covid-19 to 42.9%.

How do you travel for business trips?

Business trips mode choice Frequencies

	Responses		
	N	Percent	Percent of Cases
How do you travel for business trips? ^a	24	27.9%	49.0%
train	34	39.5%	69.4%
plane	26	30.2%	53.1%
car	2	2.3%	4.1%
others	86	100.0%	175.5%
Total			

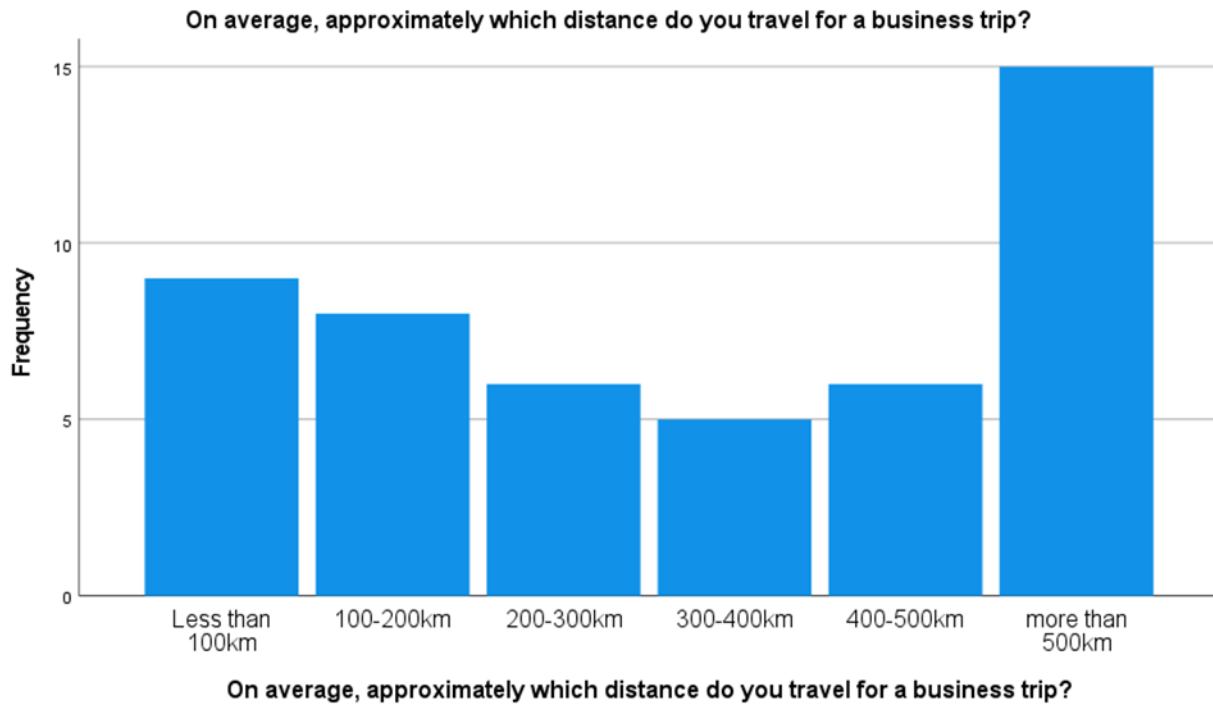
a. Dichotomy group tabulated at value 1.



For business trips, most respondents (39.5%) travel by plane followed by car and then train. Two respondents indicated that they travel by other means which are ship and bus.

On average, approximately which distance do you travel for a business trip?

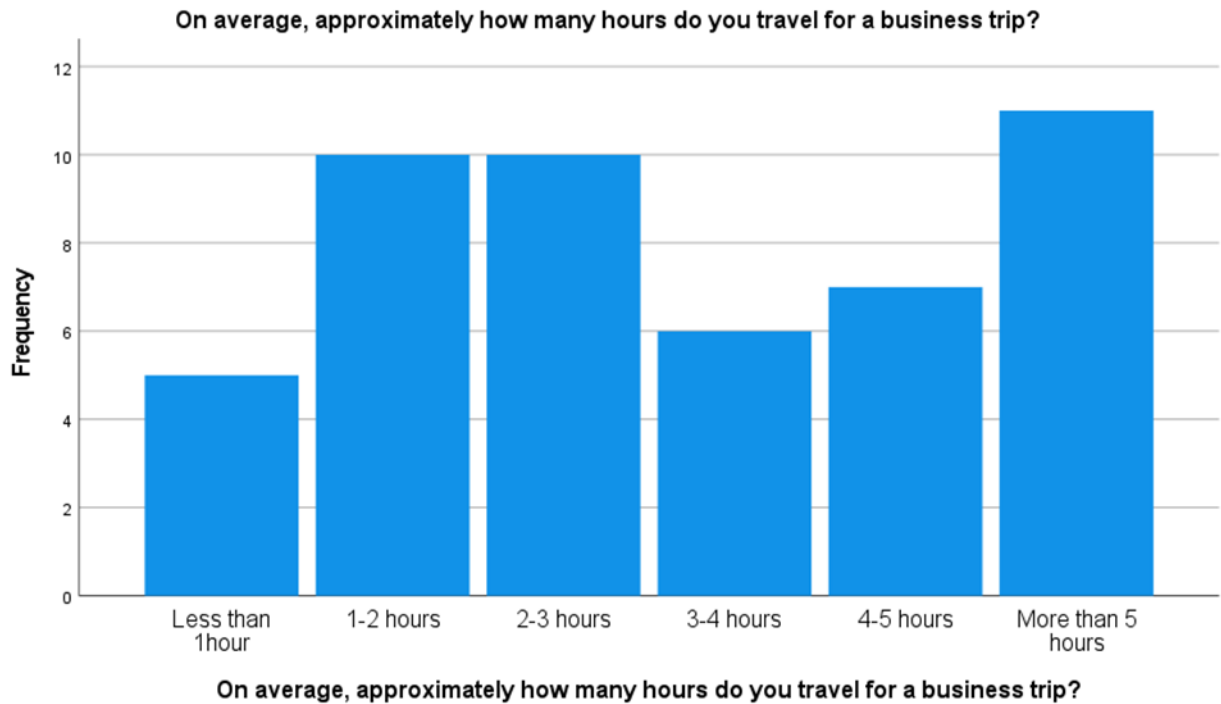
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 100km	9	18.4	18.4	18.4
	100-200km	8	16.3	16.3	34.7
	200-300km	6	12.2	12.2	46.9
	300-400km	5	10.2	10.2	57.1
	400-500km	6	12.2	12.2	69.4
	more than 500km	15	30.6	30.6	100.0
	Total	49	100.0	100.0	



Most respondents travel more than 500km and others less than 100km.

On average, approximately how many hours do you travel for a business trip?

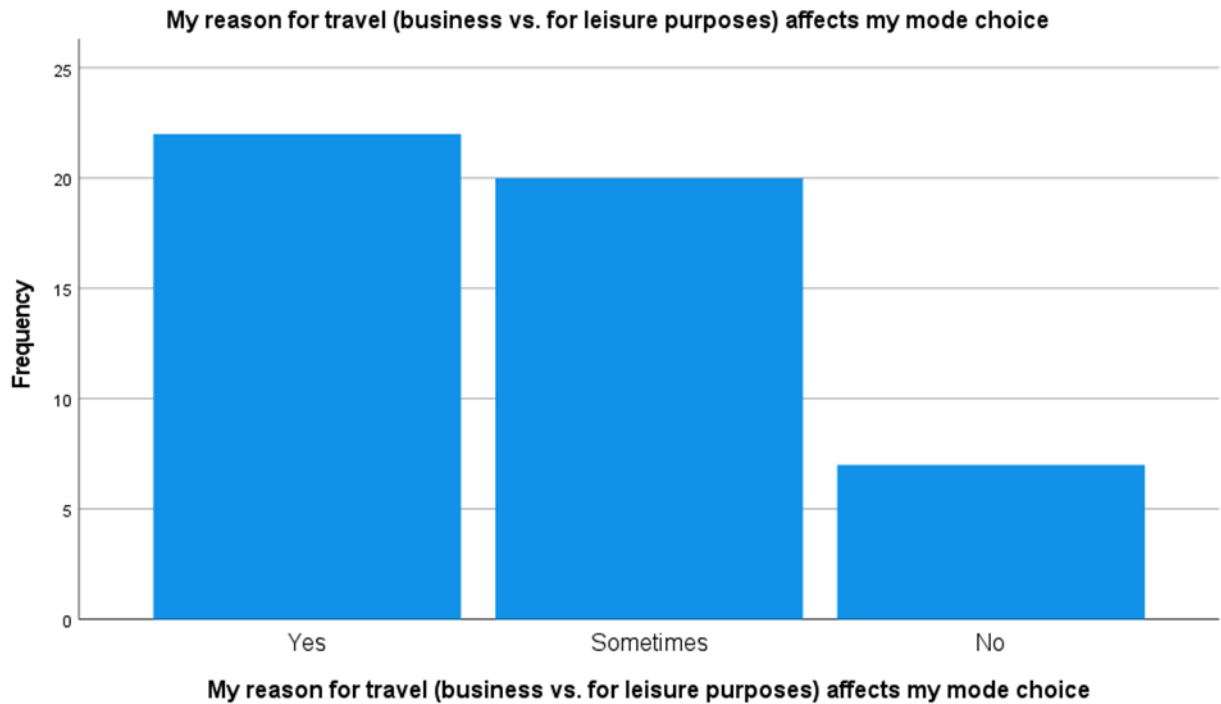
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 hour	5	10.2	10.2	10.2
	1-2 hours	10	20.4	20.4	30.6
	2-3 hours	10	20.4	20.4	51.0
	3-4 hours	6	12.2	12.2	63.3
	4-5 hours	7	14.3	14.3	77.6
	More than 5 hours	11	22.4	22.4	100.0
	Total	49	100.0	100.0	



Most respondents (22.4%) spend more than 5 hours to travel for business trips followed by 1-2 hours (20.4%) and 2-3 hours (20.4%).

My reason for travel (business vs. for leisure purposes) affects my mode choice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	22	44.9	44.9	44.9
	Sometimes	20	40.8	40.8	85.7
	No	7	14.3	14.3	100.0
	Total	49	100.0	100.0	



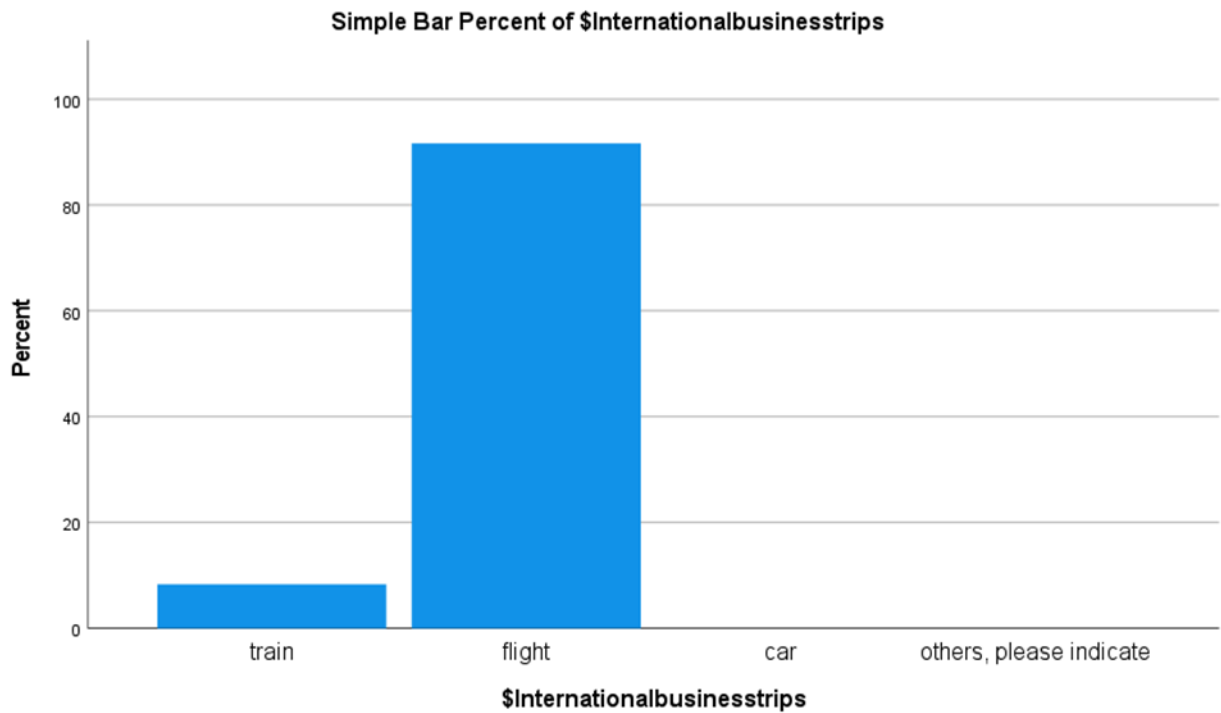
In most instances, mode choice is determined by the reason for travel. This is true for 44.9% of the cases and partially true 40.8% of the cases.

When travelling for national business trips, I use

\$Internationalbusinessstrips Frequencies

	Responses		
	N	Percent	Percent of Cases
travelling for internationaltrain business ^a	1	8.3%	9.1%
flight	11	91.7%	100.0%
Total	12	100.0%	109.1%

a. Dichotomy group tabulated at value 1.

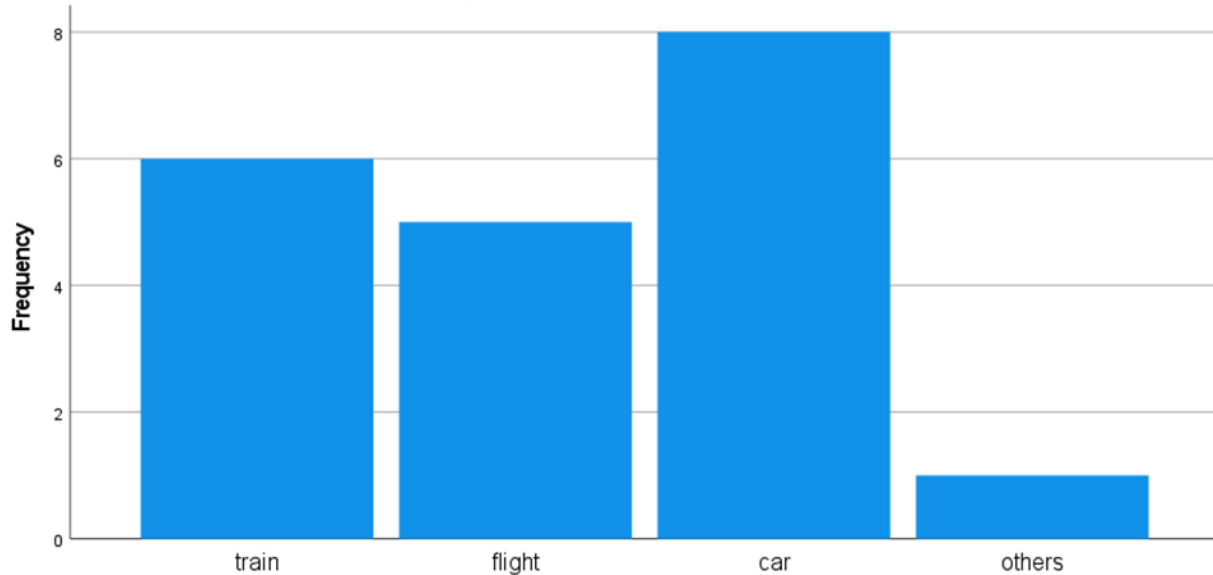


Most international business trips are carried out by flight (91.7).

When travelling for national business trips, I use, "Indicate which answers are applicable. Please note that multiple answers can be indicated"

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	29	59.2	59.2	59.2
Train	6	12.2	12.2	71.4
Flight	5	10.2	10.2	81.6
Car	8	16.3	16.3	98.0
Others	1	2.0	2.0	100.0
Total	49	100.0	100.0	

When travelling for national business trips, I use, "Indicate which answers are applicable. Please note that multiple answers can be indicated"



When travelling for national business trips, I use, "Indicate which answers are applicable. Please note that multiple answers can be indicated"

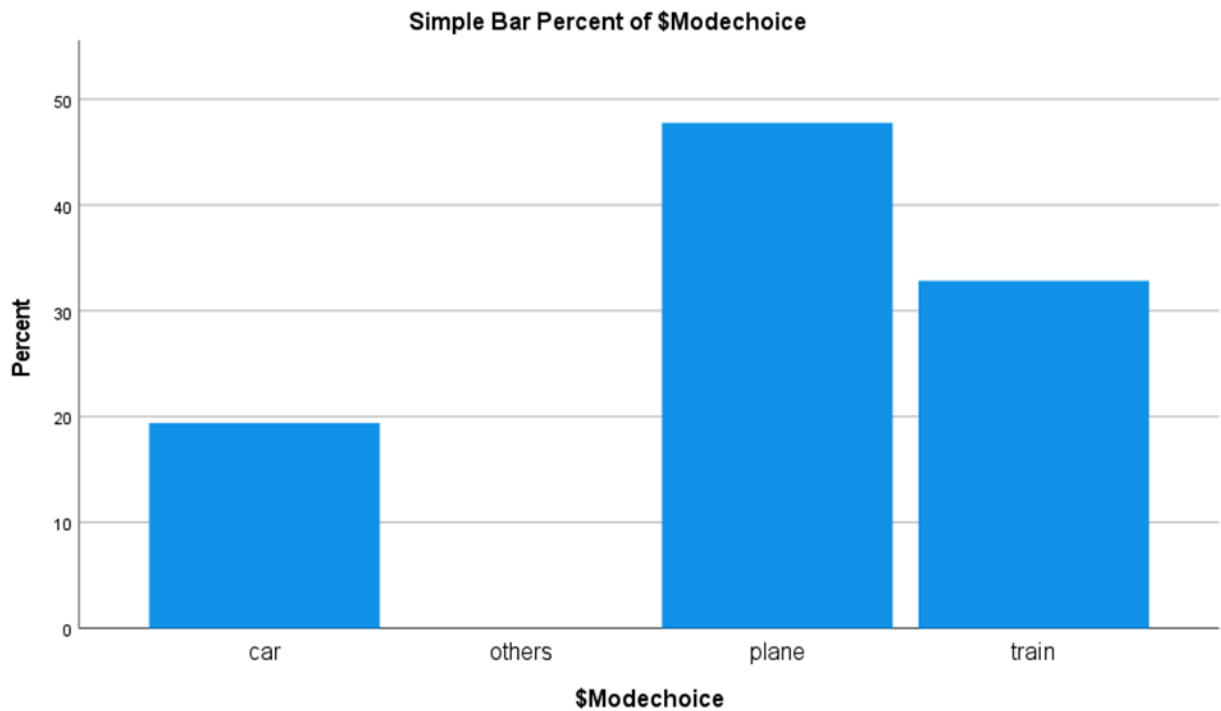
For national business trips, most long distance business travelers prefer to travel by car followed by the train. One respondent mentioned the ship as another option.

For long distance business trips (≥ 300 km) I travel by

\$Modechoice Frequencies

	Responses			
	N	Percent	Percent of Cases	
For long distance business trips ^a	train	22	32.8%	45.8%
	plane	32	47.8%	66.7%
	car	13	19.4%	27.1%
Total	67	100.0%	139.6%	

a. Dichotomy group tabulated at value 1.



For long distance business trips (≥ 300 km), 47.8% of the respondents travel by plane, while 32.8% travel by train and only 19.4% travel by car. None indicated that they travel by other modes/means of transport.

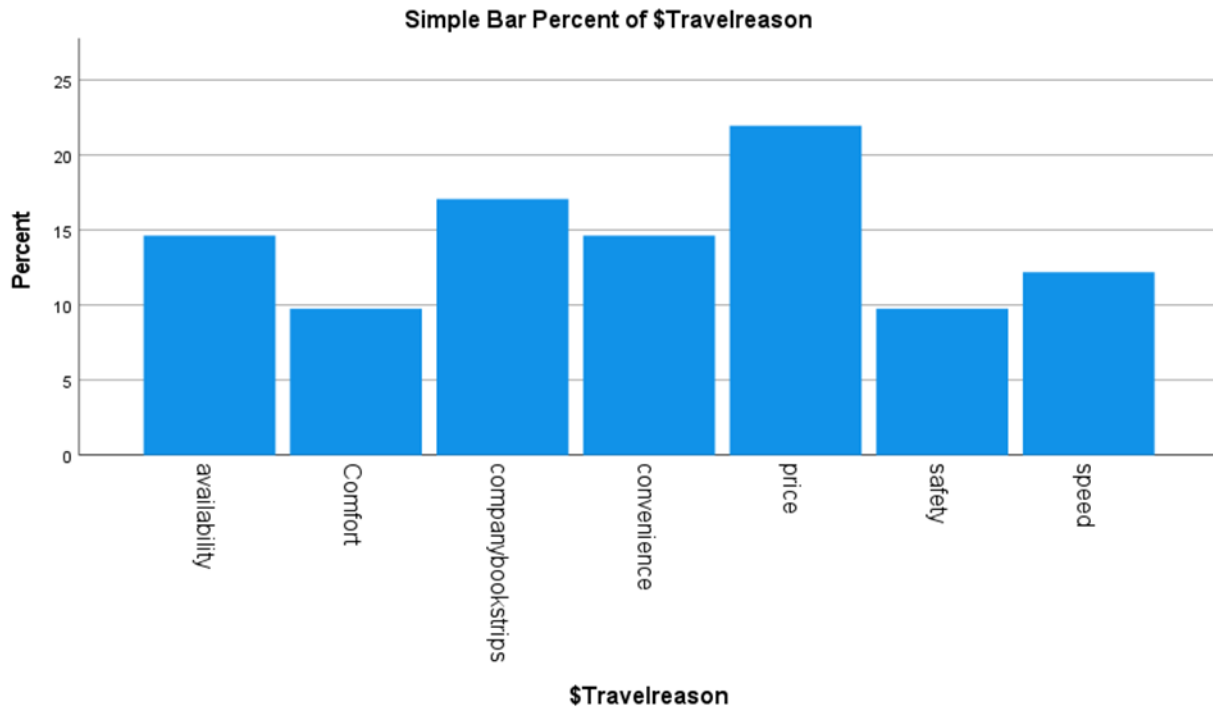
For some long distance business trips (≥ 300 km), I travel by train because of

\$Travelreason Frequencies

	Responses		
	N	Percent	Percent of Cases
For some long distance business trip ^a			
Comfort	4	9.8%	25.0%
speed	5	12.2%	31.3%
price	9	22.0%	56.3%
safety	4	9.8%	25.0%
convenience	6	14.6%	37.5%
companybookstrips	7	17.1%	43.8%
availability	6	14.6%	37.5%

Total	41	100.0%	256.3%
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a. Dichotomy group tabulated at value 1.



Most long distance business respondents travelling by train do so due the lower price of trains while factors such as comfort and safety are the least important factors considered in train travel.

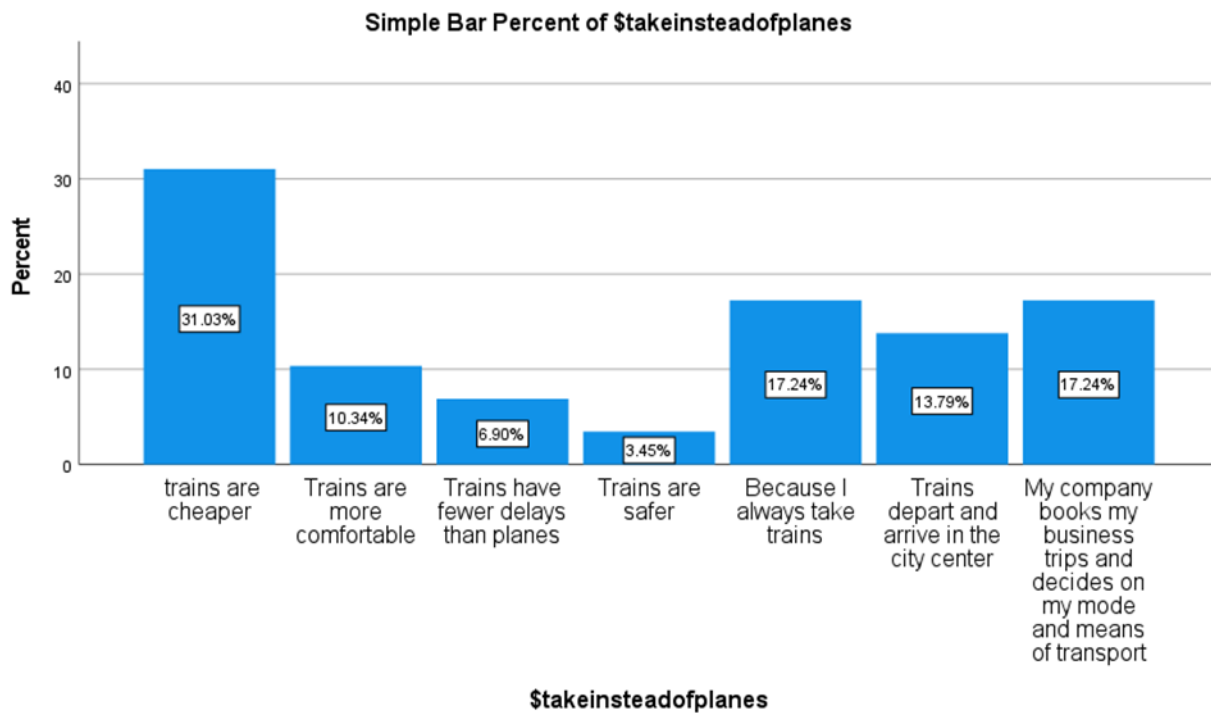
For some long distance business trips, I take trains instead of the plane because

\$takeinsteadofplanes Frequencies

	Responses		
	N	Percent	Percent of Cases
I take trains instead of the plane ^a	3	10.3%	25.0%
Trains are comfortable	3	10.3%	25.0%
trains are cheaper	9	31.0%	75.0%
Trains are safer	1	3.4%	8.3%

My company books my5 business trips and decides on my mode and means of transport	17.2%	41.7%
Trains depart and arrive in4 the city center	13.8%	33.3%
Because I always take trains5	17.2%	41.7%
Trains have fewer delays2 than planes	6.9%	16.7%
Total	29	100.0% 241.7%

a. Dichotomy group tabulated at value 1.

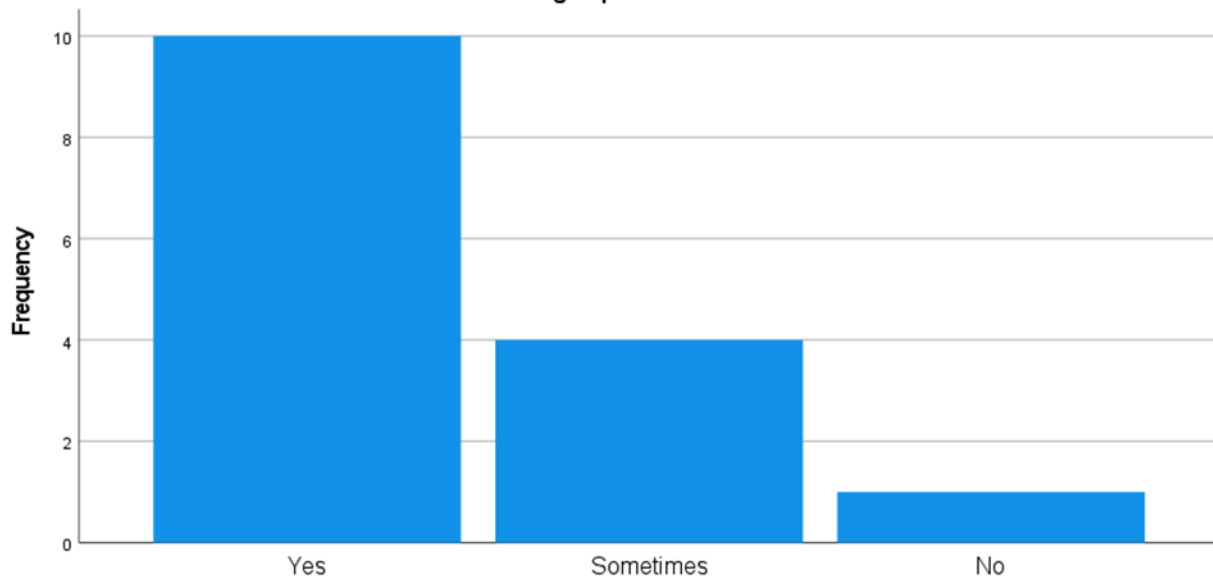


The preference of trains over flights is due to the fact that trains are cheaper than flights followed by the fact that most business travelers have their trips booked by their companies and equally because they have always taken the train. The safety of trains is the least considered factor.

For some long distance business trips(≥ 300 kms) , I would consider taking the train instead of flying if trains are high speed trains

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	10	66.7	66.7	66.7
	Sometimes	4	26.7	26.7	93.3
	No	1	6.7	6.7	100.0
	Total	15	100.0	100.0	

For some long distance business trips (≥ 300 kms) , I would consider taking the train instead of flying if trains are high speed trains



For some long distance business trips (≥ 300 kms) , I would consider taking the train instead of flying if trains are high speed trains

From the responses, most people travelling long distance for business trips will consider switching from flights to trains if trains become high speed trains. Only 6.7% of the respondents will not consider switching even if they could travel by means of high speed trains.

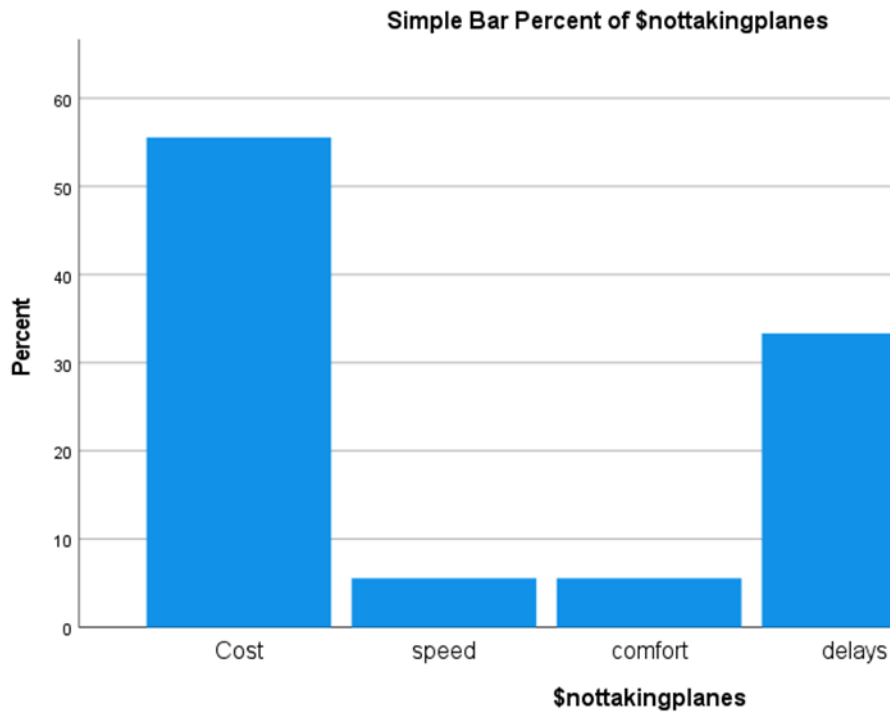
For some long distance business trips, I am discouraged from taking planes because of

Not taking planes Frequencies

	Responses			
	N	Percent	Percent of Cases	
discouraged from taking planes because ^a	Cost	10	55.6%	90.9%
	speed	1	5.6%	9.1%

	comfort	1	5.6%	9.1%
	delays	6	33.3%	54.5%
Total		18	100.0%	163.6%

a. Dichotomy group tabulated at value 1.



As concerns plane travel, what discourages most long distance business travelers is cost followed by delay of planes. Factors such as speed and comfort are not experienced as an issue.

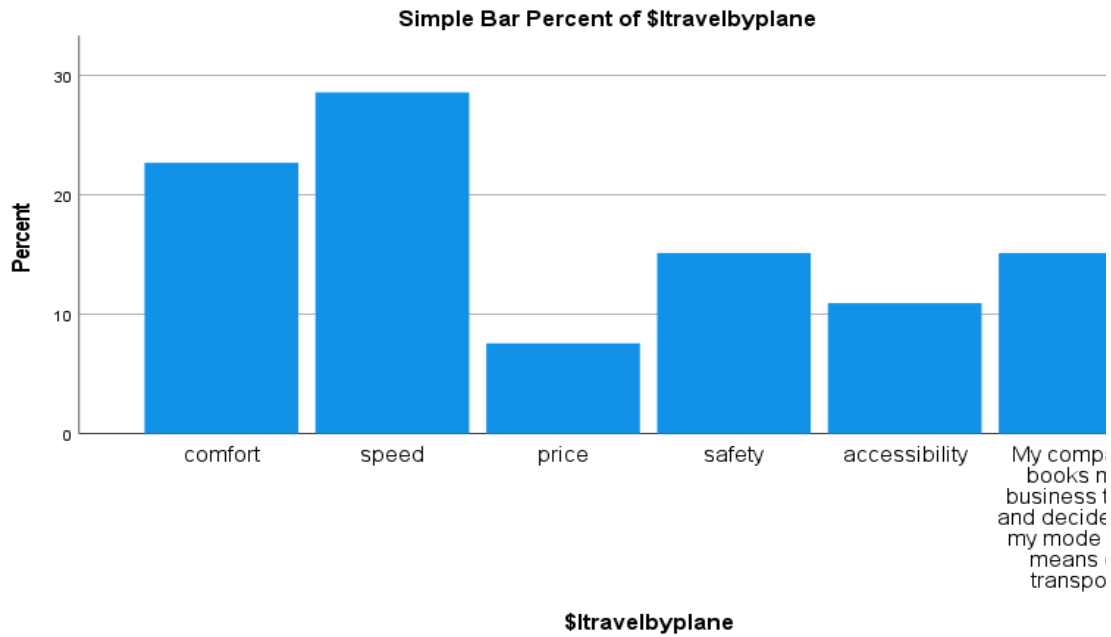
I travel by plane because

\$Travelbyplane Frequencies

	Responses		
	N	Percent	Percent of Cases
I travel by plane becauseMy company books my business trips and decides on my mode and means of transport	18	15.1%	36.7%
a accessibility	13	10.9%	26.5%

	safety	18	15.1%	36.7%
	price	9	7.6%	18.4%
	speed	34	28.6%	69.4%
	comfort	27	22.7%	55.1%
Total		119	100.0%	242.9%

a. Dichotomy group tabulated at value 1.



As for the reasons why business travelers take flights, it is due to the speed of flight, comfort and also because their companies book their trips. The price of flights is least considered by business travelers.

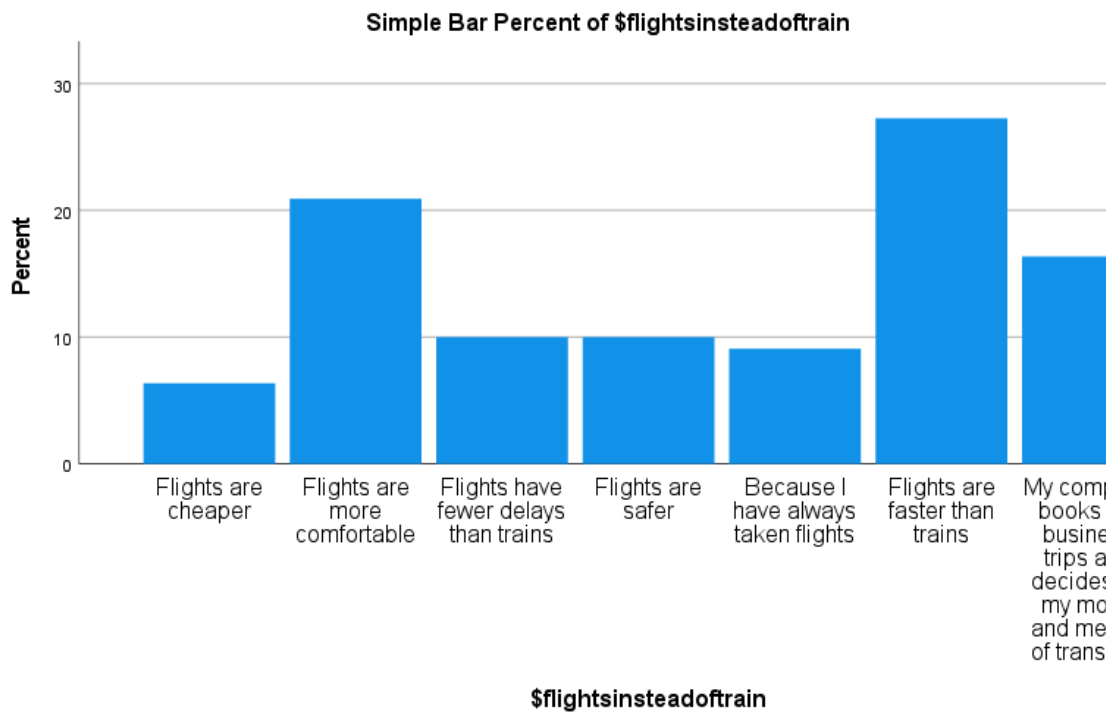
I take flights instead of the trains

\$flightsinsteadoftrain Frequencies

	Responses		
	N	Percent	Percent of Cases
I take flights instead of the train ^a	7	6.4%	14.6%
Flights are cheaper	23	20.9%	47.9%
Flights are more comfortable	11	10.0%	22.9%
Flights have fewer delays than trains	11	10.0%	22.9%
Flights are safer	30	27.3%	62.5%

Because I have always taken flights	10	9.1%	20.8%
My company books my business trips and decides on my mode and means of transport	18	16.4%	37.5%
Total	110	100.0%	229.2%

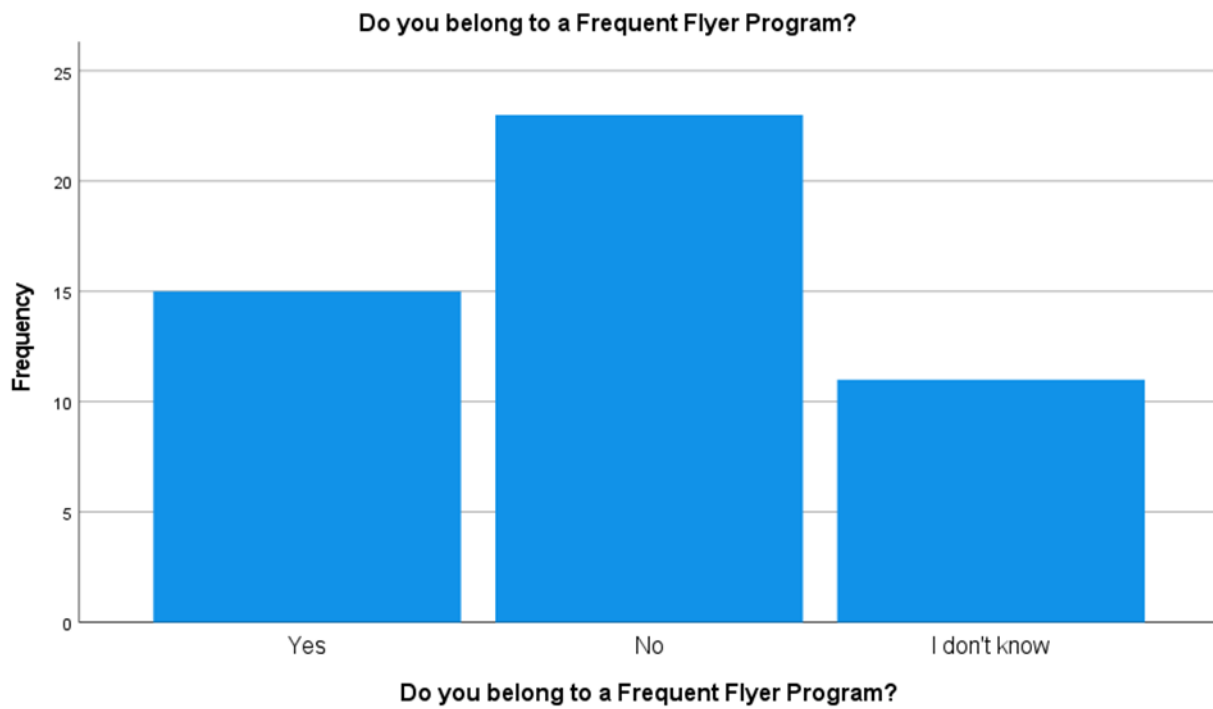
a. Dichotomy group tabulated at value 1.



As for the reasons why business travelers prefer flights to trains, the speed of flights compared to trains comes first followed by comfort and the price of flights.

Do you belong to a Frequent Flyer Program?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	30.6	30.6	30.6
	No	23	46.9	46.9	77.6
	I don't know	11	22.4	22.4	100.0
	Total	49	100.0	100.0	



30.6% of business travelers traveling by flights belong to a frequent flyer program while the majority; 46.6% do not belong to this program.

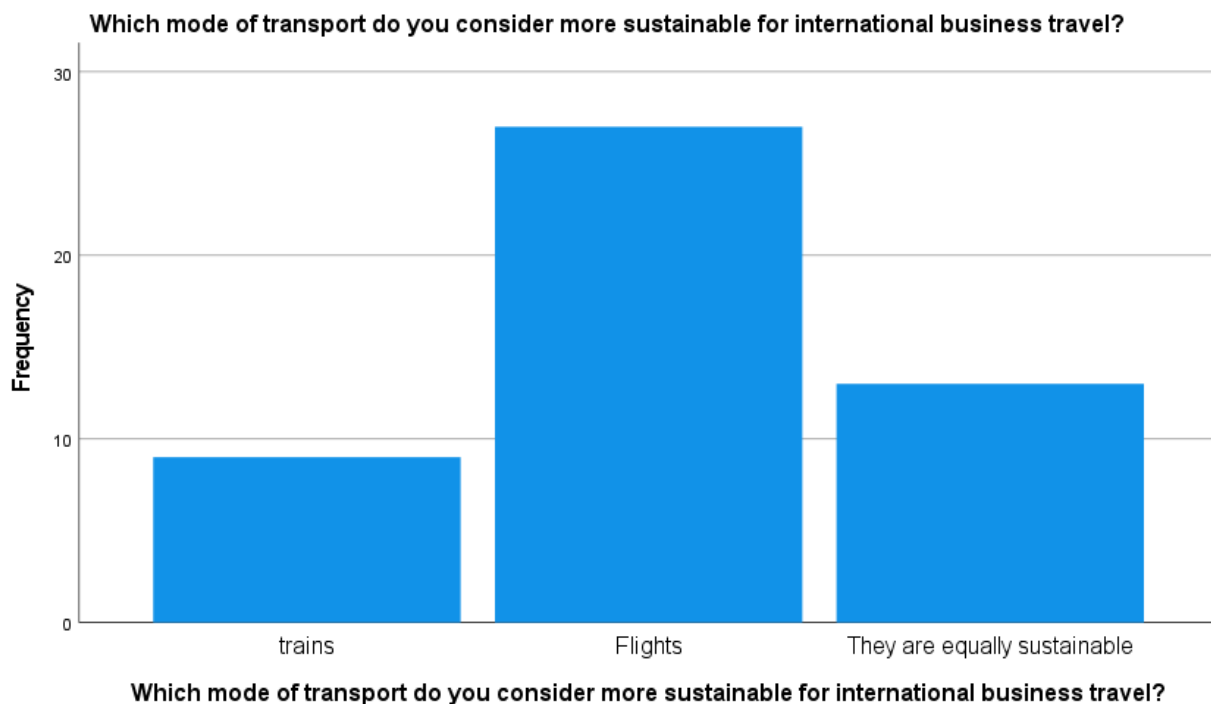
Question 25

What is your opinion on the following;	Yes	No
I would like my mode choice to be environmentally sustainable	85.7%	14.3%
I try to be environmentally sustainable because the benefits to the environment are important to me	71.4%	28.6%

I do not see the benefit of having a sustainable environment.	28.6%	71.4%
I think it is a waste of time to focus on sustainability in transportation	22.4%	77.6%
I consider environmental sustainability in my mode choice because others (friends / family / partner / work giver) would disapprove if I did not.	40.8%	59.2%

Which mode of transport do you consider more sustainable for international business travel?

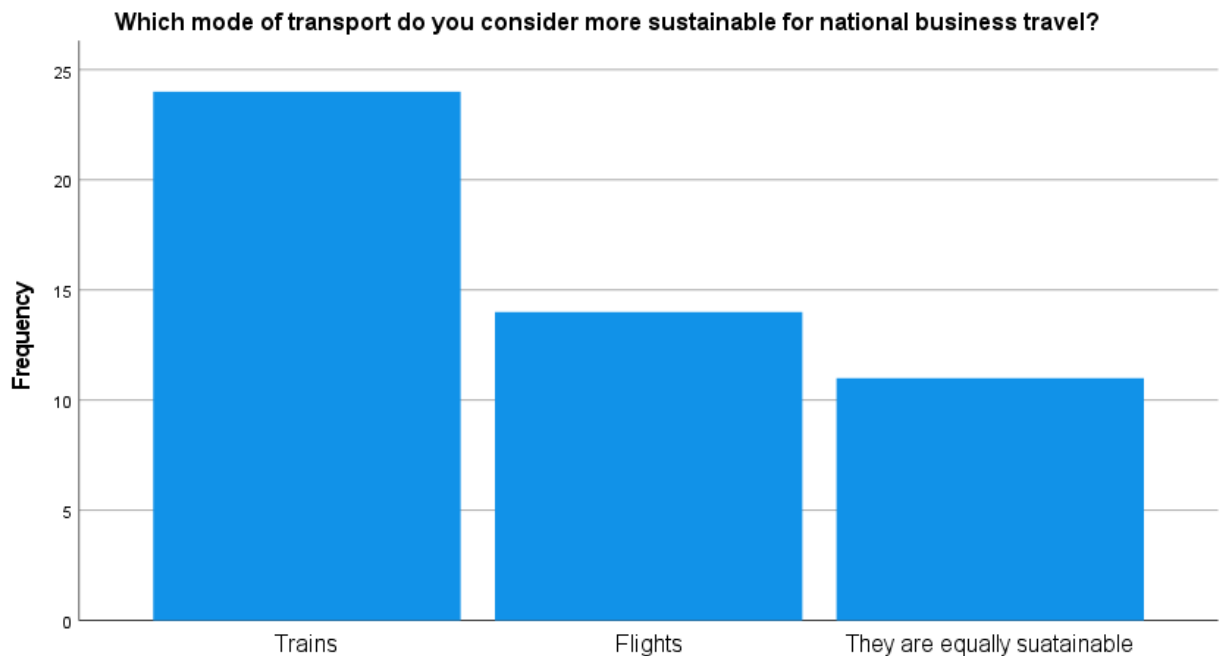
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	trains	9	18.4	18.4	18.4
	Flights	27	55.1	55.1	73.5
	They are equally sustainable	13	26.5	26.5	100.0
	Total	49	100.0	100.0	



For internal business travel, business travelers (55.1%) consider flights to be more sustainable while 26.5% of the respondents consider both flights and trains as equally sustainable.

Which mode of transport do you consider more sustainable for national business travel?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Trains	24	49.0	49.0	49.0
	Flights	14	28.6	28.6	77.6
	They are equally sustainable	11	22.4	22.4	100.0
	Total	49	100.0	100.0	

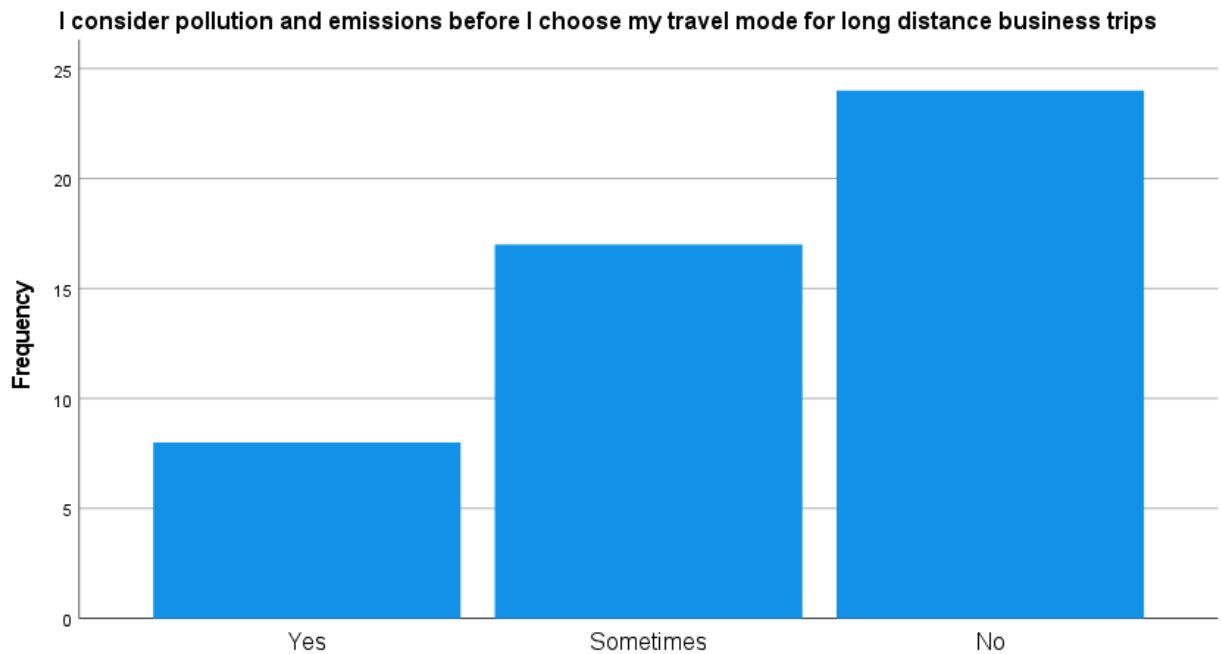


Which mode of transport do you consider more sustainable for national business travel?

For national business trips, 49% of the respondents consider trains to be more sustainable while 22.4% consider both trains and flights as equally sustainable.

I consider pollution and emissions before I choose my travel mode for long distance business trips

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	8	16.3	16.3	16.3
	Sometimes	17	34.7	34.7	51.0
	No	24	49.0	49.0	100.0
	Total	49	100.0	100.0	



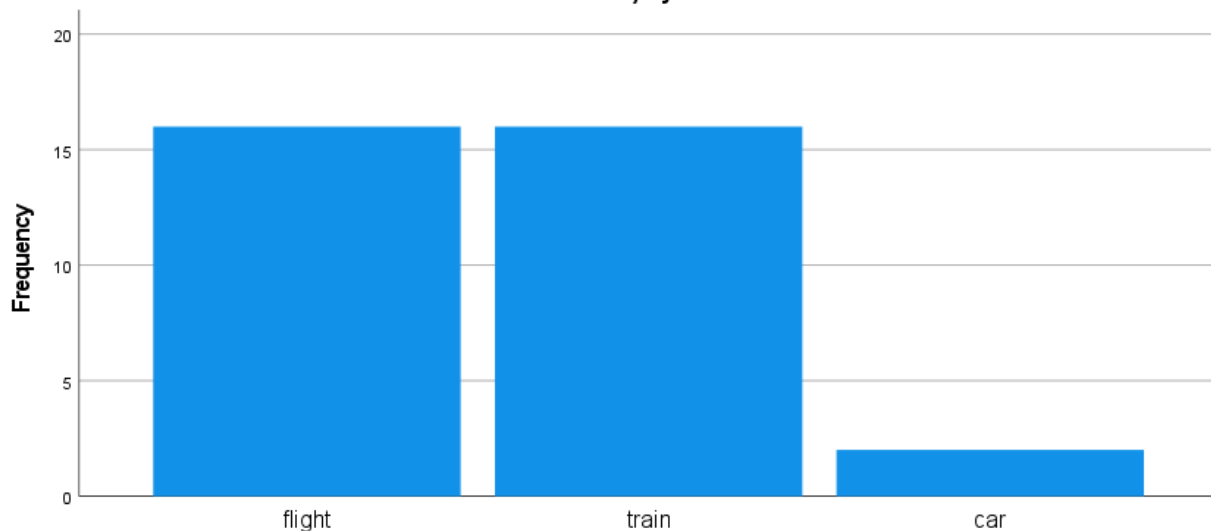
I consider pollution and emissions before I choose my travel mode for long distance business trips

Most business travelers (49%) do not consider pollution in their mode choice while 34.7% sometimes consider it and only 16.35 of the respondents consider pollution and emissions when choosing their mode for long distance business trips.

Due to large CO2 emissions from flights, consider CO2 taxes are included in flight tickets resulting in an increased cost of flights compared to the train ticket prices. I prefer to travel for long distance business trips (≥ 300 kms) by

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	flight	16	47.1	47.1	47.1
	train	16	47.1	47.1	94.1
	car	2	5.9	5.9	100.0
	Total	34	100.0	100.0	

Due to large CO2 emissions from flights, consider CO2 taxes are included in flight tickets resulting in an increased cost of flights compared to the train ticket prices. I prefer to travel for long distance business trips (≥ 300 kms) by



Due to large CO2 emissions from flights, consider CO2 taxes are included in flight tickets resulting in an increased cost of flights compared to the train ticket prices. I prefer to travel for long distance business trips (≥ 300 kms) by

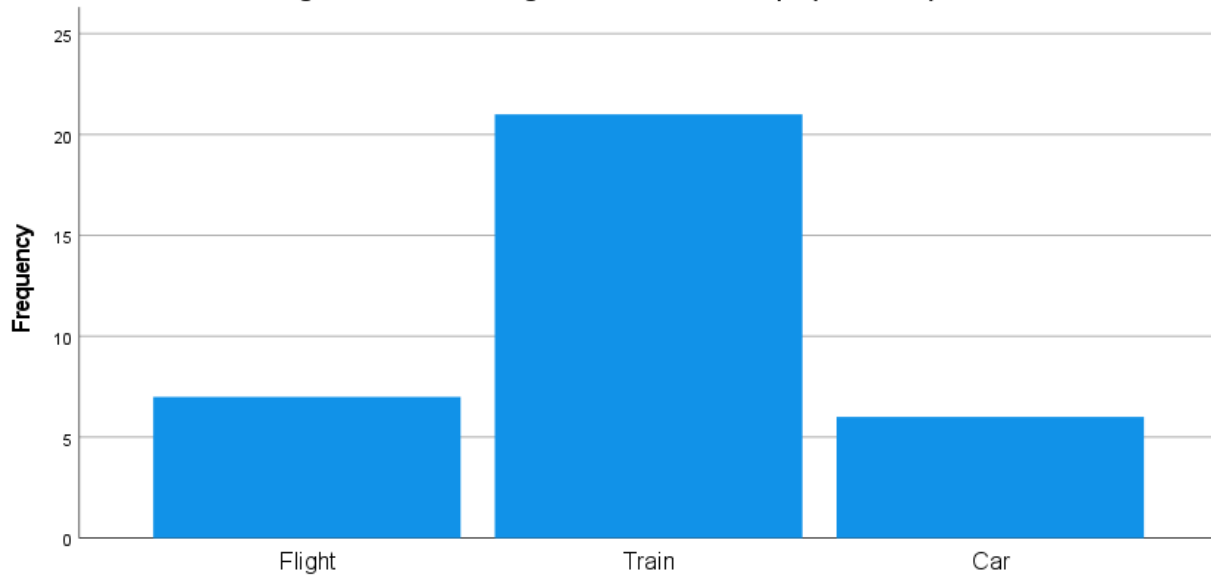
If a pollution charge increases the cost of flights through an increase in the prices of plane tickets compared to train tickets, 47.1% of the respondents would still choose to travel by flights, 47.1 would travel by train while only 5.9% would prefer to travel by car.

Knowing that flights pollute the environment more than trains, I am willing to change my travel mode from flights to trains for long distance business trips (≥ 300 kms)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Flight	7	20.6	20.6	20.6

Train	21	61.8	61.8	82.4
Car	6	17.6	17.6	100.0
Total	34	100.0	100.0	

Knowing that flights pollute the environment more than trains, I am willing to change my travel mode from flights to trains for long distance business trips (≥ 300 kms)



Knowing that flights pollute the environment more than trains, I am willing to change my travel mode from flights to trains for long distance business trips (≥ 300 kms)

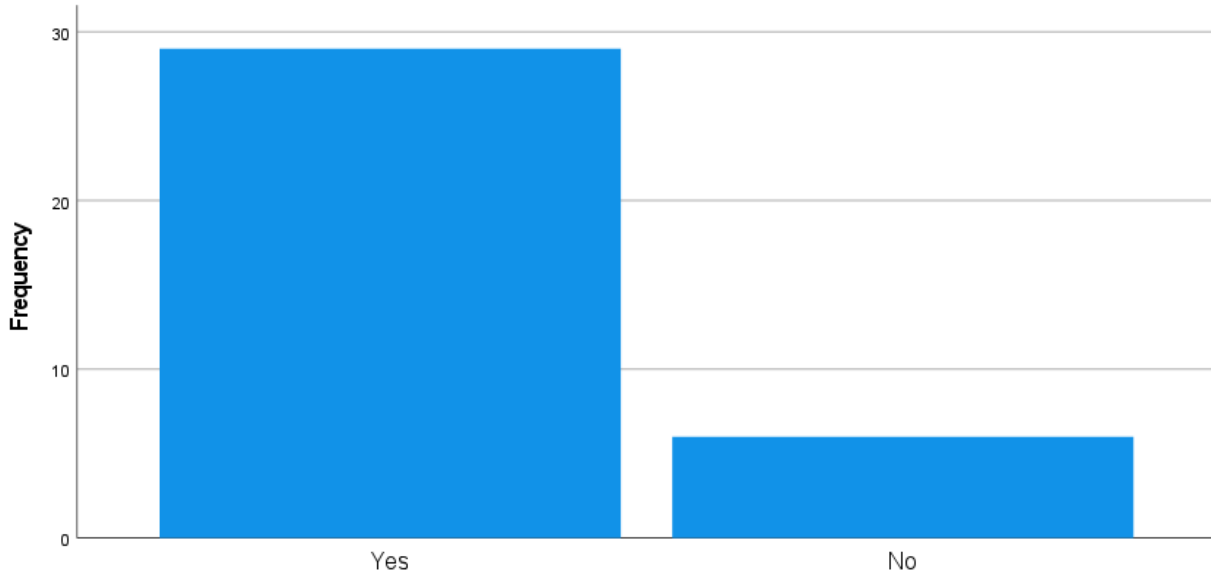
With the knowledge that flights are less sustainable than trains, 61.8% of long distance business travelers prefer to travel by train and 17.6% would rather travel by car.

Hypothesis testing

For long distance business trips (≥ 300 kms), I prefer flights because of the shorter net travel times of flights compared to trains.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	29	82.9	82.9	82.9
	No	6	17.1	17.1	100.0
	Total	35	100.0	100.0	

For long distance business trips (≥ 300 kms) , I prefer flights because of the shorter net travel times of flights compared to trains.



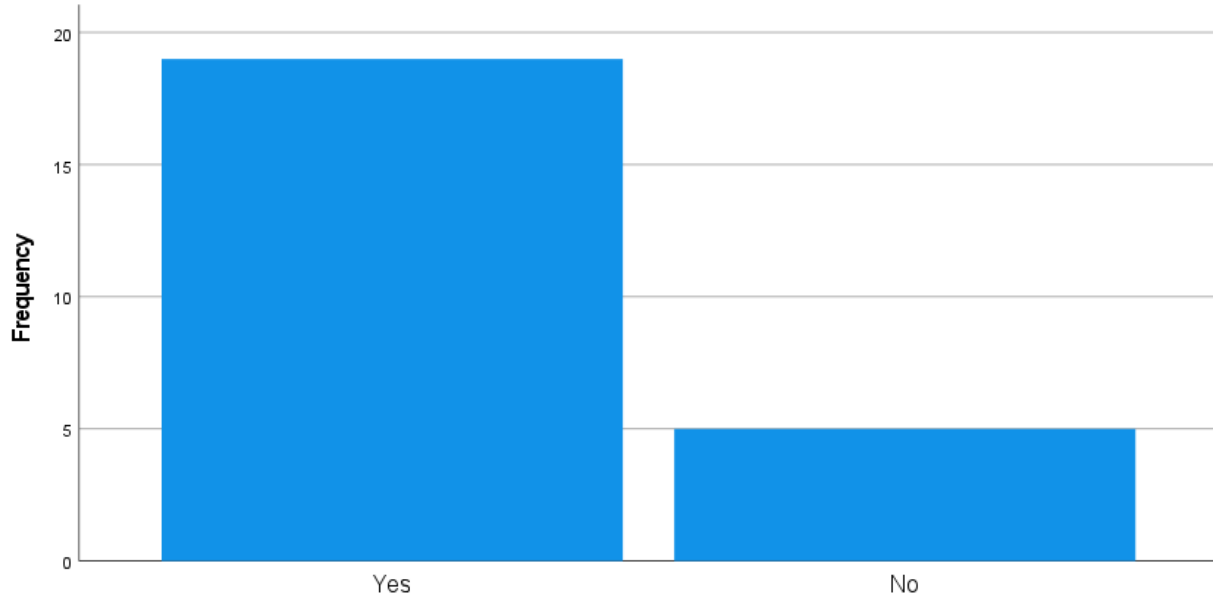
For long distance business trips (≥ 300 kms) , I prefer flights because of the shorter net travel times of flights compared to trains.

Most respondents (82.9%) prefer flights because of their shorter net travel times compared to trains.

If I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	19	79.2	79.2	79.2
	No	5	20.8	20.8	100.0
	Total	24	100.0	100.0	

If I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit

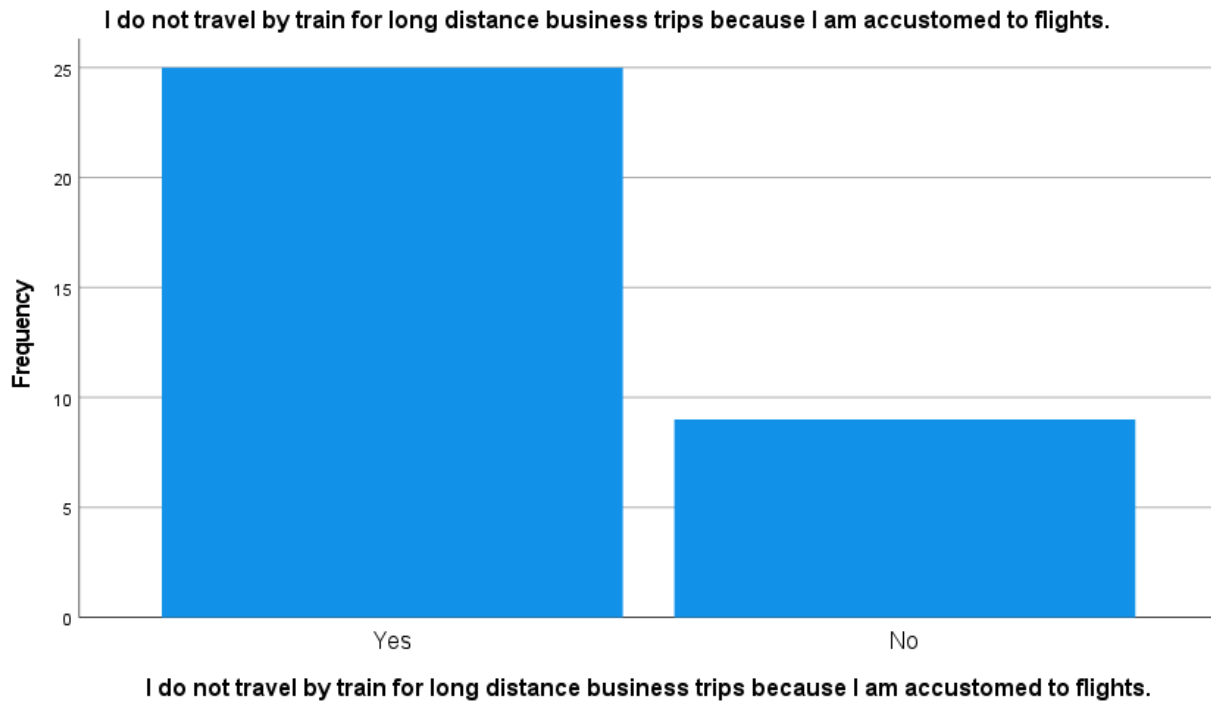


If I travel for long distance business trips (≥ 300 kms) with trains more often, I will continue to keep this habit

79.2% of the respondents indicate that they would to continue to travel by train for long distance trips if they used trains more often for this purpose.

I do not travel by train for long distance business trips because I am accustomed to flights.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	25	73.5	73.5	73.5
	No	9	26.5	26.5	100.0
	Total	34	100.0	100.0	

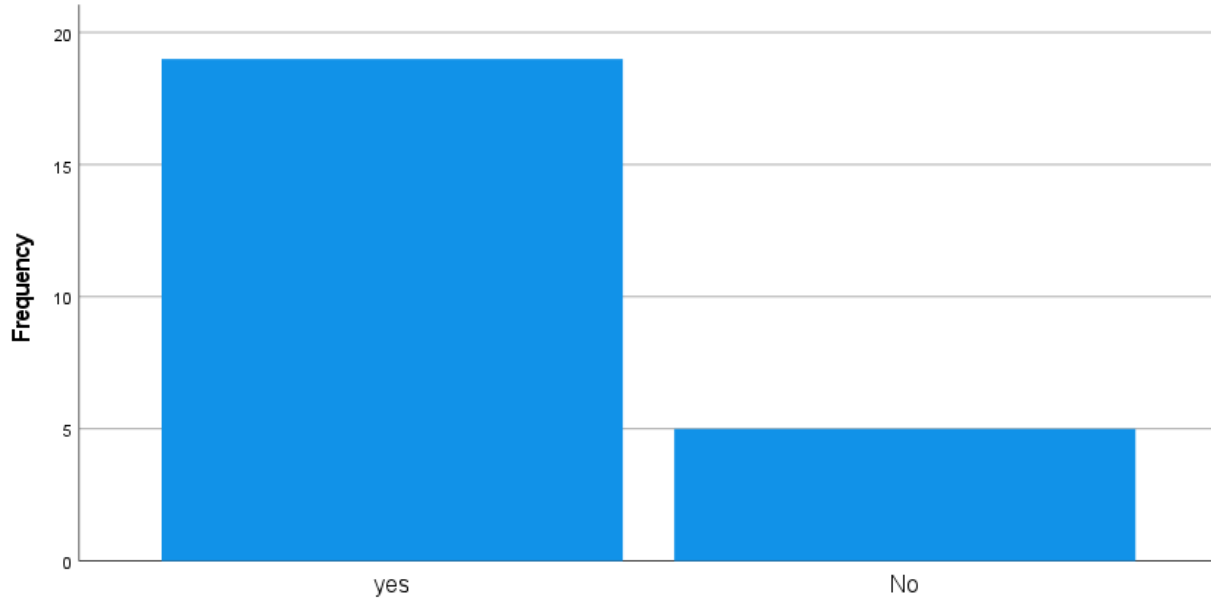


Due to being accustomed to flights, 73.5% of the respondents do not travel by train.

Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	19	79.2	79.2	79.2
	No	5	20.8	20.8	100.0
Total		24	100.0	100.0	

Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future



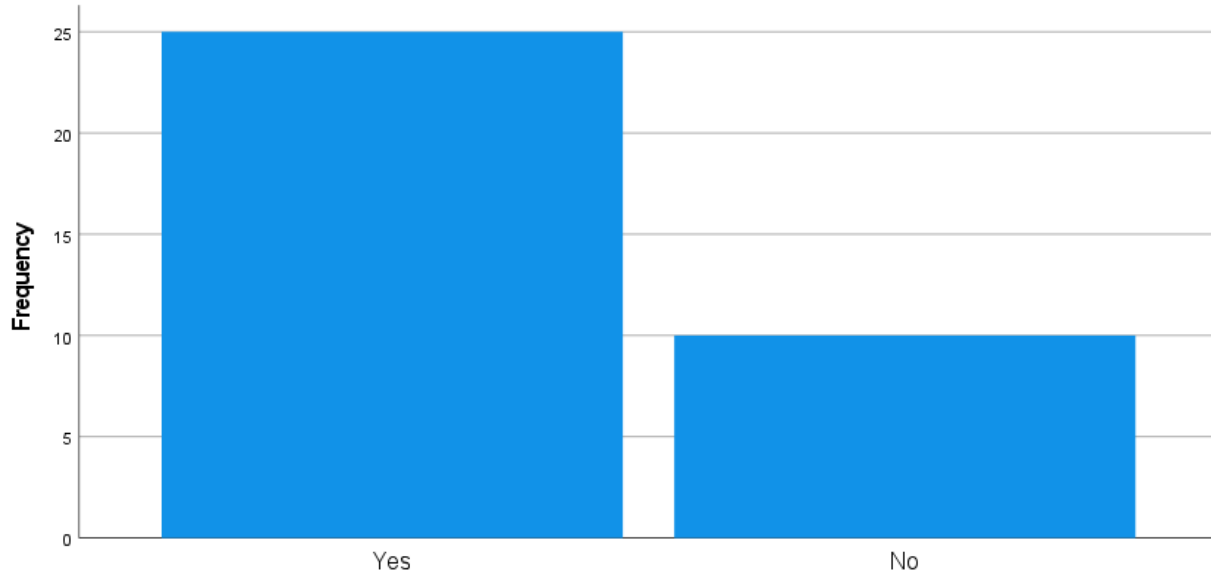
Because I have travelled previously for a long distance (≥ 300 kms) by train, I will probably do it again in future

Due to previous long distance travel by train, 79.2% of the respondents will likely travel by train again in future.

I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	25	71.4	71.4	71.4
	No	10	28.6	28.6	100.0
	Total	35	100.0	100.0	

I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future



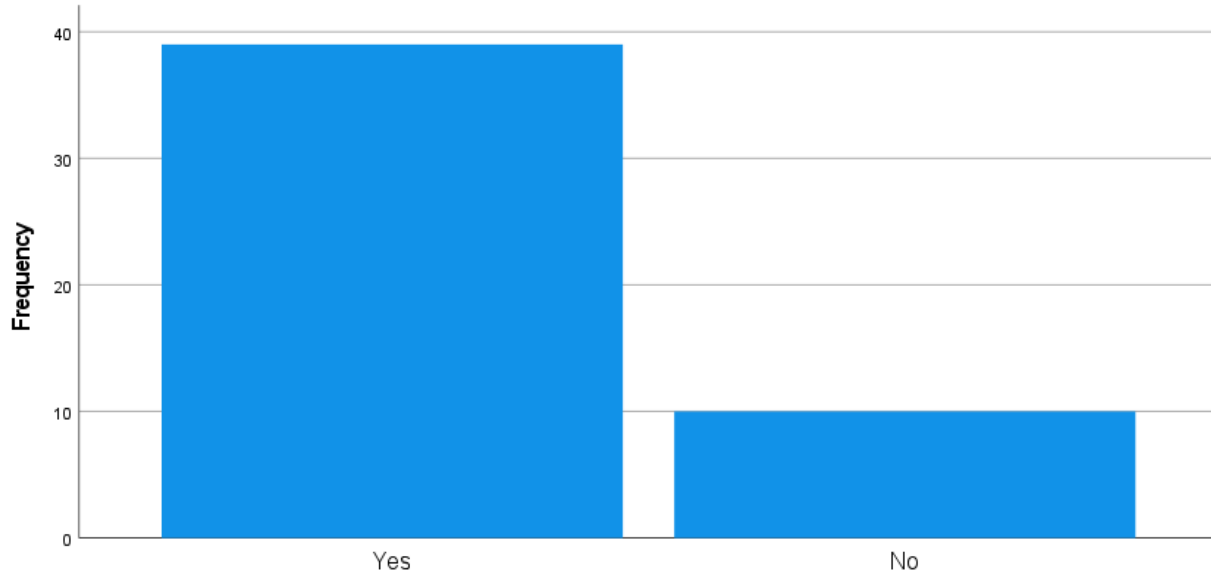
I am aware of the negativities resulting from plane travel and will consider the option of train travel for long distance business trips (≥ 300 kms) more often in the future

Being aware of the negativities resulting from plane travel will make 71.4% of the respondents to consider trains as an alternative for planes for long distance business trips.

Travelling by a particular transport mode relates to familiarity with it; If you become more familiar with train travel, you will travel more by trains from then onwards.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	39	79.6	79.6	79.6
	No	10	20.4	20.4	100.0
	Total	49	100.0	100.0	

Travelling by a particular transport mode relates to familiarity with it; If you become more familiar with train travel, you will travel more by trains from then onwards.



Travelling by a particular transport mode relates to familiarity with it; If you become more familiar with train travel, you will travel more by trains from then onwards.

In order to travel by a particular mode of transport, familiarity is important. 79.6% of the respondents indicated that if they become more familiar with trains, they will travel more by train from then onwards.

Question 37

For long distance business trips(≥ 300 kms)	Yes	No
My travel mode choice is influenced by friends / family / partner / work giver	61.2%	38.8%
My travel mode choice is influenced by my own personal reasons	75.5%	24.5%
Nothing and no one influences my travel mode choice	36.7%	63.3%

Question 38

For long distance business trips (≥ 300 kms) ,	Yes	No
I will change my transport mode if there is a reward for change or punishment if I do not change	71.4%	28.6%
I feel better when I travel through a more sustainable transport mode	61.2%	38.8%
I consider sustainability in my mode choice because people look up to me.	42.9%	57.1%
I will change my transport mode choice because I realize the dangers of pollution.	65.3%	34.7%

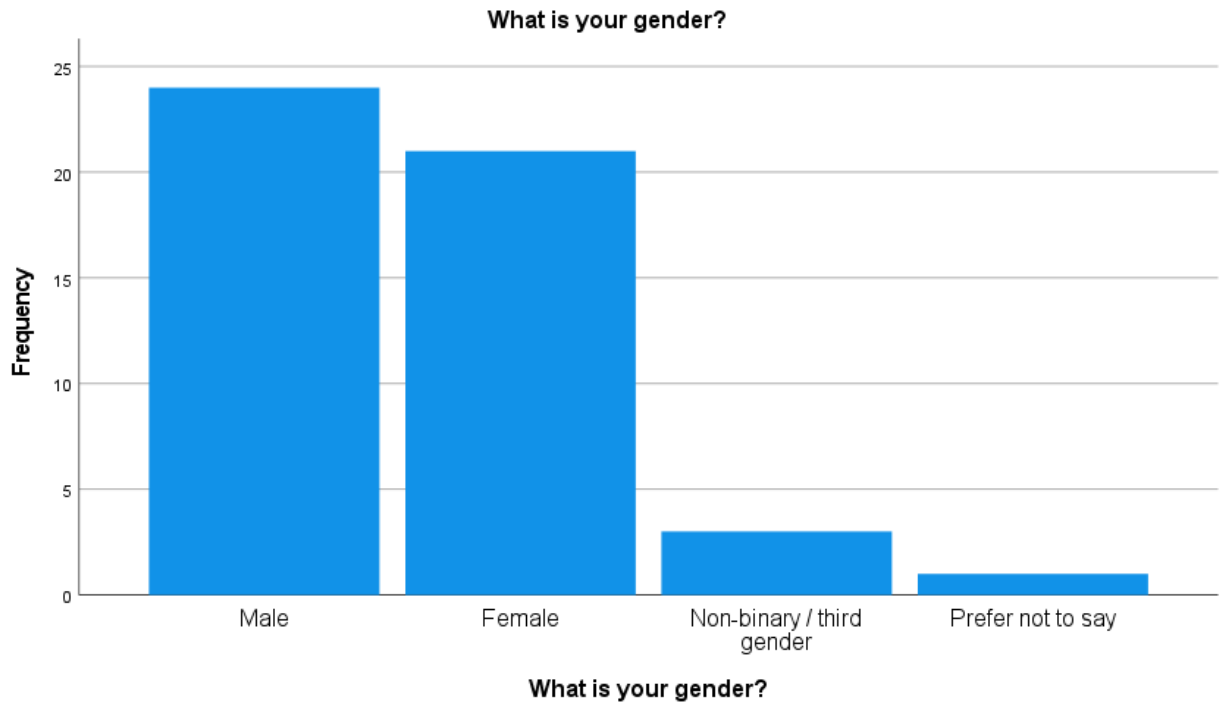
Question 39

For long distance business trips (≥ 300 kms),	Yes	No
I have never considered changing my transport mode before	53.1%	46.9%
I have already decided to change my transport mode	38.8%	61.2%
I have changed my transport mode before	42.9%	57.1%
I have continued with the changed mode of travel successful	30.6%	69.4%
I changed my mode of travel but was unsuccessful in sticking to the new mode	34.7%	65.3%

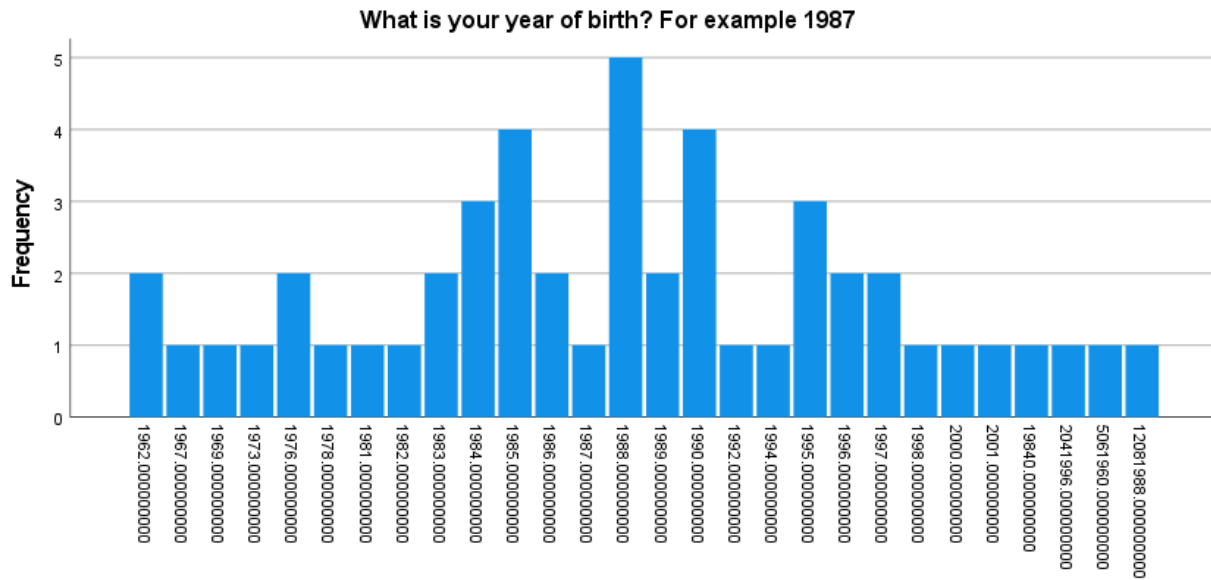
Personal Characteristics

What is your gender?

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	24	49.0	49.0	49.0
Female	21	42.9	42.9	91.8
Non-binary / third gender	3	6.1	6.1	98.0
Prefer not to say	1	2.0	2.0	100.0
Total	49	100.0	100.0	



The respondents were mostly male (49%) while 42.9% were female and the rest non binary or preferred not to reveal their genders.



What is your year of birth? For example 1987

What is your highest level of education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Basic Education	8	16.3	16.3	16.3
	Secondary education	14	28.6	28.6	44.9
	Bachelors	22	44.9	44.9	89.8
	Masters	5	10.2	10.2	100.0
	Total	49	100.0	100.0	

Most of the respondents are bachelor degree holders.



Nadege Berinyuy