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# Study of people's willingness to fly leisure after COVID-19

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**REPORT**

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## Abstract

During the current and last century, leisure flight has been an increasing market, especially in the last 30 years, the growth rate has been increasing substantially, only stopped by the episodes of global recessions. However, this aviation crisis has had no similar fact in all its history. On this project, a study of the drivers and possible lacks aviation market currently has is carried out. For this, an analysis of the facts that brought people to leisure travel that much before the global pandemic is required, to realize how people's priorities have changed from the last year.

To see this, both practical and technical studies are performed. The first will consist in reading a series of reports related to the leisure travel inner causes, while the second will consider people's thoughts by interviewing them, using a set of questions that will be extracted from the technical studies.

Once a sample of results is obtained, statistics are used to get insights on given structures and correlations between the leisure aviation drivers. These results are then compared to the ones obtained in the reviewed literature, trying to understand the reasons behind the obtained differences, broadening the general knowledge about these drivers, while discussing what things could be improved in the leisure flight industry to recover market share.



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## Introduction

### Aim of the work

The work aims to try getting the drivers that influence people's willingness to fly for leisure, evaluating how people changing their flying patterns since COVID-19 started. Getting knowledge of social trends with regards to travelling, flight industry reactions to historical crisis or potential economic growth are also key factors to get insights on possible evolution is also demanded.

Besides, an analysis of how people perceive COVID-19 risks when taking a plane and how its counter-measures, such as travelling quarantines is required to see how much does each factor influences people decision-making.

To make this observation, a sample of cases is required, so a survey development and distribution are being developed. Once obtained, the data is being subject to different statistics methodologies on data analysis.

Finally, comparing the obtained findings to the reviewed literature is needed, so the results can be validated and further discussion can be done on observed differences, trying to deliver on their possible causes.

### Justification

Nowadays, COVID-19 is one of the most popular words worldwide as it influenced everyone's way of life. In 2020, this pandemic started spreading through the world, provoking a dramatic change in both personal and professional life. Frightening news about new pandemics filled the news every day. At that point, governments started taking action and began listening to medical and health recommendations.

As the virus was highly contagious and the transmission was through the air, social distancing, mask usage and even quarantines began to be imposed on the societies. This scenario was highly incompatible with tourism activity.

Similar experiences have appeared before, with SARS and MERS viruses spreading through the Asian continent a decade ago. However, none of them was as impactful as COVID-19.

Regarding the tourism industry, it has been an ever-increasing sector, even showing a high resilience to economic crisis or political tensions, such as the September 11 attacks or the 2008 global depression. In 2019, estimations confirmed the tourism industry as one of the major actors on the global economy, exactly by contributing to the production of 9.3 trillion USD.

However, by May 2020, due to this absolute incompatibility between pandemic safety and travelling. The tourism market showed a 98% sudden decrease, starting to reflect the impact of the pandemics.

Later on, vaccines were perceived as the absolute solution that would bring society back to normal life. A period of borders opening and free state for tourism was reached during 2021



summer. However, with new virus variants coming every time, it is being appreciated how there is still room for COVID-19 to keep difficulting tourism activities.

Regarding all these happenings, some research is made in order to find the most important travelling drivers, with regards to this pandemic. This way, insights into those attributes that potentiate people willingness to fly can be obtained. Also, some data relative to people risk perception when flying or acquiring new tourism habits is obtained.

The research will be useful to see if this decrease in flight demand for leisure will keep going much longer, or even if it is not temporal but people getting used to other means of transport, as the plane is the one perceived as less safe.

With these results, an evaluation on what needs to be changed to offer the leisure flights consumers what they are looking for or make them feel more comfortable can also be carried out.

### Scope of the work

In the first instance, a state of the art is developed to see what is the current situation regarding the air industry. Some other subjects such as where does the air industry comes from, economic, health and society current situations and predictions are consulted as well. However, this task includes mere data recompilation, along with some interpretations or brief discussions, in no case, a study about these matters is going to be carried out. Also, this subjects' review is done based on some books, websites or articles parts, but no whole methodology about these sciences will be depicted.

Following the state of the art, a literature review is undertaken. In this case, some reports tackling a similar matter are reviewed, in order to get used methodology and results to validate the posterior data findings.

After this, a survey is developed and delivered using Google Forms platform. The sample cases are obtained by delivering the survey to acquaintances, and data is then collected by the same platform. The sample size is expected to be between 100 and 500 cases. No larger sample sizes are considered.

Once data is collected, statistical methods are used in order to obtain statistical models and find out the key drivers. Data procurement will be carried out using the SPSS program, owned by IBM. It is not within the scope of the work to develop software using the arithmetic definitions of a statistical method by the usage of R, Matlab or similar platforms.

Finally, the obtained results will be reviewed, validated and discussed with the results provided by the consulted papers.

### Requirements

The only requirement needed to carry out this project is an SPSS software license.



As a theoretical study is being developed, no economic, or technical requirements are needed. On the same line, as the survey conducted is anonymous, legal procedures are not required as well.

Regarding the study requirements, the development of a survey and data collection, along with getting some significant results is required.

## State of the art and literature review

In this chapter, an exploration about Spanish people costumes during vacations or leisure periods, from historical times to contemporary ones, is done in order to get deeper understandings of current tourism or leisure trips' inner reasons, parameters, situations, etc.

Some psychological research is also done, so it can be found out if there are any specific social factors that contribute to the individual person needs of leisure travelling.

Finally, a brief overview of the impact COVID-19 had in both the economical and aviation fields is reviewed, so the estimation of leisure travel future is based on real and current data.

### History and background

To begin with, it is a proper thing to start working on what is understood for leisure travel. Leisure and travel are defined as follows.

*"Leisure is the time when you are not working and you can relax and do things that you enjoy".[1]*

*"Travel is the activity of travelling".[1]*

Thus, the activity of travelling is defined as:

*"Travelling is the activity of going from one place to another, often one that is far away".[1]*

Then, leisure travelling can be interpreted as the activity done by people who go to another place for pleasure.

It is difficult to set a concrete start for leisure travel as it is known nowadays. Before the XVIII century, travelling was only reserved for royalty and upper classes, and they did it for educational or religious means. It is not until 1752 that the word tourist appears in print, and took almost 100 more years until the first leisure travel agency, Thomas Cook, was founded in June 1841. [2]

Due to the continued popularity of rail travel and the emergence of the automobile in the late 1880s, tourism popularity experimented a huge growth during those years. By the XX century, tourism became an important focus on the political field of most countries. By the time the 2<sup>nd</sup> great war ended, jet aircraft, higher living standards and better working conditions including larger holidays led to the complete popularization of what is known as tourism.

Tourism grew together with political, social, economic and cultural forces, intellectual currents and other factors inner to the modern era. It is an important matter to notice that most of the first leisure travel developments have their origins in England, which was as well the first country where industrialization began as a serious thing. This was probably because the industrialization

conducted to workers getting higher incomes, but also suffering from the downsides of heavy urbanization.[3]

Leisure travel also had a huge impact on countries' economies, and in the 1960s mass tourism, it started to become a huge business for them. It provided a lot of workplaces, industry development, local stores and restaurants boosted a lot their sales and much more. Even some countries like Spain have based their economy mainly on the tourism model.

In general terms, it can be clearly stated that tourism has been an activity in continuous growth. Despite that, the positive trend has been stopped from time to time due to negative events that had a global impact. Examples of the latest years are the 11th of September 2001 terrorist attack, SARS and MERS outbreaks that mainly affected Asia. However, none of them supposed a tourism drop as hard as the 2009 global financial crisis, where the growth rate was about -6% change over the previous year.[4]

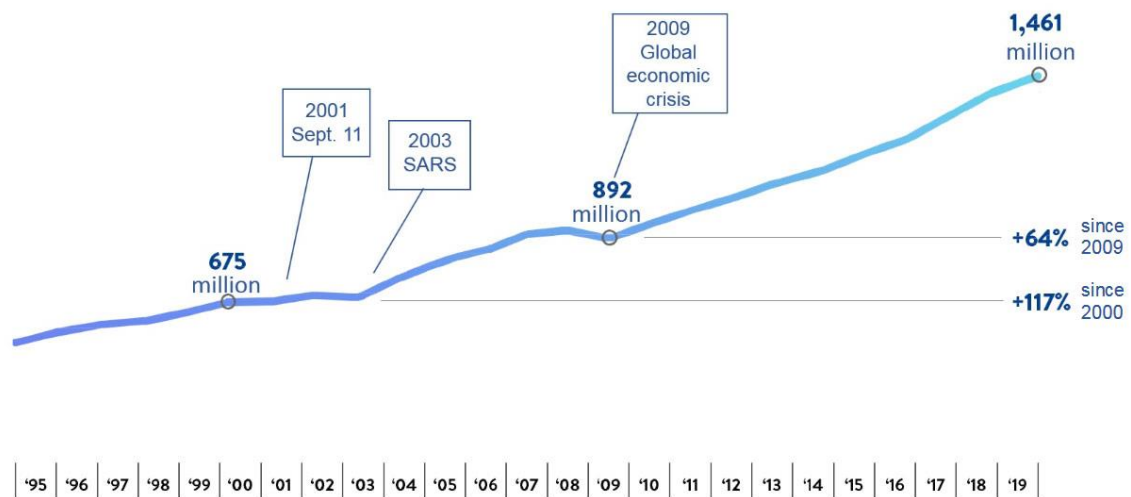


Figure 1 International tourism evolution on latest years

In Figure 1, it is noticeable how all these events stopped the progressive trend that has been mentioned earlier. However, it is interesting how the reasons for them to have a repercussion on leisure travelling are different from one to another. In the terrorist attack case, the main reason to avoid travelling was fear. On SARS crisis was health, though this one is kind of different, on one side because governments directly applied tourism restrictions; on the other side because only Asia was affected so global impact got reduced. Finally, the financial crisis main reason was the economy. A lot of people lost their jobs, countries had to hold unsustainable levels of public debt and the inflation rate grew for a lot of currencies. Despite these events, the overall and continuous tourism industry growth can be clearly appreciated. The reason behind this is the fast recovery travelling had after these events.

On another note, the current domestic/outbound tourism ratio is a matter of interest, since these two types of leisure travelling are perceived completely different for the tourist. This means the way of doing things, such as the total amount spent, safety issues, means of transport and other things completely change from one to another.

In economical terms, people use to have higher expenditures when travelling abroad. The main reasons are higher overnight length (2.6 nights average per domestic visitor against 3.8 nights average per international one in EU [5]) and higher-paid accommodation rate, as can be seen in Figure 2.

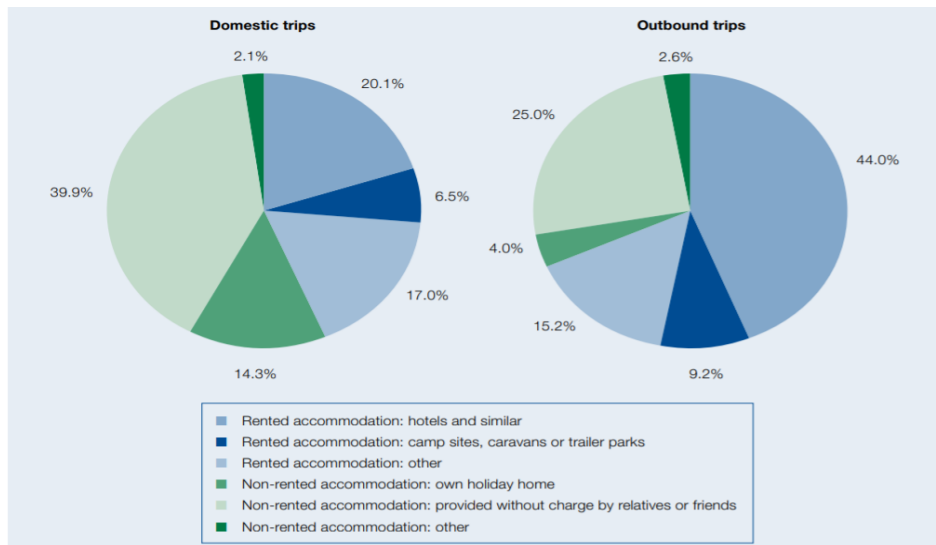


Figure 2 Ratio of accommodation place per domestic and international tourist

As a natural consequence, people tend to do domestic tourism when in economic uncertainties. As it can be seen in Figure 3, domestic leisure travelling stayed constant after the global recession in Russia, while outbound one clearly decreased that year. The drop in international tourism around 2013-2014 is because of the Crimea crisis and political reasons [6].

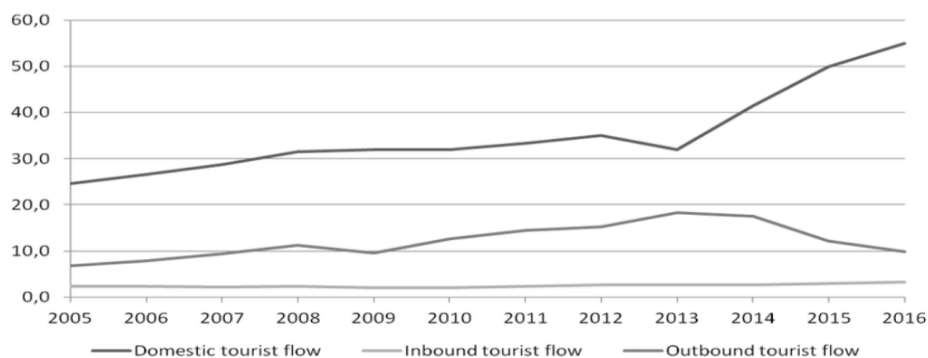


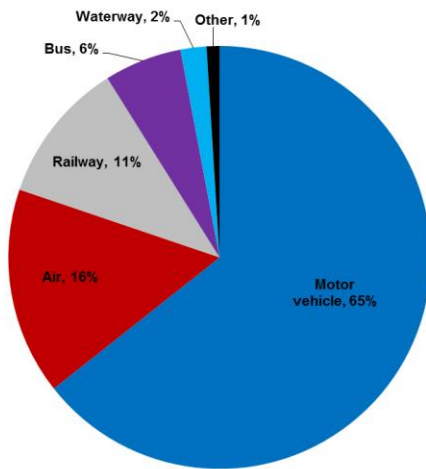
Figure 3 Outbound vs Inbound vs Domestic tourists in Millions for Russia<sup>1</sup>

<sup>1</sup> No EU data was found for this statistics.

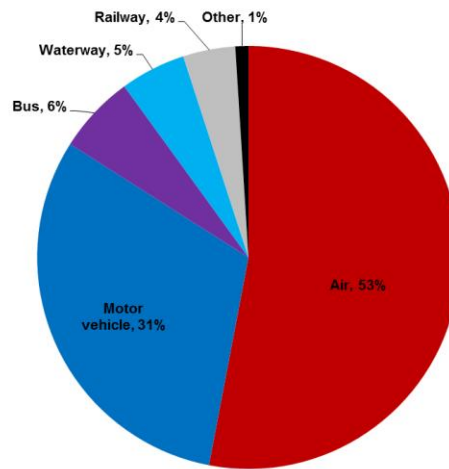
Apart from economical terms, means of transport change a lot when travelling abroad or staying in their home country. The main reason for that is the large distances to be covered when talking about international travelling. Apart from that, people are usually much more confident when driving in their own country and laws. This has a natural consequence, air transport becoming the major actor when regarding outbound trips but getting relegated when domestic travelling. This phenomenon can be observed in Figure 4.

### Main means of transport for trips made by EU residents, 2015

All trips (domestic + outbound)



Outbound trips only



[ec.europa.eu/eurostat](http://ec.europa.eu/eurostat) 

Figure 4 Preferred means of transport for each type of leisure travelling

### Air traffic industry

Once tourism analysis has been carried out, it is important to put the focus on the aviation market. From its origins to its current state, including its transformations, its drivers, trend, challenges, etc. For the scope of this project, the years of history previous to 1990 and air market liberalisation will be skipped, since the factors and market model of these times are far away from the nowadays standards, also, it would not help on getting a deeper understanding of the situation the industry had before COVID-19.

The modern history of aviation and the current market model starts during the early 90s in Europe. Prior to those years, EU air traffic, from prices and fares to associated services was strictly regulated. Each EU-member state had a state-owned national airline, and when an international flight had to be done, the national carrier was the selected operator for the bilateral air service agreements [7].

From time to time, the process of internal market liberalisation added to the fact of a lot of different actors establishing bilateral agreements led to the EU air market liberalisation.

In order to manage the process, the market freedom was given within three different measures packages. The first package gave the airlines the chance to adjust fares on EU cross-borders avoiding bilateral negotiations, the second one consisted of allowing any airline to carry passengers to and from any other member state<sup>2</sup>, and to transport them between third countries but origin and destination in the home country<sup>3</sup>. Finally, the third package provided the opening of market access, freedom on setting airfares, disabled capacity restrictions and the statement of rules to license air carriers. However, it shall be said that it was not until 1997 that stand-alone domestic services in other member states were allowed [8].

Along with this model, the liberalisation of air-related services was also tackled. The major changes were on ground handling, airport slot allocation, airline ticket advertising and computer reservation systems [8].

The second measures package released by the EU caused a positive trend on average frequency per route. However, once the third package is implemented, this frequency begins to decrease continuously, in favour of an expansion on the total number of routes. These two opposed trends marked a stabilization in the total number of EU inner flights [7].

The inclusion of these packages, with the no-restriction for cabotage released in the late 1990s made it feasible for the low-cost carriers to completely enter the EU aviation market, including the member state's domestic markets. Due to the flag carriers following a HUB-based strategy and being nationally restricted in terms of international flights, the low-cost carriers could go for a different strategy of establishing a wide number of different crew and aircraft bases around all Europe. This, along with the introduction of internet booking platforms, made low-cost carriers have an ever-increase of market share [7].

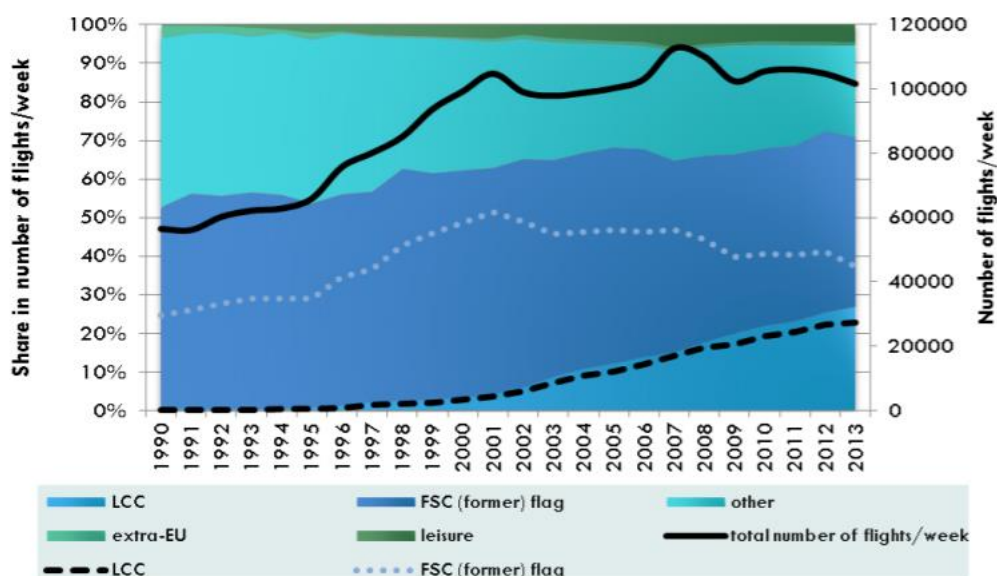


Figure 5 Market share of different carriers during the last years

<sup>2</sup> This would consist on getting the third and fourth air freedoms

<sup>3</sup> Consisting on the fifth air freedom

In Figure 5, how liberalisation and new booking means, apart from the other mentioned factors affected the market share can be appreciated.

This evolution in the aviation market led to a drastic decrease in flight prices, especially when talking about intra-EU travelling since low-cost carriers got a lot of share in these routes. This resulted in air transport becoming affordable for a lot bigger part of the population. In Figure 6 this the inaugurated routes and flights frequency per week evolution is shown, clearly supporting what is being mentioned.



Figure 6 Evolution of flights and routes during the last years

On another note, it is also necessary to talk about the drivers of the aviation market, doing some research on the reasons that took air transport to become this popular. According to Boeing, in their 2016 Current Market Outlook, the influences on air-market traffic growth can be grouped into three categories: economic activity, ease of travel and local market factors. These would explain both the demand and supply of air carriers. The thing about this is the difficulty in quantifying the factors since some of them are so diffuse. Next, each of these groups influence and decomposition is explained.

#### Economic activity

The top metric to quantify economic activity is usually the country's GDP, since it provides an exact number, it is easy to use as a quantitative metric. The GDP (Gross Domestic Product) provides the raw amount of money the country and its inhabitants have produced. It is quite related to the emplacement's economic success but sometimes is not an accurate meter. Despite this, it is usually the most understandable among the three key groups. In Figure 7 all the components that make an influence on economic activity are shown.





Figure 7 Factors that contribute to explain economic activity

### Ease of travel

This driver specifies how difficult is for someone to travel somewhere, either from an economic, political, or another point of view. Some examples of how this has been improved during the last years are the air traffic liberalisation, new technologies or infrastructures that lead to new routes openings (such as airports), business-model changes, like the LCC entry in the market, that lowered flight prices, and a vast number of other examples.

### Local market

This group includes the factors that are related to the air industry but are none included inside the ease of travel or economic activity factors. For instance, it could be the presence of a HUB in the area, the congestion of air traffic in an airport that impedes receiving more flights or airlines consolidation in the location.

### COVID-19

The appearance of COVID-19, a global pandemic that spread through the world during 2020, led to a dramatic change of worldwide situation when talking about leisure travelling and air market industry, facing a new and never known environment that raised the market difficulties and showed the industry big drawbacks.

The frightening news about pandemics, outbreaks, catastrophes and other fatal circumstances always results in a big decrease in air traffic and the tourism industry. The pandemics impact the tourists thinking and behaviour negatively from a service's industry point of view, as well as affecting their mental wellbeing. As a natural consequence, they end up dropping their plans about going abroad, usually because of being frightened about the general situation and the increase of chances of contracting the disease when travelling, as following the sanitary recommendations and being overly cautious seems highly incompatible with tourism [9].

On this note, it has been demonstrated that tourist travel increases contraction risk for the other passengers without proper and effective vaccines. Also, travellers contribute to disease spread around the local area they are visiting.

About society experience when dealing with this type of problems. The most recent virus that had a considerable impact and shared typology with COVID-19 was the SARS and MERS. This typology of disease is characterized by its spread velocity. Infected people usually pass the virus to others in close contact via droplets, coughs or similar types of secretions. Some studies identified the restriction of tourism as a driver to help avoid the spread of the virus [10].

About the COVID-19 viral disease, it was discovered by the health experts first in Wuhan, China, in late December 2019. The WHO declared the outbreak of the disease as a public health emergency of international concern during January 2020. Later, during March, it was classified as a global pandemic. As of 3<sup>rd</sup> September of 2021, 219 million people have contracted the disease and 4.54 million people have died [11].

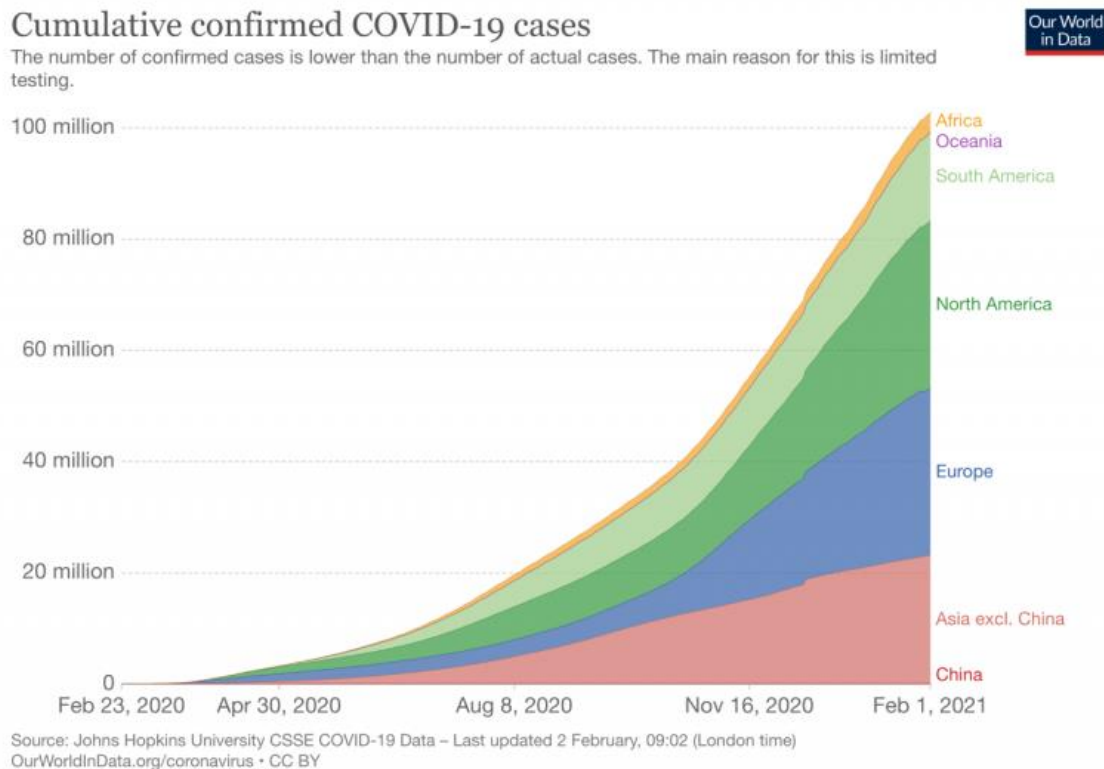


Figure 8 COVID-19 cases detected over the world

These numbers have taken this virus to be considered as one of the deadliest pandemics in human history. However, symptoms may vary from being inexistant to lethal. Transmission is carried out through the air, normally during close contact. The infected person expulses the virus when talking, breathing, coughing or other air-related physiological activities and enter the other person through their mouth, nose, or eyes [12].

Indirect infection can also be given provided the fact that an infected person spread the virus through some surface. It can be easily given the situation that the surface is a public space that a lot of people tend to touch with their hands, such as stairs railing, public baths, etc. Once another person touches that surface, the body part (usually the hands), gets impregnated by it. If it enters in contact with their face without being properly washed and disinfected before, the virus enters the body through the same openings mentioned before [12].

Individuals who contracted the disease may be infected for 14 days. Also, the virus can be spread even if the first who is spreading it has no symptoms.

### Impact on the tourism industry

As it has been mentioned in earlier modules. Tourism is a key factor for countries' economies by expanding its cultural influence or job creation, but it is also the most vulnerable one. Since late December 2019, the outbreak of the COVID-19 has left an unprecedented health crisis, that led to deeply adverse consequences on social matters and the global economy [13].

In 2019, estimations confirmed the tourism industry as one of the major contributors to the global economy, exactly by contributing to the production of 9.3 trillion USD. However, by May 2020, the tourism market showed a 98% sudden decrease, these reflected the consequences that the related-travelling restrictions which were imposed around the globe had.

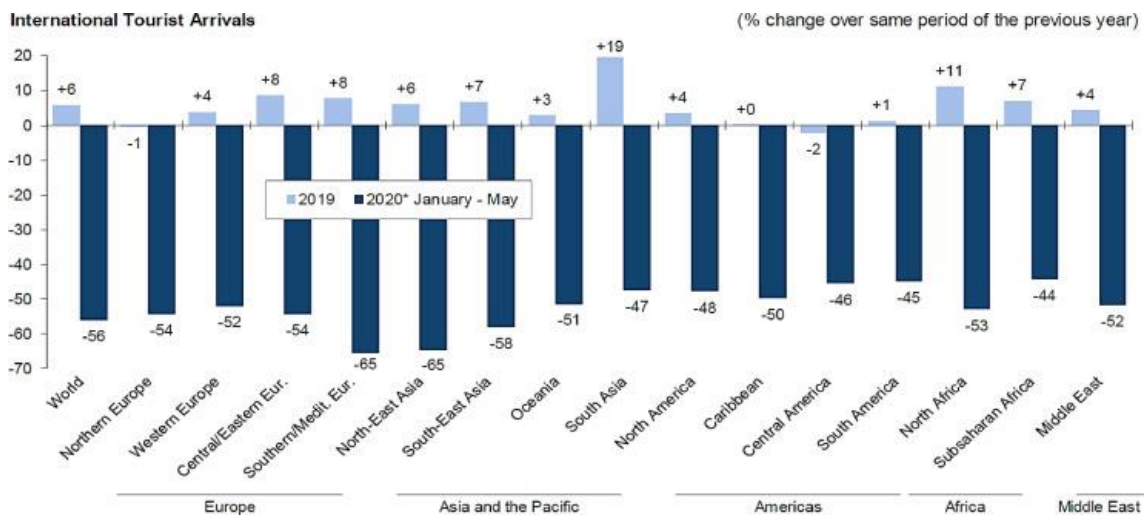


Figure 9 Tourism growth rate comparison from 2019 to 2020

In Figure 9, the worldwide decrease in tourism that occurred during the global pandemic can be appreciated. There are lots of reasons behind this, such as the “stay home” movement, where either public institutions and well-known personalities encouraged people to stay safe at home, the restrictions imposed on travellers, social isolation, tourism-related activities closed, etc [14].

### Tourism demand

Tourists have experienced either by themselves, close relatives or shared experiences from others, significant disruptions and health risks on their travel, either when planning, doing or as after-effects. This exposure to others' experiences, which nowadays is much bigger due to social



networks and globalization, can produce an effect on travellers' attitude, intentions and behaviour, as they intend to avoid having the same negative experiences as they have witnessed [15].

To understand people's behaviour after being exposed to COVID-19, not only as an infected but as a part of the society in which the virus has perturbed the daily routines of the vast majority, psychological research should be done, investigating people's change behaviour in the middle of these type of situations.

However, tourism research has lately been focused on how the tourist perceives the risks and the reactions against them, as this type of research is helpful in order to predict future tourism demand. Also, the results can be a useful note for tourism-related businesses, having a better idea of how to reduce people's risks perceptions and uncertainties. Thus, adopting a solution based on actual research data.

The results of these types of studies have shown that how tourists perceive risk is dependant on several factors. Some of them are the origin country, the age, the gender, the typology of travel and some more. Thus, the willingness to travel after COVID-19 times will be different through these different social sectors.

As has been commented before, many countries imposed severe mobility restrictions, social isolations, and similar actions on society. Therefore, people started to experience a slower pace, new lifestyles and working patterns. Agreeing to the literature [9], this situation takes the individuals to recalibrate their values, priorities and ethics. Tourism entities wonder which impact this is having on the tourism industry and if tourists will change their behaviour for this reason and how. One possibility is people expecting or looking for higher sustainability from the travel operators. In addition, COVID-19 provided a lot of positive impact on that note if talking about environmental sustainability, as it can be appreciated in **¡Error! No se encuentra el origen de la referencia.** [16].



Figure 10 Air pollution comparison between pre-pandemic and pandemic times

However, according to [17] people in social isolation situations tend to increase their materialism, increasing their purchases and feeding this never-ending loop. This fact could explain the massive growth of e-commerce or the virtual entertainment consumption patterns during the pandemic. This fact contrasts with the idea of people recalibrating their ethics and lifestyle.

Despite this previous statement, it must be said that a vast part of the society intends to experience their leisure time aligned with their ethics.

Another point to be talked about is how people may change their patterns related to the new experiences they got during the pandemic. In some sense, a majority of people got restrictions related to social isolation, the way leisure is perceived for them might have changed towards an increase in outdoor activities or personal services, instead of frequent crowded places such as beaches, restaurants, or shopping malls that often. In this sense, this might act as a downside for outbound travelling since most of tourism consists of visiting the landmarks or places of interest of the country, which are the same for all the tourists and got really crowded as a consequence. Tourists might change these travel routines for a closer place, none-crowded where outdoor and nature-related activities can be experienced [9].

Related to people perceiving infection risks, the COVID-19 outbreak has produced a route change when talking about operating standards. This can be appreciated when going anywhere, like shopping malls, restaurants, hotels or any public place. The usual air fresheners have been substituted by higher cleaning frequency or even by items that spread that clean-like smell, restaurants have seen themselves forced to provide proper social distance from table to table and between customers, public and private institutions cancelled or changed public events organization such as music festivals or local activities, air conditioning or heating indoors might be perceived as a bad ventilated space, so thermal comfortability is being relegated as a secondary thing as ventilation is taking the priority [15].

Despite only a few actions and new operating standards have been named, it can be seen how highly incompatible these are to be implemented in air carriers. At least in the first instance, it does not look possible to reduce seat capacity due to economic losses, nor ventilation can be provided because of physical principles.

#### Tourism businesses

During these times, not only did tourists' minds change, but the business also had to improve their services and adapt to this new environment. They had to improve their installations and organization in order to ensure employees and customers' safety, maintain brand image and sustain cash liquidity. New activities have been included in many ludic places and some of them have been re-designed. To fulfil travel expectations expeditions have been set in smaller groups, cleansing has been improved, including hygienic certifications, etc. Public places such as restaurants, hotels, cafes or entertainment places have re-oriented their activities to become touch-free, also, human disinfectors and hand sanitiser have been installed in all buildings [15].

Now, taking the insights of the previous module, it would have to be researched if these actions and changes fulfil travellers' standards.

#### Organisations and public administrations

The third actor to be mentioned is public administrations, which had a main role in the tourism industry during the health crisis by taking the decisions of spending public money on economic injections packages to avoid their countries' tourism operators getting into bankruptcy and ensure their continuity. This resulted in greater political interventionism. The question currently is if the applied measures and packages will be of real help [15].

Also, there is another question open in the air, how will the economy respond to the COVID-19 crisis, and in turn, how will this affect tourism projections.

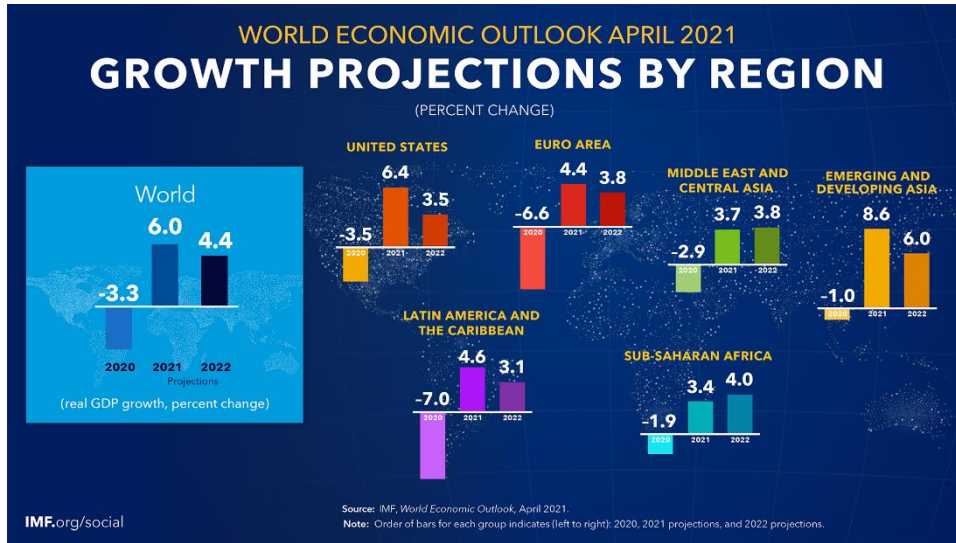


Figure 11 GDP Evolution and expected growth during COVID-19 years

As can be appreciated in Figure 11 [18], there was a massive loss of GDP during 2020. Especially when observing the major economies. However, the graphic looks somewhat tricky. It can be seen how the projections for 2021 have high expectations. However, two things should be commented. In the first place, this is natural and exists due to the economic rebound effect, and second, the second reason is the public debt increase, which has been increasing globally so nations could keep up with the public expenditure pace.

This last statement means that this might have after-effects in an economic sense. Since the common way to reduce public debt comes from applying austerity measures like cuts in public services [19].

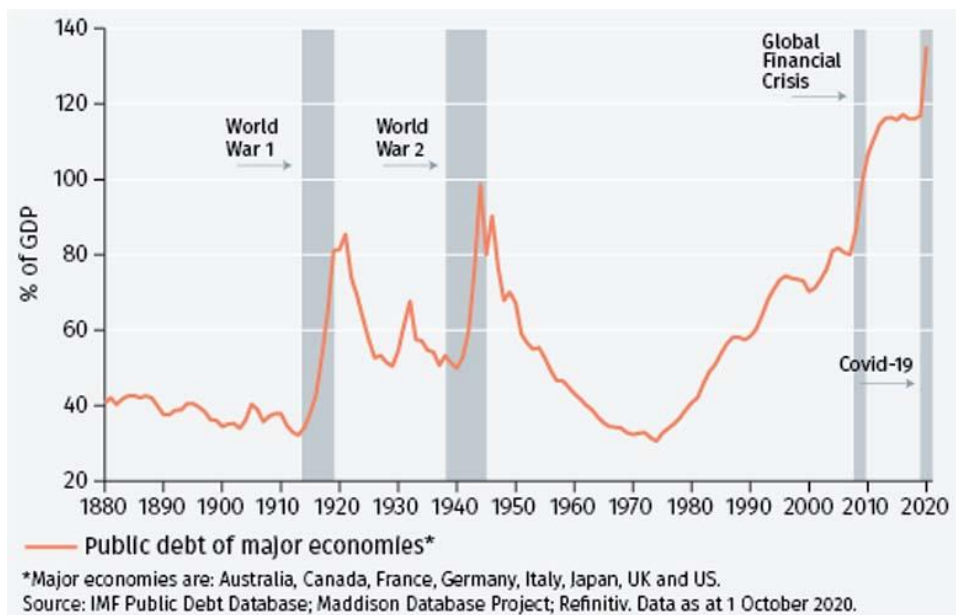


Figure 12 Evolution of great economies public debt

In addition to these facts, government responses during pandemic times have generally come from individual and nationalistic decisions if talking in general terms. However, literature related to these situations assesses to take decisions in a group, which is kind of difficult right now due to the current geopolitical environment [15].

### Literature review

Before starting on survey and data collection for the actual study. Few articles whose main objective is similar to this project have been reviewed, in order to get some knowledge about the methods applied and the predictors or variables considered. Also, this will give some data and results to compare to the study conclusions.

### Factors that predict passengers' willingness to fly during and after COVID-19

During the pandemic, the perceived threat from infection or being affected by the disease is very high. People are frightened of numerous factors or situations that could affect either their physical or mental well-being, the main ones are the risk of transmitting the disease, becoming ill, a general financial loss and employment losing.

Generally, aviation has been a resilient market in growth at a steady rate of 4.5% approximately. However, during the 2020 summer season, flight bookings decreased between 70% and 95%. To resolve some inquiries about the factors that led to this situation and get some insights into the possible development this will have, the University of Chicago carried out a study to conclude the possible predictors to evaluate the passengers' willingness to fly [20].

Starting off passengers' perception, a reference survey that was conducted in April 2020 by IATA (International Air Transport Association), asked individuals a single question. That was if they were about to fly, 30% of the interviewed stated that they would wait for 6 months, while 10% said for a year. These results suggest that the willingness to fly will drop significantly during the near future as well as concluding that the domestic flight influence will increase over the international one once confidence in flights increases again [21].

In order to get the most reliable and significant factors that increase people willingness to fly, a set of predictors was proposed, making a total of 23. These variables are classified into 5 categories, that are:

- Personality predictors
- Demographic predictors
- Emotional predictors
- Health predictors
- Air travel predictors

### *Personality predictors*

Personality traits and how they affect people social traits has been an object of discussion through all human history, it is stated that personality influences individuals decision-making,



attitude and behaviour [22]. However, as personality is a very diffuse concept to quantify by predictors, it gets broken down into 5 main traits, also referenced as the big five [23]. These personality composers are recognized by everybody without regard to gender, age, ethnics or other demographic, social factors. These are:

- **Neuroticism:** Characterised by sadness, it explains the tendency to get nervous or insecure. It gets usually mistaken for anti-social behaviour, but this stands for physical and emotional reactions that happen due to the body interpreting threats on someone's daily life. Anxiety would be the main characteristic of this neuroticism, and it has a strong link to how risks are perceived. In the first instance, this seems to be the trait that most instigate people to avoid flying.
- **Extraversion:** Characterised by excelling on talkativeness, assertiveness, and expression on all its senses. This is the trait that makes humans willing to have social interaction and continuously meet new people. At first glance, is predicted to be the trait that most would influence people to fly.
- **Agreeableness:** Characterised by altruism, kindness, and affection. Agreeableness is the trait that makes people want to help others. This is the top contributor to empathy, caring, or decision-making keeping others in mind. This trait topping high on a personality chart is seen as a positive impact for travelling.
- **Conscientiousness:** Characterised by self-control, thoughtfulness, and structured mentality. This trait is the response of people being organized, ahead-thinking or social manners. It avoids humans to be driven only by their own instincts and behaving correctly in society. The possible impact this can have on passengers' willingness to fly remains unknown to the time previous to the analysis.
- **Openness:** Characterised by imagination and insight. Openness explains people's eagerness to learn and experience. Is responsible for the curiosity feeling, creativity, abstract, and lateral thinking. The people who top high on it tends to feel great out of their comfort zone. Taking all these characteristics into account, openness is considered to have a very positive impact on people travelling.

#### *Demographic predictors*

The way humans interact with the world and how they perceive it is strongly influenced by its own position in economic, social and political terms. People's social behaviour, cognitive methods and risks perceptions are so heavily influenced by a series of demographic factors. The considered ones are:

- Age
- Gender
- Ethnicity
- Education level
- Annual income

- Political view
- Job loss due to COVID-19
- Religiosity level

The study intends to treat these factors as predictors, so it can be observed which have a heavier influence on the passenger attitude. Finally, it must be said that there are some other important demographic characteristics that have not been considered, mainly those that, despite being key factors, cannot be referenced as global standards, such as caste system in India, republicans-democrats division (and decision-making influence, like the mask-wearing issue) on the USA, etc [20].

#### *Emotional predictors*

The way a person perceives the environment and interacts with it is heavily influenced by its own emotional state. Thus, there is no discussion about this factor having an impact on decision-making. General affect represents the aggregate of many complex traits which are bipolar in nature. Some research intends to transform them into what is referenced as universal emotion scale, whose traits are:

- Anger
- Disgust
- Fear
- Happiness
- Sadness
- Surprise

As humans, and due to survival instincts, disgust or fear are common drivers against uncertainties, so both shall be considered. On another note, it has also been proved that these 6 emotional factors are common for everyone and independent from demographic circumstances.

#### *Health predictors*

It is an obvious fact that the risk perceived by the pandemic changes a lot depending on the own health state. A 25% of the US adult population under 65 have illnesses or conditions that can aggravate COVID-19 symptoms. Thus, those who have a lower capacity of taking good care of themselves (either from a social or economic point of view, especially in the US where the health system is privatized), and also those with COVID-19 symptoms accentuators are less-willing to travel [24].

Another fact that has been noticed in some research before, is that people with children are less probable to flight in the near future because they're avoiding their children exposure to the pandemic [20].

Hence, the drivers that are chosen as variables to reflect the health impact as a key factor on the willingness to fly:

- Perception of the current health
- Satisfaction with the health provider
- Number of children

#### *Air travel predictor*

When examining people flight frequencies and satisfaction, this has always been a key factor. It refers to the air carriers' capacity to provide the passengers with a flight that fits all their needs, including route, times, frequencies, etc. Due to the air traffic market fall since COVID-19 started, and owing to the fact that airlines need to operate 67% seat capacity, at least, to avoid losses. The frequency and routes are likely to go down in number.

This is an interesting factor to look after since will affect in a different way people who are more prone to flight frequently, this means, business flights usually, than people whose flight frequency is much lower, that are usually the ones travelling solely for leisure reasons.

#### *Survey data*

The survey was delivered to a population sample of 632 people from the US, whose age average was 39,85. These were split into two groups. The first sample is the one on which the statistical model is based off, this includes the regression equations development. The second one is used as a validation model, to check if there are results that should be dropped or do not fit the general trend. Also, it will diminish the study variance and verify predictors influences.

The survey framework as Google Forms and was diffused, delivered, and fulfilled by online methods. The basic scheme of the survey was:

1. Demographic questions
2. Health issues
3. Travel historic
4. 20-item mini-IPIP scale to assess their personality chart based on the big Five.
5. Fulfilling the General Risk Propensity Scale
6. Decision-making on a custom scenario: The interviewee is supposed to be travelling within the next two weeks. In this case:
  - a. They must respond to an affect scale and pictures universally recognized as disgust and fear [25].
  - b. Fulfil some fields relative to the willingness to fly scale twice. Once thinking about the situation as business travel and the other as leisure.

The points 1 to 3 were sorted randomly to avoid concentration patterns that could draw some unreal trend and alter results.

#### *Results*

Only willingness to fly leisure results will be commented due to the scope of the project. The most impactful drivers were found to be: Primary purpose of travel before COVID-19, perceived

threat from COVID-19, agreeableness, affect and fear. The effect of the conjugation of these variables is if a person perceived threat from COVID-19, agreeableness and fear increases, willingness to fly leisure decreases. While it goes the other way around if an individual's affect increases. Last, if the primary purpose of travel before the pandemic was business, people is more open to flying for pleasure. The statistical results and coefficients are attached to the tables below.

R <sup>2</sup>	0.665
Adj. R <sup>2</sup>	0.659
F	121.36
df	5.306
p	< 0.001

Table 1 Study's statistical model results

These coefficients are about the model reliability itself. The R<sup>2</sup> accounts for the variance, and how the willingness to fly gets explained or quantified by the proposed variables, this should be considered along the adjusted R<sup>2</sup>, as this model is multi-variable. However, as adjusted and original variances are pretty much the same, it can be assured that the model variance is not full of not significant variables.

When it comes to the F related variables, to get the stated F result, 121.36, the Z coefficient of the Normal distribution is 5.306. The chance to get this value considering that the obtained model fits the results only by luck is lower than 0.001 (p-value). Thus, the null hypothesis gets rejected.

	M (SD)	Beta	t	SE	Sig.	β
Constant	-	1.451	7.04	0.206	< 0.001	-
Perceived pandemic risk	4.63 (1.55)	-0.172	-5.36	0.032	< 0.001	-0.211
Agreeableness	3.75 (0.89)	-0.150	-3.05	0.049	0.002	-0.106
Fear	5.63 (3.25)	-0.063	-3.77	0.017	< 0.001	-0.161
Affect	-0.68 (1.20)	0.599	14.31	0.042	< 0.001	0.571
Pre-COVID travel purpose	N/A	0.242	2.28	0.106	0.023	0.077

Table 2 Stage 1 obtained coefficients for the most impactful variables

Relative to the validation model, the process was trying to predict 2<sup>nd</sup> sample results using the statistical model created with the 1<sup>st</sup> sample data and getting the actual results using the surveys

and see how much different obtained willingness to fly leisure were. To examine the model, the metrics used were a t-Test, correlation and cross-validated  $R^2$ .

	t-Test			Correlation		Original $R^2$	Cross-validated $R^2$
	t	df	Sig.	r	Sig.		
Willingness to Fly Leisure	0.327	626	0.744	0.768	< 0.001	0.665	0.654

Table 3 Model examination test data on most important drivers for fly leisure

The model willingness to fly leisure estimates an outcome of  $M = -0.63$  and  $SD = 1.03$  while the actual data suggests  $M = -0.60$  and  $SD = 1.30$ . In this case, the t value indicates the difference between the average value of the data obtained by surveys and the predicted by the model. In this case, the lower the values are the better, because it will verify the null hypothesis on not having notable differences between the two population groups (the simulated one and the actual one). The probability of both results not having any statistical difference is 0.744. So it would reinforce the model reliability. Pearson's correlation and cross-validated  $R^2$  results provide further validation.

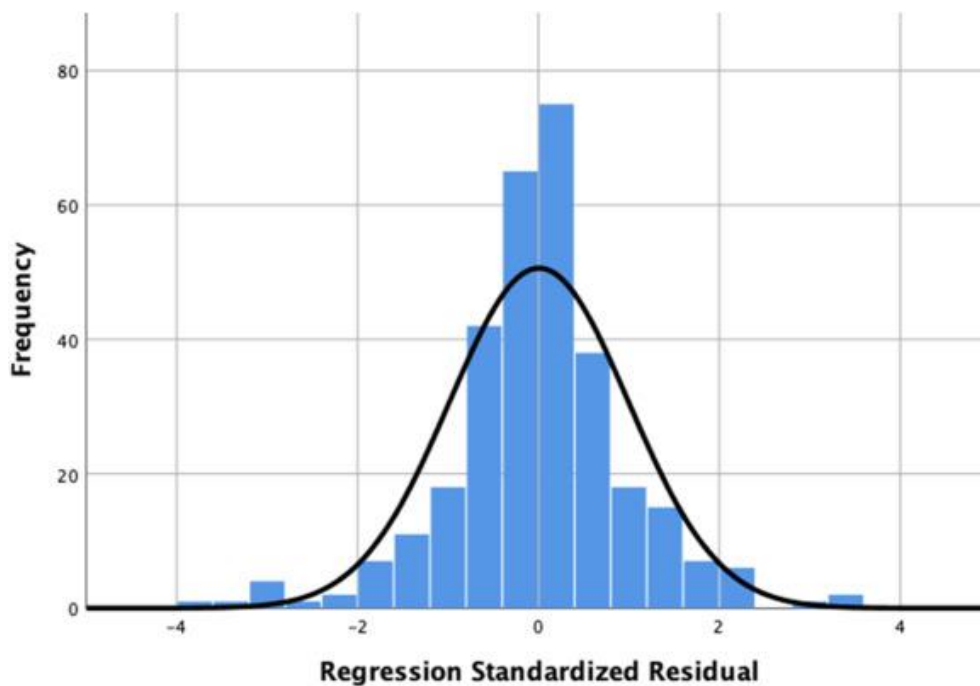


Figure 13 Standard regression distribution for willingness to fly leisure

### Discussion

About how the top influential factors and why do they have this effect is out of the scope of the project. However, little insights on which may be the reasons are carried out. For the first factor, the perceived threat of COVID-19 would be the most straightforward reason. Despite really existing a chance of airline passengers to contract the virus during the flight, the chance is not

significantly higher than disease infection on other places, but humans do make decisions based on their perceptions and not raw numbers.

Individuals who score high on agreeableness are usually helpful, generous, and empathetic. However, the negative impact it has on the willingness to travel is given due to the mentality of avoiding endangering others, including their own family and friends.

Relative to the fear, the reasons of it having the impact it has on the willingness to fly leisure are strongly related to the grade in which COVID-19 is perceived as a threat.

General affect is an aggregate of very complex emotional variables, including both positive and negative ones. Thus, it is natural for the people feeling well and motivated to have greater self-confidence, avoiding fear or threats perceptions. This always explains the other side of the coin, where a person feeling down will be more sensitive to these emotions or feelings of threat or fear.

#### Attitudes of ageing passengers to air travel since the coronavirus pandemic

Ageing passengers (those older than 65) have been the most affected group by COVID-19, being the most sensitive to COVID-19 symptoms and effects. However, they were later observed as one of the better potential markets to be exploited.

This may lead to a divergence in the attitudes taken around air travelling when compared to the general population. Thus, it is an interesting task to analyse the factors influencing their future flying related decisions and how they perceive coronavirus pandemic risks when travelling.

During the pandemics, the ageing sector was the most devastated one, with 15% of deaths happening amongst the 65-74 range, 32% of deaths involving people between 75-84 ages and 42% of total deaths given to people over 85 [26].

Before the coronavirus pandemic, ageing sector flight demand was continuously growing due to people having a much healthier lifestyle, which inevitably leads to pushing the life expectancy higher. This fact is accentuated in developed countries, which are already the ones with higher air travelling demand. 11% of total trips taken abroad by the UK residents during 2019 was made by people older than 65 [27]. As a consequence, some previous studies about the ageing sector were already being undertaken and acknowledged some of the key challenges for the industry relative to this group, as a higher portion of passengers being disabled or having health issues [28].

#### *Survey data*

The research was based on an online survey fulfilled by more than 600 UK residents aged over 65, and who had travelled by air at least once during 2019, as acquiring knowledge about different experiences is a key factor to help develop some reliable results.

The survey was not delivered during a total lockdown, as there was a very high chance that it would have biased results. Nevertheless, during the time surveys were fulfilled, society was

imposed a lot of air travel restrictions and closed borders, as these restrictions can be possible remain a common fact during the next years [26].

Age	Share [%]	Gender	Share [%]	Air trips during 2019	Share [%]	Disability / Bad health condition	Share [%]
65-69	44.7	Male	50.7	1	35.8	Yes	13.2
70-74	34.0	Female	49.3	2	32	No	86.8
75-79	16.3			3	18.3		
80-84	4.3			4	8.0		
85+	0.7			5+	5.8		

Table 4 Survey respondents characteristics

The survey accounted for a total of 21 questions, 7 of them explicitly related to COVID-19. For the age distribution, 80% of the contestants were in the 65-74 range. Further data about them can be observed in Table 4 Survey respondents characteristics Table 4.

### Results

The first and most important result of the processed data is that 60% of respondents are planning to travel during the next 12 months<sup>4</sup>. Thus, it would be a false assumption to think this sector is going to overwhelmingly avoid travel. However, it is a fact the already expect a decrease of planned trips in raw numbers.

The 30% of the surveyed people stated that they are switching to domestic trips, whereas 1 out of 5 answered they would rather choose alternative transport means to the air one.

Relative to pandemic might be affecting and influencing their travel decisions, only two-thirds of the respondents stated it would.

On what do they prioritize when travelling, a low infection rate has been chosen as the top option. On the other hand, the fact of making compulsory quarantines on origin and destination countries is considered as the least important. The whole factors rank can be observed in Figure 14 [26].

<sup>4</sup> The survey was delivered between 10<sup>th</sup> and 15<sup>th</sup> June 2020

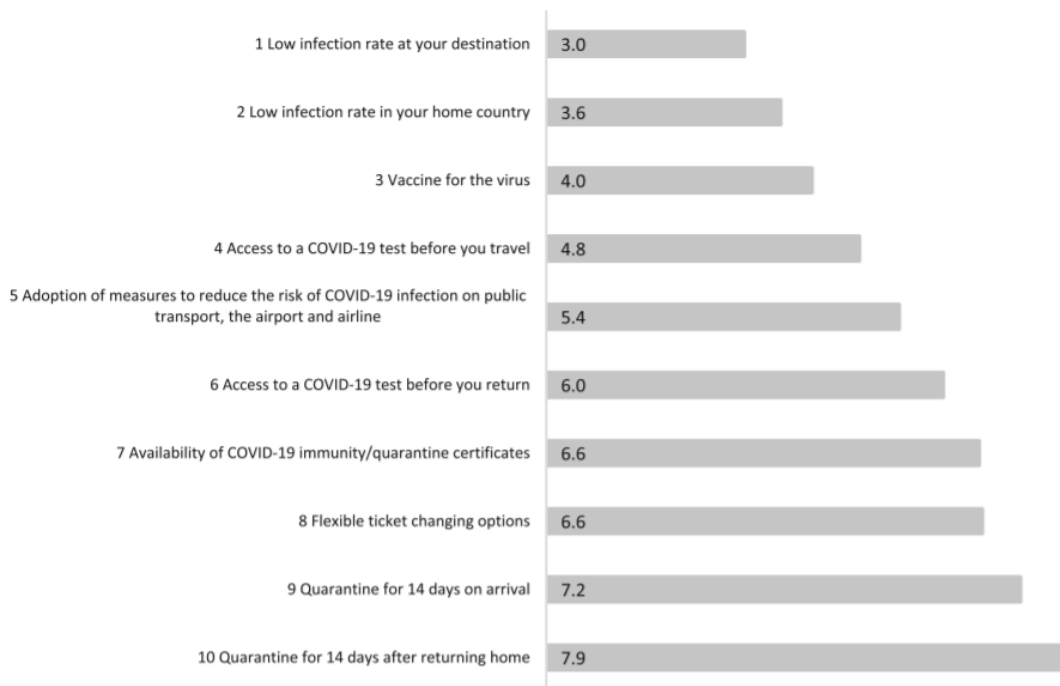


Figure 14 Factors influencing future flight decisions on the ageing sector from top to least

The most unexpected fact is that quarantines are not perceived as something determinant when making the decisions to travel, as it is usually a top determinant in those papers and studies that focus on the global society and not on a partition of it. This divergence might be explained by the unemployment of most of the ageing population, as they are not that bound to work and schedules and dispose of more time when going abroad. The flexible ticket options ranking on 8<sup>th</sup> position may be explained by the same fact [26].

When it comes down to flight safety, social distancing, regular sanitation, and mandatory use of masks are considered the most important ones, whereas the usage of contactless technology is perceived as something dispensable. The whole ranking can be observed in Figure 15.



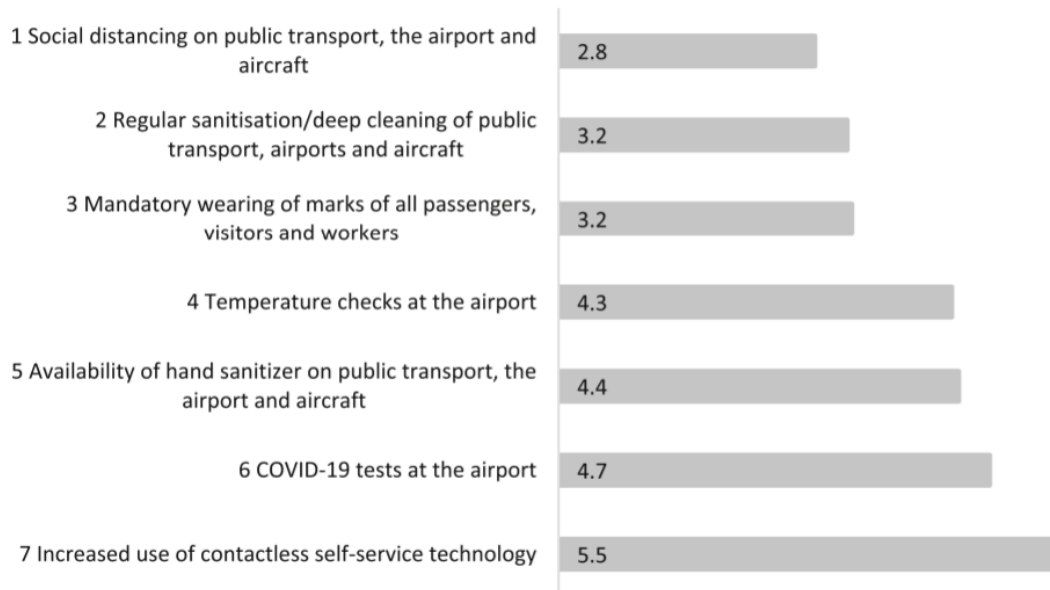


Figure 15 Practices that are perceived to make the flight experience safer

On the same note, but relative to the whole flight process phases, the onboard time is the one that worries the most, followed by the time spent on both terminals. The transportation from home / staying place to the airport is the one perceived as safer. This might be explained by the rise of private transport usage when going to or coming from terminals, which inevitably challenges airlines sustainability plans.

	Extremely concerned [%]	Very concerned [%]	Somewhat concerned [%]	A little concerned [%]	Not at all concerned [%]
Getting to the airport	5.4	4.5	15.1	21.8	53.2
In the departure terminal	12.2	17.4	28.3	35.7	6.4
Onboard the aircraft	29.3	20.7	27.0	18.2	4.8
In the arrival terminal	14.3	21.7	28.0	28.5	7.5
Getting from the airport	7.8	11.4	24.9	32.6	23.4

Table 5 How COVID-19 risk is perceived on each flight stage

As a final note on the results section, no significant relationships were found for gender or disability (U-tests proceeding) nor for age or travel frequency (H-test proceeding).



### *Discussion*

Despite the devastating impact of the coronavirus pandemic on the ageing sector, a relatively high amount of them is still willing to fly. However, this may imply some changes in their travel patterns, like reducing the amount of the trip, switching to domestic travelling and going by different means of transport. Hence, it can be expected that this sector will need a longer time to get back to 2019 numbers.

On another note, and as previous studies had noticed, the group has other priorities when travelling and different measures or offers should be done. A clear example of this is the low concern the respondents had if no flexible ticketing is available.

The low importance of the increasing amount of contactless technologies is an issue that should be considered further, as these results are might giving some hints of a digital divide occurring on aeronautic infrastructures.

No significant differences or patterns were found within the group, and this could lead to a probably false statement of it being a homogeneous one. However, it is possible that it is not but the differential factors are more complex and not covered by the survey questions. Some possibilities could be demographic factors, socio-economical position, etc. Also, the disability sample was too small to gather enough information to reach a conclusion.

## Methodology

Once all the theoretical review has been undertaken, it is concluded that the best way to get an appropriate estimation of the possible aviation market future in this always changing environment is through a survey, in order to get people's insights and opinions about that matter.

While developing the state of the art and reviewing the scientific documentation relative to the COVID-19 and people's willingness to fly, diverse factors were observed to influence the leisure flight industry, to consider all of them efficiently, the variables will be split into two groups, the independent variables and the dependent ones [29].

- **Independent variables:** Are considered those that in one or another way can influence people's behaviour or perception over all those factors directly related to the survey main object.
- **Dependent variables:** Refers to the variables that are related to the different aspects of the survey main object.

To help develop a significant survey, a concrete hypothesis is made. In this case, and after all the obtained information, the survey is based on the hypothesis of people switching from long-range trips to other foreign countries or even continents to short-range ones in an economic and health uncertainty environment. The considered variables are shown in Table 6.

Independent variables	Dependent variables
Age	The favourite mean of transport for each domestic and abroad trips
Gender	Amount of flights for each 2019 and 2021 years
Education level	Pandemic influence on plane choice as a leisure trip mean of transport
Economical level	Travel quarantine relation to trip cancellations
Political orientation	The infected rate at destination country influences destination choice
Work situation	Getting infected during flight concerning
Green thinking	Trip-range change due to COVID-19
Health situation	Expected time of recovery of travel patterns

Personality traits	The main reason for each to travel and not to travel
Work involves air travelling	

*Table 6 Variables considered on survey*

To make the survey processing easier and give the user a smoother experience while answering the test, the survey was divided into three sections.

The first one considers and asks about the discriminative variables. The second one tackles personality segmentation, on the first instance, it was considered to use a mini-IPIP test, which consists of 20 questions that make an approximation of the surveyed people personality profile, based on the big five personality traits, the psychological model considered by this project. However, this was later discarded as it would make the survey too long, provoking a loss of reliability on the general survey results [30]. As an alternative, asking directly for how people perceived themselves on the 5 traits, and applying a correction on the survey processing using a standard deviation accounting for the difference of how people perceive themselves and how they really are was thought as the best solution.

Finally, the third section gathers information about the evaluative variables.

Similarly to why 2<sup>nd</sup> section was decided to be shortened, open-text questions were also avoided, as it could lead to people finding the survey too much complicated and leaving mid-progress or answering the survey mechanically [31].

Another point to be accounted is a survey being anonymous, as it helps people be more trustful about sensitive matters, such as economical status or political ideology [32], also, on this particular survey, knowing the respondents' identities would not make any difference on the survey data processing, so there is no point on recording them.

The survey target was not restricted. It is considered that everyone can have access to leisure travelling and have their personal experience and will help to have a broader perspective on willingness to fly situation.

Regarding the survey distribution, online means have been used. Distribution channels were social media such as Facebook, WhatsApp, etc. The survey was distributed on 24<sup>th</sup> December and opened for 3 days, during COVID-19 6<sup>th</sup> strike on Spain, this is also being considered when processing results.

Finally, both survey framework and data collection are made using Google Forms, as it is considered the easier software to manage, and the one that gives a greater experience to the user since there are no advertisements, nor need for download or registration.

## Survey responses

Once the survey was distributed and enough respondents to have a considerable size sample to get significant results were obtained, each question output was interpreted by itself and afterwards processed on the dependency (MANOVA) and interdependency (Factorial and MCA) analysis. The total amount of surveys completed were 319. However, no question was compulsory but the age, so the total amount of answers may differ depending on the question, but in general, terms is always around 319. Regarding people's nationality, it was not asked, as the survey was mainly distributed in Spain.

In this section each question result is briefly commented, along with the reasoning that motivated it to be in the survey, stating what it is expecting to clear out.

As mentioned before, the survey was developed, distributed, and answered using the Google Forms platform. Its output processing to plot the graphics have been used and will be displayed below.

### Age

The first question was relative to the contestant's age, it will help the processing to try to find differences in different age groups' behaviour and reactions against flying with a COVID-19 environment. It is expected to be a very important variable, as young people are less vulnerable to pandemics and more used to new technologies. However, their economic situation might have gotten several reverses. On the other side, it is expected for +65 year-old respondents to be more reticent to travel, and will also be an interesting sample to have in order to be compared to ageing passengers studies reviewed while carrying out this project.

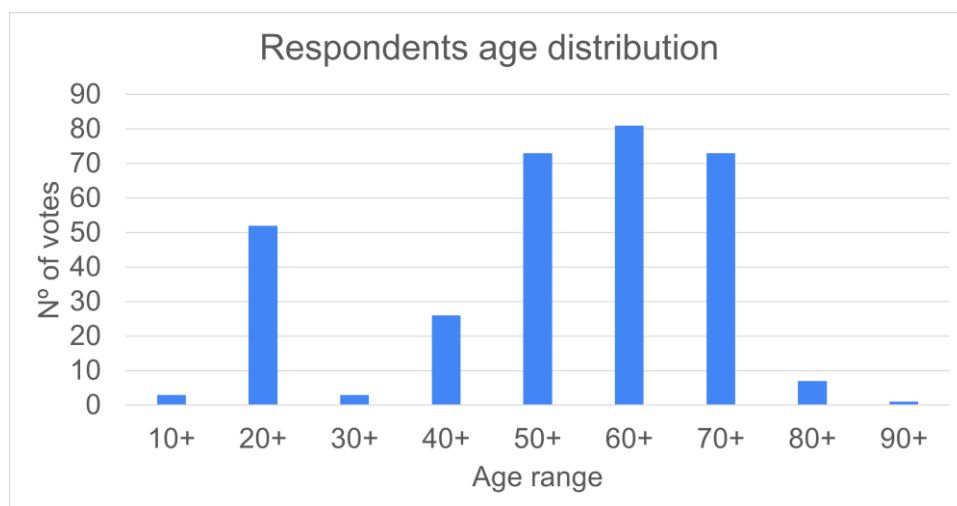


Figure 16 Survey's respondents distributed by age

As it can be appreciated in Figure 16, the age ranges that had higher participation in the survey are the 20 to 30, 50 to 60, 60 to 70 and 70 to 80 ones. This will allow the data processing to see if there are significant differences between these age groups. It would have been interested to collect more data relative to the 30-50 aged population since they represent the portion of

society that is not heavily affected by COVID-19, but at the same time have higher stability regarding economics and family. Also, it would give more insights on people with young children behaviour.

### Gender

A social question, its motivation is similar to the age one. It is mainly used to see if results differ from one gender to the other, although no significant differences are expected to be obtained here.

As it can be seen in Figure 17, a high portion of the respondents were women. However, a total amount of 94 surveys, were fulfilled by men, which is an acceptable amount of cases to be considered significant.

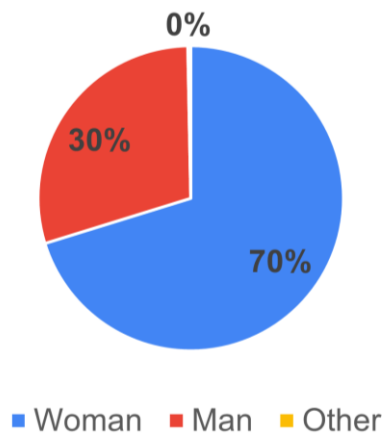


Figure 17 Results regarding gender distribution among contestants

### Education level

Regarding society groups, and trying to get some insights on them, education level is also a must question, since due to education itself, along with all the other factors that this conditionate, going from the people's surroundings to work position can heavily influence travelling decisions. Also, related to this last point, it is interesting to see, from a statistical point of view, if people with a lower education level had their economic situation go towards worse at a higher rate. Thus, maybe affect their behaviour as leisure flights consumers.

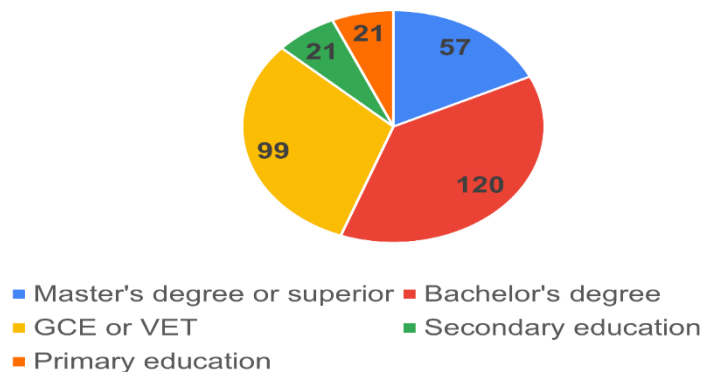


Figure 18 Respondents' education level profile

Regarding distribution, enough subjects have been obtained to extract conclusions for almost all educational profiles. However, cases having Primary or Secondary education as their top studies seem a bit low, so, as they were already expected to not have many impacts or differences between each other, their categories are being mixed into a single one, so a more reliable set is obtained.

### Economical level

This question pretends to get the relationship between people's domestic economy and their evolution in leisure flight comparing their leisure flight frequency before and during COVID-19.

It is an important fact to note that this test main object of study is people leisure flight dynamics and evolution in a COVID-19 environment. Otherwise, it would seem straightforward that people with a higher economic level can afford to leisure travel more times. However, a similar distribution is expected to be obtained. In the end, a lower economic situation leads people to avoid spending on leisure.

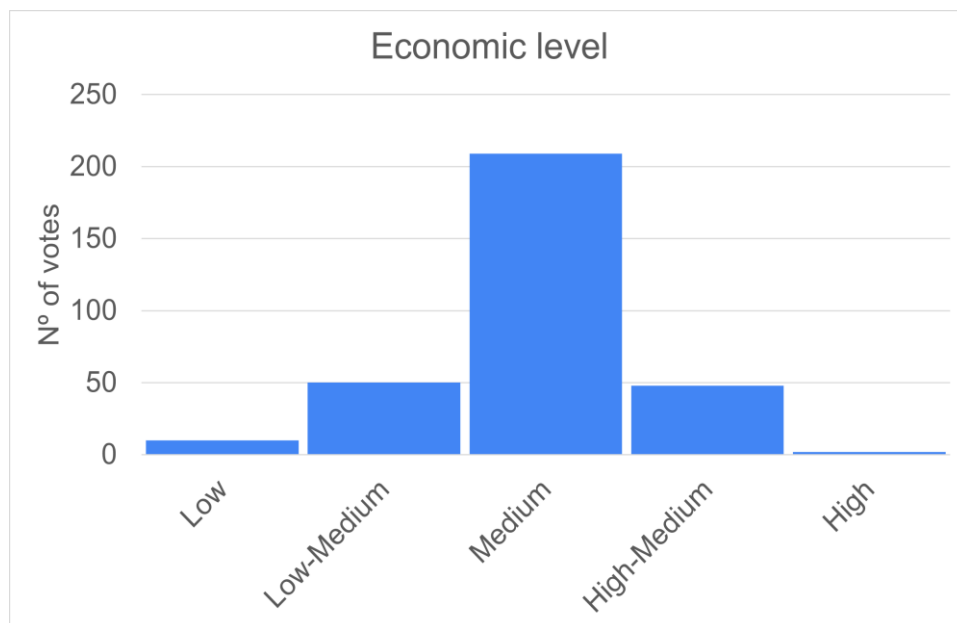


Figure 19 Survey contestant's economic grouping distribution from low income (1) to high (5)

In Figure 19 it can be appreciated how most respondents are within an average economic situation. Having the low average and high average around 50 votes each. Regarding these results, it's complicated to get some high variable dependencies regarding this value, since data is very concentrated around the average. The only dependency or interaction between the other facts that might be found will probably be low and relative to those low and high medium groups.

With regards to this question, there is also another fact that shall be considered, and it is the partiality of results. Having 220 people on the average economic tier does not mean they all have a similar amount of money, but that they perceive what they have as average. This would mean that really, this question is trying to get insights on how people perception on its economical level affects their behaviour as a leisure travelling consumer.

## Political orientation

This is a social fact that might be taking special importance on this matter, and this is because it has been recognized as a strong driver on COVID-19 threat perception. This case was outstandingly perceived in the USA, where even wearing a mask could imply your political alignment. Due to this fact, public opinion has been getting polarized relative to COVID-19 prevention and countermeasures that should be applied. So interesting insights are expected to be obtained from this question. Concretely, it is expected that people who have a right-winded political view will be more careless about COVID-19 threats or risks, so, in the end, this fact should not have reduced their flight activity.

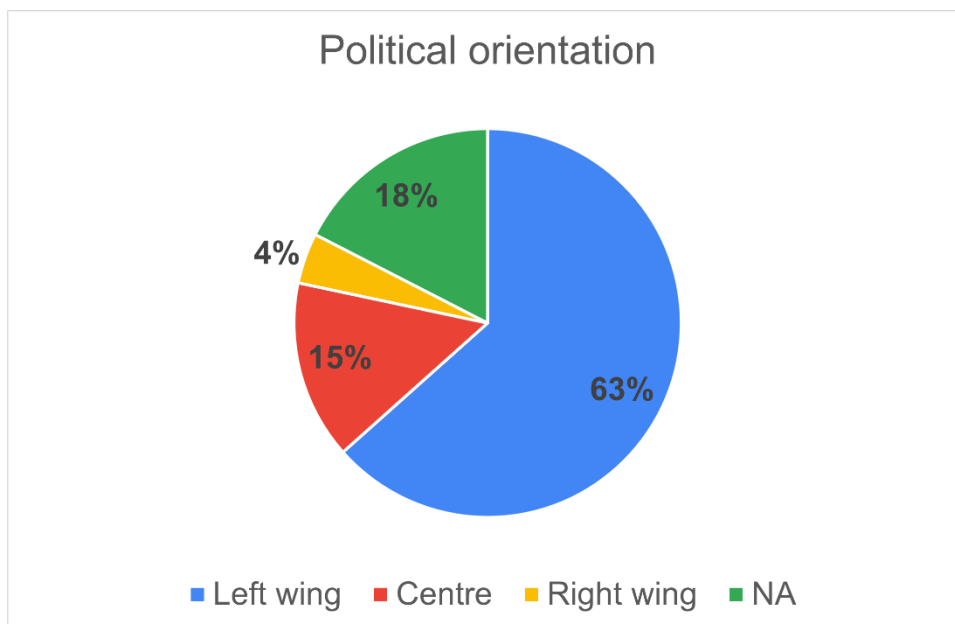


Figure 20 Political orientation of survey participants

As it can be observed in Figure 20, the vast majority of contestants answered to be left-winged, while only 4% (13) of them defined themselves as right-winged. This gives very important insight into the sample already. Differently to what was expected, the collected data is proving not to be a faithful representation of Spanish's society, at least regarding political standards, as in Spain, right-wing parties have even gotten parliament's absolute majority sometimes.

The second conclusion that can be stated is that the political effect on consumer's patterns will not be clearly observed, or at least, as it was intended to, due to low data on right-winged cases. Thus, an approximation will be applied, comparing the left minded people against the no left ones, excluding the NA voters.

## COVID-19 effects on employment

There is no question about the fact that pandemics have influenced many people's workplaces or statuses. Hence, the question was directly answered by the contestants. The fact that is willing to be observed is the number of people whose situation changed towards worse since it is highly expected they will have reduced their amount of leisure trips by now if compared to



those times before COVID-19. The amount their fly rate changed on average within these concrete cases along with the proportion of them when compared to the total amount, will be able to give a rough estimate on what is the percentage of leisure flights cancelled because of this fact.

In Figure 21 can be seen how a significant sample of people saw their employment or economic situation going worse. It is a large enough sample (97 people), to get the first estimate on the fact mentioned before. On the other side, those people whose situation went towards better will not be evaluated, due to amount of cases being too small for the posterior analysis methods.

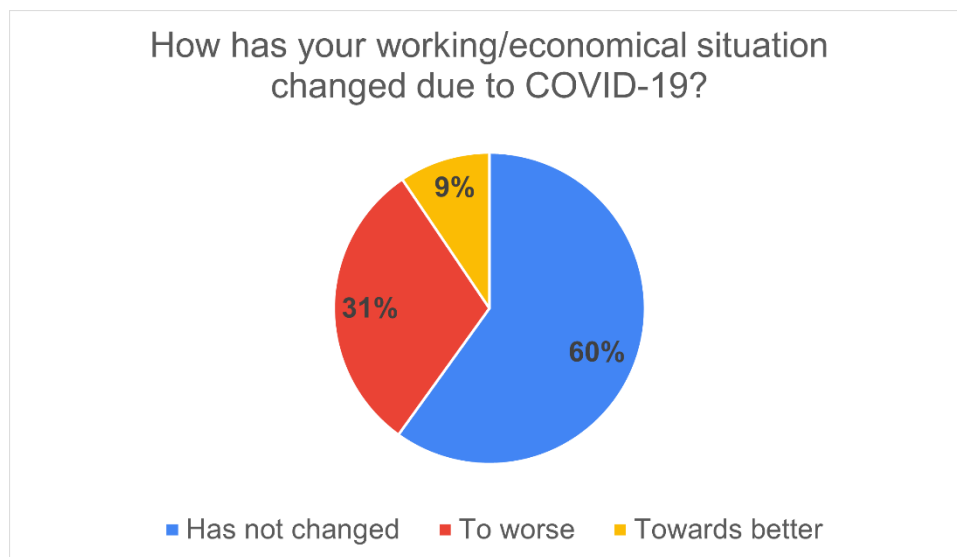


Figure 21 Work situation tendency with COVID-19

### Climate change

This fact is gradually changing people's minds over taking a plane, and some societies are beginning to shift from plane to other more sustainable transports. Moreover, during quarantine, it was observed how big cities contamination levels went to historical minimums, making some people wonder if they should change their lifestyle.

By making this question it is being intended to understand people's tendency relative to this matter, as the urgency keeps getting bigger each year. In this case, and contrary to the intuition, it is not expected to appreciate strong relations between the number of trips or their reduction and the amount of concernment they have about climate change, as there is a strong tendency of condemning climate change but not acting against it.

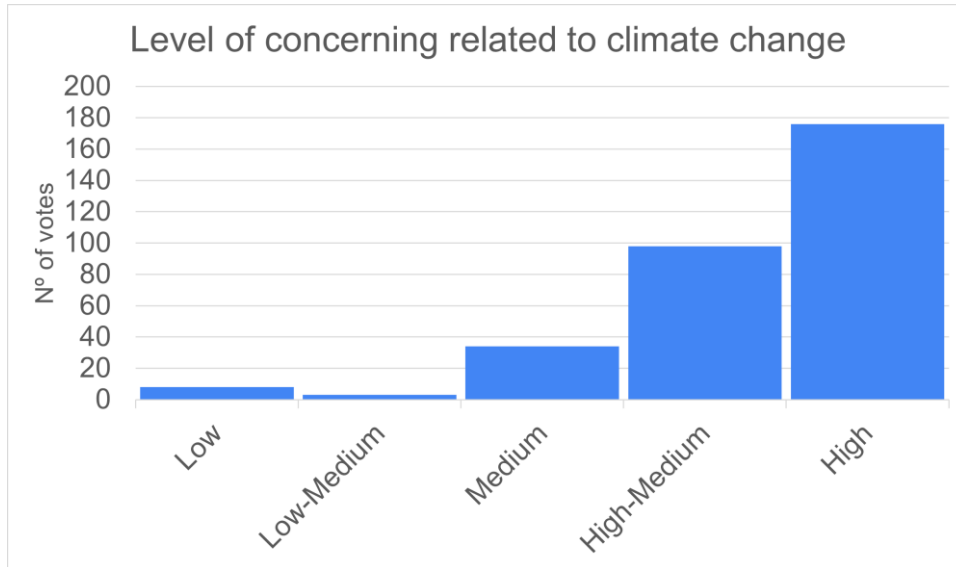


Figure 22 How much is sample concerned about climate change

### Health condition

Regarding health situation, it is considered an important indicator to study and observe its relationship to people's amount of travels. Concretely, it is intended to compare similar cases on those main drivers, that will be found once processing is over, but with different health conditions, in order to get the impact health condition have, that is expected to be important.

In Figure 23 health condition distribution is plotted, it can be seen how the majority of the population has a good health condition, ranging from "Average" to "Strongly agree on being healthy".

However, some contestants stated to understand the question relative to having a healthy lifestyle and not an actual health condition. This was found out once the survey was delivered, so it could no longer be edited. Thus, and to avoid false results, this question is not being considered during the data processing.

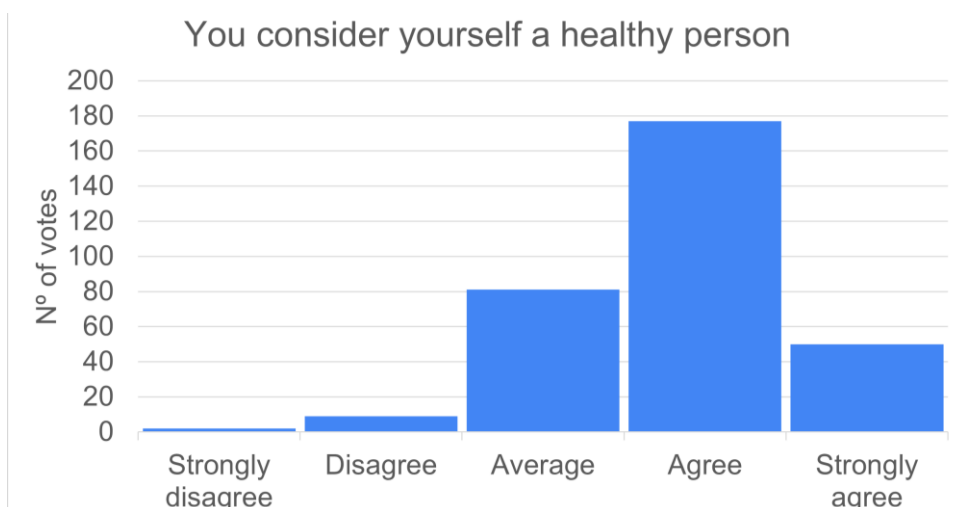


Figure 23 Respondent's health state

## Personality traits

The second part of the survey included some questions relative to personality traits. As in the reviewed study, 5 big personality factors theory is applied. However, instead of the usual 50-item IPIP or 20-item mini IPIP tests used to get a personality depiction, the contestants were asked for each of their personality traits directly. This was mainly done to cut down survey length as much as possible, going from a 20-item personality survey to a 5 one. However, it increases survey uncertainty related to 5 traits variables.

In order to see if the uncertainty had to be reduced using some technique, or some correction factor shall be applied on the post-processing, some research was done regarding what are usually the differences on the self-assessed 5 big personality factors. The research found that on average, the subject's own punctuating was on track with the punctuations received by their acquaintances, or even harsher (not significantly different, as the results obtained a standard deviation on mean results of  $\delta = -0.038$ ) [38].

On another note, the terms used to ask about personality factors were not the technical ones, as the respondents did not necessarily have a piece of knowledge on psychology. Instead of them, similar concepts but in more common words were used.

The personality traits are studied, so they can be associated with different variables, as perceived pandemic risks or travelling trends since COVID-19. Also, the results can be reviewed along with the previously mentioned study to see if results are consistent and if important changes on the matter have been found out.

	Strongly disagree (%)	Disagree (%)	Average (%)	Agree (%)	Strongly agree (%)
Openness	0	1	9	47	43
Conscientiousness	0	5	36	41	18
Extraversion	3	15	31	35	16
Agreeableness	1	3	16	47	33
Neuroticism	6	24	38	23	9

*Table 7 Results regarding people's personality*

In Table 7, people's responses to the 5 questions can be appreciated. In general terms, all factors but openness seem to be enough diversified for some influences or interdependencies to be obtained.

Keeping in mind the previously reviewed study, agreeableness and neuroticism are expected to harm the willingness to fly, whereas extraversion and openness are expected to impact positively.

### People travelling to closer places

As it was seen during the theoretical investigation, users change their travel patterns a lot when doing domestic travelling or going abroad, including means of transport. In the survey, the favourite mean of transport for each type of trip was asked. Afterwards, they were asked about their travelling destinations, concretely, if they were travelling to closer places since COVID-19 started.

It is expected for a high number of respondents to say "yes", as there are currently a lot of external conditioning factors, such as avoiding travel quarantine when domestic travelling, faster reaction and the possibility to come back early in case of some emergency happening, a deeper understanding on how the pandemic situation is and what measures are being applied every time, an easier and more practical way to get hospitalized on destination place if some emergency happens, etc.

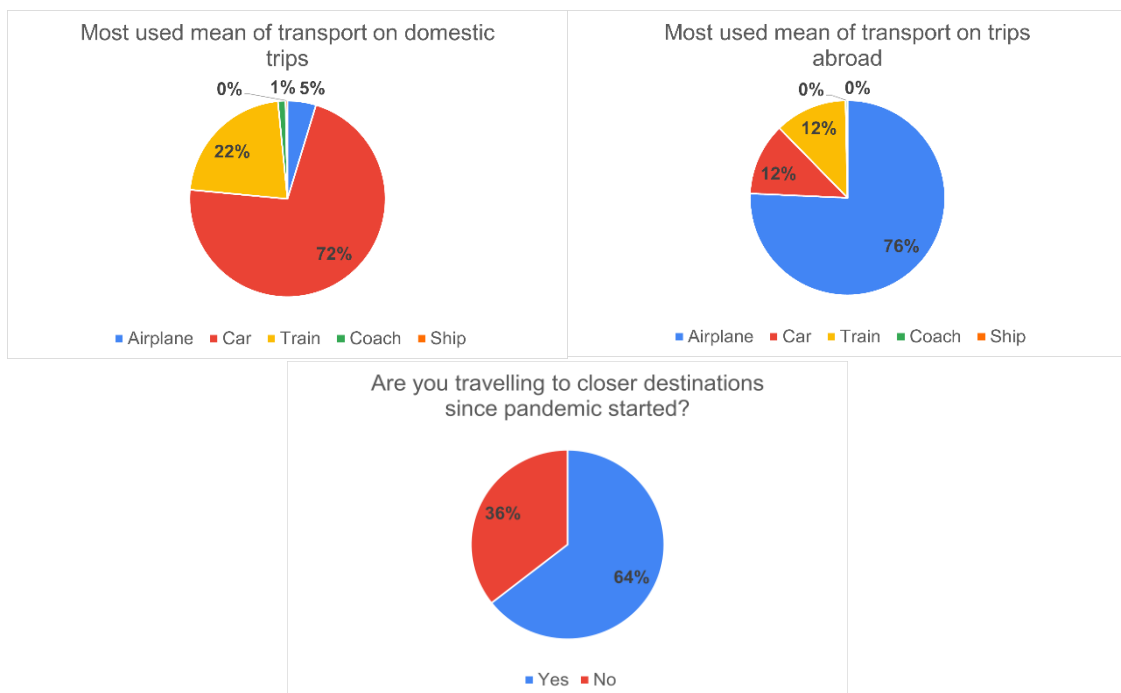


Figure 24 Respondents' trends on domestic and abroad travelling and how they were affected by COVID-19

In Figure 24 it can be appreciated how means of transport preferences changes regarding domestic against abroad travelling. Comparing this data to Figure 4, in the first chapter, it can be seen how the general trend is repeated, with air travelling being the top choice when going abroad and car when domestic travelling. However, numbers do change a bit, to be precise, in this last data, both have seen their share increased up to 70% numbers. To understand this, two key factors have to be mentioned:

- The reviewed study data is from 2015, whereas these last graphs were obtained with surveys fulfilled during 2021.
- The reviewed study collected data is referring to European citizens, while this survey has been mainly distributed among Spanish people.

On one hand, studies have already confirmed the increase in motor vehicle usage after the pandemic, since it reduces public contact, making the displacement safer than public transportation [39]. Hence, this survey getting a higher portion of people using car, regarding the domestic transportation, gets justified.

On the other hand, the difference in plane usage when travelling abroad could be justified by country size. Spain ranks on the second position regarding UE members ordered by their land extension, this means that a Spanish person will have to travel a longer distance to go to neighbouring countries when compared to other European inhabitants, leading Spanish people to take a plane more often to go abroad and this is exactly what can be appreciated when comparing the two samples' results related to outbound travelling.

Interpreting the obtained results by themselves, some insights start to show up already. In the first instance and relating to what has been previously mentioned about people preferring private car usage to domestic travel, it can be seen how the majority of cases stated to be travelling to closer places after the pandemic outbreak. Thus, observing Figure 24, it can be stated that some cases are shifting from the second plot, which means doing outbound flights, to the first one, whose majority uses private vehicle transportation.

### Evolution on leisure flight number

The participants were asked about the number of flights they took during the year previous to COVID-19 and this 2021. In order to process the data and get significant results, the resultant of the total number of flights made during 2021 minus the ones made during 2019 has been calculated. Along with the total number of flights during 2021, this will be considered the main indicator of how people is reacting in this uncertain environment.

For this case, a bit of data treatment has been done before plotting the results here, so the plot could show up more reliable and significant data. In the first instance, all those cases where no flights were taken during 2019 nor during 2021 were not considered, since it would alter the actual results causing a deviation towards the "no changes" assumption since these cases are representing people who have not been flight consumers before COVID-19 nor nowadays.

The next step onto data treatment has been the erasing of odd number results. To begin with, the cases were specific since the standard travel method is taking a round trip onto a destination. However, this data was heavily affecting the distribution observed in Figure 25, as there were cases whose resulting was -1 or -3, but a lot lower in amount than the -4 and 0 cases one. However, these points are farther from the distribution average, -2, making the plot look like a wave while the truth shows that it should look similar to a bell distribution, having the most repeated value on -2. On the same note, some outliers have been discarded, because the numbers were too far away from the observed average. These are -1000 and -128, both of them look like an error made when introducing data.

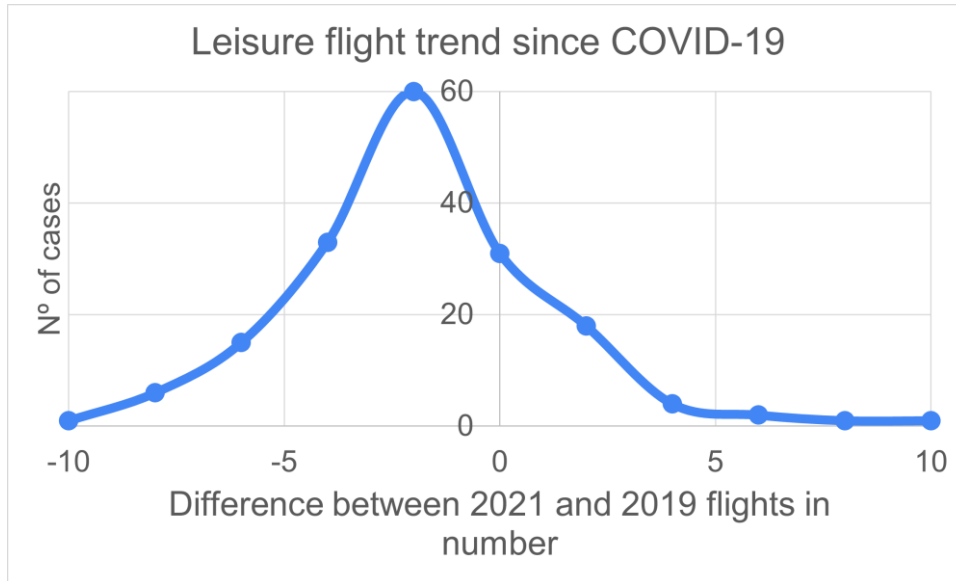


Figure 25 Leisure flight evolution regarding 2021 and 2019 flights in number

The statistical law that would explain this variable in a better way would be a Skellam distribution. The Skellam distribution supposes that a discrete variable is explained by the difference of the other two variables with different Poisson distributions [40]. These two variables would be the number of flights during 2019 and 2021.

Analyzing the plot itself, the first study conclusion can be stated, people did travel less during 2021 than they did during 2019 on average. When processing the survey, it will be intended to see the main drivers get this outcome, but health emergencies and economic situations are expected to have a great impact, as mentioned before. Regarding the actual number of flights for both years, will allow getting some insights on the study's main variables by working in the comparisons between different populations on both variables, trying to observe significant differences on one year for a factor but not on the other.

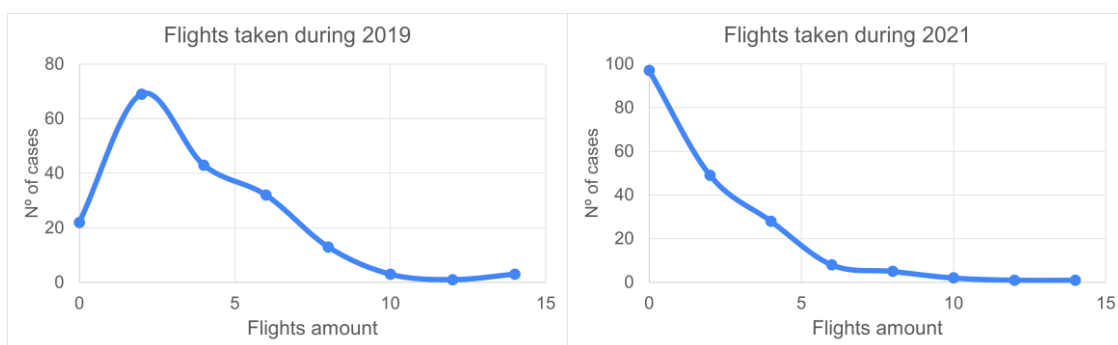


Figure 26 Flight frequency for both years of interest

The first thing to be noted when looking at Figure 26, is that there are close to 100 people that did not fly during 2021 and had already done during 2019, which is already almost half of the used sample (there are 100 cases left out of the study for this question, as are the ones who did not fly any of both years). The counterpart of this is 21 people not flying during 2019 who flew

during 2021. Regarding the 2 flights case, a reduction of about 20 cases can be observed as well, which supposes almost 30% of all the cases who took 4 flights during 2019.

Regarding these data, it can be concluded that the group of people who stopped travelling the most are those who presumably did a single round trip during 2019, leading to think that those people fond of flying who took 6 or more flights did not change their patterns that much.

### Changing travel means

To get better data on plane usage since the pandemic started and if it was substituted by alternative transports, as it would be expected from the question relative to destination distance shortening, the respondents were asked how much they agreed on COVID-19 making them shift from plane to other travelling means. Thus, this question allows to confirm or prove false that reasoning.

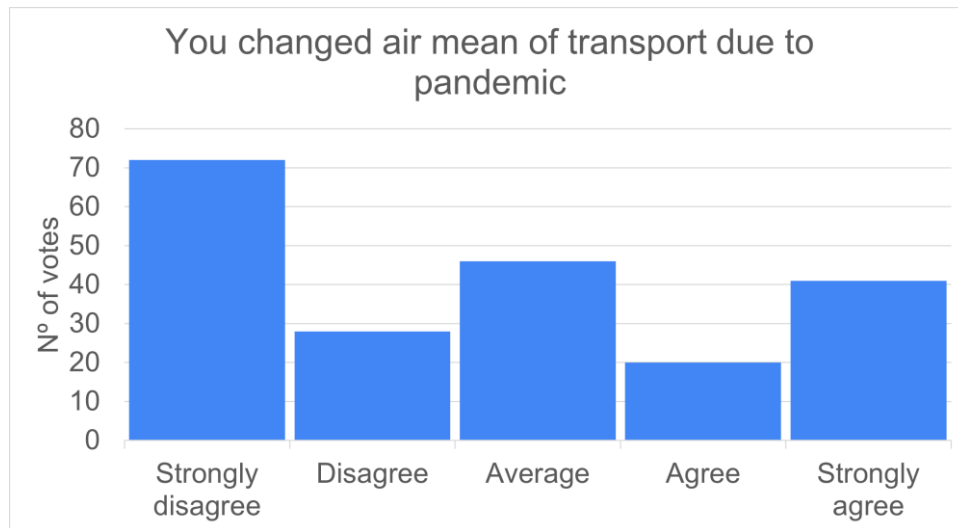


Figure 27 Responses on changing air mean of transport for any other due to COVID-19 statement

To verify survey integrity among participants, a quick match between this and the previous question can be compared. Thus, to properly carry out this check, only the participants that made at least a single flight during either 2019 or 2021 were considered. To interpret the Figure 27 results, an assumption is made, the 70+ people who strongly disagree with the statement are supposed to have maintained or even increased their fly rate. On the other side, those 40+ cases who strongly disagreed are thought of as a portion of the 97 people who did not take a plane during this year. For the central categories, the responses cannot be assumed in such an easy way without falling into false statements.

Taking this data and making a brief review, it can be assumed 72 people did not fly less, while 41 stopped flying. Amongst that interval, the agreeing and disagreeing groups are quite even in numbers and the average is assumed to have stopped by a 50%. Then, assuming they all have a similar flight number distribution for both years.

$$\frac{(72 \cdot 1 + 41 \cdot 0 + 94 \cdot 0.5)}{207} = 0,57 \rightarrow 57\% \text{ of flights}$$

Owing to this brief calculation, the data collected for flights made during 2019 and 2021 should state that the total amount of flights during 2021 was close to 57% of the 2021 totals. Regarding that data, it can be found that a total of 690 flights were taken during 2019 for the sample, for a 344 result during 2021. If the portion that 344 is to 690 gets calculated:

$$\frac{344}{690} = 0,50 \rightarrow 50\% \text{ of flights}$$

As it can be appreciated, expected and actual results are close enough for the sample integrity to be validated.

### COVID-19 risk perceived

To get some insights on how people perceive COVID-19 risks when flying, and how does this affect their travel patterns, three questions related to how the pandemic is related to their travelling choices or fears were asked.

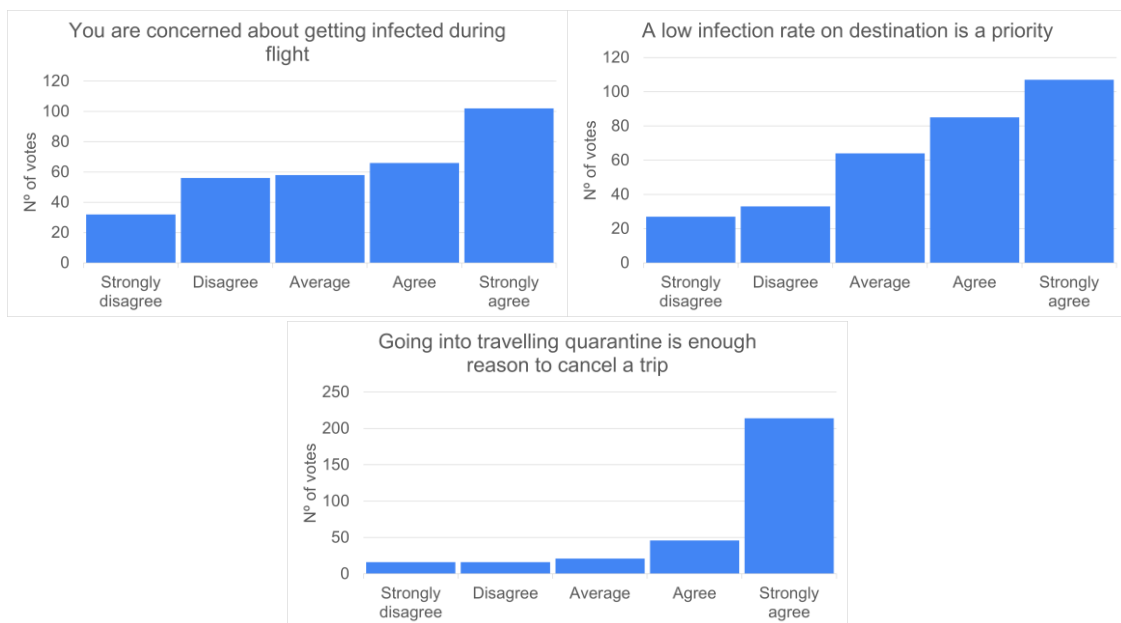


Figure 28 People's concerns related to COVID-19

When regarding Figure 28, the first thing to stand out is most votes being on strongly agree answer. At first glance, this seems to be strongly related to the number of flight decrease mentioned earlier, this will be later reviewed when making data processing.

Another thing to be noticed is the difference in obtained results when compared to the studies reviewed previously in this work. On the second reviewed report, related to the ageing passengers' attitudes, the sample indicated that top priority was a low infection rate on the destination while having to go in quarantine was almost a secondary issue. However, this data shows the opposite, being the quarantine issue the one that worries passengers in a greater way.



As stated in that same study, and fitting the obtained data here, this was a very concrete finding due to that population being 65+. Then, related supposed to be retired from work responsibilities.

### Flying for work reasons

Usually, people are more reticent to do things that are not daily life issues, which includes flying. However, this is another matter for those people travelling for work reasons. A question related to this was asked during the survey, in order to see if a partition of the sample around this fact was feasible and sensible.

On this line, it is expected that those people who do the business flight to be less afraid of COVID-19 risks and more willing to leisure travel, or at least, have a lower or zero decrease in flights during this year.

Regarding Figure 29, it can be appreciated how most of the sample is not related to flight business, so maybe the data processing cannot clear out anything or is little related to this factor.

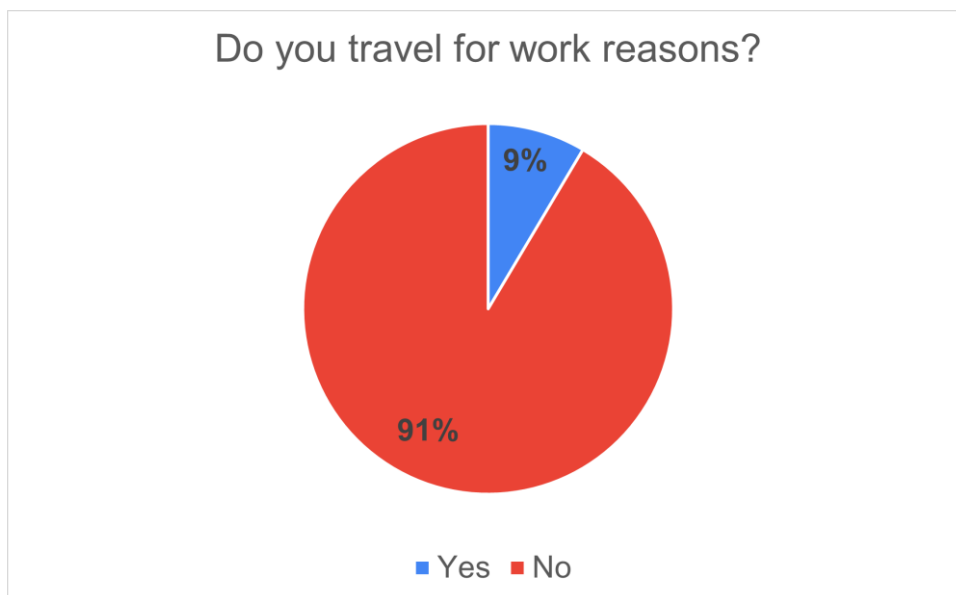


Figure 29 Participants distribution regarding the business flights

### Expected recovery time

One of the stronger related questions to the study's main objective was about expected recovery time regarding fly rate. This was included in the survey to be reviewed or thought off during the study's conclusion but is not being analysed as a variable in statistical analysis, as it is not directly related nor is expected to influence any other factor.

The obtained results represented in Figure 30, show respondents being fairly distributed among all the options. Exactly half of them think they will be flying as much as they were doing before the pandemic by the end of 2022, while the other half think this is not happening any time soon.

This proportion should be somehow related to the obtained results of flights decrease on number and substitution of air transport means.

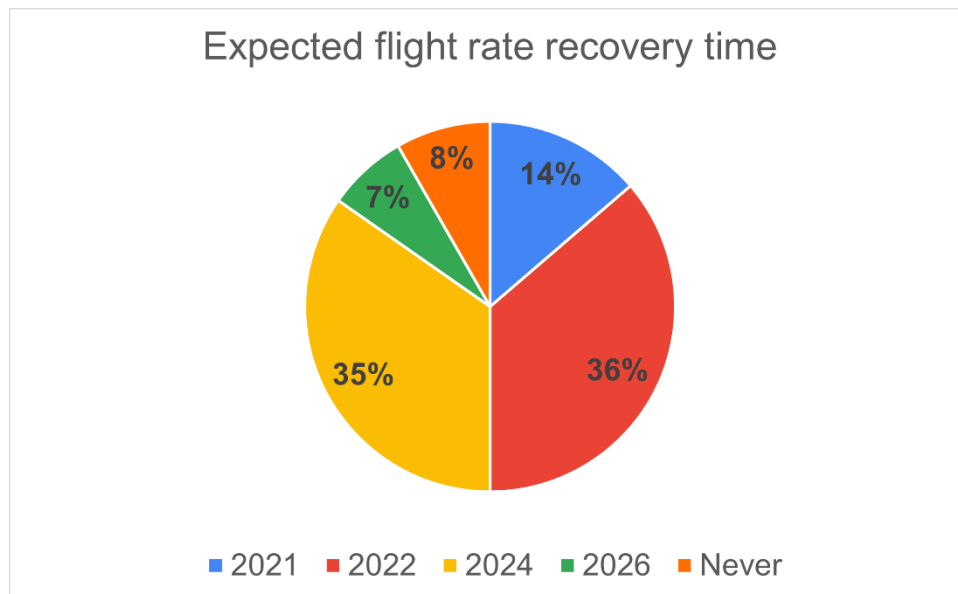


Figure 30 Voting distribution for expected recovery year regarding fly rate

Research is inclined to think full rate recovery is not coming back before 2024 [41]. This result is coherent with the obtained data, as the contestants are only answering for themselves and not the general population. This means an 85% of them see themselves flying at the full rate by 2024, which is much closer to 100%. Also, the reasons that motivate these responses can be very diverse, from the economical situation and its expected recovery time, COVID-19 and other illness risk perceptions, climate change urgency, etc.

### Main reasons to and not to fly

The last survey questions were related to travelling reasons. Regarding the not to travel main reason, it is being intended to get insights on what is the key reason behind people travelling less during COVID-19. To see if there are other factors besides COVID-19 emergency causing people to choose other means of travelling. Also, it can help validate some processed results and conclusions.

On the other hand, the main reason to fly question is motivated to try getting enough data to make a brief comparison between those who travel mainly for work reasons, or those who take the plane to visit their families. This way it could be seen if those doing leisure fly are less resilient than those visiting family within uncertain environments, or the other way around. If travelling mainly for work reason motivates the leisure travelling, etc.

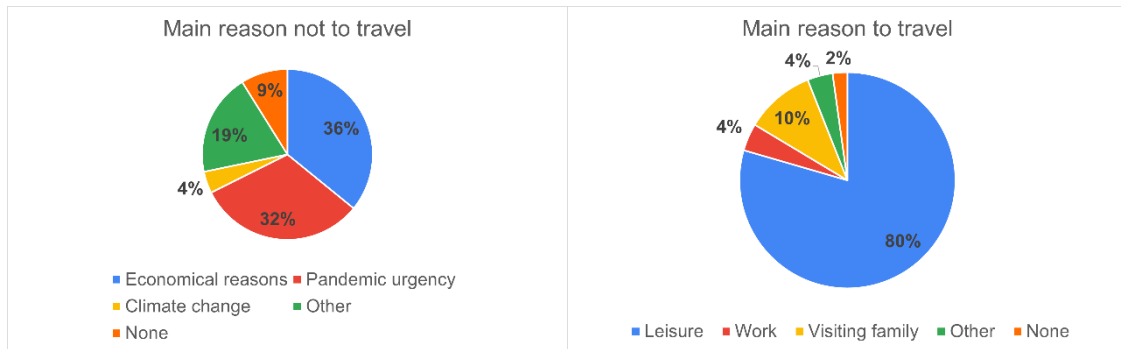


Figure 31 Voted main reasons to and not to travel distributions

In Figure 31 results can be appreciated. Regarding the reasons not to travel, it can be appreciated how the top one is the economical one, closely followed by COVID-19 emergency. However, results will be difficult to split, as pandemic has been closely related to massive job loss and economic depression.

On another note, sample punctuation was very high when responding to climate change concerning questions. However, only 4% of the respondents see it as their main reason not to travel, which makes one wonder if the ordinal scale was the best method to evaluate that question.

Moving onto main reasons to travel, most of the votes went for leisure travel. This was expected considering the survey was distributed among the general population and the study's main objective focusing on this type of trip. Regarding the others, few data could be collected, with visiting familiars ranking, but only with 10% of total punctuation, so no processing relating this data will be able to be carried out.

Once whole survey data has been summed up and briefly explained and discussed, the variable analysis using different statistical methodologies is done, so underlying structures can be found.

## Data analysis

Relative to the survey results interpretation and processing, some statistical methodologies had to be applied. Before taking any decision, some alternatives were considered. Which will be briefly commented:

- ANOVA regression
- Factorial analysis
- Cluster analysis
- MCA (Multiple correspondence analysis)

### ANOVA

The ANOVA is a predictive statistics method that describes the target variable directly related to the factor considered to influence it, also called the independent variable. The objective of this method will be the rejection of the null hypothesis considering the average and variance difference of the target value when cases are from different categories. Then, it is important to know that this analysis will relate a categorical independent variable to a continuous dependant one.

The method starts off a statistical sample data, every case contains the dependant variable observed value and gets grouped into a category, which would represent the independent variable. The averages and statistical variances of the cases are then calculated for each category, and it gets evaluated if the difference between them could be given by the same statistical distribution (meaning that the difference in the results is explained by the normal distribution variance itself) or the gap between them supposes statistically significant (meaning the normal distribution law explaining them changes subject to the case category) [33].

As technically, any results sample could be found inside the same normal distribution, a p-value gets preset, usually to 0.05, representing the chance of results to be given just by randomness.

However, the truth is that usually the variables are not dependant only on one factor, but many. This is what motivates the two way ANOVA. A method based on the basic ANOVA but considering how a dependant variable gets affected by two independent factors and the interaction between them. As in its original counterpart, this method requires the independent variables to be categorical and the dependant ones to be continuous. There's also the multi-factor version.

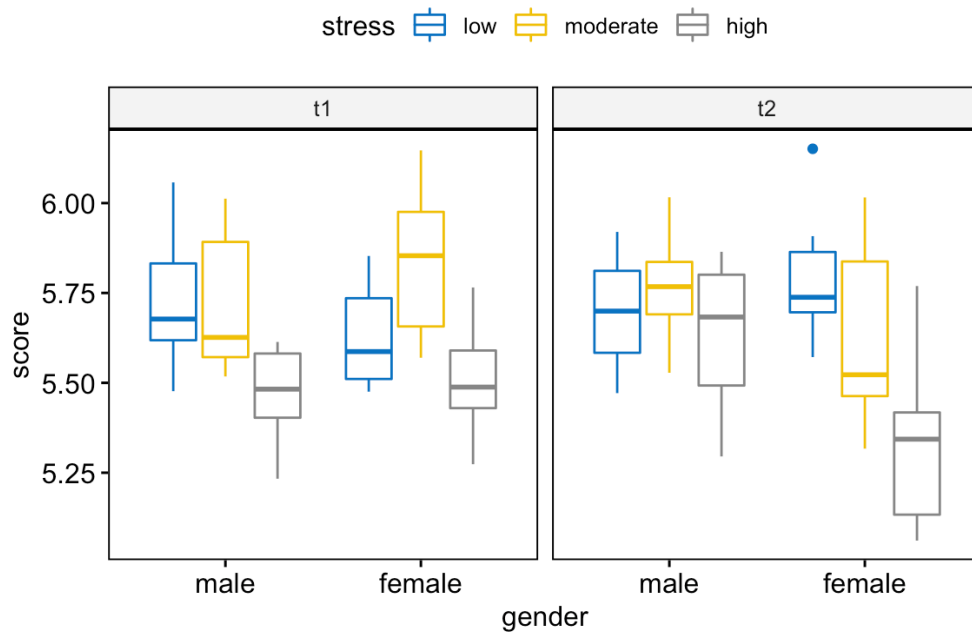


Figure 32 Computed normal distributions, where the score (dependant variable) gets affected by gender, t and stress (independent variables)

On the same line, another necessity emerges from the investigators regarding ANOVA. In some cases, results cannot be isolated from other dependant variables, and it is needed to observe and capture the interaction between them. Thus, the ensemble analysis of various dependant variables is used. The Multivariate analysis of variance, also known as MANOVA, is another method derivate from the ANOVA. It considers how an independent and categorical variable affects a set of dependant and continuous variables.

$$\text{MANOVA, } F(4,294) = 71.83, p = <0.0001$$



Figure 33 MANOVA test considering how sepal and petal lengths depend on flower species

In Figure 33, a MANOVA test relating some flower dimensions to the species can be appreciated. It is interesting seeing how in the setosa case, the petal length is much less than the sepal length if compared to the versicolor or virginica cases. Also, for the same species, it can be noted that the variance is much lower, meaning the dimensions of the species are way more similar to each other. Finally, it can also be stated that the petal length increases much more depending on the species than the sepal one.

Keeping an eye on the same figure, it is also interesting to review the outliers concept. The plotted points represent those measures that are far away from the length average. When something like this happens in a large sample, these cases are considered not reliable and get discarded, as it would have a big effect on the computed average and variance while it is highly probable that the given value is wrong due to measurement and not because of specimens' variances [34].

The MANOVA method has also its two-way type, in which multiple independent variables can be related to multiple dependant ones, with the only requirement of them fulfilling the categorical or continuous constraint. This analysis gives an answer to the following questions:

- Do changes in independent variables influence dependant variables?
- Do dependant variables interact with each other?
- Do independent variables interact with each other?

### Clustering analysis

Clustering methods main target is to identify groups within the cases in a way that those cases within the same group have similar characteristics with each other and are different from the rest.

This technique is widely used for marketing purposes, as it is highly useful to segment potential customers in different categories and get the best way in which they would feel attracted to the product.

To get a better understanding, a clustering analysis plot is shown in Figure 34.

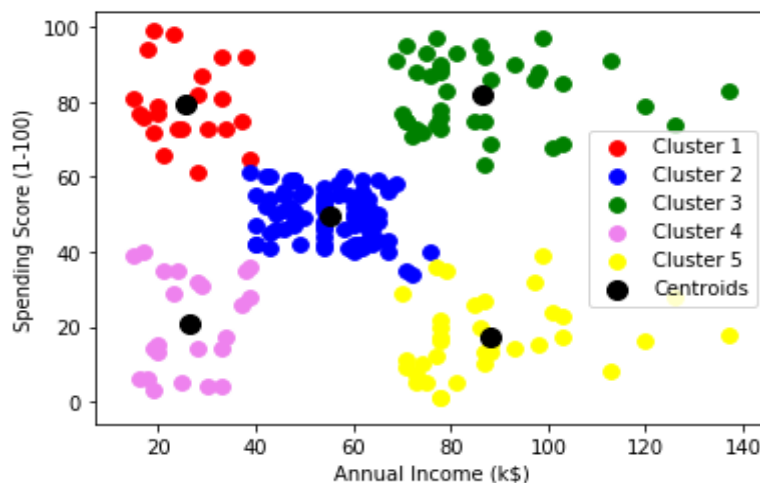


Figure 34 Cluster analysis of income vs spending subjects

In Figure 34, a scattered plot regarding the annual income vs the spending score is analysed using a clustering method. To begin with, the cluster analysis hypothesis is stating that those subjects with similar characteristics have similar values. For this case study, this would imply that those people who own a large sum of money and are reticent to spend it (Cluster 5) share characteristics with each other, it works for the investigator to get insights into them. In this case, it should be investigated which traits do these people have in common, maybe they come from more humble families than the ones who are in Cluster 3. Also, age, ethnics, education level and so on may or may not be crucial factors that would explain this behaviour.

When making a cluster analysis it is very important to focus on two main targets:

- Getting intra-cluster distance as lower as possible. This means the clusters shall be split in the best way to get the minimal distances within the members belonging to the same cluster.
- Getting inter-cluster distance as higher as possible. This means the clusters shall be split in the best way to get the maximum distances between their own members and the neighbouring clusters'.

However, this shall maintain a balance with a low number of clusters. This means, mathematically the best way to have these conditions accomplished is making a cluster of every single case, but statistically, this would not bring anything new to the table. Thus, the solution that better fulfils those two conditions and has a reasonable number of clusters regarding its own study case is the optimal solution.

When talking about clusters, two types are considered, the partitional ones and the hierarchical ones. The first type considers completely separated characteristics for each cluster whereas the second type groups work with a kind of zoom out<sup>5</sup>. The lower-level clusters are spotted, then it keeps zooming out, making a new cluster each time, where this new cluster members' characteristics are less bounded each time, as it groups a higher number of cases, this could also be seen as a parent-child cluster methodology. The first cluster typology is widely used for social partitioning while the second one is more oriented to biological studies. In Figure 35 a sample of each type can be appreciated.

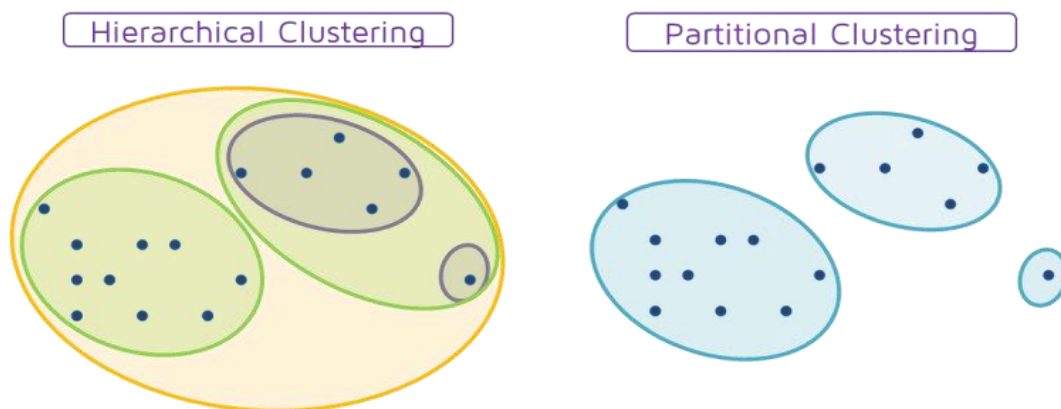


Figure 35 Different clustering typologies

<sup>5</sup> The opposite method does also exist, but it is left out of the scope of this review.

It is important to keep in mind that the clustering method does not follow a stated steps sequence, as it is gotten using a non-supervised machine learning process. A very rough explanation of this is having an autonomous algorithm that interprets the input data and starts sorting it randomly until it begins to recognize certain patterns, that will end up becoming clusters.

### K-Means algorithm

The clustering analysis is a whole science by itself, as it is clearly out of the scope of the project, only the K-means algorithm, which is the most widely used will be briefly reviewed.

For this method to start processing, the user must state a concrete number of clusters ( $n$ ). The methodology this algorithm follows is randomly assigning  $n$  centroids randomly along with the domain. From this point on, it continuously iterates the aggregated square error and calculates the new centroid position, until the new centroid location and the previous one do not differ by more than a specified value [35].

In order to correctly run this algorithm, the input data required are numerical continuous values as long as possible. If the case study has any other variable type, like the categorical one, it can be converted to numerical values using the Pearson method or similar ones, but it is not advised.

### Factorial analysis

Factorial analysis main target is to know the relations given between a whole set of continuous numerical variables and understand the underlying factors that explain their behaviour and interaction. This method assumes that any of the case variables values can be obtained through a linear combination of those subjacent factors. Mathematically, a variable value would be expressed by:

$$x_i = Wh_i + \mu + e$$

Where:

- $x_i$  represents a concrete variable result
- $W$  are the values of the factors
- $h_i$  is the vector containing factors coefficients
- $\mu$  applies for the lineal regression offset
- $e$  is the term for the variable variance

If this expression is now referred to the whole variable set values:

$$X = WH + M + E$$

As it can be seen, this tool is very useful when looking for variables' interdependency. From this interdependency, along with the factor coefficients (high/low and negative/positive). Some insights can be obtained when trying to guess what factors could be representing.



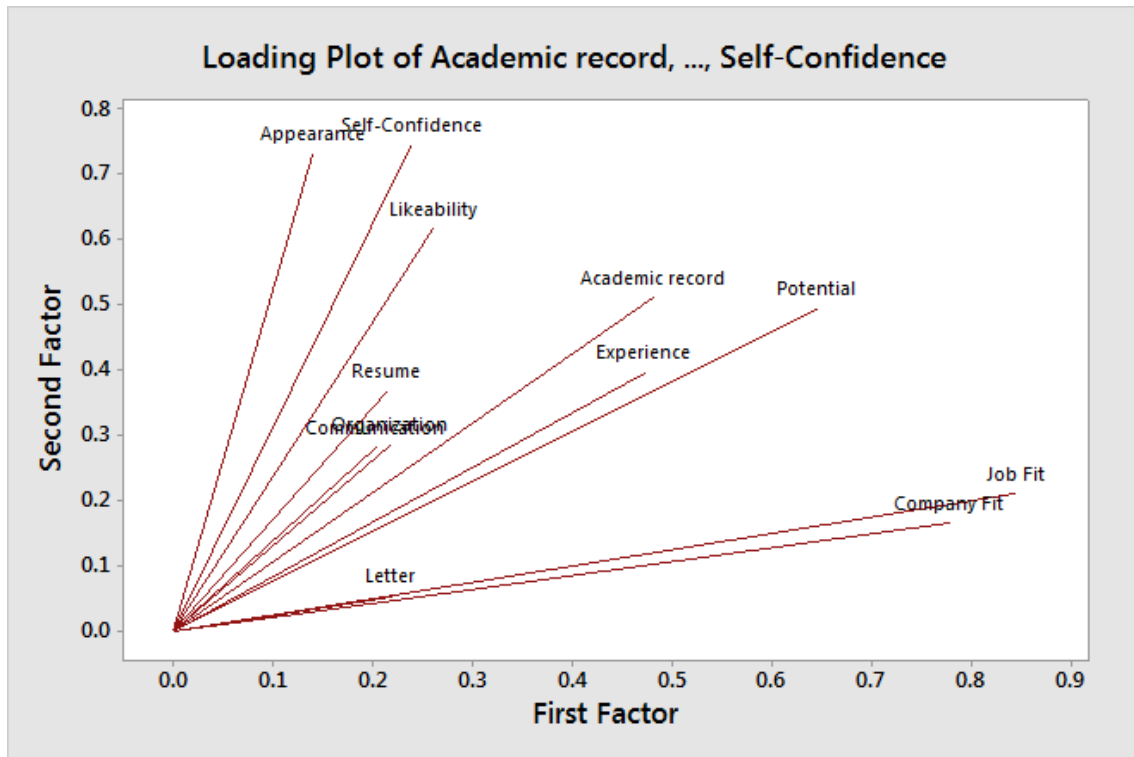


Figure 36 Factorial analysis coefficients plot

In Figure 36, a factorial analysis plot can be appreciated. It shows a case where there is a set of variables, that seem to be related to the qualities observed on a job interview, valued in a continuous interval, intended to be explained by two factors. The point where each attribute lays represents the position in the (0,0) to (1,1) 2D space. Being the X-axis the rate at which 1<sup>st</sup> Factor influences the attribute and the Y-axis is the same but for the 2<sup>nd</sup> factor. To appreciate how insights are obtained from this type of analysis, this plot will be briefly reviewed.

The first thing that stands out in the plot is the co-dependencies those traits have. In order to get a better conceptual understanding, a grouping of variables that have similar factor dependencies or weights can be made.

In this case, an approximation of 4 attribute groups seems to be fit:

- Top-left: Representing the Appearance, Self-Confidence and Likeability traits
- Bottom-right: For Job Fit and Company Fit
- Centre: For the Academic record, Potential and Experience attributes
- Bottom-left: Representing Communication, Organization, Resume and Letter

As it can be appreciated, there is a first symptom that the analysis has sensible data, as all the grouped attributes are usually held by the same people profiles. This means, a person who is self-confident causes usually has a good appearance. The same thing can be said for academic records and potential attributes, etc.

It would be interesting to relate each group with a concept for easier factor guessing. For the top-left group, those attributes could be related to social skills, while the bottom-right one could be summed up by worker potential and following with the centre group, it is clearly related to

studies or work competences. Finally, bottom-left ones could be attributes corresponding to being resolute.

Now that the variables interdependencies and groupings have been cleared out, the next step would be guessing what do these factors apply for. Thus, the work now is to think about what factors could be influencing the four trait groups the way they do.

In the first instance, it looks like the 2<sup>nd</sup> factor can have something to do with extroversion or kindness. As usual, the people who have these traits do make a positive impact on interviewers despite their work competencies when regarding social skills. On the other side, the 1<sup>st</sup> factor may be related to resilience or constancy, as it is highly required for interviewers when looking for profiles that can carry out a large career in their workplace. However, this is not related to the perceived sociability of that person, nor is the other way around. Regarding the central group, that would be related to studies or work competencies, both factors would influence by barely the same amount, to have a good academic record it is usually required to have good rates on ordinary subjects, but it is highly valued to get involved into university projects or take new initiatives with a group of students. Similar things apply for potential or work experience. Finally, none of these factors seems to be very related to being a resolute person, which makes sense with the idea of the two factors being consistency and extraversion.

It must be said that this interpretation is not mathematic, nor comes for a process. It is an interpretation from the investigator, so it can differ from others' opinions or thoughts. Once the underlying factors have been guessed, further investigation using other analytics methodologies should be made, to see if the guessed factors are actually those that influence interviewer impact [36].

The factorial analysis is not always a good solution or process to be carried out, as most of the time, mainly when variables are not correlated, no conclusive factors are found, so a sample ends up having 4, 5 or more main factors<sup>6</sup>.

Once the factorial analysis has been carried out, there are a couple of tools to validate it. These are the KMO coefficients and Barlett's sphericity test.

The KMO coefficient shows how related are the case study variables to each other, it is a coefficient going from 0 to 1, results begin to be acceptable from 0.6 onwards. High values show a big interdependency amongst all the variables, which is not truly what is intended since getting factors whose coefficients are around 0.5 in every variable would not clear anything out. However, low values show a strong correlation between pairs of variables and no interaction with the others. Getting this result is a lot more useful since it will show variables grouped by their behaviours, just as the case example that has been reviewed before.

On the other side, Barlett's sphericity test compares the obtained coefficient matrix (W) with the identity one, to check if they are significantly different.

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<sup>6</sup> The method always finds a large number of factors, but in terms of coefficients or influence among the whole variable set, there shall always be two or three that are a lot higher

## Multiple Correspondence Analysis

The multiple correspondence analysis is a preliminary study useful to see how variables interact with each other.

In a multiple correspondence analysis (MCA), the objective is grouping the different Categorical variables in the function of the input statistic sample. It works assigning numerical values to each category and case, in a way that cases of the same category are close to each other and those who are not are far away, the same thing happens with columns or variables.

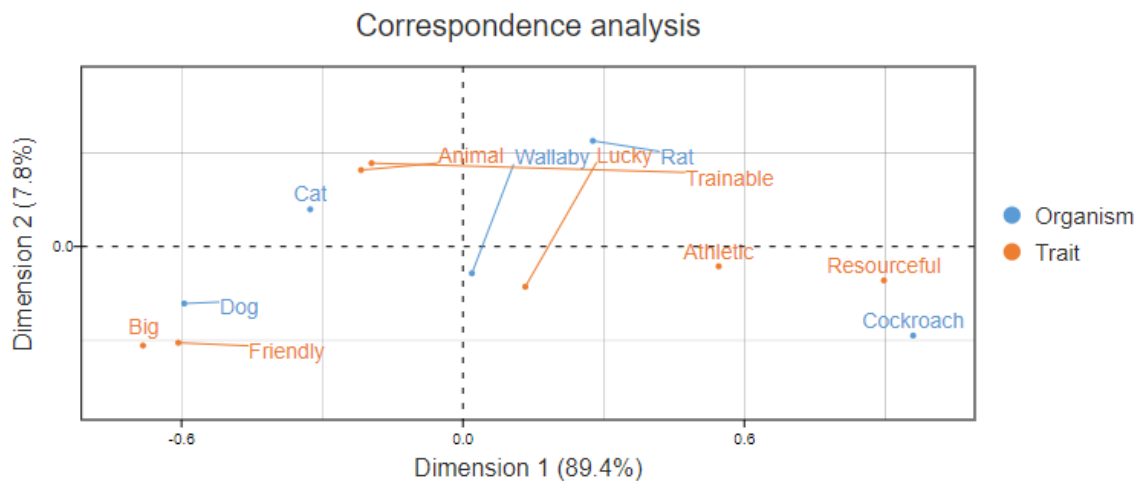


Figure 37 Simple correspondence analysis

In Figure 37 a simple correspondence analysis can be observed. The first thing to be noticed is that points are plotted in two different colours. One is representing one variable, in this case, species, while the other is representing the other one, attribute. When interpreting an MCA plot, it is really important to have clear concepts on what conclusions can be done.

After reading the definition of an MCA, one can think that two points that are plotted close are strongly related, and it must be noted this does not always work like this. It is true, that when two column labels are plotted close together, they will probably relate if values are properly normalized. Also, this applies to row values. However, there is a common false assumption that should be avoided.

- The closer an attribute is to a subject, the strongest relation they have

It is very important to think about MCA as a relative plot, then, this means that the distances and angles are drawn in the function of the other members / attributes. Everything is plotted in a way that the influence shall be measured in relative angle between their lines from the origin and the modulus of these lines. The closer the angle and larger the modulus, the closed-related these variables are. A 90° angle shows that the variable has no relation with that subject

In Figure 37 example, and making the mentioned false assumption, one would state that wallabies and lucky attributes are strongly related. At approximately the same rate as dogs and big traits are. However, following the modulus and relative angle steps, it can be appreciated



that in fact, wallabies and lucky have nothing to do with each other, while the dog and big have, since modulus is a lot greater, and the angle is closer to  $0^\circ$  on the dog case.

Another important point is to analyse the MCA plot not as a single entity, but along with the raw data. In this case, regarding the provided data [37], it can be appreciated how the wallaby and lucky traits results are not explained by the sample framework, thus, as no dependency is observed, they both fall near the origin.

In the same way, another false assumption could be made, it being that cockroaches are less related to athletic than the dog to big. Here is where the relativity concept mentioned before makes sense. Regarding data, cockroaches are more related to the athletic trait than dogs are to the big one. However, as cockroaches are even more related to resourceful, they fall relatively far from the athletic trait, leading to an intuitive but wrong interpretation. However, if it is regarded in terms of relative angles and lines, again it can be appreciated how the correct association shows off.

## Results and discussion

After collecting all survey's responses and making a brief analysis on general results, statistical methods were used to process data, trying to identify which are the underlying patterns among the provided cases, to do this, several data partitions, based on a single or group of variables, are done and studied independently, to see if those factors encourage or retain people from flying.

Finding out these drivers is an important thing, as they explain the causes of different behaviours. Thus, once the cause is found, it is a lot easier and effective to think of a solution. Also, it provides the necessary data characteristics to compare the data set to others and notice, in some cases, significant differences.

To begin with data processing, the first thing to be done is think about what statistical method is going to be used, regarding the obtained dataset types, sample size and study objectives.

All statistical processing was carried out using the IBM SPSS software, which is a specific statistics processing tool.

In the first place, the sample data types are observed in Figure 38, as it can be observed, not all of them are exactly equal to the data type extracted from the survey, and the same thing also happens when regarding their size.

1	pIntAgeGroup	Numeric	1	0	Age Group	{1, 20-39}...	None	8	Right	Nominal	Input
2	pStrGender	String	13	0	Gender	{Hombre / ...	None	13	Left	Nominal	Input
3	pIntEducation	Numeric	1	0	Education Level	{1, Basic ed...	None	8	Right	Nominal	Input
4	pIntEconomic	Numeric	1	0	Economical Level	{1, Low}...	None	8	Right	Ordinal	Input
5	pStrTwoWayPolitic	String	14	0	Political View	{Left-Winge...	None	14	Left	Nominal	Input
6	pIntWorkChange	Numeric	1	0	Employment	{1, To wors...	None	8	Right	Nominal	Input
7	pIntClimate	Numeric	1	0	Climate concerning	{1, Don't car...	None	8	Right	Ordinal	Input
8	pIntOpenness	Numeric	1	0	Openness	{1, Low}...	None	8	Right	Ordinal	Input
9	pIntConsciousness	Numeric	1	0	Consciousness	{1, Low}...	None	8	Right	Ordinal	Input
10	pIntExtraversion	Numeric	1	0	Extraversion	{1, Low}...	None	8	Right	Ordinal	Input
11	pIntAgreeableness	Numeric	1	0	Agreeableness	{1, Low}...	None	8	Right	Ordinal	Input
12	pIntNeuroticism	Numeric	1	0	Neuroticism	{1, Low}...	None	8	Right	Ordinal	Input
13	pIntAbroad	Numeric	1	0	Abroad preferred transp...	{1, Airplane}...	None	8	Right	Nominal	Input
14	pIntDomestic	Numeric	1	0	Domestic preferred tran...	{1, Airplane}...	None	8	Right	Nominal	Input
15	pIntOldFlight	Numeric	2	0	Number of 2019 flights	None	None	8	Right	Scale	Input
16	pIntNewFlight	Numeric	2	0	Number of 2021 flights	None	None	8	Right	Scale	Input
17	pIntFlightDifference	Numeric	3	0	Flight difference	None	None	8	Right	Scale	Input
18	pIntTransChange	Numeric	1	0	Transportation mean ch...	{1, Low}...	None	8	Right	Ordinal	Input
19	pIntQuarantine	Numeric	1	0	Quarantine opinion	{1, Low}...	None	8	Right	Ordinal	Input
20	pIntInfectionRate	Numeric	1	0	Infection rate	{1, Low}...	None	8	Right	Ordinal	Input
21	pIntOnboardInf	Numeric	1	0	Onboard infection	{1, Low}...	None	8	Right	Ordinal	Input
22	pIntBusFlight	Numeric	1	0	Business flight	{1, No}...	None	8	Right	Nominal	Input
23	pIntCloserDest	Numeric	1	0	Closer Destinations	{1, No}...	None	8	Right	Nominal	Input
24	pStrNotTraReason	String	42	0	Main Reason not to Travel	None	None	42	Left	Nominal	Input
25	pStrTraReason	String	36	0	Main Reason to Travel	None	None	36	Left	Nominal	Input

Figure 38 Processing data types

The reason behind this is that some data had to be treated to obtain better partitions to be used in tests. Below there is a resume of the treated data:

- Age: To avoid as many partitions as different respondent ages were introduced, this variable got grouped under three categories the 20-39 years old, 40-59 years old and 60-79 years old. Thus, this also supposed a change in data type, going from numerical discrete to nominal.

- Education: As commented during the interpretation of the results, education representatives for elementary and secondary school levels were low, so they got grouped in order to have a more robust sample. Also, later on during the analysis, similarity evidence was found between the bachelor's degree and master or higher studies groups, so they both fell into the "University Studies" category, going from a 5 group nominal variable to a 3 group one.
- Politic view: This is a very similar case to the "Education" one. As there were very few representatives on all the categories that were not "Left-winged", they all got mixed into "No Left-winged". Except for the "NA" group, whose cases were excluded during processing related to this variable
- Preferred transport means: For this variable, only the "Train", "Car" or "Airplane" responses were considered. There was a residual coach case, that got excluded from processing

Apart from this data treatment, the same procedure as when analysing flights number before was applied, so only the cases that had at least one flight dating from either 2019 or 2021 were considered.

Once all data was set to be analysed, the first thing intended to do was a multinomial logistic regression, this is a type of statistical processing used to get the equation that explains the dependant variable distribution in function of all the independent variables. However, no proper results were obtained, as the majority of variables were stated as unrelated to the target variable mean and variance.

To keep following with the data process, it was decided to analyse the variables interdependency in smaller factors environment. Indeed, the predictive part of the multinomial regression was not needed, but the coefficients would give insights on which factors do alter the resulting variable by a greater rate. Thus, it was considered that applying certain statistical techniques to the set would give a similar result in terms of getting the drivers, so they were applied.

Following this idea, a lot of tests were used to find interdependencies and variable correlations. The main used tools were the MCA (Multiple Correspondence Analysis), the factorial analysis and the Kruskal-Wallis test.

Brief explanations about MCA and factorial analysis were given 2 chapters ago, as well as ANOVA and K-Means. However, the Kruskal-Wallis test is not mentioned there. A very functional and simple resume would be being a non-parametric ANOVA test, which means not supposing the dependant variable does not follow a normal distribution (quite obvious in this case since the dependent variable is discrete, and the discrete variable cannot follow a normal distribution).

No evidence for gender, employment situation evolution along COVID-19, climate change concerns, political point of view, economical levels was found for these factors to be statistically significant.

Relative to age, it was found out to be a driver for some other variables. One of them is the number of flights taken during 2021. This conclusion was extracted by conducting a Kruskal-

Wallis test. To evaluate the dependency of the number of flights regarding the age, the cases were divided by the age category the respondents belonged to, trying to see if the same statistical distribution could explain the obtained differences for the dependent variable (2021 flights number). For this, a significance value of 0.05 was applied. In Figure 39, the obtained average value, along with its variance and outliers can be appreciated.

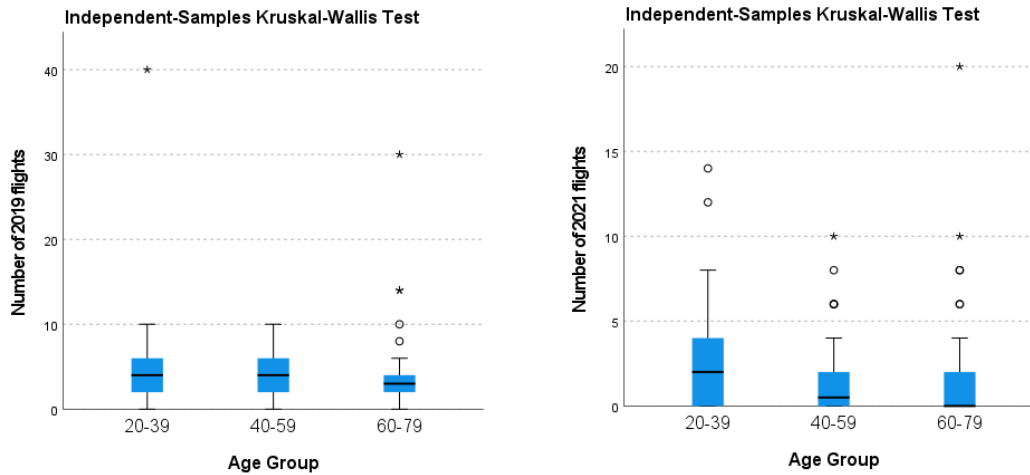


Figure 39 Obtained average and variances for the number of flights taken by different age groups

As it can be appreciated, age does not have a big influence regarding the 2019 flights taken, as mean and variance values are similar between the different populations. However, a different distribution is appreciated on the right plot, where 20-39 year-old people states to have travelled more frequently, in average value, than 40-59 or 60-79 groups. Regarding the probability for each pair of groups to get these results from the same distribution, the following results were obtained.

Pairwise Comparisons of Age Group					
Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
60-79-40-59	1,715	9,161	,187	,851	1,000
60-79-20-39	25,223	9,770	2,582	,010	,029
40-59-20-39	23,508	8,383	2,804	,005	,015

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 8 Statistic data obtained for each pair of groups

In Table 8, it can be appreciated how, as it was suspected from the Figure 39 distribution, the 20-39 group of people have statistically significant differences in their distribution. While it was not regarding 2019 flights. This means that in the COVID-19 environment, younger people stop flying at a lower rate than the other age groups.

Regarding the framework sample that was used to obtain the data, it must be noted how few cases are falling into 30-39 age, as was already stated in the last chapter. Therefore, the result should be taken cautiously, as they have probably been masked by the 20-29 age group. To see

if these cases would also have resulted statistically different, another data collection, trying to obtain more subjects in their thirties would be needed.

Reviewing the obtained results is not a surprising fact that those distributions are different for young people, as they usually get less affected by pandemics in terms of having severe symptoms or complications. However, the test did not provide the same result for the 40-59 population, who got a similar distribution to the 60-79 group. Despite these two populations being substantially different in some fields, like being work activity, pandemic severity, or technological skills. It looks like they both are refraining from flying similarly. It is very difficult to state the reason behind this, two possibilities have been considered to explain this behaviour.

- People ranging from 40 to 59 years are usually family heads or people who have old parents. Thus, they can be more careful regarding infections. Despite no evidence of this was found in the survey results regarding COVID-19 risks related questions, they might have been given if questions were related to infecting close people.
- This population has already experienced the 2008 global crisis, where there was a massive job loss and an economic depression for most people. So, they are maybe more reticent to spend money, to be better prepared in case of another economic crisis coming in a near future. Despite economic-related questions being made in the survey, none was asking for economic concerning, which might be a driver.

Aside from this test, there is another finding relating to this matter. An MCA was carried out considering the subject's age group, along with their statement related to travelling closer and how do they feel that COVID-19 made them change planes for other transport means. The following result was obtained.

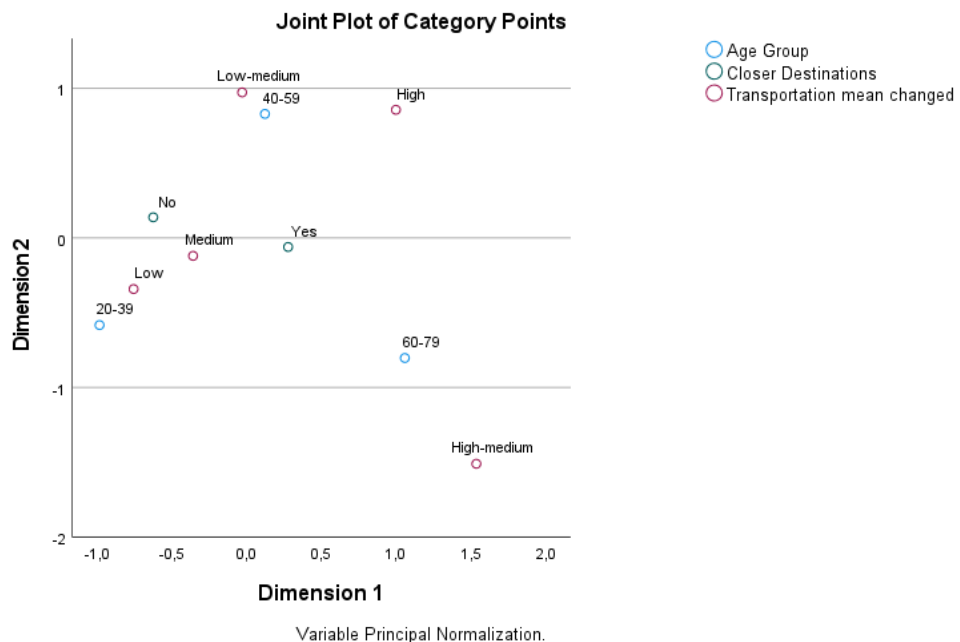


Figure 40 MCA plot representing the variables interdependencies between flying less, flying closer and age

Interpreting Figure 40, it can be appreciated how the 20-39 age group is lying close to a “low” rate on changing transportation mean since the pandemic started. However, this does not seem



to be related to going to closer destinations. From this, it can be stated that the 20-39 years old population is not changing planes for other transport means, like cars or trains, but this is independent of them travelling closer, which is given in some cases.

On the other side of the plot, a similar relationship can be observed for the 60-79 group, the cases found within this range seem to agree on the statement of stopping travel by plane and shifting to other transports. It can be observed how the relationship between these two responses is still stronger (they are farther from each other, but further away from the coordinate origin).

Also, a slight correlation of these two variables with the people confirming to be travelling closer can be observed for this ageing group. If the plot is analysed along a cross-table between travelling closer and stopping to fly, it can be seen how a high proportion of those votes stating to be shifting from plane also confirmed to be travelling closer. However, this trend was also given for the other values (at a slightly lower rate). That is why the correlation with this variable is weaker (making it tend to zero on the MCA plot). All these can be summed up into the ageing sector stepping aside air long-range trips to do short-range trips by ground.

Finally, the 40-59 age group does not seem to have stopped from flying, but just in some cases, as that "Low-Medium" trait falls close to this age group.

It is interesting to note that relating to this analysis, 20-39 population and 40-59 one should be a lot more related with regards to the first test, having them both significantly different data distribution when compared to the 60-79 group. However, this mid-age partition was found out to see a lot more similar to the ageing sector than to the youth on that test. The reason for this might be that this plot is based on a more subjective question, so in this sample, mid-age population perception might differ from reality at a higher rate than those under the other two categories.

This could explain the logic between the obtained results on the first test. In there, no relation between their economic or COVID-19 concerns and flight rate was found. Again, the same issue may happen, where they give similar responses to the 20-39 group ones, but things are not that similar in real life.

Going on to the next finding, a relationship between personality factors and flight rate was also found. To observe how these traits influenced flight rate, factor analysis was carried out for all 6 variables, obtaining the following plot.

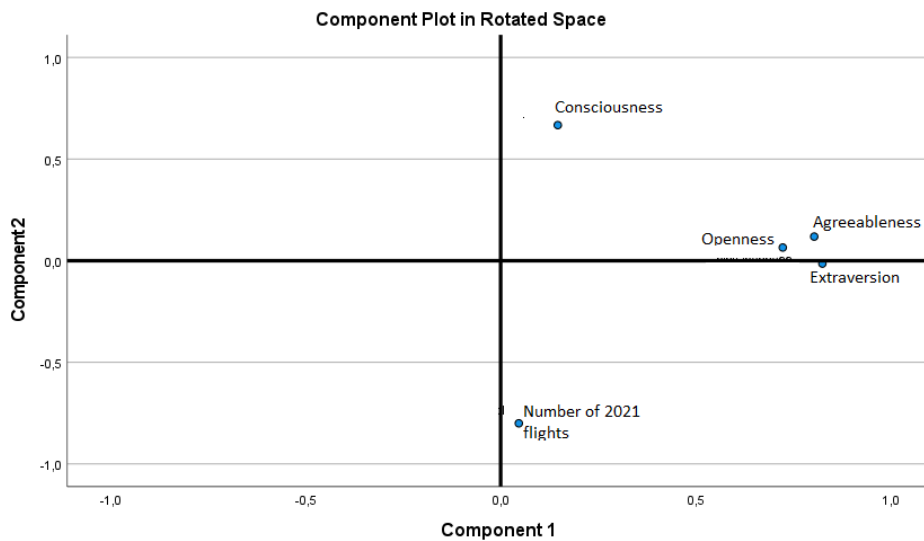


Figure 41 Factor analysis results on personality traits along 2021 fly rate

Regarding the Figure 41 plot, two factors explaining this model and the given relationship gets clearly described. Looking at variables position in the map, it can be observed how openness, agreeableness and extraversion fall very close to each other. This means there is a strong and positive correlation between the three of them. Indeed, this may not be accurate because the three traits do not necessarily score higher or lower together with regards to an IPIP test. However, it has to be pointed that these attributes were rated by the respondents themselves, and from what was learnt when doing a review on factors predicting people's willingness to fly, the actual meaning of these psychological terms is different from the collective imaginary idea, where these three traits are usually thought of being strongly related.

On the other hand, consciousness and flight rate are relatively aligned over the vertical axis, meaning they are proportional. However, the Consciousness trait lays over the positive values for the 2<sup>nd</sup> factor while Flight rate is on the negative ones. This positioning means that they are opposite to each other, so the higher a person rated in consciousness, the lower number of flights have taken during 2021.

No interaction between consciousness-flight rate and the three grouped personality traits seems to be given since each group lies in a perpendicular axis.

Related to neuroticism, the variable was left out of the study because did not have any relation with the others, meaning that a 3<sup>rd</sup> factor had to be introduced, adding nothing to the solution at the cost of noise.

To see if factor analysis was reliable, KMO and Bartlett's Sphericity tests were applied, obtaining a KMO higher than 0.6 and a p-value lower than 0.001, meaning that factor analysis is suitable for this test.

### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,656
Bartlett's Test of Sphericity	Approx. Chi-Square	100,319
	df	10
	Sig.	<,001

Table 9 Factor analysis data

The same analysis was carried out regarding the 2019 flight rate, but no signs of correlation between consciousness and flight number were found. Obtaining the following plot.

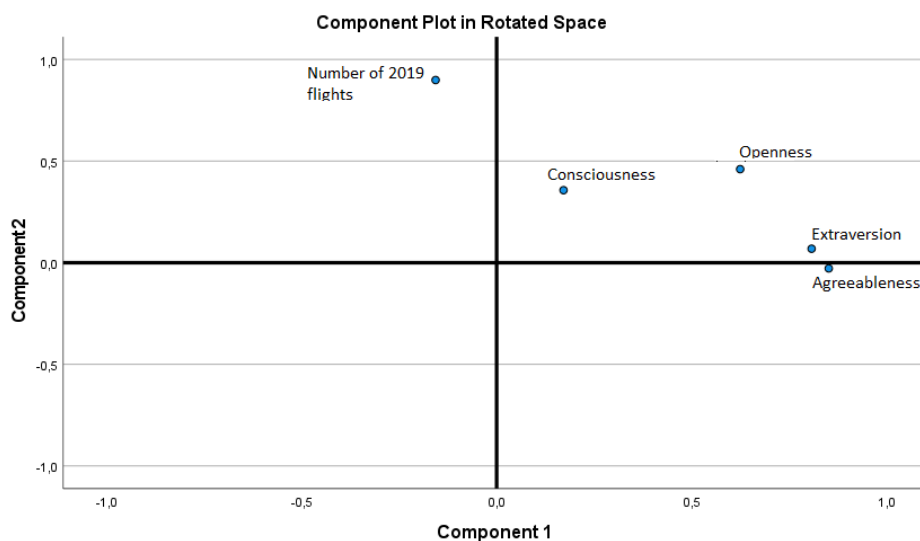


Figure 42 Factor analysis results on personality traits along 2021 fly rate

Thus, it can be concluded that, regarding the results obtained based on this sample, people that perceive themselves rating high on consciousness have been more reticent to travel during 2021, presumably, due to pandemics.

The next step within the analysis, is checking if people were consequent when answering the survey and make a test, similar to what was done during results, proving if there is a strong relationship given between the flight difference appreciated and the response given to "Stopped taking planes and using other means of transports due to COVID-19".

Again, a Kruskal-Wallis test was used in order to check population differences. And the following result was obtained.

Pairwise Comparisons of Transportation mean changed

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
High-medium-High	-3,424	14,635	-,234	,815	1,000
High-medium-Medium	5,095	14,071	,362	,717	1,000
High-medium-Low	31,883	13,423	2,375	,018	,175
High-medium-Low-medium	36,187	15,439	2,344	,019	,191
High-Medium	1,671	11,618	,144	,886	1,000
High-Low	28,459	10,824	2,629	,009	,086
High-Low-medium	32,762	13,243	2,474	,013	,134
Medium-Low	26,788	10,048	2,666	,008	,077
Medium-Low-medium	31,091	12,617	2,464	,014	,137
Low-Low-medium	-4,303	11,889	-,362	,717	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 10 Kruskal-Wallis test for response value on "Changing from air transport means" against the flight difference between 2019 and 2021 in the number

As it can be observed in Table 10, the flight change rate is very polarized between the "Low and Low-Medium" responses and the other three higher values. So again, it can be concluded that survey data is congruent once more regarding these two questions.

Another interesting study, to compare data with the reviewed reports, is checking how COVID-19 risks are perceived depending on the subject age. To appreciate this, an MCA test was applied to the pandemic related questions along with age groups, obtaining the following diagram.

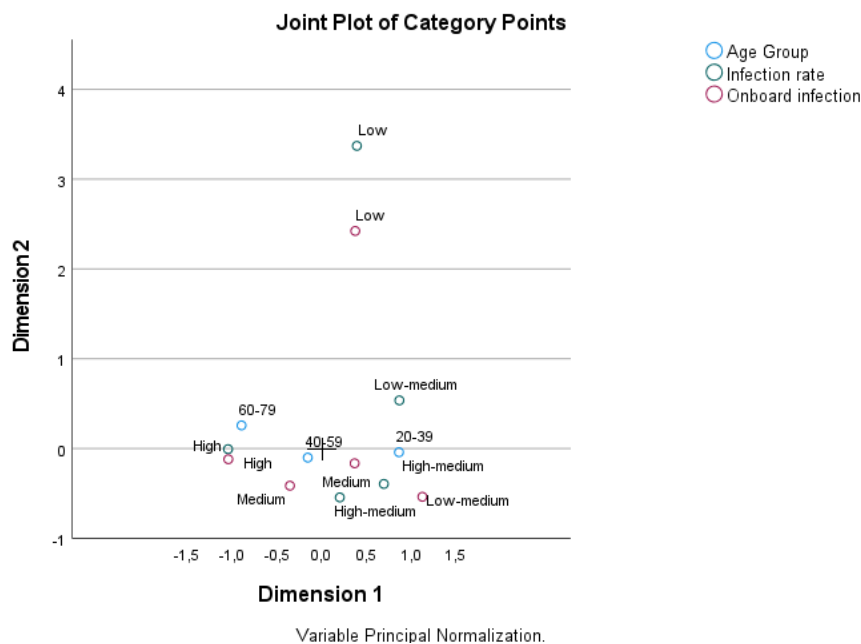


Figure 43 COVID-19 concerns rate along with age

When analysing Figure 43, the first thing to be noticed is that concerns about getting infected onboard are highly related to the given importance to a destination to be low on infection rate. This fact can be appreciated by observing how near fall each category to the same level. Relating these values to age, it is observed how the 60-79 sector falls near to High concern about getting infected onboard and on destination infection rate. This is an expected result, that gives insights

on why the ageing population has reduced more their flight rate compared to other groups, which was the first analysis evaluated.

Keeping with the analysis, it can be appreciated how the mid-age sector is near zero, again. This is happening because there is a lot of division among all the cases, with cases under that category voting for any of the options at a similar rate. Thus, no relationship can be observed between them.

Finally, regarding the younger group, it can be seen how it falls on the right side of the plot, along the zero axis and is completely opposed to high concerning votes on both risk perception variables. It must be noted that it is also close to both "Low-medium" rates on these factors. But with a considerable angle and low modulus. Meaning the connection is stronger to not having voted for High concerning more than it is to have voted for low-medium.

As expected, young people are the most careless about COVID-19 infection, while old people are the most concerned ones. Previously, it has also been observed how people under the old group were travelling significantly less than people under the young group. After seeing all these correlations, it was checked if onboard infection rate concern was related to a lower flight rate during 2021. This would lead to an explanation, at least partial, on why 60-79 people travelled significantly less.

To carry out this search, a Kruskal-Wallis test was applied for 2021 flights against onboard infection concern responses, obtaining the following distribution.

**Pairwise Comparisons of Onboard infection**

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig. <sup>a</sup>
High-Low	17,346	12,911	1,344	,179	1,000
High-Medium	17,503	10,800	1,621	,105	1,000
High-High-medium	19,224	10,305	1,866	,062	,621
High-Low-medium	35,676	10,455	3,413	<,001	,006
Low-Medium	-,157	13,634	-,012	,991	1,000
Low-High-medium	-1,879	13,245	-,142	,887	1,000
Low-Low-medium	-18,331	13,362	-1,372	,170	1,000
Medium-High-medium	-1,721	11,198	-,154	,878	1,000
Medium-Low-medium	18,174	11,335	1,603	,109	1,000
High-medium-Low-medium	16,452	10,865	1,514	,130	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 11 Kruskal-Wallis test on flight rate against onboard infection concern

Observing Table 11, paired tests can be observed to check if there were significant differences between each one of the populations. At first instance, it should be noted that cases who voted for "low" concern were very limited within the sample, so its results shall not be considered. Following the analysis, it can be appreciated how there is only a pair of significantly different distributions, and these are the group who voted for "High" concerning against the group who did for "Low-Medium".

Reviewing the MCA plot, it can be seen how these categories are the ones that were more voted<sup>7</sup> by each of the groups, so it can be stated that there is evidence of being concerned about COVID-19 stopping people from flying, and this concerns magnitude increase with the individual's age.

Surprisingly, the same relationship could not be found related to economical level or employment situation. Tests were carried out trying to get some correlation between these variables and fly rate, but the null hypothesis got accepted, meaning there was no significant difference between economics and fly rate. However, this does not fit with other reports, that define economical level to be an important driver of the willingness to fly, which would point in the same direction as economic reasons being the most-voted option for the best motive not to fly.

This leads to the conclusion of a badly formulated question regarding these terms, as it was suspected from the beginning, since defining self-economic situation is based on perception more than an objective value. Instead, asking about some descriptive variables like annual income could give better results.

Despite not finding more significant differences regarding fly rate. Education level was found to have a considerable impact regarding employment situation since COVID-19. To test this, a CA (correspondence analysis) was plotted, obtaining the following graph.

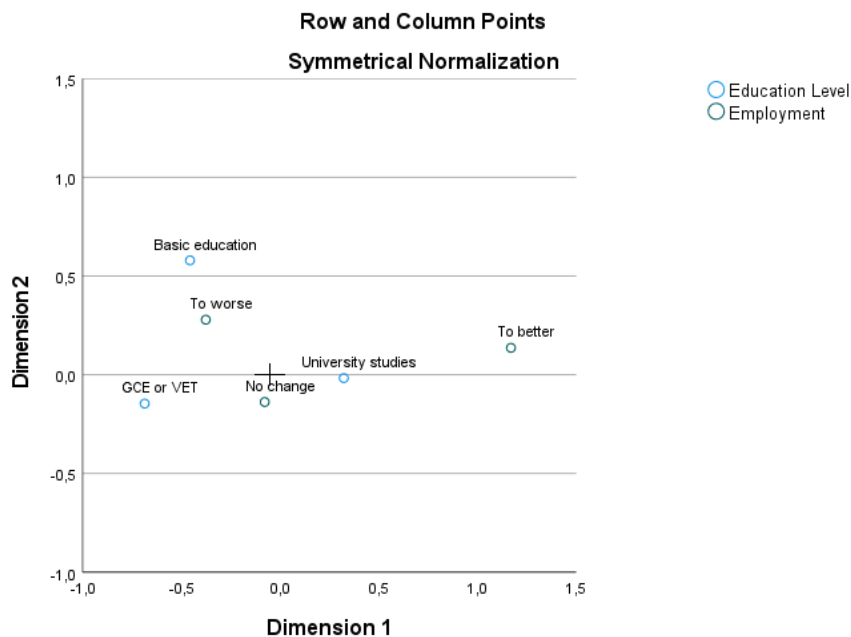


Figure 44 Correspondence analysis regarding employment projection since COVID-19 against education level

Looking at the plot in Figure 44, a very straightforward analysis can be done. To begin with, it was found that almost all the cases that declared their situation changed to better are those with university studies, but there are a lot of them who stated their situation as not changed, that is why "To better" spot and "University studies" are on a very close projection line, but first

<sup>7</sup> Not in terms of these categories getting most of votes of that group, but that the majority of votes for that category came from that single group.



one is further away from the origin. The same thing can be observed with people with a basic education level, that have a strong association with work status changing to worse. Finally, about those cases with GCE or VET studies, no direct association can be found, but being on the same projection line and the other side of the plot than "To better" spot, means there are none or very few cases who had this education level whose situation changed towards better.

This last data is not significant if analysed only within the framework sample and obtained statistics. Nevertheless, it can be of some help with regards to a better-portrayed model, in terms of economical matters, where employment situation might be a driver.

## Conclusions

This study objectives were to find out the main drivers influencing people's willingness to fly by analysing sample data, along with the current environment.

In the first instance, the meaning of leisure flight, along with its evolution during the last years has been reviewed, to be followed by an analysis of the current socio-economical situation and studying the impact COVID-19 had on the general population's daily life. There have been some impactful findings, like the aviation market facing the greater economic depression of its history or the possible after-effects economic situation might have if governments apply an austerity program, in order to get recovered from COVID-19 applied measures, where a lot of money was spent.

Following to next steps, some reports related to this study objective have been reviewed, to see what methodologies are usually applied for similar purposes. It has been seen that the most used method oriented to get the sought data was the usage of surveys, distributed either to a specific population or general one, depending on the supposed hypothesis. In addition, their results have been analysed, so once the data processing of survey responses is over, findings can be discussed, as some of the survey questions are based on the reviewed reports. During this research, some reliable results have been found.

In the first instance, the interdependency between personality factors and willingness to fly leisure is important to consider when doing sales or popularity prediction models. From the results stated by the report, it looks like it is a matter of self-esteem and caring about others balance. As extraversion, affection, and similar traits, that had a positive impact, are usually related to being self-confident. However, agreeableness, fear, neuroticism in a COVID-19 environment is related to surroundings, either by one individual's endangering them, as it would be agreeableness, to the others endangering individual, which would be a closer attitude to someone pointing high on neuroticism.

On these reports, other results can be highlighted. Mainly, it is interesting naming the people who business flight being more open to leisure flight and also, the third age population feeling more motivated to fly with safe COVID-19 and diagnosis tests, even if they have to go into quarantine.

Along with the acquired knowledge about flight data and socioeconomic dynamics, a survey trying to clear out which are the main drivers and reasons for people to fly leisure have been evaluated. The survey has been distributed among the general population. However, and after seeing the obtained results regarding economic or political view distribution, it can be concluded that these cases have not been as diverse as expected. This is probably a consequence of respondents being acquaintances, as people's surroundings and relationships are not filled up with the most possible heterogenic sample. Nevertheless, the result analysis and data processing allowed to make some important findings.

The stronger correlation given was found to be people changing their travel means, to be travelling closer and older. This is a very descriptive correlation, speaking of a travelling trend based on discovering one's surroundings, avoiding long-ranged air travels. There might be two



main factors behind this behaviour. In the first instance, as it has been found out in the first chapter, it is proved how people travelling closer tend to spend less on both transport and accommodation. Thus, making the trip itself significantly cheaper, this makes sense with regards to the last question top choice, about what is the main reason not to travel, being economical. Also, this gets reinforced by the economic uncertainty in COVID-19 times.

In the second instance, and keeping in mind the fact this trend is also related to age, it seems to exist a relationship, in people's perception, on travelling closer as travelling safer, which also includes the flight process. This is linked to age because, as has been observed by data analytics, old people tend to be a lot more concerned about COVID-19 risks than younger populations.

With regards to this issue, safer and more restrictive flight measures would probably encourage people to fly, but that would probably imply not flying at full capacity or increasing cabin crew members to continuously be disinfecting the passengers' cabin and make sure people respect hygienic and health recommendations.

Both economic and health situation does not seem to be changing in a short period. Hence, it is expected for this travel trend to be lasting long.

Relative to the personality traits that influence willingness to fly leisure, a significant difference has been found between the reviewed literature and the obtained results. As stated before, this might be given by the difference in test typology when drawing cases' personalities. However, and despite not being able to validate results, this might have given unexpected insights on the matter, as consciousness was not found as an influential factor in the literature, it was the only one that provided significant differences in this study.

Another disagreement between the survey's results and the literature findings is old people care less about having to go into quarantine. The UK study results were not replicated by this survey. That report exposed that as the ageing sector is no more an active worker population, they do not have to meet a stipulated holiday period, so they can have longer stays on their destinations. However, this is not being accomplished by the old group of respondents. This reason might be given because of a difference in economic possibilities. As long as it is true that tourism quarantine requires a longer period stay, this inevitably leads to a higher expense of the trip. Thus, as UK residents have a higher economic status on average, they are probably more willing to afford this extraordinary cost than Spanish ones.

## Future work

Despite study objectives being fulfilled, there is also room for longer investigation regarding this matter.

The first thing that could be done is repeat this same survey and analysis among a different population, to see if the same patterns and drivers are observed, validating this way the obtained results.

Following possible work related to improving the investigation quality, another survey, based on this one but reinventing how some questions are asked, to have more accurate data could be carried out as well. This way, it could be proved how economics affect flight rates or how important is health condition not only on travelling frequency but on the COVID-19 risks perceived, or the most preferred mean of transportation.

On another note, some work trying to get a significant and reliable predictor model could be done. As it would give a better explanation of how does the underlying structure behind consumer behaviour works and how do variables relate to each other.

Related to getting more insights on how different factors influence travellers' attitudes, a deeper investigation could be made regarding personality factors. Maybe, the usage of similar populations in age and other discriminant variables found, excluding the personality ones, could be subject to different personality tests, focusing not only on the big 5 factors theory but a wider range of psychological methodologies, trying to see if a more faithful model of willingness to fly depending on personality traits can be developed.

Finally, further work could be done from the point of view of the airline industry, thinking and trying to test different measures that would encourage people to fly as much as they did before COVID-19.

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