

Louvain School of Management

"The impact of airline alliances on brand perception and loyalty among adults aged between 20 and 60 years old: a study of awareness and attractiveness"

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Declaration Regarding AI Tool Usage in Master's Thesis

During the preparation of this master's thesis, the author used CHATGPT for the following purposes:

1. Explanation of certain concepts/terms.
2. Search for synonyms and rephrase certain sentences.
3. Help understanding Stata: suggestions and explanations of commands to use, and to understand some outputs.
4. Help understanding the different elements of the thesis and their layout (composition of the abstract).
5. Help explaining how to insert page numbers in Word.

After using CHATGPT, the author diligently reviewed and edited the content produced by the tool. We take full responsibility for the final content presented in this thesis.

By signing this declaration, we affirm that the content of this master's thesis reflects our original work, augmented by the responsible use of IA.

Completed and signed on 24 July 2025 in Ramillies

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Abstract

In a competitive and constantly growing sector as aviation, being part of an airline alliance, such as Star Alliance, Skyteam and Oneworld, can become a key asset in airline strategy. These alliances enable airlines to expand their networks, share many costs, and boost their global visibility. Beyond their operational advantages, alliances can also play an interesting role in marketing, by developing travellers' awareness, attractiveness and loyalty to airlines.

In this thesis, we explore the impact of airline alliances on travellers' perceptions of the reputation and attractiveness of member airlines, as well as their loyalty thanks to the Frequent Flyer Program, which travellers can join to gain access to benefits within the alliance. To this end, a quantitative survey has been carried out among the general public.

After analysing the data collected using Stata statistical software, we found that belonging to an airline alliance has no influence on the reputation and attractiveness of member airlines, and that customers are not loyal because they are members of an alliance, but probably for other criteria. However, adults with more life experience, and perhaps travel experience, are more influenced by this membership criterion than young people.

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INTRODUCTION

More than 4.96 billion passengers flew around the world in 2024 (Statista, 2025). In a sector where competition is tough, how do companies manage to stand out from the crowd and win the loyalty of travellers?

Today, the air transport sector is one of the main pillars of international mobility, facilitating economic, cultural and tourist exchanges on a world scale. This constantly evolving market is marked by fierce competition between the various airlines. They must continuously innovate to acquire and maintain the loyalty of their constantly demanding customers. In this environment, airline alliances, such as Star Alliance, SkyTeam and Oneworld, play a significant strategic role. Together, they sell 61% of the flying seats per year (IATA, 2016). By gathering various airlines under the same name and logo, they make it easier to extend the network of destinations, optimise costs, and offer passengers shared benefits, such as the Frequent Flyer Programs. (IATA, 2011)

At a time where customer loyalty is a key element of an airline strategy, it is pertinent to study the impact of airline alliances on the perception of brands, their attractiveness and the loyalty of passengers aged between 20 and 60 years. This age group, which includes both young travellers and more experienced profiles, offers a comprehensive view of current air travel behaviour and expectations. (Seliman et al., 2023)

The main objective of this thesis is to measure the impact of airline alliance membership on three key dimensions: brand awareness, brand attractiveness and customer loyalty. The analysis focuses on adults aged between 20 and 60, a strategic target group for airlines. One part of the group is often more mobile and more attentive to the way they travel, while the other part is often more experienced (Seliman et al., 2023). The study aims to understand the extent to which an airline's membership of an alliance, such as SkyTeam, Star Alliance or Oneworld, can influence how these passengers may view it, compared with airlines that do not belong to any alliance. This approach will allow us to better identify the factors of attractiveness and retention in a context of strong competition and transformation of the airline sector.

This research will focus on “*What is the influence of belonging to an airline alliance on the brand awareness, attractiveness, and customer loyalty of airlines among adults aged 20 to 60?*”

This research will be structured as follows:

We begin with a literature review to better understand the various concepts mentioned in the question. This part is divided into 4 chapters, which summarise existing data and highlight the key concepts. The first one is about the alliances, the definition and some key concepts to understand them. The second one is about the 3 airline alliances and their advantages for the members. The third one explains what brand awareness and brand attractiveness are. And the last chapter talks about loyalty with customer loyalty, loyalty program advantages and the different frequent flyer programs in the airline industry.

The second part of this thesis is dedicated to the empirical research, with 4 chapters. First, the research question and the hypotheses, as well as the variables, are described. Secondly, the research method is explained, including the target population and the survey used to gather the data required for the analysis.

The third part is dedicated to the analysis of the results and to discussing these results.

Finally, a conclusion is given to summarise the research, as well as some managerial recommendations. The limitations encountered in the course of this work are also stated to assist future research.

PART 1: LITERATURE REVIEW

CHAPTER 1: ALLIANCES: KEY CONCEPTS AND DEFINITIONS

This thesis is based on a key concept: **alliances**. The following section defines the term and highlights the benefits and risks for members.

1. Expanding strategies

There exist different strategies for companies to expand. Among these, joint ventures and strategic alliances are the most popular.

A **joint venture** is a new entity created by two or more companies, sharing tacit knowledge and establishing a long-term relationship to have a competitive advantage (Mohammed Belal Uddin & Bilkis Akhter, 2011). For example, Lockheed Martin and Boeing made a joint venture called United Launch Alliance (ULA), and with this company, they launched the Curiosity rover.

Although popular, strategic alliances are often preferred. They are more flexible, less costly, can be set up more quickly and enable companies to maintain their autonomy while working towards common goals. Companies are increasingly opting for such strategic alliances. (Pierre-Xavier Meschi, 2022)

By joining an alliance, companies combine their resources, technologies, knowledge, and personal advantages to create a long-lasting competitive advantage that they could not achieve alone. (Stephan Wohlers, 1999) It can also be described as a contractual partnership.

Alliances may vary according to the partners, the desired objectives and the commitment of each party. There are 4 main reasons for working together and creating an alliance (Klavdij Logozar, 2023):

- Market expansion and an increase in income
- Cost reduction and improving efficiency
- Risk sharing or reduction
- Access to other skills.

2. Alliance definition

Debora B. G. Q. Silva defines a strategic alliance as “a *collaborative agreement among companies from the same industry that maintain their individuality and autonomy even though they have some common goals.*”

We distinguish 2 main categories in strategic alliances: equity strategic alliance and non-equity strategic alliance.

The first refers to the fact that two or more companies hold shares in a member company of the alliance and vice versa. This creates a stronger and more stable link between the companies. The companies also share resources, such as production and R&D. For example, Toyota invested in Uber to develop technologies that enable autonomous vehicles.

The second one is based on a contract alliance to ensure competitive advantages. In this case, companies do not have equity shares in each other, but they still share their knowledge and resources with each other. This process is easier to implement compared to the first one. For example, Google and Samsung made an alliance to compete with the IOS services of Apple. Indeed, when you buy a Samsung product, the Google services are already installed in the product by default. (Mohammed Belal Uddin & Bilkis Akhter, 2011)

3. Advantages and disadvantages of alliances

Joining an alliance offers companies a wide range of strategic advantages that enhance their competitiveness in the marketplace. In an increasingly complex and globalized economy, operating alone often limits a company's ability to reduce costs, innovate or grow. By collaborating within an alliance, companies can share resources, learn from their partners and achieve goals that would be difficult to achieve independently. For example, alliances facilitate export growth, support new product development, and enable economies of scale and business diversification. They also help to reduce research and development costs, while providing access to new markets, new technologies, new customer bases and other valuable resources. In addition, alliances can lead to increased production efficiency and the development of strategic competencies essential to long-term competitiveness (Klavdij Logojar, 2021; Nicolata B. et al.).

Despite the many benefits that alliances can offer, companies need to approach them with caution, as numerous studies highlight a high failure rate. Bamford, for example, reports that between 30% and 70% of alliances fail to achieve their objectives. Allaying involves shared decision-making, which can create tensions when partners disagree on strategic objectives, have incompatible management styles, or suffer from a lack of communication. In addition, cultural differences between companies, unrealistic expectations or the inability of one member to provide promised resources or technologies can contribute to the breakdown of an alliance. Another important risk lies in becoming too dependent on a partner's assets, which can weaken a company's autonomy or flexibility (Nicolata B. et al.).

4. Key factors of success

When choosing partners, it is important to be sure of several points.

Firstly, it is important to consider the risk involved in joining an alliance. The two significant risk factors are the withdrawal of commercial expertise provided by one of the alliance partners or the realization that the financial side is not going in the right direction, with high transaction costs and uncertainty over profit sharing. Companies should avoid alliances when they must invest more money than they have available.

Secondly, it is important to be part of an alliance where shared skills and expertise are complementary and relevant to the products and services offered by the company. To be part of an alliance that does not provide useful resources can be a loss of time and money.

Thirdly, an alliance is a two-way street; there is no leader position where a company provides information, technologies or resources without getting anything in return. Everyone learns from everyone else. It is a cooperative culture.

Finally, the objectives must be compatible. Member companies must have their own objectives as well as objectives specific to the coalition. Conflicting objectives are a risk for the alliance to fail. The agreement must also achieve strategic objectives that would not have been possible without the strategic alliance and the sharing of resources between the companies. (Klavdij Logozar, 2021)

CHAPTER 2: THE THREE AIRLINE ALLIANCES

In this section, we present the criteria for airlines to be a member, the three main alliances existing in the airline sector and underscore their benefits for their members.

1. Members' criteria

Joining an alliance is a rigorous process, requiring validation of numerous criteria, both financial and related to service quality, to ensure a good customer experience. Each alliance has its criteria, but there are many similarities. First and foremost, the network must be extensive and interconnected, enabling the alliance to expand its choice of destinations. Secondly, airlines must comply with the safety standards imposed by law, ensuring safe flights for passengers and staff. Next, they must deliver quality service, always on time and with impeccable customer care. Then, future members must have code-sharing capabilities. They must also be willing to align their loyalty program with that of the alliance. They must also show their commitment to the alliance by demonstrating their willingness to cooperate and work as a team with other members. Then, companies must demonstrate social responsibility. Finally, on the financial front, companies must be financially stable and profitable and show that potential growth is possible. (Skyteam, 2025) (IATA, 2025) (AeroTime, 2023)

By validating all this, a company will be accepted into an airline alliance.

2. The main airline alliances

Star Alliance is the first of the three world-famous airline alliances. It was founded on May 14, 1997, by five airlines: Lufthansa, United Airlines, Thai Airways, Air Canada, and Scandinavian Airlines (member until 1/09/24, left to join SkyTeam). From 1997 to 2025, numerous airlines joined and left the alliance. Today, the alliance comprises 25 airlines, some are recognized as major airlines worldwide, while others are smaller regional airlines (Star Alliance, 2025):

- The founders and
- Aegean Airlines
- Air China
- Air India
- Air New Zealand
- All Nippon Airways
- Asiana Airlines
- Austrian Airlines
- Avianca
- Brussels Airlines
- Copa Airlines
- Croatia Airlines
- Egyptair
- Ethiopia, Airlines
- EVA Air
- LOT Polish Airlines
- Shenzhen Airlines
- Singapore Airlines
- South African Airways
- Swiss International Air Lines
- TAP Air Portugal
- Turkish Airlines.

ITA Airways will join the alliance in 2026 following its integration into the Lufthansa group in 2025.

The Star Alliance headquarters have been in Frankfurt, Germany, since 2000. In 2021, Star Alliance established a Centre of Excellence in Singapore. During the *World Travel Awards* held in November 2024, Star Alliance was named the World's Leading Airline Alliance for the fifth consecutive year. Moreover, the alliance offers numerous benefits for customers, with a *Frequent Flyer Program*, like lounge access, priority check-in and boarding. (Star Alliance, 2025).

SkyTeam is the second Alliance between airlines. It was founded on June 22, 2000, by 4 airlines: Aeromexico, Air France, Delta Air Lines and Korean Air. But it first started with an exclusive long-term strategic agreement between Delta and Air France. Today the alliance comprises 19 airlines from different continents with small or high notoriety in the world (SkyTeam, 2025):

- The founders and
- Aeolines Argentinas
- Air Europa
- China Airlines
- China Eastern
- Garuda Indonesia
- Kenya Airways
- KLM
- Middle East Airlines
- SAS
- Saudia
- TAROM
- Vietnam Airlines
- Virgin Atlantic
- Xiamen Air

The headquarters of SkyTeam are in Amsterdam, the Netherlands. The mission is to offer customers the smoothest travel of any global alliance. Alliance members work together to

connect millions of passengers across a vast global network. SkyTeam offers comprehensive priority services, easy and efficient transfers, and the ability to earn and redeem miles with *Frequent Flyers Benefits* on all member airlines. (SkyTeam, 2025)

Oneworld is the last Airline Alliance of the three world-famous alliances. It was founded on February 1, 1999, by American Airlines, British Airways, Cathay Pacific and Qantas. The airline alliance comprises 11 other well-known or small national members (Oneworld, 2025):

- The founders and
- Alaska Airlines
- Fiji Airways
- Finnair
- Iberia
- Japan Airlines
- Malaysia Airlines
- Oman air
- Qatar Airways
- Royal Air Maroc
- Royal Jordanian
- Srilankan Airlines

The headquarters of Oneworld were first located in Vancouver, Canada, and then New-York, United States, for more than 10 years, and now the alliance is based in another city in the USA, Fort Worth, Texas. This alliance also offers some advantages to its customers, named *Oneworld Priority*. With this program, customers have access to a lounge, priority check-in, additional baggage, and priority boarding, for example. (Oneworld, 2025)

In the next table, we can compare the 3 alliances with some interesting figures:

	SkyTeam	Star Alliance	Oneworld
Destinations	1,000 +	1,300+	900+
Annual passengers	624 million +	727,62 million	500 million
Countries	160 +	195 +	170
Numbers of Lounges	750 +	1,000+	Nearly 700
Daily departures	13,600+	19,000+	13,000
Fleet	4,300	5,013	3,400
Market share	13,7%	17,4%	11,9%
Numbers of employees	356,998	431,500	360,000

Table 1 – Comparison of figures between the three airline alliances(2022)

These figures indicate that Star Alliance is the largest in the market, with 17% of the market share, and offers travellers the greatest number of destinations, followed by SkyTeam with nearly 14% of the market and then Oneworld with almost 12%. (Skyteam, 2025) (Star Alliance, 2025) (Oneworld, 2025)

3. Benefits for the members

Beyond strategic coordination, alliances allow member airlines to implement their collaboration through the combination of various tangible and intangible resources. For instance, companies can reduce costs by jointly purchasing fuel, onboard supplies, or by sharing infrastructure such as airport lounges and common hubs (Anduamlal Allelign, 2014). Marketing expenditures and research and development efforts are also frequently centralised, facilitating the joint creation of new products or services (Debora B. G. Q. Silva, 2012).

Another key operational benefit is the use of code-sharing agreements, which allow airlines to market and sell seats on each other's flights. This practice significantly expands the range of destinations and flight schedules available to customers. For example, a passenger flying from Brussels to New York may book through Brussels Airlines, even though the flight is operated by United Airlines, both being part of the same alliance (IATA, 2011). However, it is not because companies are part of an alliance that they have code-sharing altogether. It remains an agreement between two airlines independently of the alliance, but thanks to the trust established by the alliance, it is easier to agree on prices, routes, and frequency. So, airlines that are not part of an alliance can also offer the advantages of code-sharing with other airlines to their travellers. For example, Emirates (not in one of the 3 main alliances) has an agreement with Qantas (Oneworld). (Flywest, 2025)

Finally, alliances offer a strategic gateway to global markets. By partnering with airlines from different continents, each member can extend its presence into new geographic areas, diversify its customer base, and strengthen its market position. This global reach translates into increased market power and a stronger competitive stance against non-member airlines (Debora B. G. Q. Silva, 2012).

CHAPTER 3: THE NOTION OF BRAND AWARENESS AND ATTRACTIVENESS

After the definition and analysis of alliances, it is necessary to define the concepts under study, such as brand awareness and attractiveness. These two concepts may seem similar, but they are quite distinct.

1. Brand awareness

The definition of brand awareness is “*knowledge of the name of a company and the products it sells*” (Cambridge Dictionary, 2025). It refers to the level of awareness a customer has about a brand. For a customer to be more aware of the brand, it is also important for the brand to be consistent with the message, image, and tagline they share with the public, so that it lasts and is recognised easily in the future. For example, when the tagline “Just do it” is said, most people know that it is a Nike slogan, and in their advertising, they rotate around this sentence, which involves showing determination, self-improvement and inclusivity. (Tara Gustafson and Brian Chabot, 2007)

There are three levels of brand awareness: recognition, recall and top-of-mind. The first one means that a consumer can recognise a brand with their logo, tagline or packaging. It is not spontaneous because they see something that helps them to remember the name of the brand. The other one is the recall, it means that the consumer can name a brand just by memory, no need for a logo, it is more spontaneous. The last level is the top-of-mind awareness. It means that the customer thinks about this brand directly, the first brand that comes to his mind, no need for the logo or time to think. (P. Chandon, 2013)

Consumers will always prefer to buy from a brand they know and are aware of. They are more hesitant when they do not know the brand and might do market research or ask other people whom they trust to be sure before buying a product there. If they get bad information, they might not buy it. So, having a positive image is favourable for the brand. (Z, Shahid and al, 2017).

2. Brand attractiveness

The other notion is brand attractiveness, which is explained as the brand's ability to attract customers and the customer's willingness to buy. For another point of view, the authors Célestine Annie and Tengho Metchum wrote a similar definition about this notion. They say

that “*the brand’s attractiveness is the capacity and the aptitude of those brands to attract customers towards them*”.

Different characteristics make a brand in the airline industry attractive to the customer, like the price of the tickets, the quality of the services proposed, the innovation, the security, the cabin facilities, the airline operations (schedules, connections), the cabin crew professionalism, the flight conditions, the additional charges, and the payment channels. All of this creates value for the company, and it helps them to make themselves known, attract and satisfy customers and gain an advantage over their competitors. (Diego Ramón Medina-Muñoz*, Rita Dolores Medina-Muñoz, Miguel Ángel Suárez-Cabrera, 2018)

CHAPTER 4: CUSTOMER LOYALTY IN THE AIRLINE INDUSTRY

1. Definition

The Cambridge Dictionary defines the word loyalty as “*The quality of being loyal*”; “*The feeling of support towards someone or something*”. They also define the word customer loyalty as “*The fact of a customer buying products or services from the same company over a long period of time*”. This definition helps us to understand that customers choose a company over and over for diverse criteria like price, quality, satisfaction or maybe because they want to support this brand, all of this makes them loyal to the brand.

The concept of customer loyalty is defined as the repeated purchase of goods and services despite external influences and based on the customer's experience and their future expectations. If consumers continue to buy the company's products and services despite the company's mistakes, they can be considered loyal customers. In a competitive market such as the airline industry, companies need to retain their customers to gain market power. Moreover, the more faithful a consumer is to a company, the more likely they are to recommend it to their family and friends; therefore, it's essential for companies not to overlook this aspect.

Moreover, there are two types of loyalty: behavioural loyalty and attitudinal loyalty. The first, loyalty is linked to customer behaviour, with their frequency of purchase. Attitudinal loyalty, on the other hand, refers to people's attitude towards something like a brand. It is the psychological commitment to the company's products or services. Thanks to this kind of loyalty, the customer may or may not recommend the brand to others. (Hande Şahin, Ali Osman Kuşakcı, Baboucarr Mbowe, 2021)

2. Loyalty program

A loyalty program is a customer relationship management tactic and an integrated system of marketing actions and communications, offering a range of rewards to loyal customers. There are tangible rewards such as discounts, gifts and vouchers. Then there are intangible, symbolic rewards, for example, access to exclusive events, recognition status by giving a premium membership card. These rewards play a role in emotional loyalty because they reinforce the customer's attachment to the brand. (Lars Meyer-Waarden; Johan Bruwer ; Jean-Philippe Galan, 2023)

Those programs are used for various reasons. First, to increase the turnover by increasing purchase levels or expanding the range of products purchased from the supplier, and to have a wider range of products to offer. The program can be used to encourage specific buyer's behaviour (Evanschitzky et al., 2011). By doing so, the company will arouse an attitudinal response that will translate into greater brand attachment. The second reason is to improve the relationship between the customer and the brand, and so to retain many customers. Literature shows that loyalty programs improve and strengthen the relationship and have a positive impact on customer retention (Elvira Tabaku, Mirela Zerellari).

Another purpose is to collect data about the customer. That data can help the company to know more about some performance indicators, like the redemption rate or to collect information about the gender-age, the country of residence,... of their customers (Kumar & Shah, 2004). This can help to segment consumers and so have a more personalised and targeted marketing strategy by knowing their habits, needs, and behaviour towards the brand (Rosenbaum, Ostrom & Kuntze, 2005).

Loyalty programs are also one of the most effective ways of increasing brand awareness and a long-term relationship between the brand and its customers. We know that to retain a customer it costs 5 times less than to gain a new one (Reichheld & Sasser, 1990). A lot of companies have developed loyalty programs like Quick with MyQuick or Starbucks with Starbucks Rewards, and of course, airlines have also loyalty programs like Qatar Airways with the *Privilege club* program or *Flying Blue* for Air France and KLM. Each of these programs has statuses, and they reflect the degree of loyalty shown by customers (Hande Şahin, Ali Osman Kuşakcı, Baboucarr Mbowe, 2021).

3. Frequent Flyer Programs

First, it is important to remember that loyalty programs in the airline industry are nothing new. The first initiative was launched by Southwest Airlines in the early 70s, with *Sweetheart Stamp*, the aim of which was to attract travellers. On each flight, the customer received a stamp on their loyalty card, and after a certain number of stamps, the passenger received a free ticket. This program led to the creation of the first airline loyalty program *AAdvantage*, created by American Airlines (Oneworld founder) in 1978. The main objective of this Frequent Flyer

program was to offer empty seats to frequent business travellers to use all the airline capacity. (Hande Şahin, Ali Osman Kuşakcı, Baboucarr Mbowe, 2021)

The aim of Frequent Flyers Programs is first and foremost to build customer loyalty by offering various rewards such as free tickets, promotions, upgrades, etc. The other aim is to stand out from rival airlines. These programs are not only beneficial for the consumer, but also for the airlines, which may see an increase in their sales, free advertising or increased customer loyalty. Another benefit for airlines, which is not often mentioned, is the ability to collect demographic data to segment customers and offer them personalised services. (Hande Şahin, Ali Osman Kuşakcı, Baboucarr Mbowe, 2021)

As said previously, each alliance offers different advantages regarding the status of the member.

For **Star Alliance**:

STAR ALLIANCE	Silver member	Gold member
Priority reservations	Yes	Yes
Waitlist	Yes	Yes
Priority airport stand-by	Yes	Yes
Priority Airport Check-in	No	Yes
Priority baggage handling	No	Yes
Airport lounge access	No	Yes
Priority boarding	No	Yes
Extra baggage allowance	No	Yes
Gold track	No	Yes

Table 2 – Star Alliance loyalty program advantages

However, each airline has its own rewards program, and each status is equivalent to a Star Alliance status. For example, the Lufthansa Group offers the *Miles & More* program with different statuses: Miles & More members are equivalent to a status in the Star Alliance program, Frequent Traveller is equivalent to Star Alliance Silver status, and Senator and HON Circle are equivalent to Star Alliance Gold status. (Star Alliance, 2025)

For SkyTeam:

SKYTEAM	Base member	Elite member	Elite + member
Extra baggage allowance	No	Yes	Yes
Priority check-in	No	Yes	Yes
Bag drop	No	Yes	Yes
Preferred seating	No	Yes	Yes
Priority boarding	No	Yes	Yes
Priority airport standby	No	Yes	Yes
Priority waitlist	No	Yes	Yes
Lounge access	No	No	Yes
Sky Priority recognition	No	No	Yes
Priority transfer desk	No	No	Yes
Priority baggage delivery	No	No	Yes
Guaranteed reservations	No	No	Yes
Priority security & immigration	No	No	Yes

Table 3 – SkyTeam loyalty program advantages

As for Star Alliance, each airline has its own program with an equivalent status in the SkyTeam program. For example, KLM is part of the *Flying Blue* program with different statuses. An Explorer at KLM is equivalent to a basic member within SkyTeam status, a Silver is equivalent to an Elite member, and finally, Club 2000, Gold, Platinum, Platinum for life and Ultimate are equivalent to an Elite Plus member in the SkyTeam program. (SkyTeam, 2025)

For **Oneworld**:

ONEWORLD	Ruby member	Saphire member	Emerald member
Access to preferred or pre-reserved seating	Yes	Yes	Yes
Priority in waitlists and when on standby	Yes	Yes	Yes
First & Business class lounges	No	Yes*	Yes
Business class priority check-in	No	Yes	Yes
Priority boarding	No	Yes	Yes
Additional baggage	No	Yes	Yes
Priority baggage handling	No	Yes	Yes
Fast Track	No	No	Yes
First Class priority check-in	No	No	Yes

Table 4 – Oneworld loyalty program advantages

*= Only access to the business class lounges

Like for the two others, each airline company has a loyalty program in which the status corresponds to one within the Oneworld alliance. For example, Cathay Airways offers the *Asia Miles* program with different statuses: Cathay Silver members are equivalent to the Ruby status, Cathay Gold is equivalent to the Saphire status, and Cathay Diamond is equivalent to the Emerald status in the program of Oneworld. (Oneworld, 2025)

To sum up, each Alliance operates as a network offering passengers several benefits in each of the member's airports, but the Frequent Flyer Program remains managed by the member airline with its loyalty program.

PART 2: EMPIRICAL RESEARCH

CHAPTER 1: RESEARCH QUESTION AND HYPOTHESES

1. Research question

This research aims to see whether belonging to an airline alliance influences the attractiveness and reputation of a company and the loyalty of people aged between 20 and 60.

The research question is as follows:

“What is the influence of belonging to an airline alliance on the brand awareness, attractiveness, and customer loyalty of airlines among adults aged 20 to 60?”

This research question can also be translated into a model; developing a research question model has several advantages. A model makes it possible to formalise what the study is trying to demonstrate. In this case, the aim is to understand the impact of membership of an airline alliance on various elements, brand awareness, attractiveness and customer loyalty. In developing the model, we make explicit which are the dependent variables, what we are trying to explain, and which are the explanatory variables, the factors that influence the dependent variables. A model can also be used to organise data collection by helping to determine which variables to measure in the questionnaire and statistical analysis, and by analysing the relationships between these variables. It also helps with the interpretation of the results during the analysis of the data.

The model used for this question is the following:

$$Y_1, Y_2, \text{ or } Y_3 = f(\text{Alliance membership}) + \text{Control variables} + \varepsilon$$

with Y_1 = Brand awareness, Y_2 = Brand attractiveness and Y_3 = Customer loyalty.

This model examines how Alliance membership affects the brand awareness, brand attractiveness and loyalty. To use it in a regression model, the equation was changed to this one:

$$Y_{1,2,3} = \beta_0 + X\beta_1 (\text{Alliance membership}) + X\beta_x + \varepsilon$$

With β_0 = the intercept, β_1 = the coefficient measuring the impact of the alliance membership, β_x = control variables (age, gender) and ε = the error term.

2. Variables

A dependent variable is a variable that the study attempts to measure and explain in relation to other variables, in particular the independent variables or explanatory variables that influence it. As the models above show, the dependent variables in this study are brand awareness, brand appeal and customer loyalty. The independent variable in this case is membership of an airline alliance.

Naturally, there are other variables which will not be analysed in this thesis, such as behavioural variables with consumer habits or personal experience with an airline, as well as variables linked to the market and competition.

3. Hypotheses

To respond to the research question, hypotheses have been formulated and will be tested using a questionnaire and a statistical study on Stata to validate or reject them.

3.1. Hypothesis 1

Brand awareness is defined as the capacity of a consumer to recognise or recall a brand in different categories (Keller, 1998). By being part of an airline alliance, member airlines engage in joint marketing campaigns, feature shared design elements at airports, which increases the visibility of all member airlines. In addition, alliances help smaller or lesser-known companies gain from the global image of the larger members, creating a “brand spillover effect” (Wang et al, 2011). Therefore, belonging to an alliance is likely to boost brand awareness among travellers.

H1: *Alliance membership has an impact on brand awareness.*

3.2. Hypothesis 2

The attractiveness of a brand is the result of a subjective evaluation of the brand's advantages as perceived by customers. (Zeithaml, 1988). In the context of air travel, the alliance expands the offer in terms of choice of destinations, easy connections, easy accumulation of frequent

flyer points, and access to airport lounges. These elements contribute to a perception of a more complete, flexible and international offer, factors particularly valued by frequent flyers.

Joining an alliance is therefore likely to boost a company's perceived attractiveness, independently of its services.

H2: Alliance membership impacts an airline's perceived attractiveness.

3.3. Hypothesis 3

Loyalty programs encourage repeated behaviour by offering future rewards (Dowling & Uncles, 1997). Today, loyalty programs are at the heart of corporate relationship strategies. When frequent flyer programs (FFPs) are shared within an alliance with different airline loyalty programs, passengers can accumulate and redeem points with multiple airlines, increasing the perceived value of the program and reducing the likelihood of switching airlines and alliances (Bolton et al., 2000). This strategy is particularly effective with frequent flyers, who seek to optimise their benefits within the same network.

H3: Belonging to an alliance impacts customer loyalty thanks to the benefits accumulated within the same alliance

3.4. Hypothesis 4

It is pertinent to study the impact of airline alliances on the perception of brands, their attractiveness and the loyalty of passengers aged between 20 and 60. This age group, which includes both young travellers and more experienced profiles, offers a comprehensive view of current air travel behaviour and expectations. (Seliman et al., 2023)

H4: Young adults are less influenced by a membership alliance than older adults

4. Hypothesis summary

H1: *Alliance membership has an impact on brand awareness.*

H2: *Alliance membership impacts an airline's perceived attractiveness.*

H3: *Belonging to an alliance strengthens customer loyalty thanks to the benefits accumulated within the same alliance.*

H4: *Young adults are less influenced by a membership alliance than older adults.*

CHAPTER 2: METHODOLOGY

1. Target

To carry out this research, we decided to focus on adults aged between 20 and 60 without gender criteria and geographical restrictions. This choice is explained by the intention to analyse the perceptions and behaviour of a diversified sample of passengers.

As for the age criteria, we decided not to take the whole population, but those aged between 20 and 60. The age range chosen covers both young adults (20 to 30), a population still studying or at the start of their career, mobile and sensitive to the way they travel, and more experienced adults (31 to 60), who generally have greater purchasing power and travel experience. This generational diversity provides a more nuanced analysis of the impact of alliance membership on the different dimensions studied, such as brand awareness, attractiveness and loyalty.

The aim is to achieve a minimum of 150 valid responses.

2. Survey

In order to collect the data required for the study, we decided to create an online questionnaire using Google Forms. The online survey is a simpler and less expensive way of collecting data and allows us to reach a wider audience and collect the necessary data more easily.

As the study is quantitative, the questions asked in the questionnaire are multiple choice questions, rankings or Likert scales (1 as Strongly Disagree to 5 as Strongly Agree), The Likert scale allows for more nuanced and detailed feedback to be collected (Qualtrics, 2025). On the other side, we also must make sure that the survey is not too long and easy to understand with simple words and the translation in French for non-English speakers. The questions were worded to be as neutral as possible so as not to influence participants' answers. Finally, to minimise social desirability bias, the introduction to the questionnaire stated that anonymity was guaranteed, allowing participants to answer as honestly as possible.

The structure of the questionnaire is divided into several sections. The first section contains information about the participants, such as the person's age, to ensure that the age requirement is met (20 to 60 years old). Then there is also information about their location, their professional status, the frequency of the flight and the reasons why they take the plane. The second section is dedicated to the brand awareness variable. In this one, there are questions to see if the

respondents know the alliances by recognition, by seeing the logo in question 2.3 or by recall with the first question of the section, and how they perceived an alliance. The third section is about the attractiveness, to see what the respondents find attractive in an airline, and how they perceive an airline member or not of an alliance. The last section is dedicated to customer loyalty. This one will tell us if the participants in the study are aware of the loyalty programs, and members of them, and how they perceive them.

Before sharing the survey on social media, we proceed with a pre-check to ensure that the questions are comprehensive and that it did not take too much time to respond. After this pre-check, the survey was shared online. The use of social media like Instagram, LinkedIn and Facebook helped us to reach as many people as possible.

3. Analysis

The Stata software package was used to perform various tests, such as Cronbach's alpha, correlation, and regression.

Inference statistics is the main approach to validate or reject the hypotheses due to the objective point of view it gives. However, some descriptive statistics are used to understand the sample's use or to analyse some open questions.

The answers to the Likert questions have been adapted to a format that the software could read.

Number	corresponding answers
1	Strongly disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly agree

Table 5 – Coding of data collected using Likert Questions

PART 3: DATA ANALYSIS

CHAPTER 1: SAMPLE DESCRIPTION

We have collected 156 reliable responses over a period of three months, from April 1, 2025, to July 14, 2025. Of these, 65.38% are women (102 out of 156 participants) and 34.62% are men (54 out of 156 participants). The majority of the sample is between 20 and 30 years old. Note that our sample consists of 55.2% employees, 39.7% students, 3.2% Other, and 1.9% not working.

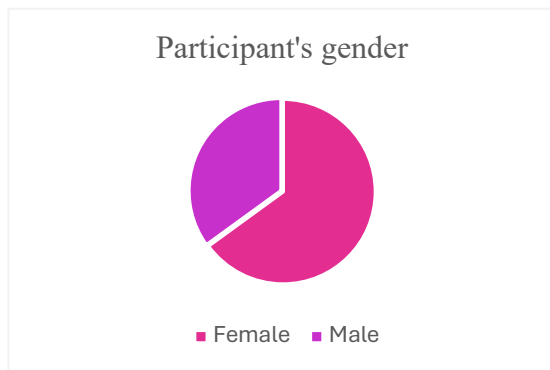


Figure 1: Participants' gender

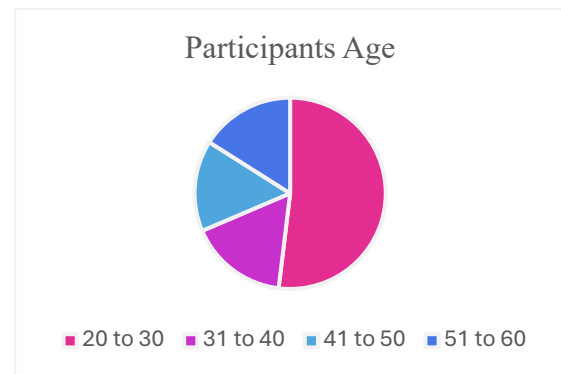


Figure 2: Participants' age

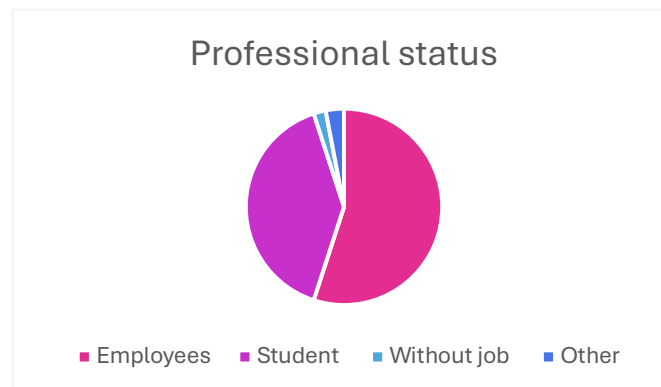


Figure 3: Participants' professional status

We also note that 73.7% are from Belgium (115 out of 156 participants), 12.8% from Taiwan (20 out of 156 participants), and the rest, 13.5%, from diverse countries like Slovakia, Spain, Germany, Poland, Germany, Turkey, France, etc (21 out of 156 participants).

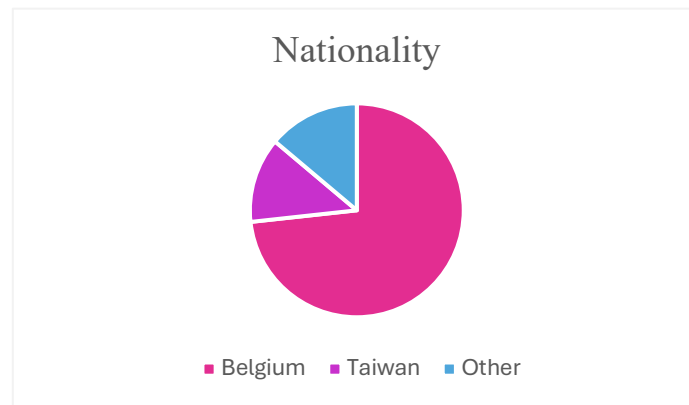


Figure 4: Participants' nationality

We observe that 57.6% of the sample travel one to two times a year, 21.2% three to five times a year, 13.5% more than five times a year, and 7.7% never take planes to travel. The main reasons for travelling are to go on holiday with 90.3%, for work with 21.6%, for family reasons with 13.7%, and for other reasons with 6.5%. We also notice that people travel for more than one reason¹.

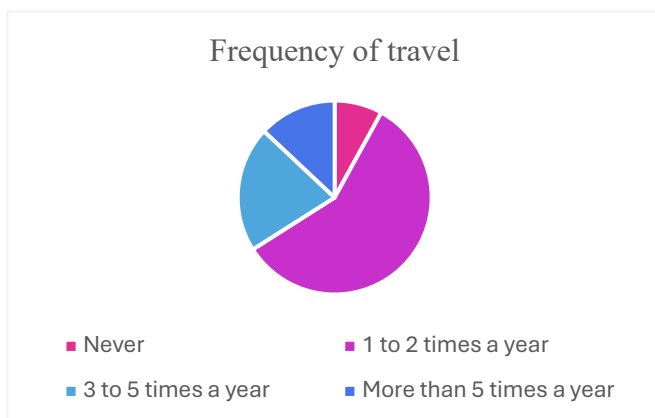


Figure 5: Participants' frequency of travel

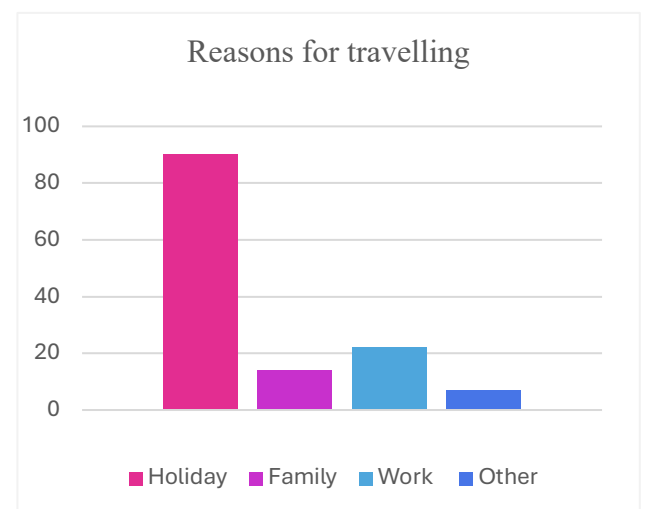


Figure 6: Participants' reasons to travel

Note that the sample of this study is not a generalisation of the population due to some external factors while gathering the survey, such as its scope, which was not national or global, and the fact that more women responded than men.

¹ The participants could vote for more than one reason.

CHAPTER 2: HYPOTHESIS TESTING

We have analysed and interpreted the results obtained by using a statistical software program called Stata. We have built our analysis in the order of the hypotheses presented in the previous section

1. Hypotheses 1

“Alliance membership has an impact on brand awareness.”

• Descriptive analysis

The data collected allows us to observe that only 34.2% (53 out of 156 participants) of the sample know what an alliance is, 15.48% (24 out of 156 participants) have heard the term but do not understand it, and 50.32% (78 out of 156 participants) do not know what it is.

To test this further, two questions allow us to assess brand recall and brand recognition. As explained in the first part, brand recall refers to the ability of consumers to name a brand by memory when asked about the category, whereas brand recognition is less spontaneous but involves recognising a brand through a presented logo.

Firstly, question 2 in section 2 asked people who know what an alliance is and people who heard about it, to note whether they know the name of an Alliance by memory. The answers show that 53.25% (41 out of 77 participants) know Star Alliance, 27.27% (21 out of 77 participants) Skyteam and 14.29% (11 out of 77 participants) Oneworld.

Participant's knowledge about alliances

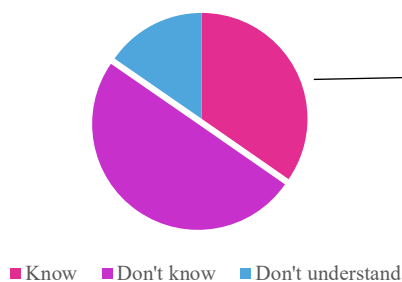


Figure 7: Participants' knowledge about alliances

Alliances known

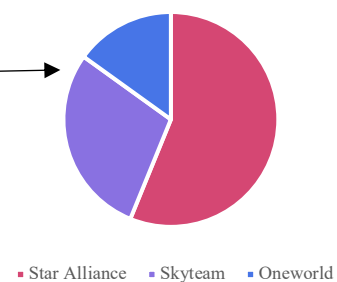


Figure 8: Alliances known

Question 3 in section 2 shows the logos of the three alliances to all participants to see if they recognise any of them. The Star Alliance logo has been recognised by 46.15% (72 out of 156

participants) and not recognised by 53.85% (84 out of 156 participants), SkyTeam by 27.56% (43 out of 156 participants) and not recognised by 72.44% (113 out of 156 participants), and Oneworld by 9.62% (15 out of 156 participants) and not recognised by 90.38% (141 out of 156 participants).



Image 1: Logo Star Alliance



Image 2: Logo SkyTeam



Image 3: Logo Oneworld

With these two questions, we can observe that at least half the sample is aware of these alliances.

- **Inference analysis** (Annexe 2.a.)

To continue with our analysis, inference statistics are used. Note that we have made the hypothesis that our variables are supposedly continuous.

The equation is as follows:

$$\text{Brand awareness} = \beta_0 + \beta_1 (\text{Alliance membership}) + \beta_2 (\text{Gender}) + \beta_3 (\text{Age}) + \varepsilon$$

First, we need to look at the correlation matrix to check that our items are minimally correlated with each other. In our case, all variables are at least slightly correlated, so there is no need to reject any of them. (Annexe 2.a.1.)

Next, we do the Kaiser-Meyer-Olkin (KMO) test, whose purpose is to compare the correlations observed between the variables. Here, the index is of good quality, as it is 0.7748, which is greater than 0.5. We also see that Bartlett's sphericity test is significant, as our p-value is less than 0.05. We can therefore reject the null hypothesis that the correlation matrix is an identity matrix, where all correlations are equal to zero. Rejecting this hypothesis allows us to continue our analysis. (Annexe 2.a.2)

The reliability analysis allows us to ensure that the scale is stable over time and that it accurately measures the variables we have identified. Cronbach's alpha coefficient is greater than 0.70 (0.7812), so we have a satisfactory level of consistency. (Annexe 2.a.3.)

The classic ordinary least squares (OLS) hypothesis assumes that the model residuals have constant variance (homoscedasticity). The null hypothesis is therefore that the residuals have

constant variance, and the alternative hypothesis is that the residuals have non-constant variance. To test this hypothesis, the Breusch-Pagan/Cook-Weisberg test was applied. Here, the P-value is equal to 0.2124 (Annexe 2.a.5.), which means that the null hypothesis is not rejected. There is no evidence of heteroscedasticity in the model; the errors appear to have a constant variance.

Finally, the post-regression diagnostic, the collinearity index (Variance Inflation Factor = VIF), is calculated to verify the absence of multicollinearity between the explanatory variables. The average VIF of 1.17 is well below the critical limit of 10, indicating that there is no collinearity issue in the data. (Annexe 2.a.6.).

In order to test this hypothesis, we have created a new variable called ‘ba_score’ (brand awareness score) with the five variables from the Likert questions of section 2.

The null hypothesis suggests that belonging to an alliance does not affect brand awareness, while the alternative hypothesis suggests that belonging to an alliance affects brand awareness.

- H_0 = Alliance membership does not influence brand awareness
- H_1 = Alliance membership has an influence on brand awareness

We put on Stata the command: `reg ba_score alliance gender age`

```

-----
(1)
ba_score
-----
alliance          -1.669**
                  (-3.18)

gender            -1.107
                  (-1.54)

Age               0.0465
                  (1.84)

_cons             18.77***
                  (9.73)
-----
N                  155
-----
t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001

```

Table 6: Stata brand awareness regression

At first glance, we can reject the null hypothesis H_0 because the P-value is less than 0.05 (0.02), and we can conclude that the effect is statistically significant. However, looking at the coefficient of the Alliance variable, we see that it is less than 0 (-1.167).

To sum up, Alliance membership does not influence brand awareness. It also tends to have a negative influence.

→ Hypothesis 1 is not validated.

2. Hypothesis 2 (Annexe 2.b.)

“Alliance membership impacts an airline's perceived attractiveness.”

• Descriptive analysis

The first question in section 3 aims to assess the perceived importance of several attractiveness criteria when choosing a flight or company. This was given an ordinal rating from 1, equivalent to the most important, to 6, equivalent to the least important.

Summary of the different criteria					
Variable	Obs	Mean	Std. dev.	Min	Max
c_1	156	1.865385	1.349248	1	6
c_2	156	2.801282	1.188221	1	6
c_3	156	2.480769	1.317236	1	6
c_4	156	4.352564	1.593553	1	6
c_5	156	4.089744	1.563172	1	6
c_6	156	2.019231	1.388762	1	6

Table 7: Summary of the different criteria

We observe that the Price (C_1) is the most important criterion with a mean of 1.86, which means that most of the people put it in first or second place; 88 participants, 56.4%, chose price as the most important factor of attractiveness. The second most important criterion is the Safety (C_6) with a mean of 2.02, which means that the majority of the people put it in second or third place. Choices of Destinations (C_3) and Comfort (C_2) come just after with a mean of 2.48 and 2.8, respectively. The least important criteria are Frequent Flyer Program (C_5) and Airline Alliance (C_4), with a mean of 4.09 and 4.35; 53 participants, 33.97%, put it in the sixth position.

We can conclude that people do not consider whether the company is a member of an alliance as an important attractiveness criterion while booking a flight, but it still influences a small number of travellers.

- **Inference analysis**

To continue with our analysis, inference statistics are used. Note that we have made the hypothesis that our variables are supposedly continuous.

The equation used is as follows:

$$\text{Attractiveness} = \beta_0 + \beta_1 (\text{Alliance membership}) + \beta_2 (\text{Gender}) + \beta_3 (\text{Age}) + \varepsilon$$

First, we need to look at the correlation matrix to check that our items are minimally correlated with each other. In our case, all variables are at least slightly correlated, so there is no need to reject any of them. (Annexe 2.b.1)

Next, the KMO index is of good quality, as it is 0.8917, which is greater than 0.5. We also see that Bartlett's sphericity test is significant, as our p-value is less than 0.05. We can therefore reject the null hypothesis that the correlation matrix is an identity matrix, where all correlations are equal to zero. Rejecting this hypothesis allows us to continue our analysis. (Annexe 2.b.2)

The reliability analysis allows us to ensure that the scale is stable over time and that it accurately measures the variables we have identified. Cronbach's alpha coefficient is greater than 0.70 (0.8841), so we have a good level of consistency. (Annexe 2.b.3)

The classic ordinary least squares (OLS) hypothesis assumes that the model residuals have constant variance (homoscedasticity). The null hypothesis is therefore that the residuals have constant variance, and the alternative hypothesis is that the residuals have non-constant variance. To test this hypothesis, the Breusch-Pagan/Cook-Weisberg test has been applied. Here, the P-value is equal to 0.3601, which means that the null hypothesis is not rejected. There is no evidence of heteroscedasticity in the model; the errors appear to have a constant variance. (Annexe 2.b.5)

Finally, the collinearity index (Variance Inflation Factor) has been calculated to verify the absence of multicollinearity between the explanatory variables. The average VIF of 1.17 is well

below the critical limit of 10, indicating that there is no collinearity issue in the data. (Annexe 2.c.6)

In order to test this hypothesis, we have created a new variable called 'att_score' (brand attractiveness score) with the eight variables from the Likert questions of section 3.

The null hypothesis suggests that belonging to an alliance does not improve an airline's perceived attractiveness, while the alternative hypothesis suggests that belonging to an alliance does improve an airline's perceived attractiveness.

- H_0 = Alliance membership does not affect attractiveness
- H_1 = Alliance membership affects attractiveness

We put on Stata the command: `reg att_score alliance gender age`

	(1)
	att_score

alliance	-0.719 (-0.89)
gender	-0.257 (-0.23)
Age	0.0558 (1.44)
_cons	25.59*** (8.63)

N	155

t statistics in parentheses	
* p<0.05, ** p<0.01, *** p<0.001	

Table 8: Stata brand attractiveness regression

Here, the P-value of the first variable is greater than 0.05 (0.374), and we can observe that the coefficient of the independent variable, alliance, is negative. We can directly conclude that the alliance membership does not affect attractiveness.

→ Hypothesis 2 is not validated

3. Hypothesis 3 (Annexe 2.c.)

“Belonging to an alliance impacts customer loyalty thanks to the benefits accumulated within the same alliance”

- **Descriptive analysis**

The first question of section 4 helps us to know if the participants are members of a Frequent Flyer Program. We can see that 67.31% of them do not have a membership, and 32.69% have one. Among this segment of the sample, 23.53% do not take into account the benefits of an alliance while choosing a company, 37.25% do it but not every time, and 39.22% consider the advantages while booking a flight

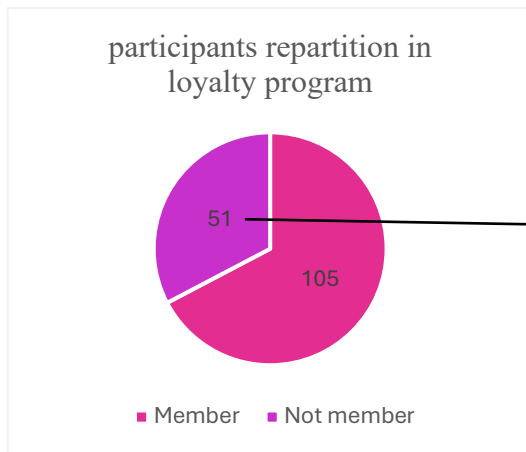


Figure 9: Participants' repartition in loyalty program

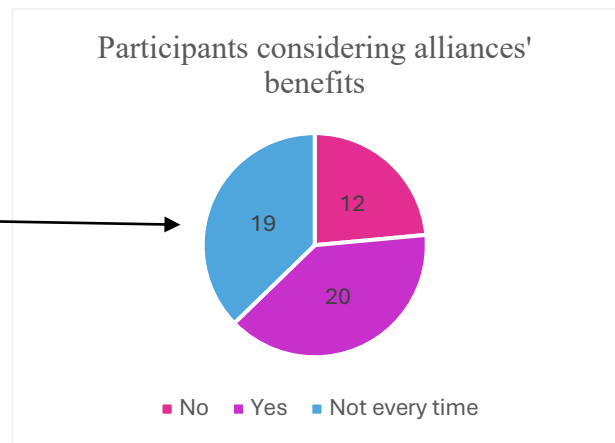


Figure 10: Participants considering alliances' benefits

To analyse this hypothesis, we have only considered the 32.69% parts of the sample.

- **Inference analysis**

To continue with our analysis, inference statistics are used. Note that we have made the hypothesis that our variables are supposedly continuous.

The hypothesis used is as follows:

$$\text{Customer loyalty} = \beta_0 + \beta_1 (\text{Alliance membership}) + \beta_2 (\text{Gender}) + \beta_3 (\text{Age}) + \varepsilon$$

As mentioned above, we have only used one part of the sample, those who are members of a frequent flyer program. To do so, we have created a new variable called “ffpm”, for frequent flyer program members. If *ffpm* is equal to 1, it means they are a member, and if it is equal to 0, it means that they are not a member of a Frequent Flyer Program.

First, we need to look at the correlation matrix to check that our items are minimally correlated with each other. In our case, all variables are at least slightly correlated, so there is no need to reject any of them. (Annexe 2.c.1)

Next, the KMO index is of good quality, as it is 0.8504, which is greater than 0.5. We also see that Bartlett's sphericity test is significant, as our p-value is less than 0.05. We can therefore reject the null hypothesis that the correlation matrix is an identity matrix, where all correlations are equal to zero. Rejecting this hypothesis allows us to continue our analysis. (Annexe 2.c.2)

The reliability analysis allows us to ensure that the scale is stable over time and that it accurately measures the variables we have identified. Cronbach's alpha coefficient is greater than 0.70 (0.8299), so we have a good level of consistency. (Annexe 2.c.3)

The classic ordinary least squares (OLS) hypothesis assumes that the model residuals have constant variance (homoscedasticity). The null hypothesis is therefore that the residuals have constant variance, and the alternative hypothesis is that the residuals have non-constant variance. To test this hypothesis, the Breusch-Pagan/Cook-Weisberg test was applied. Here, the P-value is equal to 0.7086, which means that the null hypothesis is rejected. There is no heteroscedasticity problem detected in the model; the errors appear to have a constant variance. (Annexe 2.c.5)

Finally, the collinearity index (Variance Inflation Factor) has been calculated to verify the absence of multicollinearity between the explanatory variables. The average VIF of 1.24 is well below the critical limit of 10, indicating that there is no collinearity issue in the data. (Annexe 2.c.6)

In order to test this hypothesis, we have created a new variable called ‘f_score’ (fidelity score) with the five variables from the Likert questions in section 4.

The null hypothesis suggests that belonging to an alliance does not strengthen customer loyalty because of the benefits accumulated within the alliance, while the alternative hypothesis

suggests that belonging to an alliance does strengthen customer loyalty because of the benefits accumulated within the alliance.

- H_0 = Alliance membership does affect customer loyalty
- H_1 = Alliance membership affects customer loyalty

We put on Stata the command: `reg f_score alliance gender age if ffp = 1`

	(1) f_score
alliance	-2.114* (-2.02)
gender	0.893 (0.68)
Age	0.0938 (1.85)
_cons	13.76*** (4.19)
N	51
t statistics in parentheses	
* p<0.05, ** p<0.01, *** p<0.001	

Table 9: Stata customer loyalty regression

At first glance, we can reject the null hypothesis H_0 because the P-value is slightly less than 0.05 (0.049), and we can conclude that the effect is statistically significant. However, when we examine the coefficient of the Alliance variable, we see that it is less than 0 (-2.114185).

In summary, being part of a loyalty programme does not influence customer loyalty.

→ **Hypothesis 3 is not validated**

4. Hypothesis 4 (Annexe 2.d)

“Young adults are less influenced by a membership alliance than older adults”

- **Descriptive analysis**

We observe that out of the 156 participants, 51.92 % are between 20 and 30 years old. 16.67% belong to the older group between 51 and 60, 15.38% are between 41 and 50 years old, and the last group, aged between 31 and 40, represents 16.03% of the sample.

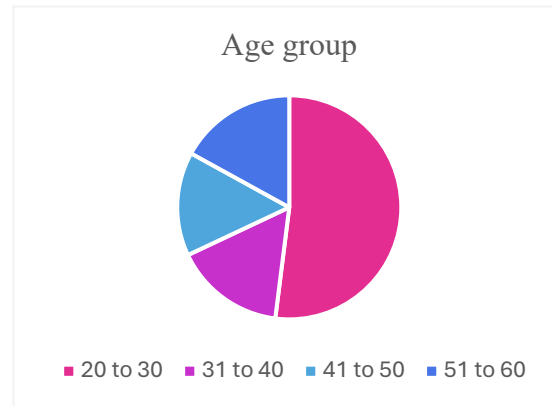


Figure 11: Age group

• Inferences analysis

To continue with our analysis, inference statistics are used. Note that we have made the hypothesis that our variables are supposedly continuous.

This hypothesis has a different equation from the three others. Here we have:

$$\text{Influence Alliance} = \beta_0 + \beta_1 (\text{Age group}) + \beta_2 (\text{Gender}) + \varepsilon$$

To analyse this hypothesis, we need to create a new variable called “Influence_score”. We have used six Likert questions from the different sections:

- Section 1: Belonging to an alliance improves an airline's image.
- Section 1: I think that alliance member airlines offer better service than independent airlines.
- Section 2: An airline that is a member of an alliance seems more reliable to me.
- Section 2: I am more likely to choose an airline if it belongs to a well-known alliance.
- Section 2: Independent (non-alliance) airlines are less attractive to me.
- Section 3: I prefer an airline based on its alliance membership.

We have tested the validity of those variables together.

First, we have looked at the correlation matrix to check that our items are minimally correlated with each other. In our case, all variables are at least slightly correlated, so there is no need to reject any of them. (Annexe 2.d.1.)

Next, we see that the KMO index is of good quality, as it is 0.8079, which is greater than 0.5. We also see that Bartlett's sphericity test is significant, as our p-value is less than 0.05. We can therefore reject the null hypothesis that the correlation matrix is an identity matrix, where all correlations are equal to zero. Rejecting this hypothesis allows us to continue our analysis. (Annexe 2.d.2.)

Then, the reliability analysis allows us to ensure that the scale is stable over time and that it accurately measures the variables we have identified. Cronbach's alpha coefficient is greater than 0.70 (0.7634), so we have a sufficient level of consistency. (Annexe 2.d.3.)

The classic ordinary least squares (OLS) hypothesis assumes that the model residuals have constant variance (homoscedasticity). The null hypothesis is therefore that the residuals have constant variance, and the alternative hypothesis is that the residuals have non-constant variance. To test this hypothesis, the Breusch-Pagan/Cook-Weisberg test was applied. Here, the P-value is equal to 0.5704, which means that the null hypothesis is rejected. There is no heteroscedasticity problem detected in the model; the errors appear to have a constant variance. (Annexe 2.d.5.)

Finally, the collinearity index (Variance Inflation Factor - VIF) of the regression is calculated to verify the absence of multicollinearity between the explanatory variables. The average VIF of 1.10 is well below the critical limit of 10, indicating that there is no collinearity issue in the data. (Annexe 2.d.6.)

The null hypothesis suggests that young adults are more influenced by a membership alliance than older adults, while the alternative hypothesis suggests that young adults are less influenced by a membership alliance than older adults

- H_0 = Young adults are more influenced by a membership alliance than older adults
- H_1 = Young adults are less influenced by a membership alliance than older adults

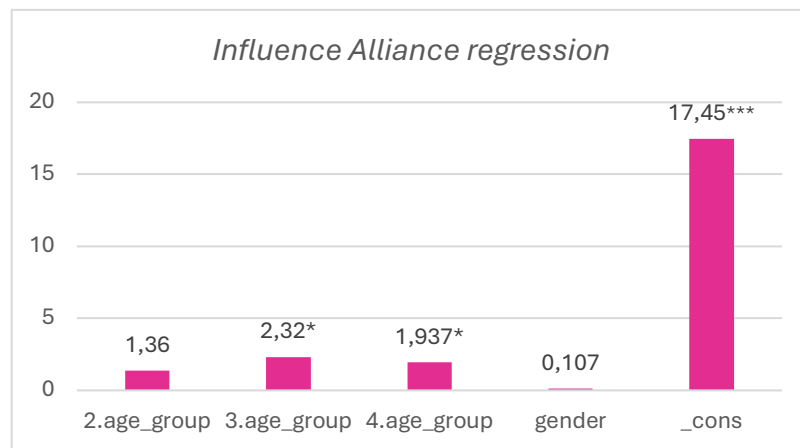


Figure 12: Stata Influence Alliance regression

With 2.age_group = 31-40 years; 3.age_group = 41-50; 4.age_group = 51-60

Compared to young adults aged between 20 and 30 (basis for comparison), the 41–50 and 51–60 age groups are significantly more influenced by the air alliance. This group rejects the null hypothesis with a P-value below 0.05 (0.017 and 0.041, respectively) and a positive coefficient. Meanwhile, the 31–40 age group shows a tendency to be more influenced, but without strong statistical evidence. For this group, the P-value is 0.155, which is higher than 0.05, but the coefficient remains positive. This small difference between the two groups may be since the beginning of the age group (31–35 years old) may still be perceived as young adults by some people.

Hypothesis 4 is therefore partially confirmed: it is supported for the last two age groups (41–50 and 51–60 years old), but not completely for the 31–40 age group.

→ Hypothesis 4 is partially validated

CHAPTER 3: HYPOTHESIS CONCLUSION

Now that our 4 hypotheses have been tested, we can summarise our results for each of them.

	Hypotheses	Validated or not
H1	<i>Alliance membership has an impact on brand awareness.</i>	Not Validated
H2	<i>Alliance membership impacts an airline's perceived attractiveness.</i>	Not Validated
H3	<i>Belonging to an alliance impacts customer loyalty thanks to the benefits accumulated within the same alliance</i>	Not Validated
H4	<i>Young adults are less influenced by a membership alliance than older adults</i>	Partially Validate

Table 10: Summary of hypothesis testing results

To sum up, we tested 4 hypotheses about four different topics.

First of all, we have tested the brand awareness, and it turns out that being part of an alliance does not impact participants' perception of an airline. The hypothesis has been rejected because the observed effect is significantly negative.

Then we have tested brand attractiveness, and the hypothesis has also been rejected because the P-value is greater than 0.05 and the coefficient is negative.

We have also tested the fact that being part of a Frequent Flyer Program and accumulating miles would strengthen our loyalty to the alliance, but after analysis, it turns out not to be the case. Most of the participants who are members do not take into account the fact that the airline is a member of an alliance; the alternative hypothesis has been rejected due to the coefficient being less than 0, and so the effect is significantly negative.

Finally, we have been wondering whether young adults are less influenced than older adults. The hypothesis has been verified as they are slightly less influenced than older adults.

CONCLUSION AND RECOMMENDATIONS

CHAPTER 1: GENERAL CONCLUSION

In this thesis, we aimed to understand the role of airline alliances on the perception of brand awareness and attractiveness, as well as the influence of Frequent Flyer Programs on adults. We therefore sought to answer the question: *“What is the influence of belonging to an airline alliance on the brand awareness, attractiveness, and customer loyalty of airlines among adults aged 20 to 60?”*

In this work, we first determined the key concepts and the context of this topic. The development of this theoretical part enabled us to highlight, first of all, the different existing airline alliances and the advantages of being part of an alliance in the airline sector, as well as in any other sector. We have then defined the concepts of awareness and attractiveness, and finally, we took an interest in the subject of loyalty programs with Frequent Flyer Programs and the advantages they bring to travellers.

In order to provide a potential answer to our research question, 3 hypotheses were formulated. Those were based on the different concepts studied: awareness, attractiveness and customer loyalty. A final hypothesis was then formulated based on the age of the participants to see the question from a generational perspective.

To analyse our hypotheses, we have decided to carry out a quantitative study based on responses to an online survey posted on various social networks. Once we had collected enough responses, we analysed the results using Stata software. Of the four hypotheses put forward, only one is partially validated, and the rest are not validated.

Our analysis allows us to conclude that membership in an airline alliance has no impact on the reputation of a member airline and the attractiveness while booking flights, as the criteria of price, comfort and safety remain the most important ones when choosing an airline. This analysis also enables us to see that even if someone is a member of a loyalty program, this does not mean that she or he will always be loyal to the alliance, but that the person might remain more loyal to the airline. Finally, we also notice that the more experienced persons in life are slightly more influenced by the membership of an airline in an alliance than the younger adults who have less life experience.

CHAPTER 2: MANAGERIAL IMPLICATIONS AND LIMITATIONS

1. Managerial implications

Following our theoretical research and our quantitative study, we can now formulate various managerial recommendations for airlines and airline alliances.

Firstly, to build loyalty among travellers, it is important to strengthen the brand's image, an easy way could be to put the logo of the alliance more prominently, it is already on the screen and the tickets, but perhaps a little pins on the uniform could be a subtle way to inform the passengers that they are on board of a company member of the alliance. Another way to do this, could be to consolidate brand loyalty by offering a unique selling proposition. In other words, the perfect combination between what travellers want and what the brand can offer. The alliance needs to strengthen its points of difference, like the loyalty program it offers. A recommendation could be to centralise the Frequent Flyer Program (FFP). Each airline has its own FFP, and regarding the partnerships between airlines, the miles can be accumulated, but most of the advantages are not. For example, if a passenger is a Miles & More member, they can enjoy benefits with Singapore Airlines thanks to Star Alliance. They can earn and redeem miles on Singapore Airlines flights, subject to fare classes. If they have a high status, such as Senator or HON Circle, they enjoy additional benefits such as lounge access, priority check-in, and priority boarding, even in economy class. However, the benefits depend on your status and the type of ticket booked. So, by harmonising loyalty programs' advantages into the alliances, and not the status or airlines, travellers could more easily choose a member of the same alliance to be more loyal to the alliance. This would also simplify the understanding of the FFP.

Another recommendation based on FFPs would be to adapt them more precisely and personalise them according to the different profiles of travellers. They could be segmented according to the Customer Lifetime Value, this measure allows the calculation of the profitability of a customer according to its flight frequency and its average basket (CRM Course, 2025). By understanding this, it will be possible to implement more personalised loyalty strategies depending on the group to which the traveller belongs. For example, travellers who take the same alliance for each flight (a rate of flights per year could be set to have the reward) could receive a 2% discount on their next flights for a specific period, such as 2 years, to encourage the customers to come back and thus ensure loyalty. Then, the alliance could also create a group for students, for example, an Erasmus + package which would allow the student to have x kilos of free baggage and a discount on the return flight if they take the same company or a partner company.

Moreover, by doing this, the alliance will also touch on the Price criterion, which is the main criterion while choosing a company.

Another aspect in which alliances could work is the harmonisation of customer services offered by the different airlines. This will give the impression that every company in the alliance offers the same service, but is still unique due to the different nationalities, i.e. By doing this, the perceived value of the alliance will be reinforced, and so being a member of an alliance could become a lever of differentiation. It would ensure quality services. To further push the differentiation level, the alliance and company could do some advertising about the fact that an alliance is global, and their members are safe due to the same regulations imposed to become a member. It would give a feeling of peace and easy choice while choosing a company; choosing this company would mean choosing safety and premium services.

2. Limitations of the study

It is important to realise that the study encounters certain limitations throughout its development.

The main limitation is that the topic is not a subject known to the general public, which increased the response time; it took more than three months to collect all the data necessary for the research. And to collect enough data, we had to change the age group in order to reach a wider audience than expected.

Another limitation is that the documentation on the subject is very limited. There is little academically approved material, and many documents are sometimes 15 or even 20 years old, which does not provide a solid basis, knowing that the economic and aviation context has changed significantly since then.

This is a counterintuitive first result, due to sampling bias or other effects not tested in this thesis. For a future study, consider partnering with an airline or alliance to reach a larger audience. However, a new empirical study would likely be needed to build on the results in order to validate/disprove them.

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ANNEXE

1. Survey

a. Beginning

Hello and welcome,

First of all, thank you very much for taking the time to answer this questionnaire, it takes 10 to 15 minutes.

This survey is part of my dissertation and concerns the impact of membership of an airline alliance on the reputation and attractiveness of airlines, as well as on the loyalty of consumers aged between 20 and 60.

Your participation is valuable and will contribute to a better understanding of this subject.

Confidentiality: All responses are anonymous and will only be used for research purposes. Nothing that could identify you will be mentioned in the study.

Thank you again for your help! ✈️

Bonjour et bienvenue,

Tout d'abord, un grand merci pour le temps que vous prenez pour répondre à ce questionnaire, ça prendra environ 10/15min.

Cette enquête s'inscrit dans le cadre de mon mémoire et porte sur l'impact de l'appartenance à une alliance aérienne sur la notoriété et l'attractivité des compagnies aériennes, ainsi que sur la fidélité des consommateurs âgés de 20 à 60 ans.

Votre participation est précieuse et contribuera à une meilleure compréhension de ce sujet.

Confidentialité : Toutes les réponses sont anonymes et ne seront utilisées qu'à des fins de recherche. Aucun élément permettant de vous identifier ne sera mentionné dans l'étude.

Merci encore pour votre aide ! ✈️

b. Section 1: Sample information's

Age *

Réponse courte

Gender (sexe) *

- ☐ Male (Homme)
- ☐ Female (Femme)
- ☐ Prefer not to say (je ne préfère pas le dire)

Country of residence (Pays de résidence) *

Réponse courte

Professional status (Statut professionnel) *

- ☐ Student (étudiant)
- ☐ Worker (Employé)
- ☐ Without job (Sans emploi)
- ☐ Other (Autre)

Flight frequency (Fréquence de vol) *

- ☐ Never (Jamais)
- ☐ 1 to 2 times a year (1 à 2 fois par an)
- ☐ 3 to 5 times a year (3 à 5 fois par an)
- ☐ More than 5 times a year (plus de 5 fois par an)

Reason(s) for travelling (Motif(s) du voyage)

- ☐ Work (Travail)
- ☐ Vacation (Vacances)
- ☐ Family reason (raison familiale)
- ☐ Other (Autre)

c. Section 2: Brand awareness

Brand awareness (Notoriété de la marque)



NB: Une alliance aérienne est une alliance entre diverses compagnies aériennes afin de partager leurs avantages et connaissances.

NB: An airline alliance is an alliance between various airlines in order to share their advantages and knowledge.

...

Do you know the airlines alliances? (Connaissez-vous les alliances aériennes?) *

- ☐ Yes (Oui)
- ☐ No (Non)
- ☐ I heard about it but don't understand it (J'en ai entendu parlé mais je ne comprends pas ce que c'est)

Which one(s) do you know? (Si oui, la/lesquelles connaissez-vous ?)

Réponse courte

...

Did you ever see these logos? Click on the one(s) you already saw (Avez-vous déjà vu ces logos ? Cliquez sur celui/ceux que vous avez déjà vu)

☐ Option 1



☐ Option 2



☐ Option 3



☐ No, never

	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
I can name at least one airline that is a member of an alliance. (Je peux citer au moins une compagnie aérienne qui est membre d'une alliance.)	☐	☐	☐	☐	☐
I trust airlines that are members of an alliance. (Je fais confiance aux compagnies aériennes qui sont membres d'une alliance.)	☐	☐	☐	☐	☐
Belonging to an alliance improves an airline's image. (L'appartenance à une alliance améliore l'image d'une compagnie aérienne.)	☒	☐	☐	☐	☐

I perceive an airline belonging to an alliance as more prestigious. (Je perçois une compagnie aérienne appartenant à une alliance comme plus prestigieuse.)	☐	☐	☐	☐	☐
I think that alliance member airlines offer a better service than independent airlines. (Je pense que les compagnies aériennes membres d'une alliance offrent un meilleur service que les compagnies aériennes indépendantes.)	☐	☐	☐	☐	☐

Which criteria are most important in your choice of airline? Rank them (Quels sont les critères les plus importants dans votre choix de compagnie aérienne ? Classe les)

[illegible]

How much do you agree with these statements? (Dans quelle mesure êtes-vous d'accord avec ces affirmations ?) *

1 - Strongly
disagree

2 - Disagree

3 - Neutral

4 - Agree

5 - Strongly
agree

An airline that is a member of an alliance seems more reliable to me (Une compagnie aérienne membre d'une alliance me semble plus fiable)

☐
☐
☐
☐
☐

I have more confidence in an airline belonging to a major alliance (Je fais davantage confiance à une compagnie aérienne appartenant à une grande alliance)

☐
☐
☐
☐
☐

An airline belonging to an alliance offers better services (Une compagnie aérienne appartenant à une alliance offre de meilleurs services)

☐
☐
☐
☐
☐

I am more likely to choose an airline if it belongs to a well-known alliance (Je suis plus enclin à choisir une compagnie aérienne si elle appartient à une alliance bien connue)

☐
☐
☐
☐
☐

Airlines
belonging to an
alliance offer
more convenient
routes (Les
compagnies
aériennes
membres d'une
alliance
proposent des
itinéraires plus
pratiques)

☐☐☐☐☐

The fact that an
airline belongs to
an alliance gives
me the
impression that
it is safer
(L'appartenance
d'une compagnie
aérienne à une
alliance me
donne
l'impression
qu'elle est plus
sûre)

☐☐☐☐☐

Being part of an
alliance gives me
the impression
that an airline is
more
international
(L'appartenance
à une alliance
me donne
l'impression
qu'une
compagnie
aérienne est plus
internationale)

☐☐☐☐☐

Independent
(non-alliance)
airlines are less
attractive to me
(Les compagnies
aériennes
indépendantes
(qui ne font pas
partie de
l'alliance) sont
moins
attrayantes à
mes yeux)

☐☐☐☐☐

e. Section 4: Customer Loyalty

Have you ever joined an airline loyalty program? (Avez-vous déjà adhéré à un programme de fidélisation d'une compagnie aérienne ?) *

☐ Yes (oui)

☐ No (non)

If yes, do you take into account the benefits of the alliance when choosing your flight? (Si oui, tenez-vous compte des avantages de l'alliance lors du choix de votre vol ?)

☐ Yes (oui)

☐ No (Non)

☐ Not every time (Pas à chaque fois)

	1 - Strongly disagree	2 - Disagree	3 - Neutral	4 - Agree	5 - Strongly agree
I prefer an airline based on its alliance membership (Je préfère une compagnie aérienne en fonction de son appartenance à une alliance)	☐	☐	☐	☐	☐
I am loyal to an airline mainly because of its frequent flyer program (Je suis fidèle à une compagnie aérienne principalement en raison de son programme de fidélisation.)	☐	☐	☐	☒	☐

The fact that I can collect and use my miles on several airlines in an alliance is a major advantage (Le fait de pouvoir accumuler et utiliser mes miles sur plusieurs compagnies aériennes membres d'une alliance est un avantage majeur.)

☐ ☐ ☐ ☐ ☐

I would be less loyal to an airline if it left its current alliance (Je serais moins fidèle à une compagnie aérienne si elle quittait son alliance actuelle.)

☐ ☐ ☐ ☐ ☐

I often choose airlines from the same alliance to maximize my benefits (Je choisis souvent des compagnies aériennes de la même alliance pour maximiser mes avantages.)

☐ ☐ ☐ ☐ ☐

2. Stata

a. Hypothesis 1

1. Correlation

```
. cor ab_1 ab_2 ab_3 ab_4 ab_5
(obs=156)
```

	ab_1	ab_2	ab_3	ab_4	ab_5
ab_1	1.0000				
ab_2	0.5385	1.0000			
ab_3	0.3517	0.5460	1.0000		
ab_4	0.3092	0.4644	0.5517	1.0000	
ab_5	0.2656	0.3888	0.4529	0.6084	1.0000

2. KMO – Bartlett

```
. factor test ab_1 ab_2 ab_3 ab_4 ab_5
```

Determinant of the correlation matrix
Det = **0.196**

Bartlett test of sphericity

Chi-square = **248.252**
Degrees of freedom = **10**
p-value = **0.000**
H0: variables are not intercorrelated

Kaiser-Meyer-Olkin Measure of Sampling Adequacy
KMO = **0.775**

3. Cronbach Alpha

```
. alpha ab_1 ab_2 ab_3 ab_4 ab_5
```

Test scale = mean(unstandardized items)

Average interitem covariance: **.543139**
Number of items in the scale: **5**
Scale reliability coefficient: **0.7812**

4. Regression

```
. reg ba_score alliance gender Age
```

Source	SS	df	MS	Number of obs	=	155
Model	296.283597	3	98.7611989	F(3, 151)	=	6.24
Residual	2389.87124	151	15.8269619	Prob > F	=	0.0005
Total	2686.15484	154	17.4425639	R-squared	=	0.1103
				Adj R-squared	=	0.0926
				Root MSE	=	3.9783

ba_score	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
alliance	-1.669382	.5246091	-3.18	0.002	-2.705904	-.6328594
gender	-1.106578	.7171386	-1.54	0.125	-2.5235	.3103436
Age	.046452	.0252932	1.84	0.068	-.0035224	.0964264
_cons	18.77346	1.930144	9.73	0.000	14.95988	22.58703

5. Heteroskedasticity

```
. estat hettest

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of ba_score

H0: Constant variance

      chi2(1) =    1.56
Prob > chi2 = 0.2124
```

6. VIF

```
. vif
```

Variable	VIF	1/VIF
alliance	1.24	0.803470
gender	1.13	0.882363
Age	1.12	0.892771
Mean VIF	1.17	

b. Hypothesis 2

1. Correlation

```
. corr at_1 at_2 at_3 at_4 at_5 at_6 at_7 at_8
(obs=156)
```

	at_1	at_2	at_3	at_4	at_5	at_6	at_7	at_8
at_1	1.0000							
at_2	0.7628	1.0000						
at_3	0.6185	0.5673	1.0000					
at_4	0.4568	0.4795	0.4164	1.0000				
at_5	0.5306	0.4867	0.4136	0.5019	1.0000			
at_6	0.5785	0.5130	0.4814	0.4800	0.6582	1.0000		
at_7	0.6116	0.6270	0.5226	0.4216	0.5053	0.5004	1.0000	
at_8	0.3830	0.3729	0.3060	0.5003	0.4321	0.4883	0.3445	1.0000

2. KMO – Bartlett

```
. factortest at_1 at_2 at_3 at_5 at_6 at_7 at_8

Determinant of the correlation matrix
Det          =    0.030

Bartlett test of sphericity

Chi-square    =    534.017
Degrees of freedom =    21
p-value       =    0.000
H0: variables are not intercorrelated

Kaiser-Meyer-Olkin Measure of Sampling Adequacy
KMO          =    0.880
```

3. Cronbach Alpha

```
. alpha at_1 at_2 at_3 at_4 at_5 at_6 at_7 at_8
```

```
Test scale = mean(unstandardized items)
```

```
Average interitem covariance:    .5172383
Number of items in the scale:      8
Scale reliability coefficient:    0.8841
```

4. Regression

```
. reg att_score alliance gender Age
```

Source	SS	df	MS	Number of obs	=	155
Model	152.415627	3	50.8052089	F(3, 151)	=	1.36
Residual	5643.00373	151	37.3708856	Prob > F	=	0.2574
				R-squared	=	0.0263
				Adj R-squared	=	0.0070
Total	5795.41935	154	37.6325932	Root MSE	=	6.1132

att_score	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
alliance	-.7191972	.8061275	-0.89	0.374	-2.311943	.8735487
gender	-.25708	1.101973	-0.23	0.816	-2.434357	1.920197
Age	.0558274	.0388662	1.44	0.153	-.0209645	.1326193
_cons	25.59392	2.965907	8.63	0.000	19.73389	31.45396

5. Heteroskedasticity

```
. estat hettest
```

```
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of att_score
```

```
H0: Constant variance
```

```
chi2(1) = 0.84
Prob > chi2 = 0.3601
```

6. VIF

```
. estat vif
```

Variable	VIF	1/VIF
alliance	1.24	0.803470
gender	1.13	0.882363
Age	1.12	0.892771
Mean VIF	1.17	

c. Hypothesis 3

1. Correlation

```
. corr f_1 f_2 f_3 f_4 f_5
(obs=156)
```

	f_1	f_2	f_3	f_4	f_5
f_1	1.0000				
f_2	0.4874	1.0000			
f_3	0.4724	0.4682	1.0000		
f_4	0.4976	0.5129	0.4377	1.0000	
f_5	0.4981	0.5572	0.4375	0.5781	1.0000

2. KMO – Bartlett

```
. factortest f_1 f_2 f_3 f_4 f_5
```

Determinant of the correlation matrix
 Det = 0.185

Bartlett test of sphericity

Chi-square = 257.144
 Degrees of freedom = 10
 p-value = 0.000
 H0: variables are not intercorrelated

Kaiser-Meyer-Olkin Measure of Sampling Adequacy
 KMO = 0.850

3. Cronbach Alpha

```
. alpha f_1 f_2 f_3 f_4 f_5
```

```
Test scale = mean(unstandardized items)
```

```
Average interitem covariance:    .625732
Number of items in the scale:      5
Scale reliability coefficient:     0.8299
```

4. Regression

```
. reg alliance f_score gender Age if ffpn == 1
```

Source	SS	df	MS	Number of obs	=	51
Model	4.42507934	3	1.47502645	F(3, 47)	=	4.88
Residual	14.2023716	47	.30217812	Prob > F	=	0.0049
				R-squared	=	0.2376
				Adj R-squared	=	0.1889
Total	18.627451	50	.37254902	Root MSE	=	.54971

alliance	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
f_score	-.0377194	.0186903	-2.02	0.049	-.0753194	-.0001194
gender	-.2765356	.1724602	-1.60	0.116	-.6234808	.0704096
Age	-.0062024	.0069714	-0.89	0.378	-.0202271	.0078223
_cons	2.681773	.333272	8.05	0.000	2.011316	3.35223

5. Heteroskedasticity

```
. estat hettest
```

```
Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of f_score
```

```
H0: Constant variance
```

```
chi2(1) = 0.06
Prob > chi2 = 0.8018
```

6. VIF

```
. estat vif
```

Variable	VIF	1/VIF
Age	1.12	0.892428
alliance	1.12	0.892428
Mean VIF	1.12	

d. Hypothesis 4

1. Correlation

```
. cor ab_3 ab_5 at_1 at_4 at_8 f_1
(obs=156)
```

	ab_3	ab_5	at_1	at_4	at_8	f_1
ab_3	1.0000					
ab_5	0.4529	1.0000				
at_1	0.4671	0.4796	1.0000			
at_4	0.3847	0.3347	0.4568	1.0000		
at_8	0.2856	0.2259	0.3830	0.5003	1.0000	
f_1	0.2733	0.1727	0.2739	0.3534	0.3110	1.0000

2. KMO – Bartlett

```
. factortest ab_3 ab_5 at_1 at_4 at_8 f_1
```

```
Determinant of the correlation matrix
Det = 0.245
```

```
Bartlett test of sphericity
```

```
Chi-square = 214.168
Degrees of freedom = 15
p-value = 0.000
H0: variables are not intercorrelated
```

```
Kaiser-Meyer-Olkin Measure of Sampling Adequacy
KMO = 0.808
```

3. Cronbach Alpha

```
. alpha ab_3 ab_5 at_1 at_4 at_8 f_1
```

```
Test scale = mean(unstandardized items)
```

```
Average interitem covariance: .3709016
Number of items in the scale: 6
Scale reliability coefficient: 0.7634
```

4. Regression

```
. reg influence_score i.age_group gender
```

Source	SS	df	MS	Number of obs	=	156
Model	150.377806	4	37.5944515	F(4, 151)	=	2.22
Residual	2560.59655	151	16.9575931	Prob > F	=	0.0698
				R-squared	=	0.0555
				Adj R-squared	=	0.0304
Total	2710.97436	155	17.4901572	Root MSE	=	4.118

influence_	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
age_group						
2	1.36048	.95076	1.43	0.155	-.5180303	3.238991
3	2.319635	.9634694	2.41	0.017	.4160133	4.223257
4	1.936645	.9391322	2.06	0.041	.0811088	3.792181
gender	.1066323	.706116	0.15	0.880	-1.288511	1.501776
_cons	17.44597	.9999998	17.45	0.000	15.47017	19.42177

5. Heteroskedasticity

```
. estat hettest
```

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of **influence_score**

H0: Constant variance

chi2(1) = 0.32
Prob > chi2 = 0.5704

6. VIF

```
. estat vif
```

Variable	VIF	1/VIF
age_group		
2	1.12	0.893585
3	1.11	0.899555
4	1.13	0.887398
gender	1.04	0.963258
Mean VIF	1.10	

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