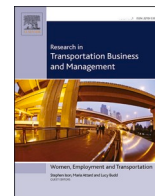




Contents lists available at ScienceDirect

Research in Transportation Business & Management

journal homepage: www.elsevier.com/locate/rtbm

Environmental certification and the financial performance of passenger airlines. The mediating effect of image perception, asset management and employee behaviour

Jose Antonio Cavero-Rubio^{*}, Monica Gonzalez-Morales

Department of Economics and Financial Studies, Miguel Hernández University of Elche, Avenida de la Universidad s/n, 03202, Elche, Alicante, Spain

ARTICLE INFO

Keywords:

Environmental certification
Financial performance
Passenger airlines
Image perception
Asset management
Employee behaviour

ABSTRACT

Passenger airlines is an important sector throughout the world. However, it has faced criticism and pressure due to its harmful effects on the planet, leading airlines to adopt measures to protect the environment. As environmental responsibility can be a source of competitive advantages resulting from an improvement in image and internal technical and operational efficiency, it could increase their financial performance. Therefore, the aim of this study is to analyse whether their financial performance increases as a result of the competitive advantages gained from the effect of their environmental attitude on the environmental image of passengers, sustainable asset management, and employee ecological behaviour. Using the panel data technique for the 2010–2019 period, a comparison is made of certified and non-certified passenger airlines, differentiated according to ownership, routes they operate, fares, belonging to an alliance and the airline's world region. On the whole, the evidence obtained shows that while the effect of certification on the environmental image of passengers and on sustainable asset management does not increase the financial performance of certified airlines, it does so partially with respect to employee ecological performance. It could be affirmed that the funds and efforts allocated to being more respectful towards the environment do not lead to competitive advantages that could have a greater impact on financial performance.

1. Introduction

The sector for passenger airline transport has a considerable economic impact on a global level. According to the [International Air Transport Association \(IATA\) \(2023\)](#), a passenger airline is the airline over whose routes a passenger and his baggage are transported or are to be transported from the point of origin or stopover or a transfer going, to the next interline connection point. It is no surprise that, in 2019, before the negative effects of COVID-19 on the aviation industry, it represented 55 % of international air transport ([United Nations World Tourism Organization \(UNWTO\), 2020](#)), with spending on this transport reaching 4.8 % of global GDP ([International Civil Aviation Organization \(ICAO\), 2020](#)).

However, the harmful effects on the environment by the passenger airlines (hereafter referred to as airlines) have led to criticism from the public and governmental pressures ([Karaman et al., 2018](#)). In response, the airlines have directed their efforts at being more environmentally sustainable. Environmental responsibility is the tool that the airlines can

use to achieve a win-win situation ([Porter, 1991](#); [Porter & van der Linde, 1995](#)). Environmental responsibility can minimise the negative environmental impacts and, at the same time, improve the financial performance of the organisation ([Hagmann et al., 2015](#); [Phillips et al., 2019](#)).

Nevertheless, studies that have analysed the relationship between financial performance and environmental proactivity of airlines are scarce and contradictory ([Mak et al., 2007](#); [Stevenson & Marintseva, 2019](#)). They have mainly focused on analysing their environmental concern ([Mak & Chan, 2006](#)), the level of detail and information contained in the reports ([Mak et al., 2007](#)), the percentage of airlines that publish them and geographical asymmetries ([Coles, Dinan and Fenclova, 2009](#)).

Moreover, to assess the environmental sustainability of airlines, information primarily contained in sustainability reports or Corporate Social Responsibility reports has been used ([Cowper-Smith & de Grosbois, 2011](#); [Mak and Chan, 2006](#)). As this information lacks objectivity, independence and verification, and shows significant heterogeneity,

^{*} Corresponding author.

E-mail addresses: cavero@umh.es (J.A. Cavero-Rubio), monica.gonzalez@umh.es (M. Gonzalez-Morales).

many studies establish a tenuous or questionable relationship between airline environmental proactivity and several variables (Cowper-Smith & de Grosbois, 2011; Haggmann et al., 2015; Wang et al., 2015).

In response to these limitations, environmental certification has been used to objectively compare and measure the environmental performance of the airline sector and to study the relationship between environmental management and the financial performance of airlines (Benito & Alonso, 2018). Environmental certification has become a widely accepted approach in the literature to analyse this relationship (Cavero-Rubio & Amorós-Martínez, 2020). This approach involves establishing measurable objectives, a detailed programme, and a follow-up and evaluation process to achieve continuous improvement in the airline's behaviour and environmental performance). As noted by Jongsaguan and Ghoneim (2017), environmental certification has strengthened the airline industry's capacity to meet its environmental objectives, encouraging them to comply with environmental performance indicators.

In this respect, Chen (2010) indicates that an environmentally committed could obtain competitive advantages in differentiation and costs. Environmental proactivity can differentiate the airline and would improve how passengers perceive its image and reputation, which could increase its reserves and income from sales. Furthermore, according to Leamon et al. (2019) and Phillips et al. (2019), investment in technology, aimed at using more sustainable assets, and an improvement in operational efficiency, which would mean increasing employees' environmental awareness, could result in savings in costs. In this way, ultimately, there would be an increase in the financial performance of airlines (Geerts, 2014; Inoue & Lee, 2011).

This study aims to contribute to a deeper understanding of the relationship between environmental management and the financial performance of airlines. Unlike previous studies, this research introduces the impact of environmental certification on passengers' environmental perception, sustainable asset management, and employees' ecological behaviour as mediating factors in the financial performance of airlines, thus offering a novel and more robust perspective.

In order to achieve the proposed objective, certified and non-certified airlines have been compared for the 2010–2019 period. In addition, given that the effects of certification on financial performance can vary according to the individual characteristics of the airlines, they have been segmented according to ownership, the routes they operate, fare price, belonging to an alliance and region in the world (Coles et al., 2009; Haggmann et al., 2015).

By applying a multiple linear regression with panel data, the findings from this study will contribute to informing stakeholders about whether the effect of environmental practices on passengers, assets and employees will lead to an increase in the financial performance of passenger airline companies, providing them with information that is essential to their decision-making.

The remaining sections of this paper are organised as follows. Firstly, the literature is reviewed, and the hypotheses are established. Next, the methodology is outlined, followed by the presentation and discussion of the results. Finally, the implications, conclusions, limitations and future research lines are presented.

2. Literature review and hypothesis

2.1. Environmental certification and financial performance of airlines

The progressive liberalisation and globalisation of the aviation industry have led to a 70 % growth in passenger demand in the last decade, making it one of the most economically, culturally and socially important sector in the world (International Civil Aviation Organization (ICAO), 2020). At the same time, its negative impact on the environment has risen dramatically. Therefore, it is not surprising that in 2019, air transport was responsible for 2.4 % of global greenhouse gas emissions (Leamon et al., 2019).

For this reason, because of its harmful effects on climatic change, the aviation industry has come under fierce criticism and public and private pressure (Mak & Chan, 2006). In response to this, to become sustainable and to mitigate their negative effect on the planet, airlines are adopting measures centred on environmental conservation (Haggmann et al., 2015). In this sense, a proactive environmental attitude would benefit the environment and would allow airlines to gain competitive advantages resulting from improving their image and/or operational efficiency, which would increase their financial performance (Phillips et al., 2019).

Nevertheless, although there are numerous studies that have analysed the effects of the airlines' environmental impact, little attention has been given to the relation between financial performance and environmental proactivity (Stevenson & Marintseva, 2019). Likewise, the methodological and theoretical heterogeneity of these studies have led to contradictory, inconsistent and inconclusive results (Karaman et al., 2018). In this sense, authors like Wang et al. (2015), Luo et al. (2015), Lynes and Andrachuk (2008), Inoue and Lee (2011) and Coles et al. (2009) observed a positive relation between sustainability and economic performance. In contrast, Karaman et al. (2018), Lee and Park (2010) and Kang et al. (2010) verified that there was no relation between responsible environmental activities by airlines and financial performance.

Meanwhile, authors like Karaman et al. (2018) have pointed out that the studies conducted have limitations because the indicators used to measure the environmental commitment of airlines are unrepresentative and unreliable. Also, Haggmann et al. (2015) and Wang et al. (2015) have claimed that the information used is neither objective nor independent, it has not been verified, and it is heterogenic, scant and difficult to locate.

In light of all these considerations, this paper aims to further and extend the research into the relation between environmental management and financial performance. To do so, environmental certification based on international standards and verified by external organisations is used as a variable that is representative of an airline's environmental proactivity. Although the variables used for measuring environmental proactivity are diverse, there is extensive literature that has used certification to analyse this relation (Cavero-Rubio & Amorós-Martínez, 2020). This decision aims to reduce the bias arising from the disadvantage of not having an objective and standardised variable that would increase the reliability and the comparability of the study (Mak & Chan, 2006). Besides, according to International Air Transport Association (IATA) (2021) and International Civil Aviation Organization (ICAO) (2020), environmental certification is one of the strategies most widely used by airlines to obtain recognition for their environmental efforts.

In this respect, the main standard used for obtaining environmental certification in aviation is ISO 14001 and to a lesser extent the Eco-Management and Audit Scheme (EMAS) (Haggmann et al., 2015). In addition, IATA has created its own environmental certification based on ISO 14001, IATA Environmental Assessment (IEnVA), specifically for airlines.

In line with the above discussion and from the perspective of Resource-Based View (Barney, 1991), the adoption of environmental certification can be seen as a source of strategic differentiation in seeking customer approval and social legitimacy. Obtaining this certification could have a positive impact on a company's image and reputation by demonstrating its commitment to environmental management and sustainability. Environmental certification could also influence passengers' decisions and increase their demand and sales (Chen, 2010; Haggmann et al., 2015; Karaman et al., 2018).

In addition, the benefits of environmental certification would extend to human and internal operational improvements, leading to a reduction in costs. Thus, the environmental awareness of employees could determine an improvement in their performance, and technological investment and sustainable asset management would enable operations to be executed more effectively and decrease resource consumption (Leamon

et al., 2019; Lee & Park, 2010; Phillips et al., 2019; Wang et al., 2015). In this way, an increase in the financial performance of airlines could be achieved (Geerts, 2014; Inoue & Lee, 2011).

Consequently, this study departs from previous research by introducing the mediating effect of the green image of passengers, sustainable asset management, and employee ecological performance on the relationship between airline environmental management and financial performance.

2.2. Perception of the green image, environmental certification and financial performance of airlines

The growing relevance of sustainability indicators in the aviation industry (Keiser et al., 2023) has led to increased attention towards ISO 14001 certification, which is considered a concrete indicator of companies' environmental commitment (Boiral, 2007; Heras-Saizarbitoria et al., 2011). According to Graafland (2018), the complexity of the certification process and the fees that companies often paid for it, already demonstrate the environmental awareness of organisations. This commitment contributes to the improvement of the company's green image and reputation (Boiral, 2007; Heras-Saizarbitoria et al., 2011; Li et al., 2017; Quintana-García et al., 2021). It has been shown to increase customer satisfaction and loyalty (Danso et al., 2019; Idris, & Durmuşoğlu, 2023; Park, 2019; Tang et al., 2012). For instance, Park's (2019) study, based on data from 967 airline users, concludes that airlines' environmental responsibility has a significant impact on customer attitudes and satisfaction, and customer attitudes and satisfaction, in turn, affect the company's reputation.

Therefore, the adoption of ISO 14001 certification provides companies with competitive advantages in the market that are linked to customer satisfaction, loyalty and corporate reputation (Dangelico & Pontrandolfo, 2015; Graffin & Ward, 2010; Lin & Niu, 2018). These advantages could influence consumers' purchasing decisions towards certified companies (Chen & Ho, 2019; Radhouane et al., 2018). In this vein, Baumeister et al. (2022a) study, based on a survey of 1170 airline passengers, finds that environmental certification increases the likelihood of passengers traveling with the airline again and positively recommending or commenting on it. Moreover, several studies agree that consumers would be willing to pay more for products and services from certified companies (Akan et al., 2022; Baumeister et al., 2022b; Thompson et al., 2010). Conversely, consumers may also penalise companies that do not comply with environmental standards by refraining from purchasing their products or services and by negative word-of-mouth advertising (Camilleri, 2022).

In line with the above, environmental certification could yield a positive impact on sales and, consequently, indirectly benefit firms' profitability by enhancing their environmental image and reputation (Oh et al., 2020; Paelman et al., 2021; Wong et al., 2013). This relationship is supported by the literature, which suggests that factors such as customer satisfaction and reputation are pivotal for corporate financial performance (Arocena et al., 2021; Le, 2023), highlighting the strategic significance of environmental certification as a driver of financial performance. Based on these considerations and congruent with Dangelico (2015), the following hypothesis is formulated:

H1. The effect of environmental certification on passengers' green image increases the financial performance of airlines.

2.3. Sustainable asset management, environmental certification and financial performance of airlines

The implementation of environmental certification has the potential to enhance a company's environmental image and reputation, as well as serve as an important motivator for technological innovation (Jiang et al., 2020; Porter & van der Linde, 1995). Jiang et al. (2020) note that despite the significant costs associated with environmental certification,

companies are willing to make substantial investments in technology. This commitment is motivated by the need to comply with stringent certification requirements and adopt cleaner, more efficient and sustainable technologies in order to ensure the success of the environmental label and to avoid potential failures.

Therefore, certification is not merely a formal process; it also drives companies to proactively invest in sustainable technologies and to align their technical and operational practices with environmental criteria (Abid et al., 2022; Heras-Saizarbitoria & Boiral, 2013). In the context of the airline industry, investments in sustainable assets may entail the acquisition of new aircraft that are more fuel-efficient, the implementation of on-board energy management systems to optimise resource use, and the adoption of emission reduction technologies to mitigate environmental impacts.

This technological transformation contributes to the elimination of inefficient production procedures and the optimisation of organisational resource utilisation (Camilleri, 2022; He & Shen, 2019; Waxin et al., 2020). As a result, operating costs are decreased and business profitability is improved (Treacy et al., 2019). For instance, Arocena et al. (2021) demonstrate that ISO 14001 certification has been an effective catalyst for reducing carbon emissions through reducing energy consumption, thereby increasing profitability. Furthermore, the changes introduced by certification lead to an improvement in technological and operational efficiency, resulting in a competitive advantage that positively impacts airlines' profitability (Baumgartner, 2014; McWilliams et al., 2006; Porter, 1991). Based on these arguments, the following hypothesis is formulated:

H2. The effect of environmental certification on asset sustainability increases the financial performance of airlines.

2.4. Employee ecologic behaviour, environmental certification and financial performance of airlines

The adoption of environmental certification in airlines is conditioned by organisational and structural factors, but human resources also play a crucial role (Delmas & Pekovic, 2013; Lo et al., 2014). To obtain certification, a company must demonstrate genuine commitment to environmental management. This is achieved through Green Human Resource Management (GHRM) practices, which include the provision of environmental training for employees (Blunch & Castro, 2007; Khanna & Anton, 2002). GHRM is an acronym for Green Human Resource Management, which refers to the strategies and activities that promote ecological behaviour among employees. It has emerged as a cornerstone in driving workplaces and organisations towards sustainability and environmental respectfulness (Ahmad, 2015).

The relationship between environmental certification and GHRM highlights the importance of holistically integrating environmental aspects into human resource management (Yong et al., 2020). It is important to recognise that environmental certification should not be considered merely as a superficial requirement to meet stakeholder expectations. Rather, it should be viewed as a genuine commitment to sustainability and environmental responsibility (Testa et al., 2018).

Previous research has demonstrated that both environmental certification and GHRM practices can provide significant competitive advantages to companies (Malik et al., 2020; Mustafa et al., 2023). On the one hand, research has shown that the adoption of environmental certification can have a positive impact on employees' attitudes towards the company and their commitment to the environment (Chaudhary, 2020; Amec & Lanoie, 2008). The commitment of an organisation to the environment can enhance the attractiveness of the company as an employer and strengthen employees' sense of belonging and motivation (Guillot-Soulez et al., 2022). On the other hand, implementing GHRM practices can significantly enhance employees' knowledge and skills regarding environmental issues, thereby leading to an overall improvement in work performance and efficiency (Sharma et al., 2021;

Delmas & Pekovic, 2013; Gadenne et al., 2009; Dearden et al., 2006). According to a recent meta-analysis of 75 studies conducted by Carballo-Penela et al. (2023), which examines the effect of GHRM practices on the economic performance of organisations, these competitive advantages could translate into a higher financial return for the companies.

Furthermore, the findings of Wang et al. (2023) establish a positive relationship between GHRM and corporate reputation. Moreover, Afum et al. (2021) demonstrate that the combination of environmental management with GHRM enhances a firm's reputation and enables it to achieve higher financial performance. Therefore, a positive perception of the company's environmental practices can create a virtuous circle, where improved labour efficiency and positive reputation mutually reinforce each other, ultimately contributing to corporate profitability (Ren et al., 2022). In accordance with these considerations and in line with Delmas and Pekovic (2013), the following hypothesis is formulated:

H₃. The effect of environmental certification on employee ecological behaviour increases the financial performance of airlines.

2.5. Airline characteristics, environmental certification and financial performance of airlines

As the literature has revealed that airline characteristics condition the research results (Hagmann et al., 2015), at this point of our study, the differentiated effects of certification on financial performance are analysed according to these characteristics. This is done by including them in the hypotheses defined above.

The first characteristic to be considered is whether the airline operates international or domestic routes. Following Cowper-Smith and de Grosbois (2011) and Lynes and Andrachuk (2008), the environmental, technical and economic implications are different. The routes airlines operate are a factor that can affect fuel consumption, the airline fleet, CO₂ emission rates, dangerous waste management and technical and operational efficiency. Hence, the following hypotheses are defined:

H_{1.1a}/H_{1.1b}. The effect of environmental certification on the green image of passengers increases the financial performance of international/domestic airlines.

H_{2.1a}/H_{2.1b}. The effect of environmental certification on asset sustainability increases the financial performance of international/domestic airlines.

H_{3.1a}/H_{3.1b}. The effect of environmental certification on employee ecological behaviour increases the financial performance of international/domestic airlines.

Secondly, in line with the studies by Stevenson and Marintseva (2019) and Cowper-Smith and de Grosbois (2011), government ownership of airlines has historically been a country's cultural symbol. Hence, governments are responsible for maintaining a positive image. Thus, the fact that airlines are government or privately owned permits the definition of the following hypotheses.

H_{1.2a}/H_{1.2b}. The effect of environmental certification on the green image of increases the financial performance of government/private airlines.

H_{2.2a}/H_{2.2b}. The effect of environmental certification on asset sustainability increases the financial performance of government/private airlines.

H_{3.2a}/H_{3.2b}. The effect of environmental certification on employee ecological behaviour increases the financial performance of government/private airlines.

On the other hand, in line with Assaf and Josiassen (2012), in recent decades, low-cost airlines have revolutionised the tourism industry. Given that their objective is to minimise costs in order to offer low price

flights, it might be assumed that low-cost airlines are not committed to sustainability. In addition, as they have fewer economic resources, their investments in new sustainable and technically more efficient technologies are likely to be limited (Chang & Yu, 2014). In this respect, the following hypotheses are established:

H_{1.3a}/H_{1.3b}. : The effect of environmental certification on the green image of increases the financial performance of low-cost/full-service airlines.

H_{2.3a}/H_{2.3b}. : The effect of environmental certification on asset sustainability increases the financial performance of low-cost/full-service airlines.

H_{3.3a}/H_{3.3b}. : The effect of environmental certification on employee ecological behaviour increases the financial performance of low-cost/full-service airlines.

Likewise, considering the studies by Hagmann et al. (2015) and Phillips et al. (2019), airlines have sought to enhance passenger accessibility, expand their market share and achieve resource efficiency through the establishment of strategic international alliances. Given that alliances can have a positive impact on an airline's environmental activity, the following hypotheses are defined:

H_{1.4a}/H_{1.4b}. The effect of environmental certification on the green image of passengers increases the financial performance of airlines that belong to/do not belong to an alliance.

H_{2.4a}/H_{2.4b}. The effect of environmental certification on asset sustainability increases the financial performance of airlines that belong to/do not belong to an alliance.

H_{3.4a}/H_{3.4b}. The effect of environmental certification on employee ecological behaviour increases the financial performance of airlines that belong to/do not belong to an alliance.

Finally, the zone where an airline operates is another characteristic to consider in this sector. Depending on the region an airline belongs to, commitment, attitude and environmental responsibility are different (Lynes & Andrachuk, 2008). Not only are there different motivations, barriers, perceptions and environmental practices, but there are also different regulatory frameworks, governmental pressures and emission rates. In line with the studies by Assaf and Josiassen (2012), and considering the five world regions in which the United Nations World Tourism Organization (UNWTO) (2020) classifies the airlines, the following hypotheses are established for each of the five regions:

H_{1.5a}/H_{1.5b}/H_{1.5c}/H_{1.5d}/H_{1.5e}. The effect of environmental certification on the green image of passengers increases the financial performance of airlines belonging to the Americas/Europe/Asia-Pacific/Africa/Middle East.

H_{2.5a}/H_{2.5b}/H_{2.5c}/H_{2.5d}/H_{2.5e}. The effect of environmental certification on asset sustainability increases the financial performance of airlines belonging to the Americas/Europe/Asia-Pacific/Africa/Middle East.

H_{3.5a}/H_{3.5b}/H_{3.5c}/H_{3.5d}/H_{3.5e}. The effect of environmental certification on employee ecological behaviour increases the financial performance of airlines belonging to the Americas/Europe/Asia-Pacific/Africa/Middle East.

3. Methodology

3.1. Sample

Following the studies by Inoue and Lee (2011), Wang et al. (2015) and Karaman et al. (2018), a longitudinal study has been carried out for the 2010 to 2019 period, analysing airlines dedicated to the transport of passengers. According to these studies, the period is extensive enough to

develop the study. As COVID-19 has caused a serious impact on the aviation industry since 2020, to avoid the results being distorted by the effects of the pandemic, 2019 is the last year considered (International Civil Aviation Organization (ICAO), 2021) and (International Air Transport Association (IATA), 2020).

The inclusion of the airlines to be studied was carried out as follows. Firstly, a selection process was performed by referring to the airlines as listed by IATA (International Air Transport Association (IATA), 2020). Out of the 194 airlines that were active in passenger transport, elimination criteria were applied to those that could not be located, whose annual reports were not published on their websites, whose financial information could not be found on the EIKON database (Thomson Reuters Dataset, 2021), and whose data for the variables used in this study were not available, were incomplete or presented unreliable accounting data. The final population was 99 airlines.

The second stage consisted of dividing the airlines into two groups: certified and non-certified. The certified airline group comprises airlines certified by ISO 14001, EMAS or IEnvA in the 2010 to 2019 period. In this regard, as several airlines were not certified for the entire period from 2010 to 2019, the years preceding their certification acquisition are analysed within the non-certified airlines group. Conversely, the years following their certification acquisition are analysed within the certified airlines group.

In order to ascertain which airlines were environmentally certified, verification was conducted to determine whether they were included in the EMAS database for organisations registered with the European Commission (2021) and in the list of certified airlines IEnvA from IATA (International Air Transport Association (IATA), 2021). EMAS, unlike ISO 14001, is a detailed and updated database that guarantees the availability of a reliable register that is accessible and open to certified companies. The ISO 14001 certification, however, does not have a centralized database or provide public access to ISO 14001 certified companies. Therefore, it was necessary to use other means to verify whether the airline had this certification. In this sense, firstly, the databases of companies certified by the leading inspection organisations in aviation industry (e.g. Association for Standardisation and Certification (AENOR), Bureau Veritas, TÜV SÜB, Lloyds Register, SGS International Certification Services) were consulted. Additionally, considering that the internet serves as an interactive and relatively economical medium for companies to showcase their environmental commitment and publicise their certification, airlines' websites were also visited (Peiró-Signes et al., 2014).

The airlines for which no evidence of certification was found were included in the group of non-certified airlines for this period. The classification result obtained was 40 certified airlines (333 observations) and 59 non-certified (657 observations).

3.2. Data and variables

As explained above, environmental certification could imply an increase in passenger bookings and an improvement in employee performance and assets, which should mean an increase in the financial performance of airlines.

In line with the studies conducted by Cavero-Rubio and Amorós-Martínez (2020), Segarra-Oña et al. (2011), and Chen (2010), the return on assets (ROA) was chosen as the dependent variable to assess financial performance. These scholars highlight that ROA is widely employed in environmental management research to gauge financial performance. Furthermore, in aviation industry research, many scholars consider ROA as the most stable and indicative measure of financial performance, reflecting the asset utilisation and operational efficiency of a firm (Hong et al., 2023; Karaman et al., 2018; Kuo et al., 2021; Phillips et al., 2019; Stevenson & Marintseva, 2019).

Secondly, the environmental image that passengers may have can condition their flight bookings. It would be logical to think that certification would improve an airline's reputation, increasing its sales.

Therefore, in line with the studies by Segarra-Oña et al. (2011), Wang and Lin (2022), Spasojevic et al. (2018) and Phillips et al. (2019), the variable chosen to measure the effect of environmental certification on passengers is the variation in sales (SG).

For its part, environmental proactivity would entail investing in green technology and the sustainable management of assets, which would result in an increase in an airline's asset performance. Hence, following Noh (2019), Treacy et al. (2019) Collins et al. (2011) and Dizkirici et al. (2016), the variable chosen to quantify the impact that certification has on sustainable asset management is asset turnover (AT).

Finally, environmental standards and GHRM can impact favourably on employee ecological behaviour, and consequently, on their performance. Therefore, following Prajogo et al. (2014), Lo et al. (2014) and Delmas and Pekovic (2013), net operating income per employee (NOIPE) is used to quantify employee performance. It seems reasonable that an ecological attitude by employees would mean an improvement in their performance.

Table 1 provides a definition of these three variables, which will be considered independent or explanatory of ROA.

In addition, as explained in the previous section, because the effects of certification on financial performance can be significantly different according to the individual characteristics of airlines (Cowper-Smith & de Grosbois, 2011), Table 1 includes the variables defined to differentiate the impact of certification according to these individual characteristics. In this sense, a continuous control variable, SIZE, is included along with nine dichotomous variables: INT, GOV, LOWCOST, ALLI, AME, EUR, AS&PAC, AFR and MEAST. Table 2 presents a classification of the airlines analysed according to the UNWTO world region. Table 2 relates the airlines analysed and its classification by UNWTO world region.

Table 1
Variables analysed.

Variable	Description	Abbreviation
Return on assets	Earnings Before Interest and Taxes/ Total assets	ROA
Sales growth	(Sales year ^t - Sales year ^{t-1})/(Sales year ^{t-1});	SG
Asset turnover	Revenues/Total assets	AT
Net operating income per employee	Net operating income/Number of employees	NOIPE
Size of the airline	Logarithm of total number of assets	SIZE
Environmentally certified	Yes = 1 if the airline is environmentally certified No = 0 otherwise	CERT
Routes operated	Yes = 1 if the airline operates international routes No = 0 otherwise	INT
Ownership	Yes = 1 if the airline is government-owned No = 0 otherwise	GOV
Fare	Yes = 1 if the airline is low-cost fare No = 0 otherwise	LOWCOST
Alliance	Yes = 1 if the airline belongs to an alliance No = 0 otherwise	ALLI
World Region	Americas Yes = 1 if the airline belongs to Americas No = 0 otherwise	AME
	Europe Yes = 1 if the airline belongs to Europe No = 0 otherwise	EUR
	Asia-Pacific Yes = 1 if the airline belongs to Asia-Pacific No = 0 otherwise	AS&PAC
	Africa Yes = 1 if the airline belongs to Africa No = 0 otherwise	AFR
	Middle East Yes = 1 if the airline belongs to Middle East No = 0 otherwise	MEAST

Table 2
Airlines by UNWTO world region.

Americas	Europe	Asia&Pacific	Africa	Middle East
Aeromexico			Air Mauritius	Air Arabia
Aero Republica Air Canada	Aegean Airlines	Air China	Comair Kenya Airways	Egyptair
Air Transat	Aer Lingus	Air India Air New Zealand ANA (All Nippon Airways)	Precision Air	Emirates
Alaska Airlines	Aeroflot		Jazeera Airways	
American Airlines	Aigle Azur	Asiana Airlines	South African Airways	Kuwait Airways MEA
Atlas Air Avianca	Air Astana	Bangkok Airways	Tunisair	Middle East Airlines
Azul Brazilian Airlines	Air Europa Air France	Cathay Pacific		Oman Air Royal Jordanian
Copa Airlines	Air Greenland	China Airlines		
Delta Air Lines	Air Nostrum	China Eastern		
GOL Linhas Aereas Hawaiian Airlines	Atlantic Airways	China Southern Airlines		
Interjet	BH Air (Balkan Holidays Airlines)	EVA Air		
JetBlue	Binter Canarias	Garuda Indonesia		
LATAM Airlines	BMI Regional (British Midland Regional Limited)	Hainan Airlines		
Argentina Southwest Airlines	British Airways	Japan Airlines		
Spirit Airlines	Brussels Airlines			
United Airlines	Condor			
WestJet	Flugdienst GmbH	Jet Airways		
	Croatia Airlines	Juneyao Airlines		
	DHL Aviation	Korean Air		
	Easyjet	PIA Pakistan International Airlines		
	El Al Israel Airlines			
	Evelop Airlines	Qantas		
	Finnair	Shandong Airlines		
	IBERIA	Singapore Airlines		
	Icelandair	SriLankan Airlines		
	KLM	Thai Airways International		
	Lufthansa	Vietnam Airlines		
	Luxair	Virgin Australia		
	Norwegian Air Shuttle			
	Pegasus Airlines			
	Ryanair			
	S7 Airlines			
	SAS Scandinavian Airlines			
	SATA Air Açores			
	SATA Internacional			
	TAP Portugal			
	Turkish Airlines			
	Ural Airlines			
	Virgin Atlantic			
	Vueling			
	Wizz Air			

As discussed in the previous paragraph, Table 3 presents the certified and non-certified airlines and the number of observations for each of the groups resulting from the classification according to the individual characteristics selected.

4. Results

4.1. Descriptive statistics and univariate analysis

The ratios corresponding to each airline are calculated from the EIKON database (Thomson Reuters Dataset, 2021). For those airline companies that are not available in the database, the Annual Reports published on their websites are used. Table 4 shows the median, mean and standard deviation values calculated for all the airlines, both certified and noncertified, and for each of the dichotomous variables. To determine if the differences between the results obtained are significant, Table 4 presents the values corresponding to the difference between the ratios of the airline companies for each group and the student-t-test. It should be noted that because there were no certified airlines in the Middle East it was not possible to obtain information for this region of the world.

Table 4 shows that the student-t-test indicates that the differences are negative and statistically significant for all the certified airlines in ROA (-1.59 %), SG (-3.88 %), and NOIPE (-2954.51). Across the various groupings considered, nearly all results point to significant differences between certified and non-certified airlines, except for NOIPE among government-owned (3232.81) and Asia&Pacific airlines (4554.87).

In contrast, the differences for the whole population of AT (0.02) are higher for certified airlines, but no statistically significant. AT stands out as the ratio where the statistically significant differences among groupings exhibit different signs. While the differences are favourable for the certified airlines that not operate international routes (0.79), are not owned by the government (0.05), low-cost (0.60) and operate in Americas (0.15), they are negative for airlines that operate international routes (-0.04), full-service (-0.06), belong (-0.08) and do not belong to an alliance (-0.15) and Asia&Pacific (-0.09).

4.2. Multivariate analysis

In line with Karaman et al. (2018) and Inoue and Lee (2011), a multivariate linear regression using ordinary least squares (OLS) has been conducted to contrast the proposed hypotheses. The objective of the hypotheses established is to verify whether the effects of certification on sales, asset turnover and employee performance imply a higher financial performance of the airlines with environmental certification.

In line with Keppel and Zedeck (1989), Hardy (1993) and Aiken and West (1991), to determine the effects of certification, CERT has been introduced as a fictitious variable. According to the studies by these authors, the influence of the explanatory variables on the dependent variable is conditioned by the effect from certification. Therefore, to analyse whether the influence of sales, asset turnover, and employee performance on financial performance depends on certification, it is necessary to introduce a new effect on the model that will include these interactions. To do so, the product of CERT is added to the model with the explanatory variables SG, AR and NOIPE (CERT * SG; CERT * AT; CERT * NOIPE). In this way, the β coefficients of the interactions represent the effect of sales, asset turnover and employee performance on ROA for certified airlines.

Given that the interactions only affect certified airlines, to determine the total effect of the explanatory variables on the performance of certified airlines, the β of the interactions (CERT * SG; CERT * AT; CERT * NOIPE) will have to be added to or subtracted from the β of all the individual values of SG, AT and NOIPE. If the β coefficient has a positive value, the financial performance of the certified airline will be high, so the hypothesis can be accepted. However, if the β coefficient is negative or does not appear in the model, it will indicate respectively that the effect of financial performance of certified airlines is lower than or equal to non-certified airlines, which would mean the hypothesis is rejected. It should be noted that to find out the impact of certification on size, its interaction with CERT has been included in the model.

Table 3
Distribution of airlines in the sample.

Variables		CERT		NoCERT		Total	
		Observations (airlines)	%	Observations (airlines)	%	Observations (airlines)	%
INT	Yes	297(35)	89.19 %	535(48)	81.43 %	832(83)	84.04 %
	No	36(5)	10.81 %	122(11)	18.57 %	158(16)	15.96 %
GOV	Yes	143(18)	42.92 %	240(20)	36.53 %	383(38)	38.69 %
	No	190(22)	57.06 %	417(39)	63.47 %	607(61)	61.31 %
LOWCOST	Yes	31(5)	9.31 %	200(18)	30.44 %	231(23)	23.33 %
	No	302(35)	90.69 %	457(41)	69.56 %	759(76)	76.67 %
ALLI	Yes	297(34)	89.19 %	195(15)	29.68 %	492(49)	49.70 %
	No	36(6)	10.81 %	462(44)	70.32 %	498(50)	50.30 %
WORLD REGION							
AME		47(6)	14.11 %	154(14)	23.80 %	201(20)	20.51 %
EUR		164(19)	49.25 %	236(21)	36.48 %	400(40)	40.82 %
AS&PAC		107(13)	32.13 %	142(12)	21.95 %	249(25)	25.41 %
AFR		15(2)	4.50 %	45(4)	6.96 %	60(6)	6.12 %
MEAST		0(0)	0.00 %	70(8)	10.82 %	70(8)	7.14 %
POOLED SAMPLE		333(40)	100.00 %	657(59)	100.00 %	990(99)	100.00 %

Thus, for airline *i* at year *t* the defined equation is as follows:

$$ROA_{it} = \alpha_0 + \beta_1 SG_{it} + \beta_2 AT_{it} + \beta_3 NOIPE_{it} + \beta_4 SIZE_{it} + \beta_5 CERT + \beta_6 CERT * SG_{it} + \beta_7 CERT * AT_{it} + \beta_8 CERT * NOIPE_{it} + \beta_9 CERT * SIZE_{it} + e_{it}$$

Although the contrasted hypotheses will depend on whether the analysis is of the whole population or different groupings, the equation will be the same. As shown in Table 2, depending on the hypothesis, the data corresponding to each grouping will be used, so the number of observations and data will be different for each one of them. It should be noted that to find out the impact of individual characteristics, nine dichotomous variables have been included in the model: INT, GOV, LOWCOST, ALLI, AME, EUR, AS&PAC, AFR and MEAST.

4.2.1. Stationary test

In time series analysis, data must be stationary to avoid spurious regression. If the data is not stationary, the results obtained with OLS method can be erroneous. To verify that the variables in the time series are not stationary, the Augmented Dickey-Fuller (ADF) Unit Root Test has been conducted. The results of the unit root-tests for all variables are presented in Table 5. As the *p*-values of all variables are less than 5 %, it can be concluded that the variables are stationary in first difference.

4.2.2. Autocorrelation test

Autocorrelation in an Ordinary OLS model can be a problem that arises in time series data. When autocorrelation is present, the OLS model produces unbiased estimates due to the lack of independence among the residuals. Each residual observation at two different time periods should not be correlated.

Initially, the Durbin-Watson test value can provide a preliminary assessment of whether serial correlation exists. As shown in Table 6, the values are close to 2, indicating that the OLS models are not subject to serial correlation. However, the Durbin-Watson test alone is not sufficient to guarantee the absence of serial correlation. Therefore, the LM test of Breusch-Godfrey has been employed. As can be seen in Table 6, the *p*-values of the Breusch-Godfrey LM test for serial correlation are greater than 5 %, indicating the absence of serial correlation in all estimated models. This corroborates the results obtained from the Durbin-Watson statistics.

4.2.3. Panel data regression model

Following the existing literature, given that the study sample comprises a heterogeneous combination of years and airlines cross-sectional data, the panel data technique has been used (Tan et al., 2017; Wagner,

2010). This technique allows for controlling unobservable and time-varying variables that do not change at the individual entity level.

Panel data regression models are classified into two categories: fixed effects and random effects. In order to determine which of the two models, fixed effects or random effects, is more appropriate, the Hausman test has been employed. Table 7 presents the values of the Chi-square statistic and the *p*-value for all regression models. As can be seen in Table 7, all *p*-values are less than 5 %, indicating that the appropriate estimation method is a fixed effects model. This is because the coefficients obtained by the fixed effects model are consistent and efficient.

Following the implementation of the Hausman test, the results indicate that the fixed effects model (Gujarati, 2009) was more appropriate for the observed behaviour of the sample. The fixed effects model is considered an appropriate technique for addressing unobservable heterogeneity and strict endogeneity. This model effectively controls for time-invariant effects by assuming that the individual and time-specific effects α_i of the sample remain constant (Gujarati, 2009).

The fixed effects model is typically employed as a static panel model, which does not permit the inclusion of lagged dependent variables as explanatory variables in the econometric model (Wooldridge, 2015). Furthermore, panel data inherently incorporates unobservable heterogeneity due to the stringent endogeneity. To capture the effects of unobservable heterogeneity associated with the specific characteristics of airlines and years, the fictitious variables α_i have been introduced to include the individual characteristics and annual periods.

4.2.4. Environmental certification and the financial performance

Tables 8, 9, and 10 show the results of the multivariate regression for the whole population as well as for the segmentations. As the Pearson correlation coefficients (untabulated) between variables do not exceed the rule of thumb level (0.80), and the Variance Inflation Factors (VIF) and condition indices (untabulated) for the independent variables are less than 4 and 10 respectively, multicollinearity is unlikely to be an issue of concern (Kleinbaum et al., 1998; Menard, 2002). The adjusted R_2 suggests that the all the models present a fine goodness-of-fit for the sample data.

In Tables 8, 9 and 10, the coefficients SG, NOIPE and AT are positive and statistically significant for the entire population and for the various airline segmentations, with the exception of SG for domestic, government, Europe and Africa, where no effect is observed. These coefficients indicate that they exert a positive influence on ROA. These effects are observed in both certified and non-certified airlines.

Table 4
Descriptive statistics. Mean Differences. Student-t-test.

Variables		Ratio	CERT			NoCERT			Difference Student-t-test
			Mean	Median	Std. dev.	Mean	Median	Std. dev.	
INT	Yes	ROA	2.83 %	2.83 %	4.17 %	4.39 %	4.25 %	5.91 %	-1.57 %*
		SG	4.55 %	4.43 %	7.59 %	8.15 %	7.04 %	10.97 %	-3.60 %*
		AT	0.83	0.76	0.41	0.87	0.77	0.45	-0.04**
	No	NOIPE(€)	10,681.89	10,964.69	16,177.79	13,109.16	9,199.65	21,846.72	-2,427.27***
		ROA	5.14 %	4.65 %	6.57 %	5.73 %	5.95 %	5.42 %	-0.58 %
		SG	4.17 %	5.54 %	8.84 %	9.50 %	9.13 %	11.38 %	-5.33 %*
GOV	Yes	AT	1.59	1.58	0.31	0.80	0.80	0.60	0.79*
		NOIPE(€)	12,900.49	9,654.59	21,117.17	17,241.13	12,321.61	20,647.31	-4,340.64
		ROA	1.91 %	2.00 %	3.58 %	2.19 %	2.60 %	5.35 %	-0.28 %
	No	SG	4.95 %	4.64 %	7.66 %	6.15 %	4.85 %	10.65 %	-1.21 %***
		AT	0.87	0.71	0.47	0.90	0.78	0.45	-0.04
		NOIPE(€)	7,599.23	7,439.64	15,129.10	4,316.92	4,133.65	15,943.32	3,232.81**
LOWCOST	Yes	ROA	3.89 %	3.52 %	4.94 %	5.84 %	5.88 %	5.69 %	-1.95 %*
		SG	4.17 %	4.54 %	7.79 %	9.60 %	8.83 %	12.67 %	-5.43 %*
		AT	0.88	0.83	0.42	0.83	0.77	0.43	0.05***
	No	NOIPE(€)	13,397.23	12,881.80	17,578.14	19,410.32	15,064.89	22,587.05	-6,013.10*
		ROA	4.55 %	3.79 %	6.26 %	5.77 %	5.78 %	5.95 %	-1.22 %***
		SG	3.88 %	4.74 %	9.45 %	11.13 %	9.32 %	11.10 %	-7.25 %*
ALLI	Yes	AT	1.37	1.45	0.49	0.77	0.78	0.42	0.60*
		NOIPE(€)	11,326.16	11,340.33	21,062.89	20,227.07	18,481.70	23,492.10	-8,900.92**
		ROA	2.92 %	2.88 %	4.29 %	4.13 %	4.03 %	5.71 %	-1.21 %*
	No	SG	4.57 %	4.61 %	7.54 %	7.15 %	6.30 %	10.80 %	-2.57 %*
		AT	0.84	0.77	0.41	0.90	0.78	0.44	-0.06**
		NOIPE(€)	10,898.91	10,764.10	16,305.53	10,974.01	7,559.54	20,118.38	-75.10
WORLD REGION AME	Yes	ROA	3.14 %	3.05 %	4.45 %	4.55 %	4.58 %	5.34 %	-1.41 %*
		SG	4.69 %	4.65 %	7.75 %	8.03 %	6.13 %	10.58 %	-3.34 %*
		AT	0.86	0.77	0.45	0.94	0.78	0.44	-0.08**
	No	NOIPE(€)	11,801.67	11,632.86	16,868.73	14,389.35	9,308.57	19,565.22	-2,587.69*
		ROA	2.46 %	0.75 %	5.27 %	4.71 %	4.64 %	6.03 %	-2.24 %**
		SG	3.17 %	3.18 %	7.57 %	8.54 %	7.78 %	11.24 %	-5.37 %*
EUR	Yes	AT	1.01	0.93	0.37	1.16	0.78	7.11	-0.15**
		NOIPE(€)	2,027.50	680.48	13,424.47	13,715.03	9,742.67	22,516.70	-11,687.54*
		ROA	4.29 %	4.48 %	4.29 %	4.29 %	7.40 %	5.40 %	-3.30 %*
	No	SG	4.62 %	4.14 %	7.62 %	9.54 %	7.49 %	11.16 %	-4.92 %*
		AT	0.98	0.89	0.42	0.76	0.75	0.26	0.23*
		NOIPE(€)	13,341.64	12,283.28	14,646.58	29,966.10	28,659.96	21,021.80	-16,624.46*
AS&PAC	Yes	ROA	3.46 %	3.26 %	4.97 %	4.49 %	3.91 %	5.35 %	-1.02 %**
		SG	4.19 %	4.87 %	7.87 %	8.28 %	7.78 %	10.86 %	-4.09 %*
		AT	1.01	0.95	0.44	0.97	0.92	0.52	0.04
	No	NOIPE(€)	10,217.86	9,636.72	17,326.39	10,474.70	7,854.54	18,222.00	-256.83
		ROA	2.37 %	2.07 %	3.58 %	2.89 %	2.34 %	5.44 %	-0.51 %
		SG	4.86 %	4.57 %	7.53 %	9.18 %	7.88 %	11.01 %	-4.32 %*
AFR	Yes	AT	0.66	0.64	0.36	0.75	0.67	0.34	-0.09**
		NOIPE(€)	12,055.25	11,607.70	17,155.84	7,500.38	4,922.66	16,896.11	4,554.87**
		ROA	-0.62 %	-0.43 %	4.49 %	1.88 %	1.74 %	6.91 %	-2.50 %***
	No	SG	5.39 %	2.20 %	8.90 %	2.18 %	3.21 %	11.26 %	3.21 %
		AT	1.06	0.81	0.52	1.11	1.08	0.43	-0.05
		NOIPE(€)	-972.10	506.80	9,486.42	3,174.72	1,663.66	15,991.09	-4,147.42
MEAST	Yes	ROA	-	-	-	3.47 %	4.11 %	6.00 %	-
		SG	-	-	-	9.00 %	7.62 %	10.42 %	-
		AT	-	-	-	0.66	0.57	0.41	-
	No	NOIPE(€)	-	-	-	11,386.96	9,835.29	30,046.16	-
		ROA	3.07 %	2.91 %	4.53 %	4.66 %	4.60 %	5.83 %	-1.59 %*
		SG	4.51 %	4.61 %	7.73 %	8.39 %	7.40 %	11.04 %	-3.88 %*
POOLED SAMPLE	No	AT	0.87	0.79	0.44	0.86	0.78	0.44	0.02
		NOIPE(€)	10,942.05	10,964.99	16,806.16	13,916.56	9,583.45	21,660.40	-2,974.51**

Significance: * $p < 0.01$; ** $p < 0.05$; *** $p < 0.1$.

4.2.5. The mediating effect of the green image of passengers

In the interactions of the variable CERT with SG, no value appears in columns A, D and E of Table 8, all the columns in Table 9, and columns A and B and D of Table 10. This means that for the pooled sample, for that are owned and no owned by the government, all the fares, belong or do not belong to an alliance, and belong to Americas, Europe and Africa, the effect of certification on sales does not have any impact on financial performance. Thus, it could be affirmed that the effect on sales from the improvement in environmental image of these certified airlines does not influence financial performance, which would signify the rejection of the hypotheses: H_1 ; $H_{1.2a}$; $H_{1.2b}$; $H_{1.3a}$; $H_{1.3b}$; $H_{1.4a}$; $H_{1.4b}$; $H_{1.5a}$; $H_{1.5b}$ and $H_{1.5d}$.

For its part, in columns B and C of Table 8 and in column C of Table 10, the β coefficient value of the interaction is negative. In this case, for the certified airlines that operate international flights (-0.051) and domestic flights (-0.142), and belong to Asia&Pacific (-0.058), the effect of sales on financial performance decreases. In contrast to what could be expected, the effect on sales of a better environmental reputation negatively influences the financial performance of these airlines, rejecting the hypotheses $H_{1.1a}$; $H_{1.1b}$ and $y_{H_{1.5c}}$.

It is noteworthy that no positive value appears for the interaction of sales with certification, which would imply that the effect of environmental image does not influence passengers when making their bookings.

Table 5
Augmented Dickey-Fuller (ADF) unit root test results.

Variable	z.lag.	Coefficient	t-value	p-value
SG	1	-0.99955	-30.45	0.0000
SGxCERT	1	-0.99965	-30.45	0.0000
AT	1	-0.76938	-23.87	0.0000
ATxCERT	1	-0.31781	-13.12	0.0000
ROA	1	-0.76938	-23.87	0.0000
ROAxCERT	1	-106.192	-31.54	0.0000
NOIPE	1	-0.71222	-22.65	0.0000
NOIPExCERT	1	-0.92263	-28.16	0.0000
TAM	1	-0.029556	-3.742	0.0001
TAMxCERT	1	-0.028402	-3.606	0.0003

Table 6
Autocorrelation tests results.

Airline characteristics		Breusch-Godfrey LM			Durwin-Watson
		Chi-Sq. Statistic	Df	p-value	
Routes operated	International	1.3727	1	0.2414	1.922
	Domestic	0.0083	1	0.9274	2.115
Ownership	Government	0,9056	1	0.8701	2.018
	No Government				
Fare	Government	3.4166	1	0.0645	1.797
	Low-cost	1.2615	1	0.2614	1.889
Alliance	Full-service	1.2158	1	0.2702	1.936
	Alliance	1.5209	1	0.2175	2.049
UNWTO World Region	No Alliance	1.0372	1	0.3085	2.128
	Americas	0.4199	1	0.5170	1.984
Pooled Sample	Europe	1.5629	1	0.2112	1.968
	Asia&Pacific	0.9281	1	0.3354	1.863
	Africa	0.8938	1	0.3445	1.690
		1.0703	1	0.3009	1.871

Table 7
Hausman test results.

Airline characteristics		Chi-Sq. Statistic	p-value
Routes operated	International	137.220	0.0000
	Domestic	14.098	0.0149
Ownership	Government	25.627	0.0001
	No Government	37.397	0.0000
Fare	Low-cost	14.218	0.0143
	Full-service	17.410	0.0427
Alliance	Alliance	184.845	0.0000
	No Alliance	150.921	0.0000
	Americas	18.117	0.0338
UNWTO World Region	Europe	63.268	0.0000
	Asia&Pacific	44.882	0.0000
	Africa	9.138	0.0104
Pooled Sample		51.394	0.0000

4.2.6. The mediating effect of sustainable asset management

With respect to the interactions of the variable CERT with AT, no value appears in columns B, C and E of Table 8, columns B and C of Table 9, and columns B, C and D of Table 10. Thus, for airlines that operate international and domestic routes, no owned by the government, full-service, belong to an alliance and Europe, Asia&Pacific and Africa, the effect of certification on sustainable asset management of these airlines does not influence financial performance, which would mean rejecting the hypotheses H_{2.1b}; H_{2.1b}; H_{2.2b}; H_{2.3b}; H_{2.4a}; H_{2.5b}; H_{2.5c} and H_{2.5d}.

Nevertheless, in columns A and D of Table 8, in columns A and D of Table 9, and column A of Table 10, the β coefficient value is negative. For all the certified airlines (-0.010), that are owned by government (-0.017), low-cost (-0.034), do not belong to an alliance (-0.031) and

Americas (-0.045), the effect of certification on sustainable asset management decreases the financial performance of these airlines, thereby rejecting the hypotheses H₂; H_{2.2a}; H_{2.3a}; H_{2.4b} and H_{2.5a}.

Just as in the case of sales, there is no positive value, which would imply that the effect of certification on asset turnover does not lead to an increase in the financial performance of airlines.

4.2.7. The mediating effect on employee ecological behaviour

Finally, for the interactions of the variable CERT with NOIPE, no value appears in column B of Table 9, and columns C and D of Table 10. Therefore, for a full-service, for an Asia&Pacific and Africa airline, the effect of certification on employee performance does not affect financial performance, which would mean rejecting hypotheses H_{3.3b}; H_{3.5c} and H_{3.5d}.

However, in column D of Table 8, the β coefficient value of the interaction is negative. For certified airlines that are government-owned (-8.237E-7), the effect of employee performance on financial performance decreases. The effect of certification on employee ecological behaviour negatively affects the financial performance of airlines, rejecting the hypotheses H_{3.2a}.

In contrast, the β coefficient value of the interaction is positive for columns A, B, C and E of Table 8, columns A and C of Table 9, and columns A and B of Table 10. The effect of employee performance on financial performance increases for all the airlines (4.237E-7), which operate international (4.434E-7) and domestic routes (1.098E-7), are privately owned (8.138E-7), low-cost (1.531E-7), belong to an alliance (2.057E-7) and do not belong to an alliance (1.979E-7) and belong to the region of the Americas (8.213E-7) and Europe (1.029E-7). The effect of certification on employee ecological employment positively affects the financial performance of certified airlines, accepting the hypotheses H₃; H_{3.1a}; H_{3.1b}; H_{3.2b}; H_{3.3a}; H_{3.4a}; H_{3.4b}; H_{1.5a} and H_{1.5b}.

4.2.8. Effect of the individual characteristics of the airlines

With regard to the values of the variables that include the individual characteristics of the airlines, in column B of Table 9 and in column A of Table 10, SIZE is negative. This suggests that the financial performance of large airlines may be lower for full-service (-0.003) and airlines operating in the Americas (-0.030). Conversely, positive values in Columns A and D of Table 9 and Columns C and D of Table 10 indicate that the financial performance of large airlines may be higher for low-cost airlines (0.021), airlines not affiliated with an alliance (0.005), operating in Asia&Pacific (0.009) and Africa (0.020).

The interactions of CERT with SIZE are positive in column D of Table 8, in column B of Table 9 and in column A of Table 10. Therefore, for airlines that are government-owned (0.003), full-service (0.001), and those operating in the Americas (0.005), the effect of certification increases financial performance as the size of the airline grows. For the rest of the airlines, as they do not appear in the model, this would imply that the size there is no impact at all on financial performance.

The negative values of the variable INT are observed in Column A of Table 8, Columns B and C of Table 9, and Column A of Table 10. These findings suggest that for airlines operating international routes, including the entire sample (-0.006), full-service carriers (-0.023), those belonging to an alliance (-0.015), and those in the Asia&Pacific region (-0.015), their financial performance would be adversely affected.

For GOV, negative values appear in column A of Table 8, in column C of Table 9 and in column A of Table 10. For airlines that are government-owned, for all the airlines (-0.005), that belong to an alliance (-0.006) and that belongs to Americas (-0.100), financial performance would be lower.

The LOWCOST values are negative in column C of Table 8 and in column C of Table 10, and positive in column B of Table 8, in column D of Table 9, and in columns A, B, and C of Table 10. This implies that while financial performance would be lower for low-cost airlines that operate domestic routes (-0.025) and belong to an alliance (-0.009), it

Table 8
Results of regression analysis. Pooled sample. Routes operated. Ownership.

Variables	Certified vs Non-Certified				
	Pooled sample	International	Domestic	Government	No Government
Intercept	Column A -0.013 (-2.687)*	Column B -0.025 (-7.190)*	Column C	Column D -0.025 (-4.713)*	Column E
SG	0.045 (3.559)*	0.063 (4.056)*			0.060 (3.624)*
AT	0.025 (7.954)*	0.023 (6.863)*	0.017 (2.544)*	0.035 (7.397)*	0.024 (5.822)*
NOIPE	2.036E-6 (26.525)*	1.953E-6 (23.401)*	2.593E-6 (22.412)*	3.352E-6 (19.939)*	1.775E-6 (20.366)*
SGxCERT		-0.051 (-1.701)***	-0.142 (-2.006)**		
ATxCERT	-0.010 (-3.317)*			-0.017 (-2.489)*	
NOIPExCERT	4.237E-7 (3.015)*	4.434E-7 (3.013)*	1.098E-7 (3.643)*	-8.237E-7 (-3.366)*	8.138E-7 (4.177)*
SIZExCERT				0.003 (2.971)*	
INT	-0.006 (-1.829)**				
GOV	-0.005 (-1.971)**				
LOWCOST		0.114 (3.318)*	-0.025 (-5.267)*		
ALLI			-0.013 (-2.317)**	-0.015 (-4.097)*	0.008 (1.787)***
AME	0.010 (2.869)*	0.015 (4.144)*	-0.011 (-2.092)**		
EUR	0.010 (3.793)*	0.012 (3.891)*			
AS&PAC					-0.010 (-2.754)*
AFR			0.031 (3.710)*	-0.023 (-3.995)*	0.016 (1.860)**
MEAST				-0.022 (-3.263)*	0.015 (2.046)*
Fixed effect variables	included	included	included	included	included
N	990	832	158	383	607
Adj. R2	0.678	0.657	0.892	0.732	0.673

Corrected t-statistics are in parentheses. Significance: *p < 0.01; **p < 0.05; ***p < 0.1.

would be higher for airlines that operate international routes (0.014), belong to an alliance (0.011), and are from the regions of the Americas (0.011), Europe (0.014), and Asia&Pacific (0.014).

The ALLI value is negative in columns C and D of Table 8, in column A of Table 9, and column B of Table 10, and positive in column E of Table 8 and in columns A and D of Table 10. Therefore, while financial performance would be lower for airlines that belong to an alliance and operate domestic routes (-0.013), are government-owned (-0.023), low-cost (-0.024), and belong to Europe (-0.025), it would be higher for airlines that are not government-owned (0.008) and belong to the Americas (0.024) and Africa (0.027).

Upon examination of the regions in which an airline operates, it can be observed that the Americas has positive values in columns A and B of Table 8 and a negative value in column C of Table 9. For airlines from the Americas, financial performance would be higher for those operating international routes (0.015) and lower for those operating domestic routes (-0.011).

For the European airlines, the values are positive in columns A and B of Table 8 and in columns A and D of Table 9. For all airlines belonging to Europe (0.010), operating international routes (0.012), being low cost (0.016), and not belonging to an alliance (0.014), financial performance would be higher. However, in column C of Table 9, the value is negative. For European airlines belonging to an alliance (-0.011), financial performance would be lower.

The Asia&Pacific airlines have negative values in column E of Table 8 and in column C of Table 9, and a positive value in column A of Table 9. While for the Asia& Pacific airlines that are not government-

owned (-0.010) and that belong to an alliance (-0.009), financial performance would be lower, for low-cost airlines, financial performance would be higher.

For Africa airlines, the values in columns C and E of Table 8 are positive, while they are negative in column D of Table 8 and Table 9. The Africa airlines that operate domestic routes (0.031) and are not government-owned (0.016) would experience higher financial performance. In contrast, the Africa airlines that are government-owned (-0.023) and do not belong to an alliance (-0.022) would experience lower financial performance.

Finally, as shown in column D of Table 8 and column C of Table 9, the financial performance of Middle East airlines is lower for airlines that are government-owned (0.002) and belong to an alliance (-0.050). The positive values in column E of Table 8 and column A of Table 9 show that for non-government-owned airlines (0.015) and low-cost airlines (0.032), financial performance would be higher.

5. Discussion

The results show that the effect of certification on sales has no positive effect on financial performance. While the certified airlines that operate international flights and domestic flights and belong to Asia&Pacific, the effect of sales on financial performance decreases, for the rest of airlines there is no impact.

Environmental certification may enhance the airline's image and increase preference among certain customer segments (Mkono, 2020). However, fierce competition among airlines in terms of schedules,

Table 9
Results of regression analysis. Fare. Alliance.

Variables	Certified vs NonCertified			
	Low-cost	Full-service	Alliance	No Alliance
	Column A	Column B	Column C	Column D
Intercept	-0.181 (-5.806)*	0.016 (1.678)**		-0.054 (-3.566)*
SG	0.076 (2.498)*	0.022 (6.874)*	0.044 (3.362)*	0.021 (1.328)*
AT	0.077 (7.995)*	0.021 (1.697)**	0.020 (6.617)*	0.033 (6.171)*
NOIPE	1.511E-6 (10.742)*	2.465E-6 (35.407)*	2.296E-6 (25.481)*	1.952E-6 (18.441)*
SIZE	0.021 (5.336)*	-0.003 (-1.988)**		0.005 (2.201)**
ATxCERT	-0.034 (-3.710)*			-0.031 (-3.169)*
NOIPExCERT	1.531E-7 (3.585)*		2.057E-7 (1.861)**	1.979E-7 (2.006)**
SIZExCERT		0.001 (2.140)**		
INT		-0.023 (-5.737)*	-0.015 (-3.654)*	
GOV			-0.006 (-2.270)**	
LOWCOST			-0.009 (-2.713)**	0.011 (2.619)*
ALLI	-0.024 (-2.381)*			
EUR	0.016 (2.347)**		-0.011 (-3.571)*	0.014 (3.243)*
AS&PAC	0.028 (2.585)*		-0.009 (-2.868)*	
AFR				-0.022 (-2.386)*
MEAST	0.032 (3.512)*		-0.050 (-4.301)*	
Fixed effect variables	included	included	included	included
N	231	759	492	498
Adj. R2	0.692	0.726	0.828	0.616

Corrected t-statistics are in parentheses. Significance: *p < 0.01; **p < 0.05; ***p < 0.1.

prices, costs for additional services, service quality, comfort, safety, punctuality, and reputation may overshadow environmental considerations in customers' choices. Passengers may prioritise these aspects over sustainability because they are direct, immediate, and tangible attributes related to the flight experience.

The intangible nature of certification may lead to scepticism among customers, who may perceive it as a mere bureaucratic formality rather than a genuine commitment to sustainability (Camilleri, 2022; Jiang et al., 2020). Additionally, if airlines pass on the additional costs associated with environmental management to their products and services, this could result in reduced competitiveness and a decline in demand (Camilleri, 2022). Although several survey-based studies indicate that passengers would be willing to pay a higher price for flights with environmentally friendly airlines (Akan et al., 2022; Baumeister, Zeng, & Hoffendahl, 2022), the results of this study align with those of Korba et al. (2023) and suggest that price may be a crucial factor in their choice.

On international routes, this is compounded by the fact that competition intensifies, limiting the effectiveness of environmental improvement as a differentiating factor against the competition (Treacy et al., 2019). The higher cost of international flights makes passengers more price-sensitive, leading to a preference to book lower fares, which has a negative effect on financial profitability.

In airlines operating on domestic routes, where, in addition, the market is more saturated, environmental management would not be sufficient to achieve differentiation from their competitors that passengers would value as a determining factor in their choice. Passengers will prioritise other factors such as quality of service, punctuality, and

Table 10
Results of regression analysis. UNWTO World Region.

Variables	Certified vs Non-Certified			
	Americas	Europe	Asia&Pacific	Africa
	Column A	Column B	Column C	Column D
Intercept	0.154 (3.712)*		-0.082 (-4.637)*	-0.186 (-4.094)*
SG	0.048 (2.298)**		0.039 (2.366)*	
AT	0.045 (4.374)*	0.019 (4.291)*	0.037 (6.165)*	0.049 (3.705)*
NOIPE	2.326E-6 (20.351)*	1.723E-6 (11.908)*	2.350E-6 (23.320)*	4.512E-6 (14.005)*
SIZE	-0.030 (-5.015)*		0.009 (3.961)*	0.020 (3.453)*
SGxCERT				-0.058 (-2.058)**
ATxCERT	-0.045 (-3.461)*			
NOIPExCERT	8.213E-7 (2.632)*	1.029E-7 (4.246)*		
SIZExCERT	0.005 (2.265)*			
INT			-0.015 (-2.959)*	
GOV	-0.100 (-5.325)**			
LOWCOST	0.011 (1.898)*	0.014 (2.976)*	0.014 (2.814)*	
ALI	0.024 (0.224)*	-0.025 (-4.884)*		0.027 (3.184)*
Fixed effect variables	included	included	included	included
N	201	400	249	60
Adj. R2	0.799	0.586	0.770	0.876

Corrected t-statistics are in parentheses. Significance: *p < 0.01; **p < 0.05; ***p < 0.1.

comfort of flights, which may limit the impact of sustainability on profitability (Cowper-Smith & de Grosbois, 2011).

Based on the results of this research, Asia&Pacific is the only region where passengers penalise certified airlines, possibly due to lower awareness of the environmental benefits of certification and economic constraints. This could lead passengers to choose more economical options, overlooking environmental certification, which may negatively affect airline sales.

Similar to sales, the results indicate that investment in sustainable technology and the increase in technological and operational efficiency resulting from the changes introduced by certification do not influence or even decrease financial performance. In this regard, the effect of certification on sustainable asset management does not influence financial performance for airlines operating international and domestic routes, not owned by the government, offering full-service, belonging to an alliance, and located in Europe, Asia&Pacific, and Africa. However, financial performance decreases for all certified low-cost airlines owned by the government, not belonging to an alliance, and located in the Americas.

Consequently, the findings indicate that investment in sustainable technology and improved operational efficiency due to certification does not guarantee an increase in financial returns in the short term. Despite the potential benefits of such investments, they may not be quickly recouped and require a long payback period. Furthermore, they often entail additional expenses such as maintenance and staff training (Alnavis et al., 2021; Low & Yang, 2019). The difficulty in proportionally increasing the price of fares to compensate for all these costs would be an additional reason for the zero or negative influence of technology investment on financial performance.

In the case of low-cost airlines, which compete to keep operating costs low, investments in sustainable technology may have a negative impact on profitability. This is because they cannot wait for the long term to reduce operating costs and have difficulties increasing prices.

Furthermore, compared to full-service airlines, they would be in a weaker financial position and would be less able to invest in cleaner technologies and sustainability programmes without significantly compromising their profitability.

Airline ownership also plays a key role in the adoption of efficient environmental decisions. Government-owned airlines may be subject to political interference and administrative constraints, which can result in costlier processes that hinder the achievement of business objectives and profitability (Adler et al., 2020). Furthermore, due to their relative insulation from competitive market forces and the demands of shareholders and investors, the imperative to monetise the cost of sustainable technology investments is less pronounced (Kim & Son, 2021).

Conversely, for airlines that do not belong to an alliance, individual investment decisions in environmental technology would limit economies of scale and cost-sharing benefits. In contrast, it is common for airlines within an alliance to compete in different markets and routes, and may benefit from the coordination of environmental needs and strategies in each of them (Payán-Sánchez et al., 2021). Consequently, the effect of sustainable asset management on the profitability of airlines that do not belong to an alliance could be negative.

Furthermore, the economic, political and social situation of the region in which a certified airline operates affects the impact of sustainable management on profitability (Chang et al., 2015; Kim & Son, 2021). The environmental regulations of the geographical area, the level of competition, infrastructure and air market development, passenger typology and acquisition cost would condition the funds an airline can invest in environmentally sustainable technology (Aigbavboa et al., 2023). In light of the aforementioned constraints, airlines may be compelled to prioritise other forms of investment and expenditure over those relating to environmental sustainability, particularly in regions where access to finance and financial resources is limited.

Lastly, the effect of certification on employee ecological behaviour for all the airlines, which operate international and domestic routes, are privately owned, low-cost, belong to an alliance and do not belong to an alliance and belong to the region of the Americas and Europe increases the financial performance.

These findings provide empirical support for the relationship established by the literature regarding the impact of environmental certification and GHRM on airline financial performance (Carballo-Penela et al., 2023). The commitment to sustainability among employees of certified airlines has been found to increase their financial profitability, regardless of their operating route or alliance affiliation. The implementation of environmental certification has positively influenced the comprehension of environmental issues and the significance of sustainability within these airlines, facilitating the integration of sustainable practices into the organisational culture. Airlines have invested in training and education to promote the adoption of sustainable behaviours among their staff, which has the effect of improving processes and reducing operational costs, thereby increasing the financial profitability of the airline (Mustafa et al., 2023).

However, the effect of certification on employee ecological behaviour does not affect the financial performance of a full-service, an Asia&Pacific and an Africa airline. As previously stated, cost reduction is not the primary objective of full-service airlines. Consequently, they may be required to incur a higher cost in order to train their employees and financially reward sustainable behaviour. In contrast to low-cost airlines, full-service would have greater financial resources at their disposal, allowing them to prioritise more essential actions than improving the environmental performance of employees. Furthermore, the more intricate operational structure of full-service airlines may present additional obstacles for employees in adapting to the requisite changes to adopt environmental practices in their daily work. This would restrict the development of more efficient activities, thereby increasing costs. Unlike low-cost airlines, it would prevent them from increasing their profitability.

The environmental awareness of each region can also influence the

organisational culture and the sustainable behaviour of employees. In certain regions, such as Asia and Africa, airlines do not prioritise employee environmental behaviour, which negatively affects staff motivation to adopt sustainable practices. Nevertheless, a robust organisational culture that emphasises the significance of sustainability is essential for aligning employees' environmental conduct with the company's financial performance (Lee et al., 2023).

The results indicate that public ownership of airlines is the only scenario in which the environmental conduct of employees has a detrimental impact on financial performance. In these airlines, where profitability is not a primary concern and efficiency is not a central focus for employees, there may be less emphasis on environmental performance, which could result in a lower level of environmental awareness among staff. Furthermore, political and labour constraints in state-owned airlines may devalue the environmental activity of employees (Wittmer & Müller, 2021). These airlines are typically associated with less economically developed countries, which constrains the focus on environmental efficiency and results in environmental efficiency of employees being a lower priority. Furthermore, the remuneration system for public employees, which encompasses additional benefits and intricate working conditions, can impede the swift implementation of environmental initiatives, influencing both short- and medium-term profitability.

Finally, the size of certified airlines can have a positive or neutral impact on their financial performance. The findings indicate that for airlines that are government-owned, offer full-service, and are based in the Americas, an increase in size is associated with enhanced financial performance. For the remaining airlines, there is no discernible impact on financial performance. In the three cases where size increases financial performance, these are large airlines that tend to operate in extensive and diversified networks, which gives them access to economies of scale and favourable conditions in technological investments, training and environmental training of human resources and compliance with environmental regulations (Ginieis et al., 2020; Vega et al., 2016). Their size confers upon them greater bargaining power with suppliers, enabling them to offer competitive rates and thereby maximise sales. Furthermore, their superior financial capacity enables them to make significant investments in sustainable and efficient technologies and to access concessional finance.

6. Implications

The timeliness and relevance of this study is justified since it contributes to the literature that has dealt with the relation between the financial performance and environmental management of airlines. The added value of this research is that it is an empirical study on an international level which covers an extensive period, 2010–2019, and uses an objective variable of environmental commitment, the certification, to determine if the airline is environmentally proactive. Although environmental certification is not the only variable used to explain the relation between environmental management and financial performance, there is extensive literature that has used it to explain this relation (Peiró-Signes et al., 2014).

The results of this research are relevant for airline executives, since it has been made evident that funds allocated to environmental management do not lead to achieving competitive advantages arising from an improvement in external reputation as perceived by clients, and thereby an increase in financial performance. Besides, although in the majority of the classifications performed, the effect of certification on employee performance does increase financial performance, the effect on the contribution of assets for generating income does not imply an increase for either of the groups of airlines. Consequently, it could be affirmed that, overall, financial performance of certified airlines is lower than those that are not.

Moreover, knowledge of the relation between airlines' financial performance and environmental certification according to whether the

airline is government or privately owned, low-cost, if it belongs to an alliance, if it operates internationally, and the world regions where it provides services will also provide airline managers with important information (Assaf & Josiassen, 2012).

In this sense, it is important to note that the results indicate that the impact of certification on sales does not have a positive effect on financial performance. With regard to this matter, airline clients do not consider whether an airline is certified when making purchasing decisions. While they do value this certification positively, it does not affect their booking intentions. In a highly competitive market, it is crucial for the directors of the airline sector to understand that it is not feasible to establish a close relationship with clients and cultivate loyalty based on environmental management (Sharma et al., 2007).

Consequently, in line with Mak et al. (2007), the fact that an airline has a proactive environmental attitude is not valued by passengers, either because they give priority to prices due to the rigidity of supply, which does not provide enough leeway to be able to choose between several airline companies, or because the airlines are not disseminating their certification enough. Environmental commitment does not improve quality as perceived by clients nor does it improve their environmental image (Chan & Wong, 2006).

Although environmental management is still not seen as a variable that conditions passenger decisions, it is possible that this will soon change, and it seems that steps have already been taken (Adlwarth, 2011). Environmentally committed airlines will be able to attract a type of client whose decisions are not based on economic and financial aspects alone, but clients attuned to environmental management who prefer to buy from airline companies recognised for their implementation of environmental measures (Chang & Yu, 2014).

This scenario could deter company managers from adopting environmental actions since they involve a cost that would not positively impact on results (Inoue & Lee, 2011), or they may limit themselves to the minimum standards required by the national and international regulations established by countries, airline associations and organisations. To counteract this situation, states as well as international environmental organisations and airline associations must continue to move forward in environmental regulation and, also monitor compliance. Moreover, it is hoped that airline companies will continue to take these actions from their own convictions and environmental responsibility, and not just think about their corporate interests (Karaman et al., 2018).

The results obtained are also interesting for consumer and ecologist groups. It is precisely these organisations that put most pressure on the airline companies to be more respectful towards the environment through their condemnations in the media and on social networks (Hagmann et al., 2015). They are taking the first steps on the path they began a short time ago and must play a fundamental role in sensitizing consumers so they will change their preference for more economical airlines to those that are environmentally committed. A change cannot be expected without the active cooperation of consumers and a modification of society's environmental values and they must bear the cost that this change will involve (Lee & Park, 2010).

Another group involved are the investors and shareholders. Given that their primordial objective is to obtain benefits, in light of the data obtained, it is only reasonable that they do not positively value that an airline is certified when making decisions. They even divert their investments to airlines without an environmental commitment (Karaman et al., 2018). Yet, it is worth considering that a mentality of respecting the environment could be a factor to be considered when investing, with the financial performance of the investment being relegated to secondary importance (Dienes et al., 2016).

As previously explained, states, international organisations and airline associations are committed both publicly and privately to the regulation of actions by aviation so that it will achieve a lower level of pollution (Stevenson & Marintseva, 2019). Through this study, they will become aware of how each type of airline and the region it belongs to is affected, making it possible to adopt policies and specific standards

according to the individual characteristics of the airline. These standards should serve as an instrument for making airlines aware of the need to respect the environment. It is essential that they promote environmental measures that act as a showcase for transmitting that environmental management is necessary.

States should play a vital role in supporting airlines committed to environmental management, encouraging actions towards minimising the harmful effects from aviation, but which also allow them to improve their financial performance. Respect for the environment has to be compatible with improving the airlines' financial performance (Leamon et al., 2019). It is necessary for states transmit to passengers the need for airlines to be ecological, motivating them to transfer their booking decisions to environmentally sustainable companies. On the basis of this initial approach, the gradual advances in awareness of this need will lead to consolidating environmental management definitively in airlines and consumers (Wang et al., 2015).

Finally, as demonstrated in this study, employees play an essential part since their participation in the management system requires their active involvement. Feeling that they are participating in such a relevant task as well as contributing to the improvement of the planet will increase their satisfaction, morale and motivation (Stevenson & Marintseva, 2019) employees play an essential part since their participation in the management system requires their active involvement. Feeling that they are participating in such a relevant task as well as contributing to the improvement of the planet will increase their satisfaction, morale and motivation (Stevenson & Marintseva, 2019).

7. Conclusions

The results of the study reveal that the impact of certification on sales does not imply an increase in the financial performance of certified airlines. It should be pointed out that the effect of sales on financial performance decreases for certified airlines that operate international and domestic flights and to Asia&Pacific. This could indicate, in a similar way to Barr et al. (2011), that passengers' preferences when choosing a company to fly with are indifferent to an airline's environmental concerns. In line with Hagmann et al. (2015) and contrary to what could be expected, although environmental certification implies an improvement in a company's image, it is not a variable that increases the financial performance of airlines.

In analysing the impact of certification on sustainable asset management, findings parallel those for sales, indicating that there is no evidence of an improvement in financial performance among airlines. In contrast, for all the certified airlines, that are government-owned, low-cost, do not belong to an alliance and are from the region of the Americas, the effect of sustainable asset management on financial performance decreases. This would indicate that investments and internal and operational improvements in sustainable asset management attributed to certification would entail a lower contribution of assets to generate income (Arjomandi & Seufert, 2014).

In contrast to the above, the effect of certification on employee ecological performance does imply an increase in financial performance in certain cases. Except for full-service and airlines that belong to Asia&Pacific and Africa, which are not affected, and for those that are government-owned, in which case it decreases, for the rest there is an increase. Therefore, for airlines belonging to the latter group, this study reveals that the environmental engagement and commitment of employees from certified airlines would improve their performance, thereby increasing the financial performance of airlines. (Phillips et al., 2019).

Finally, meanwhile for airlines that are government-owned, full-service, and those operating in the Americas, the effect of certification on increasing financial performance is greater the larger the size of the airline, for the rest of the airlines, size has no impact at all.

To sum up, in view of the results obtained, it is evident that the effect of certification of the environmental management system on the image

of passengers, sustainable asset management and employee ecological behaviour has not enabled airlines to achieve competitive advantages, they have not been enough or the effects have not been what was expected for increasing their financial performance (Geerts, 2014).

8. Limitations and suggested future research

Even though airline companies have become aware of the need to be environmentally sustainable, the availability and reliability of environmental information is limited. In many cases, the information published on their websites is insufficient to obtain information related to certification.

With respect to the economic and financial information about airlines, the situation is even worse because there are few annual reports that are accessible for the period analysed and the information is limited. This lack of information has led to the elimination of a high number of both certified and noncertified airlines. In addition, depending on the type of airline and region, the availability of data is very different. Hence, there are groups or regions where information is scarce.

It is also important to note that although environmental certification have been employed in this study, it is not the only variable that can be used in association with the environmental activity of airlines. Admittedly, certification does not imply an unequivocal causal relation with environmental proactivity and it would be of interest to use other variables that represent it.

In this paper, it has been assumed that certification implies environmental proactivity. To avoid the limitation that could arise from the bias of assuming homogeneity in the environmental behaviour of the groups of certified and noncertified airlines, it would be of interest to introduce the variable of symbolic adoption of environmental certification in future research.

This paper is of interest to researchers because it could be a starting point for broadening the scope of its application. One line of research, which will be extensively written about in the future, is to introduce the pandemic and economic crisis of COVID-19 into the study. Finally, it would be opportune to apply this approach to other sectors of activity as well as using it from a comparative perspective.

CRedit authorship contribution statement

Jose Antonio Cavero-Rubio: Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Investigation, Conceptualization. **Monica Gonzalez-Morales:** Writing – review & editing, Validation, Supervision, Investigation, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Abid, N., Ceci, F., & Ikram, M. (2022). Green growth and sustainable development: Dynamic linkage between technological innovation, ISO 14001, and environmental challenges. *Environmental Science and Pollution Research*, 1–20.
- Adler, N., Delhaye, E., Kivel, A., & Proost, S. (2020). Motivating air navigation service provider performance. *Transportation Research Part A: Policy and Practice*, 132, 1053–1069.
- Adlwarth, W. (2011). Corporate social responsibility in tourism. Consumer requests and the image of suppliers. In R. Conrady, & M. Buck (Eds.), *Trends and issues in global tourism* (pp. 293–300). Heidelberg: Springer Verlag.
- Afum, E., Agyabeng-Mensah, Y., Opoku Mensah, A., Mensah-Williams, E., Baah, C., & Dacosta, E. (2021). Internal environmental management and green human resource management: Significant catalysts for improved corporate reputation and performance. *Benchmarking: An International Journal*, 28(10), 3074–3101.
- Ahmad, S. (2015). Green human resource management: Policies and practices. *Cogent Business & Management*, 2(1), Article 1030817.
- Aigbavboa, C. O., Ebekozi, A., & Mkhize, N. (2023). An assessment of south African airlines' growth in the era of fourth industrial revolution technologies: The unexplored dimension. *Journal of Facilities Management*. <https://doi.org/10.1108/JFM-07-2022-0076>
- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage Publications Inc.
- Akan, Ş., Özdemir, E., & Bakır, M. (2022). Purchase intention toward green airlines and willingness to pay more: Extending the theory of planned behaviour. In C. Governance (Ed.), *Vol. I. Sustainability, and information systems in the aviation sector* (pp. 123–143). Singapore: Springer Nature Singapore.
- Alnavis, N. B., Martono, D. N., & Hamzah, U. S. (2021). Recommendations for improving the ISO 14001 certification based on the company's perception analysis of the certification obstacles and benefits. *Journal Kesehatan Lingkungan*, 13(3), 132–141.
- Ambec, S., & Lanoie, P. (2008). When and why does it pay to be green. *Academy of Management Perspective*, 23, 45–62.
- Arjomandi, A., & Seufert, J. H. (2014). An evaluation of the world's major airlines' technical and environmental performance. *Economic Modelling*, 41, 133–144. <https://doi.org/10.1016/j.econmod.2014.05.002>
- Arocena, P., Orcos, R., & Zouaghi, F. (2021). The impact of ISO 14001 on firm environmental and economic performance: The moderating role of size and environmental awareness. *Business Strategy and the Environment*, 30(2), 955–967.
- Assaf, A. G., & Josiassen, A. (2012). European vs. U.S. airlines: Performance comparison in a dynamic market. *Tourism Management*, 33, 317–326. <https://doi.org/10.1016/j.tourman.2011.03.012>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99–120.
- Barr, S., Shaw, G., & Coles, T. (2011). Times for (un)sustainability? Challenges and opportunities for developing behaviour change policy. A case-study of consumers at home and away. *Global Environment*, 21(4), 1234–1244. <https://doi.org/10.1016/j.gloenvcha.2011.07.011>
- Baumeister, S., Nyrrhinen, J., Kempainen, T., & Wilksa, T. A. (2022). Does airlines' eco-friendliness matter? Customer satisfaction towards an environmentally responsible airline. *Transport Policy*, 128, 89–97.
- Baumeister, S., Zeng, C., & Hoffendahl, A. (2022). The effect of an eco-label on the booking decisions of air passengers. *Transport Policy*, 124, 175–182.
- Baumgartner, R. J. (2014). Managing corporate sustainability and CSR: A conceptual framework combining values, strategies and instruments contributing to sustainable development. *Corporate Social Responsibility and Environmental Management*, 21, 258–271. <https://doi.org/10.1002/csr.1336>
- Benito, A., & Alonso, G. (2018). Energy efficiency and the environment. *Energy Efficiency in Air Transportation*, 153–159. <https://doi.org/10.1016/B978-0-12-812581-6.00009-0>
- Blunch, N. H., & Castro, P. (2007). Enterprise-level training in developing countries: Do international standards matter? *International Journal of Training and Development*, 11(4), 314–324. <https://doi.org/10.1111/j.1468-2419.2007.00284.x>
- Boiral, O. (2007). Corporate greening through ISO 14001: A rational myth? *Organization Science*, 18(1), 127–146. <https://doi.org/10.1287/orsc.1060.0224>
- Camilleri, M. A. (2022). The rationale for ISO 14001 certification: A systematic review and a cost-benefit analysis. *Corporate Social Responsibility and Environmental Management*, 29(4), 1067–1083.
- Carballo-Penela, A., Ruzo-Sanmartín, E., Álvarez-González, P., & Paillé, P. (2023). How do GHRM practices influence firms' economic performance? A meta-analytic investigation of the role of GSCM and environmental performance. *Journal of Business Research*, 165, Article 113984.
- Cavero-Rubio, J. A., & Amorós-Martínez, A. (2020). Environmental certification and Spanish hotels' performance in the 2008 financial crisis. *Journal of Sustainable Tourism*, 28(5), 771–796. <https://doi.org/10.1080/09669582.2019.1705316>
- Chan, E. S., & Wong, S. C. (2006). Motivations for ISO 14001 in the hotel industry. *Tourism Management*, 27(3), 481–492. <https://doi.org/10.1016/j.tourman.2004.10.007>
- Chang, D. S., Chen, S. H., Hsu, C. W., & Hu, A. H. (2015). Identifying strategic factors of the implantation CSR in the airline industry: The case of Asia-Pacific airlines. *Sustainability*, 7(6), 7762–7783. <https://doi.org/10.3390/su7067762>
- Chang, Y. C., & Yu, M. M. (2014). Measuring production and consumption efficiencies using the slack-based measure network data envelopment analysis approach: The case of low cost carriers. *Journal of Advanced Transportation*, 48(1), 15–31. <https://doi.org/10.1002/atr.198>
- Chaudhary, R. (2020). Effects of green human resource management: Testing a moderated mediation model. *International Journal of Productivity and Performance Management*, 70(1), 201–216.
- Chen, C. M., & Ho, H. (2019). Who pays you to be green? How customers' environmental practices affect the sales benefits of suppliers' environmental practices. *Journal of Operations Management*, 65(4), 333–352. <https://doi.org/10.1002/joom.1018>
- Chen, M. H. (2010). The economy, tourism growth and corporate performance in the Taiwanese hotel industry. *Tourism Management*, 31(5), 665–675. <https://doi.org/10.1016/j.tourman.2009.07.011>
- Coles, T., Dinan, C., & Fenclova, E. (2009). *Corporate social responsibility among low-fares airlines: Current practices and future trends*. Exeter: University of Exeter.
- Collins, D. L., Román, F. J., & Chan, H. C. (2011). An empirical investigation of the relationship between profitability persistence and firms' choice of business model: Evidence from the U.S. airline industry. *Journal of Management Accounting Research*, 23(1), 37–130. <https://doi.org/10.2308/jmar-10124>

- Cowper-Smith, A., & de Grosbois, D. (2011). The adoption of corporate social responsibility practices in the airline industry. *Journal of Sustainable Tourism*, 19(1), 59–77. <https://doi.org/10.1080/09669582.2010.498918>
- Dangelico, R., & Pontrandolfo, P. (2015). Being 'green and competitive': The impact of environmental actions and collaborations on firm performance. *Business Strategy and the Environment*, 24(6), 413–430. <https://doi.org/10.1002/bse.1828>
- Dangelico, R. M. (2015). Improving firm environmental performance and reputation: The role of employee green teams. *Business Strategy and the Environment*, 24(8), 735–749. <https://doi.org/10.1002/bse.1842>
- Danso, A., Adomako, S., Amankwah-Amoah, J., Owusu-Agyei, S., & Konadu, R. (2019). Environmental sustainability orientation, competitive strategy and financial performance. *Business Strategy and the Environment*, 28(5), 885–895. <https://doi.org/10.1002/bse.2291>
- Dearden, L., Reed, H., & Van Reenen, J. (2006). The impact of training on productivity and wages: Evidence from British panel data. *Oxford Bulletin of Economics and Statistics*, 68(4), 397–421. <https://doi.org/10.1111/j.1468-0084.2006.00170.x>
- Delmas, M. A., & Pekovic, S. (2013). Environmental standards and labour productivity: Understanding the mechanisms that sustain sustainability. *Journal of Organizational Behaviour*, 34(2), 230–252. <https://doi.org/10.1002/job.1827>
- Dienes, D., Sassen, R., & Fischer, J. (2016). What are the drivers of sustainability reporting? A systematic review. *Sustainability Accounting Management and Policy Journal*, 7(2), 154–189. <https://doi.org/10.1108/SAMPJ-08-2014-0050>
- Dizkirci, A. S., Topal, B., & Yaghi, H. (2016). Analyzing the relationship between profitability and traditional ratios: Major airline companies sample. *Journal of Accounting, Finance and Auditing Studies*, 2(2), 96–114. <https://doi.org/10.56578/jafas020205>
- European Commission. (2021). Data from: Statistics and graphs. Retrieved from: https://ec.europa.eu/environment/emas/emas_registrations/register_en.htm
- Gadenne, D. L., Kennedy, J., & McKeiver, C. (2009). An empirical study of environmental awareness and practices in SMEs. *Journal of Business Ethics*, 84, 45–63. <https://doi.org/10.1007/s10551-008-9672-9>
- Geerts, W. (2014). Business travel and the environment: The strains of travelling for work and the impact on travellers' pro-environmental in situ behaviour. In C. Weeden, & K. Boluk (Eds.), *Managing ethical consumption in tourism* (pp. 188–207). New York: Routledge. <https://doi.org/10.4324/9781315879437>
- Ginieis, M., Hernández-Lara, A. B., & Sánchez-Rebull, M. V. (2020). Influence of airlines' size and labour costs on profitability. *Aviation*, 24(4), 157–168.
- Graafland, J. J. (2018). Ecological impacts of the ISO14001 certification of small and medium sized enterprises in Europe and the mediating role of networks. *Journal of Cleaner Production*, 174, 273–282.
- Graffin, S. D., & Ward, A. J. (2010). Certifications and reputation: Determining the standard of desirability amidst uncertainty. *Organization Science*, 21(2), 331–346. <https://doi.org/10.1287/orsc.1080.0400>
- Guillot-Soulez, C., Saint-Onge, S., & Soulez, S. (2022). Green certification and organizational attractiveness: The moderating role of firm ownership. *Corporate Social Responsibility and Environmental Management*, 29(1), 189–199.
- Gujarati, D. N. (2009). *Basic econometrics*. New York: McGraw-Hill Higher Education.
- Hagmann, C., Semeijn, J., & Vellenga, D. B. (2015). Exploring the green image of airlines: Passenger perceptions and airline choice. *Journal of Air Transport Management*, 43, 37–45. <https://doi.org/10.1016/j.jairtraman.2015.01.003>
- Hardy, M. A. (1993). *Regression with dummy variables. Quantitative applications in the social sciences*. Newbury Park, CA: Sage Publications Inc.
- He, W., & Shen, R. (2019). ISO 14001 certification and corporate technological innovation: Evidence from Chinese firms. *Journal of Business Ethics*, 158(1), 97–117. <https://doi.org/10.1007/s10551-017-3712-2>
- Heras-Saizarbitoria, I., & Boiral, O. (2013). ISO 9001 and ISO 14001: Towards a research agenda on management system standards. *International Journal of Management Reviews*, 15(1), 47–65. <https://doi.org/10.1111/j.1468-2370.2012.00334.x>
- Heras-Saizarbitoria, I., Landín, G. A., & Molina-Azorin, J. F. (2011). Do drivers matter for the benefits of ISO 14001? *International Journal of Operations & Production Management*, 31(2), 192–216. <https://doi.org/10.1108/0144357111104764>
- Hong, S. J., Farris, M. T., Pohlen, T. L., & Idug, Y. (2023). Exploring the impact of working capital in the U.S. aviation industry for profitability and shareholder value. *Transport Policy*, 144, 90–101. <https://doi.org/10.1016/j.tranpol.2023.10.006>
- Idris, M. C., & Durmuşoğlu, A. (2023). An empirical examination of ISO 9001's influence on sustained success of companies. *Accreditation and Quality Assurance*, 28(5), 221–235.
- Inoue, Y., & Lee, S. (2011). Effects of different dimensions of corporate social responsibility on corporate financial performance in tourism-related industries. *Tourism Management*, 32(4), 790–804. <https://doi.org/10.1016/j.tourman.2010.06.019>
- International Air Transport Association (IATA). (2020). IATA passenger glossary of terms. Retrieved from <https://www.iata.org/contentassets/04c5400c2dcd4b05a520330672b13ef6/iata-passenger-glossary-of-terms.xlsx>
- International Air Transport Association (IATA). (2021). IEnvA registered airlines. Retrieved from <https://www.iata.org/en/services/certification/ienva/environmental-assessment/ienva/>
- International Civil Aviation Organization (ICAO). (2020). Statistical results on air transport for 2019. Retrieved from: https://www.icao.int/annual-report-2019/Documents/ARC_2019_Air%20Transport%20Statistics.pdf
- International Civil Aviation Organization (ICAO). (2021). Presentation of 2020 air transport statistical results. Retrieved from: https://www.icao.int/annual-report-2020/Documents/ARC_2020_Air%20Transport%20Statistics_final_sched.pdf
- International Air Transport Association (IATA) (2023). Annual Review 2023. (2023). Retrieved from <https://www.iata.org/contentassets/04c5400c2dcd4b05a520330672b13ef6/iata-passenger-glossary-of-terms.xlsx>
- Jiang, Z., Wang, Z., & Zeng, Y. (2020). Can voluntary environmental regulation promote corporate technological innovation? *Business Strategy and the Environment*, 29(2), 390–406.
- Jongsagan, S., & Ghoneim, A. (2017). Green IT/IS investments evaluation within the aviation industry: A focus on indirect cost management. *Journal of Enterprise Information Management*, 30(2), 206–225.
- Kang, K. H., Lee, S., & Huh, C. (2010). Impacts of positive and negative corporate social responsibility activities on company performance in the hospitality industry. *International Journal of Hospitality Management*, 29(1), 72–82. <https://doi.org/10.1016/j.ijhm.2009.05.006>
- Karaman, A. S., Kilic, M., & Uyar, A. (2018). Sustainability reporting in the aviation industry: Worldwide evidence. *Sustainability Accounting Management and Policy Journal*, 9(4), 362–391. <https://doi.org/10.1108/SAMPJ-12-2017-0150>
- Keiser, D., Schnoor, L. H., Pupkes, B., & Freitag, M. (2023). Life cycle assessment in aviation: A systematic literature review of applications, methodological approaches and challenges. *Journal of Air Transport Management*, 110, 102418. <https://doi.org/10.1016/j.jairtraman.2023.102418>
- Keppel, G., & Zedeck, S. (1989). *Data analysis for research designs: Analysis of variance and multiple regression/correlation approaches*. New York: W.H. Freeman and Company.
- Khanna, M., & Anton, W. R. (2002). Corporate environmental management: Regulatory and market-based incentives. *Land Economics*, 78(4), 539–558. <https://doi.org/10.2307/3146852>
- Kim, H., & Son, J. (2021). Analyzing the environmental efficiency of global airlines by continent for sustainability. *Sustainability*, 13(3), 1571.
- Kleinbaum, D. G., Kupper, L. L., Muller, K. E., & Nizam, A. (1998). *Applied regression analysis and other multivariable methods*. Belmont: Thomson Brooks/Cole Publishing Co.
- Korba, P., Sekelová, I., Koščáková, M., & Behúnová, A. (2023). Passengers' knowledge and attitudes toward green initiatives in aviation. *Sustainability*, 15(7), 6187.
- Kuo, T. C., Chen, H. M., & Meng, H. M. (2021). Do corporate social responsibility practices improve financial performance? A case study of airline companies. *Journal of Cleaner Production*, 310, Article 127380. <https://doi.org/10.1016/j.jclepro.2021.127380>
- Le, T. T. (2023). Corporate social responsibility and SMEs' performance: Mediating role of corporate image, corporate reputation and customer loyalty. *International Journal of Emerging Markets*, 18(10), 4565–4590.
- Leamon, M. A., Rincon, E. J., Robillard, N. M., & Sutherland, J. J. (2019). Sustainable skies: How the airline industry is addressing climate change. *Journal of Strategic Innovation and Sustainability*, 14(2), 85–112. <https://doi.org/10.33423/jsis.v14i2.1373>
- Lee, S., & Park, S. Y. (2010). Financial impacts of socially responsible activities on airline companies. *Journal of Hospitality and Tourism Research*, 34(2), 185–203. <https://doi.org/10.1177/2F1096348009349822>
- Lee, S. C., Huang, S. Y., Hu, L., & Chang, T. W. (2023). Why do employees show pro-environmental behaviors? A perspective of environment social responsibility. *Behavioural Sciences*, 13(6), 463.
- Li, J., He, H., Liu, H., & Su, C. (2017). Consumer responses to corporate environmental actions in China: An environmental legitimacy perspective. *Journal of Business Ethics*, 143(3), 589–602. <https://doi.org/10.1007/s10551-015-2807-x>
- Lin, S. T., & Niu, H. J. (2018). Green consumption: Environmental knowledge, environmental consciousness, social norms, and purchase behaviour. *Business Strategy and the Environment*, 27(8), 1679–1688. <https://doi.org/10.1002/bse.2233>
- Lo, C. K. Y., Pagell, M., Fan, D., Wiengartenpra, F., & Yeung, A. C. L. (2014). OHSAS 18001 certification and operating performance: The role of complexity and coupling. *Journal of Operations Management*, 32(5), 268–280. <https://doi.org/10.1016/j.jom.2014.04.004>
- Low, J. M. W., & Yang, K. K. (2019). Understanding the operating landscape of the global airline industry: A DEA integrated alternating conditional expectation approach. *Journal of Airline and Airport Management*, 9(2), 27. <https://doi.org/10.3926/jairm.126>
- Luo, X., Wang, H., Raitel, S., & Zheng, Q. (2015). Corporate social performance, analyst stock recommendations, and firm future returns. *Strategic Management Journal*, 36(1), 123–136. <https://doi.org/10.1002/smj.2219>
- Lynes, J. K., & Andrachuk, M. (2008). Motivations for corporate social and environmental responsibility: A case study of Scandinavian airlines. *Journal of International Management*, 14(4), 377–390. <https://doi.org/10.1016/j.intman.2007.09.004>
- Mak, B. L., & Chan, W. W. (2006). Environmental reporting of airlines in the Asia Pacific region. *Journal of Sustainable Tourism*, 14(6), 618–628. <https://doi.org/10.2167/jost586.0>
- Mak, B. L., Chan, W. W., Wong, K., & Zheng, C. (2007). Comparative studies of standalone environmental reports-European and Asian airlines. *Transportation Research Part D: Transport and Environment*, 12(1), 45–52. <https://doi.org/10.1016/j.trd.2006.10.003>
- Malik, S. Y., Cao, Y., Mughal, Y. H., Kundi, G. M., Mughal, M. H., & Ramayah, T. (2020). Pathways towards sustainability in organizations: Empirical evidence on the role of green human resource management practices and green intellectual capital. *Sustainability*, 12(8), 3228.
- McWilliams, A., Siegel, D., & Wright, P. M. (2006). Corporate social responsibility: Strategic implications. *Journal of Management Studies*, 43(1), 1–18. <https://doi.org/10.1111/j.1467-6486.2006.00580.x>
- Menard, S. (2002). *Applied logistic regression analysis. Series: Quantitative applications in the social sciences*. London: Sage Publications.
- Mkono, M. (2020). Eco-anxiety and the flight shaming movement: Implications for tourism. *Journal of Tourism Futures*, 6(3), 223–226. <https://doi.org/10.1108/JTF-10-20190093>

- Mustafa, K., Hossain, M. B., Ahmad, F., Ejaz, F., Khan, H. G. A., & Dunay, A. (2023). Green human resource management practices to accomplish green competitive advantage: A moderated mediation model. *Heliyon*, *9*(11).
- Noh, Y. (2019). The effects of corporate green efforts for sustainability: An event study approach. *Sustainability*, *11*(15), 4073. <https://doi.org/10.3390/su11154073>
- Oh, M., Shin, J., Park, P. J., & Kim, S. (2020). Does eco-innovation drive sales and technology investment? Focusing on eco-label in Korea. *Business Strategy and the Environment*, *29*(8), 3174–3186.
- Paelman, V., Van Cauwenberge, P., & Vander Bauwhede, H. (2021). The impact of B Corp certification on growth. *Sustainability*, *13*(13), 7191.
- Park, E. (2019). Corporate social responsibility as a determinant of corporate reputation in the airline industry. *Journal of Retailing and Consumer Services*, *47*, 215–221.
- Payán-Sánchez, B., Pérez-Valls, M., Plaza-Úbeda, J., & Vázquez-Brust, D. (2021). Network ambidexterity and environmental performance: Code-sharing in the airline industry. *Business Strategy and the Environment*, *31*(3), 1169–1183. <https://doi.org/10.1002/bse.2948>
- Peiró-Signes, A., Segarra-Oña, M. D. V., Verma, R., Mondéjar-Jiménez, J., & Vargas-Vargas, M. (2014). The impact of environmental certification on hotel guest ratings. *Cornell Hospitality Quarterly*, *55*(1), 40–51. <https://doi.org/10.1177/2F1938965513503488>
- Phillips, S., Thai, V. V., & Halim, Z. (2019). Airline value chain capabilities and CSR performance: The connection between CSR leadership and CSR culture with CSR performance, customer satisfaction and financial performance. *The Asian Journal of Shipping and Logistics*, *35*(1), 30–40. <https://doi.org/10.1016/j.ajsl.2019.03.005>
- Porter, M. (1991). America's green strategy. *Scientific American*, *264*(4), 168. <https://doi.org/10.1038/scientificamerican0491-168>
- Porter, M., & van der Linde, C. (1995). Toward a new conception of the environment competitiveness relationship. *The Journal of Economic Perspectives*, *9*(4), 97–118. <https://doi.org/10.1257/jep.9.4.97>
- Prajogo, D., Tang, A. K. Y., & Lai, K. H. (2014). The diffusion of environmental management system and its effect on environmental management practices. *International Journal of Operations & Production Management*, *34*(5), 565–585. <https://doi.org/10.1108/IJOPM-10-2012-0448>
- Quintana-García, C., Benavides-Chicón, C. G., & Marchante-Lara, M. (2021). Does a green supply chain improve corporate reputation? Empirical evidence from European manufacturing sectors. *Industrial Marketing Management*, *92*, 344–353.
- Radhouane, I., Nekhili, M., Nagati, H., & Paché, G. (2018). The impact of corporate environmental reporting on customer-related performance and market value. *Management Decision*, *56*, 1630–1659. <https://doi.org/10.1108/MD-03-2017-0272>
- Ren, S., Jiang, K., & Tang, G. (2022). Leveraging green HRM for firm performance: The joint effects of CEO environmental belief and external pollution severity and the mediating role of employee environmental commitment. *Human Resource Management*, *61*(1), 75–90.
- Segarra-Oña, M. D. V., Miret-Pastor, L., & Peiró-Signes, A. (2011). Is the food industry taking a proactive stance on environmental issues? Results from an empirical analysis. *Review of Business Information Systems*, *15*(5), 11–16. <https://doi.org/10.19030/rbis.v15i5.6013>
- Sharma, S., Aragón-Correa, J. A., & Rueda-Manzanares, A. (2007). The contingent influence of organizational capabilities on proactive environmental strategy in the service sector: An analysis of north American and European ski resorts. *Canadian Journal of Administrative Sciences*, *24*(4), 268–283. <https://doi.org/10.1002/cjas.35>
- Sharma, S., Prakash, G., Kumar, A., Mussada, E. K., Antony, J., & Luthra, S. (2021). Analysing the relationship of adaption of green culture, innovation, green performance for achieving sustainability: Mediating role of employee commitment. *Journal of Cleaner Production*, *303*, Article 127039.
- Spasojevic, B., Lohmann, G., & Scott, N. (2018). Air transport and tourism—a systematic literature review (2000–2014). *Current Issues in Tourism*, *21*(9), 975–997. <https://doi.org/10.1080/13683500.2017.1334762>
- Stevenson, I., & Marintseva, K. (2019). A review of corporate social responsibility assessment and reporting techniques in the aviation industry. *Transportation Research Procedia*, *43*, 93–103. <https://doi.org/10.1016/j.trpro.2019.12.023>
- Tan, S. H., Habibullah, M. S., Tan, S. K., & Choon, S. W. (2017). The impact of the dimensions of environmental performance on firm performance in travel and tourism industry. *Journal of Environmental Management*, *203*, 603–611. <https://doi.org/10.1016/j.jenvman.2017.02.029>
- Tang, A. K., Lai, K. H., & Cheng, T. C. E. (2012). Environmental governance of enterprises and their economic upshot through corporate reputation and customer satisfaction. *Business Strategy and the Environment*, *21*(6), 401–411. <https://doi.org/10.1002/bse.1733>
- Testa, F., Boiral, O., & Iraldo, F. (2018). Internalization of environmental practices and institutional complexity: Can stakeholders pressures encourage greenwashing? *Journal of Business Ethics*, *147*, 287–307. <https://doi.org/10.1007/s10551-015-2960-2>
- Thompson, D. W., Anderson, R. C., Hansen, E. N., & Kahle, L. R. (2010). Green segmentation and environmental certification: Insights from forest products. *Business Strategy and the Environment*, *19*(5), 319–334. <https://doi.org/10.1002/bse.1733>
- Thomson Reuters Dataset. (2021). EIKON database. Retrieved from: <https://eikon.thomsonreuters.com/index.html>.
- Treacy, R., Humphreys, P., Mclvor, R., & Lo, C. (2019). ISO14001 certification and operating performance: A practice-based view. *International Journal of Production Economics*, *208*, 319–328. <https://doi.org/10.1016/j.ijpe.2018.12.012>
- United Nations World Tourism Organization (UNWTO). (2020). *International tourism highlights*. Retrieved from: <https://doi.org/10.18111/9789284422456>.
- Vega, D. J. G., Pamplona, D. A., & Oliveira, A. V. (2016). Assessing the influence of the scale of operations on maintenance costs in the airline industry. *Journal of Transport Literature*, *10*, 10–14.
- Wagner, M. (2010). The role of corporate sustainability performance for economic performance: A firm-level analysis of moderation effects. *Ecological Economics*, *69*(7), 1553–1560. <https://doi.org/10.1016/j.ecolecon.2010.02.017>
- Wang, C., & Lin, Y. (2022). Does bargaining power mitigate the relationship between environmental regulation and firm performance? Evidence from China. *Journal of Cleaner Production*, *331*, Article 129859. <https://doi.org/10.1016/j.jclepro.2021.129859>
- Wang, Q., Gazi, M. A. I., Sobhani, F. A., Al Masud, A., Islam, M. A., & Akter, T. (2023). Green human resource management and job pursuit intention: Mediating role of corporate social responsibility and organizational reputation. *Environmental Research Communications*, *5*(7), Article 075001.
- Wang, Q., Wu, C., & Sun, Y. (2015). Evaluating corporate social responsibility of airlines using entropy weight and grey relation analysis. *Journal of Air Transport Management*, *42*, 55–62. <https://doi.org/10.1016/j.jairtraman.2014.08.003>
- Waxin, M. F., Knuteson, S. L., & Bartholomew, A. (2020). Outcomes and key factors of success for ISO 14001 certification: Evidence from an emerging Arab gulf country. *Sustainability*, *12*(1), 258.
- Wittmer, A., & Müller, A. (2021). The environment of aviation. In A. Wittmer, T. Bieger, & R. Müller (Eds.), *Aviation systems* (pp. 79–117). Cham: Springer. Classroom Companion: Business https://doi.org/10.1007/978-3-030-79549-8_3.
- Wong, C., Lai, K., Shang, K., & Lu, C. (2013). Uncovering the value of green advertising for environmental management practices. *Business Strategy and the Environment*, *23*, 117–130. <https://doi.org/10.1002/bse.1776>
- Wooldridge, J. M. (2015). *Introductory econometrics: A modern approach*. Mason, OH: South-Western, Cengage Learning.
- Yong, J. Y., Yusliza, M. Y., Ramayah, T., Chiappetta Jabbour, C., Sehnem, S., & Mani, V. (2020). Pathways towards sustainability in manufacturing organizations: Empirical evidence on the role of green human resource management. *Business Strategy and the Environment*, *29*(1), 212–228.