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**An analysis of the compatibility of ESG performance and
financial performance within the U.S. airline industry**



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The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

This study examines the relationship between Environmental, Social and Governance (ESG) performance and the financial performance of U.S. airlines. For this purpose, a panel analysis is conducted for which the data are obtained from the Bloomberg database. The analysis uses data from ten U.S. airlines for the period 2015-2021. This also includes an examination of whether the type of business model plays a role in how sustainable investments affect financial performance. No significant effect of ESG performance on financial performance results from the study. As for the effect of Environmental performance, it only has a significant positive effect on the profitability financial indicator. For the market-based indicator, the effect of ESG appears to differ for Low-Cost airlines (LC) and Full-Service (FS) airlines. The effect is negative and significant for FS airlines and positive and insignificant for LC airlines. Furthermore, no evidence was found for the existence of quadratic relationships or lagged effects.

Keywords: JEL L25; L93; M14; C33

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1. Introduction

Aviation is one of the most rapidly growing and at the same time one of the most polluting industries. Major changes within this industry are therefore necessary to ensure its future (Upham, Maughan, Raper & Thomas, 2012). The International Civil Aviation Organization (2013) defines a sustainable aviation system as ‘a system that is affordable, operates safely, securely, efficiently and offers choices of air services while supporting a competitive economy and balanced regional development’. Such system goes along with sustainability standards, which can be covered by Corporate Social Responsibility (CSR). In addition to contributing to a more sustainable world, CSR-entrepreneurship can ensure better financial performance (FP) (Casado-Diaz, Nicolau, Ruiz-Moreni & Sellers, 2014). Also Abdi, Li & Càmara-Turull (2022) argue that investment in sustainability initiatives can affect a company's financial position and performance. Although these investments often involve high costs in the short term, companies can enjoy a stronger and sustainable competitive position in the long term (Branco & Rodrigues, 2006). Consequently, considerable research is being conducted on the impact of investing in sustainability initiatives on firm performance and firm value (Park, Song & Lee, 2017). In the present study, a contribution is made to the current literature by examining the relationship between sustainability activities and financial performance within the U.S. airline industry.

In the existing literature, corporate sustainability initiatives and activities are mostly discussed and measured in the context of three pillars, namely Environmental, Social and Governance performance (ESG) (Gillan, Koch & Starks, 2021). The data are used in many studies to investigate possible relationships with companies' financial performance. The results of the various studies vary in the relationships found and therefore no unequivocal conclusion can yet be drawn. Also, research focusing on the airline industry is limited and results are inconsistent. Therefore, more research is needed in this area (Park, Song & Lee, 2017).

More research within this sector is particularly important as it is claimed to be the most challenging sector to implement sustainability initiatives in. However, in order to continue operating in the long term, it is very important to start implementing such initiatives as regulations require a move to sustainable operations (McManners, 2016). For companies, implementing CSR initiatives can be a competitive advantage over competitors. As a consequence, more and more companies are implementing Corporate Social Responsibility, although in the airline industry this still seems to be relatively rare compared to other industries. In addition, companies do not know what effect the various initiatives will have, so more

research within the industry is required. As more clarification on this becomes available, airlines may be more encouraged to adopt socially responsible business practices. For this, it is important to conduct research on whether and how companies can invest in CSR in a way that goes along with improved financial performance (Kuo, Chen & Meng, 2021).

Forsyth (2011) examined whether environmental and financial sustainability can be pursued side by side in the airline industry. He defines financial sustainability as the ability of a company to make sufficient profit to be able to continue operating in the long term. In conclusion, these objectives can be pursued alongside each other. Therefore it is important that a good environmental sustainability policy is pursued which is least at the expense of other objectives such as profitability.

According to Almeyda and Darmansya (2019), for a business to be sustainable, it is crucial that it is supported by the community. This will only be the case if companies effectively take responsibility regarding their impact on the environment. With increasing pressure from society, legislation regarding corporate emissions is becoming more stringent, which has a direct effect on the way companies operate (Bassen & Kovacs, 2020).

The limited amount of literature on the relationship between sustainable performance and financial performance within the airline industry and the varying results found call for more research on this topic. In addition, only a few studies distinguish between different types of airlines. According to Yang and Baasandorj (2017), this distinction does need to be made as different business models affect how ESG and FP are related. Therefore, this study will distinguish between Low-Cost carriers (LC) and Full-Service airlines (FS). In this way, it can be determined whether these different types of business models should be considered separately when studying this topic.

This study on the effect of ESG performance on the financial performance of airlines focuses on the effect of the composite ESG score and, in particular, the Environmental score. In addition, the results are compared for different types of airlines. The study will use data from ten different U.S. airlines over the period 2015-2021. This paper focuses on the following research question:

What is the effect of ESG performance, and in particular Environmental performance, on financial performance in the U.S. airline industry and how do these effects differ for various types of airlines?

Results of this research can be of value to both airlines and investors. According to Sarigül and Coskun (2022), innovations within the aviation sector have a positive effect on financial performance and provide profit-maximizing benefits in the long run. In addition, investors have become increasingly discerning in recent years about the extent to which companies are socially responsible. In 2020, nearly 80% of all investors considered ESG performance as an important factor when making investment decisions (PWC, 2021). They can base investment decisions on ESG performance when they understand which factors are important for company performance (Abdi, Li & Càmarà-Turull, 2022). Kalia and Aggarwal (2022) argue that by investing in ESG initiatives, firms can demonstrate commitment to working effectively on long-term goals, which builds investor confidence. Ashwin Kumar, Smith, Badis, Wang, Ambrosy and Tavares (2016) showed that stocks of companies that have implemented ESG activities in their operations are less volatile. In addition, ESG activities reduce the risk of stock price collapse and portfolio risk (Kim, Li & Li, 2014; Neitzert & Petras, 2022). Thus, for several reasons, it is very interesting to consider ESG performance when developing investment strategies. However, in order to make nuanced investment decisions, it is important to understand the effects of certain types of ESG activities on financial performance. As these effects are specific to industries and geographic markets, it is important to have more research on this (Kalia & Aggarwal, 2022).

From the results of this study, no statistically significant relationship can be concluded between ESG performance and financial performance for U.S. airlines. For the Environmental score, a positive relationship was shown for the financial performance indicator Return On Assets (ROA), however, this effect was not visible for Tobin's Q (TQ). When comparing the different business models, no significant difference is observed for ROA. With respect to TQ, the effect of ESG performance is significant and positive for the Low-Cost carriers and insignificant and negative for the Full-Service airlines. Finally, no quadratic relationships or lagged effects are observed for the relationship between ESG/environmental performance and financial performance within the U.S. airline industry.

This research contributes to the existing literature through its specific focus on the U.S. airline industry. The study controls for all factors considered relevant in previous research to minimise the chance of finding confounding effects. In addition, this research distinguishes between different business models to provide more insight into the different impact of implementing ESG initiatives for Full-Service airlines and Low-Cost airlines. Finally, possible U-shaped relationships and lagged effects are controlled for, as these factors are mentioned in the literature as possible explanations for varying prior results.

This research paper is structured as follows. First, an overview of the existing literature is provided, followed by a more detailed discussion of the studies, the methods used and the results found. From the discussion of the existing literature also flow the hypotheses that are tested in this study. Subsequently, the data and methodology used are explained and the results found are discussed. In addition, the robustness of the results are checked by means of a sensitivity analysis. Finally, a discussion of the results is provided and an answer to the research question is formulated.

1. Literature review

In this section the existing literature is reviewed in order to get a clear view of the main concepts and results found within the area of research. First, Corporate Social Responsibility and its relationship with financial performance are discussed. Next, ESG is discussed since it is a commonly used measure of CSR, hence it is frequently used to examine its relationship with financial performance, as in this present study. The next section discusses the relationship between ESG and financial performance within the aviation industry. From the analyses of the existing literature on this specific topic, the hypotheses used in this study to answer the research question are derived.

2.1 Corporate Social Responsibility and Financial Performance

For a company to design a successful policy or strategy in the light of CSR, it is important to determine which factors are important for successful elaboration in reality and who should be served by this policy or strategy. According to many studies, it is important for the success of a company that managers consider the needs of the stakeholders when determining the strategy for the company (Berman, Wicks, Kotha & Jones, 1999; Falck & Hebllich, 2007). This idea is commonly referred to as the stakeholder theory (Freeman, 2010). Freeman (2010) describes that stakeholders should be defined as not only shareholders and managers but all actors in society who have an interest in the way a company operates. Therefore, in this context, the stakeholder is defined as anyone affected by a company's actions and performance in some way. For many stakeholders, it is important the company operates in a socially desirable manner, which is referred to as Corporate Social Responsibility (CSR). CSR is thus seen, in the context of stakeholder theory, as corporate governance in which the firm acts in a responsible manner towards society rather than just the shareholders. As a result, companies may perform CSR activities that do not align with financial objectives (Donaldson & Preston, 1995). With the increasing focus in the literature and in firms on CSR to make markets more sustainable, there is a diversion from classical economic ideas of self-regulating markets and market efficiency (Fama, 1970; Sen, 1988).

The stakeholder theory can be used to examine the way stakeholder needs are incorporated into a firm's operations from three different perspectives, namely normative, descriptive, and instrumental (Donaldson & Preston, 1995). From the normative and instrumental perspectives, Berman et al. (1995) formulated the *stakeholder management model*, which has two types. The first model is the direct effects model, which describes that the effect of CSR on financial

performance (FP) is not considered when formulating a business strategy. In contrast, the moderated model states that stakeholder interests may be taken into account when formulating a corporate strategy, but only if these interests are aligned with the interests of shareholders. Thus, this model is very focused on corporate profitability, whereas Freeman (2010) describes that financial profit is only one of many ways a company can create value for society. This idea is more in line with the second model formulated by Berman et al. (1999) from the normative perspective of shareholder theory. In the *intrinsic stakeholder commitment model*, stakeholder interests and the relationship between CSR and FP are fully considered when making important business decisions.

As argued in the previous paragraph, the required CSR investments may not serve the financial goals of the firms. However, it is argued by Mohr and Webb (2005) that CSR activities can provide a competitive advantage over competitors. This is possible, for example, through a higher willingness to pay for the products of social enterprises (Kang, Stein, Heo & Lee, 2012) and through the positive corporate image created (Fombrun & Shanley, 1990). Kalia and Aggarwal (2022) also cite sustainable activities as a potential source of value creation. Operating in a way that aligns with the interests of different stakeholder groups creates external support that can benefit the company in, for example, resource acquisition. These ideas have been extensively tested; researchers examined whether doing business in a socially responsible manner can go hand in hand with strong financial performance (McWilliams, Siegel & Wright, 2006). From this, various results emerged as different industries were examined, and different methods applied.

2.2 ESG as a measure for CSR performance

The extent to which a company conducts its business in a socially responsible manner is measured by several organizations and expressed in so-called ESG scores. This study will use ESG data from the Bloomberg database, which provide Environment, Social, and Governance scores for thousands of companies. These three pillars are then further divided into many components so that one can see in more detail the performance on specific components. The scores on these pillars together form the overall ESG score of a company. ESG data are widely used in studies of corporate CSR, particularly when examining their relationship to financial performance (Friede, Busch & Bassen, 2015; Whelan, Atz, Van Holt & Clark, 2021; Xie, Nozawa, Yagi & Managi, 2019).

The various studies on the ESG-FP relationship show different results (Abdi, Li & Càmaraturull, 2022). Most of the studies suggest a positive relationship (Aouadi & Marsat, 2018; Brogi & Lagasio, 2019; Li, Gong, Zhang & Koh, 2018). A negative relationship is also implied by some, which would be due to the costs associated with implementing the initiatives (Buallay, 2019; Duque-Grisales & Aguilera-Caracuel, 2021; Moore, 2001). Finally, there are also studies where no relationship is found, which may be due to the fact that the costs and benefits of ESG initiatives are roughly equal (Lahouel, Gaies, Zaid & Jahmane, 2019; McWilliams, Siegel & Teoh, 1999). Several studies are elaborated on in this section.

Tarmuji, Maelah and Tarmuji (2016) examined the effect of ESG performance on economic performance for companies from all industries in Malaysia and Singapore for the period 2010-2014. They used a linear regression where a non-financial economic indicator compiled by Thomson Reuters was the dependent variable and Economic, Social, and Governance scores were the independent variables. They only found significant positive results for the relationship between Social and Governance scores and financial performance.

Duque-Grisales and Aguilera-Caracuel (2021) examined the non-industry-specific relationship between ESG and financial performance in Latin America's emerging markets. They found a significant negative relationship, which they attribute to weak implementation of ESG initiatives and the fact that there is limited government support for such initiatives. This lack of support causes society, and thus stakeholders, to recognize the challenges ESG addresses to a lower degree and thus value the initiatives less. This study shows that it is important to look at specific markets as each market has different characteristics that can affect the relationship between ESG and FP in different ways.

The study by Almeyda and Darmansya (2019) used panel data to examine whether there is a positive relationship between ESG performance and FP in the real estate sector in G7 countries. They found a significant positive relationship between overall ESG scores and accounting-measured FP indicators. This positive association was mainly due to the effect of the Environmental score on FP. They also looked at the relationship between ESG and market-based measures, namely stock price and the price-to-equity ratio, which turned out to be insignificant.

Friede, Busch and Bassen (2015) conducted a meta-analysis using data from more than 2,200 studies on the relationship between ESG and FP. From this, they found that the vast majority of studies resulted in significantly positive relationships, also for the environmental, social, and governance components in isolation. To this, they added that the positive relationship found appears to be stable over time. They also looked at the differences between geographic markets,

from which it can be concluded that North American companies benefit financially more from better ESG performance compared to European and Asian firms. This shows that it is important to consider the geographic market to be studied as markets can be different from each other in many ways which can also affect the relationship between ESG and FP.

Whelan, Atz, Van Holt and Clark (2021) conducted a more recent meta-analysis with data from about 1,000 studies from 2015-2021. Similarly, they observed a positive relationship between ESG and FP in a majority of studies. This relationship even appears to be increasingly evident over time. In addition, they concluded that ESG investments provide downside protection, as it enables firms to better survive in challenging times. For the aviation sector, this may be of great importance given the high volatility of this market (Horobet, Zlatea, Belascu & Dumitrescu, 2022). Also, this meta-analysis showed that in many cases managing a low-carbon future ensures a better FP. For airlines, this is particularly interesting since they are in a highly polluting sector in which regulation is increasingly being developed with regard to reducing emissions. For this reason, this study also specifically examines the effect of environmental performance on financial performance.

Kalia and Aggarwal (2022) examine the relationship between ESG activities and FP in the healthcare sector. They argue that the fact that different results are found in the literature for the relationship is partly because the relationship varies by country. They contribute to the existing literature by comparing the relationship in developed and developing countries. In line with their expectations, they found a positive relationship between ESG and FP for developed countries and a negative relationship for developing countries.

Xie, Nozawa, Yagi and Managi (2019) conducted research on the relationship between ESG and FP for different sectors, also looking at the disclosure level of ESG information. From this, they concluded that only a moderate disclosure level has a positive significant effect on corporate efficiency. Furthermore, they found a positive relationship with FP for most ESG initiatives using a nonparametric regression. As the researchers take the position that a linear regression is not appropriate to capture the complex relationship between ESG and FP. Bruna, Loprevite, Raucci, Ricca and Rupo (2022) also attribute the varying results of previous studies predominantly to the fact that most studies tested for a linear relationship. The expected nonlinear relationship between ESG performance and FP was also reflected in the results, which is in line with results previously found by Adegbite, Gunney, Kwabi and Tahir (2019) and Barnett and Salomon (2012).

Nollet, Folis and Mitrokostas (2016) use the Bloomberg database to examine both the potential linear and non-linear relationship between ESG performance and FP for S&P500 companies

over the period 2007-2011. In doing so, they control for the 2008 financial crisis, as well as firm size, risk, and R&D spending. Besides the commonly used accounting-based measures, in this study Returns On Assets (ROA) and Returns On Capital (ROC), they also use a market-based performance measure, namely excess stock returns. They find no significant linear relationship. In contrast, for the non-linear model, they find a significant U-shaped relationship for the accounting-based measures. According to the researchers, this relationship found implies that ESG investments are not directly translated into FP, but only from a certain threshold of social responsibility. When analyzing the effects of the ESG pillars separately, they see a U-shaped relationship only for the Government score.

Rodríguez-Fernández, Sánchez-Teba, López-Toro and Borrego-Domínguez (2019) conducted a study on the relationship between ESG performance and financial performance within the tourism sector. As indicators for the FP, they used ROE, ROA and Tobin's Q, the final two are also used in this study. In contrast, they used only data from 2017 and conducted multiple regression analyses with it. However, they only found a significant positive relationship between the Governance score and FP.

Bruna, Loprevite, Raucci, Ricca and Rupo (2022) studied the relationship between ESG and FP, thereby focusing on the moderating role of firm size in this relationship. For this, they used data from 350 European firms for the period from 2014-2019. They argue that CSR investments take time to translate into improved financial performance since there are many costs involved initially, because of this, they argue that the use of a time-lagged panel regression model is most appropriate. Nollet, Folis and Mitrokostas (2016) also argue that designing, implementing and executing sustainable strategies is time-consuming. Consequently, a period of time passes before a sustainable investment will translate into improved financial performance. They also use timelags in their research in order to investigate the effect of an ESG initiative as accurately as possible.

2.3 ESG and Financial Performance within the Airline Industry

Although much research has been conducted on the relationship between ESG and FP, according to Endrikat, Guenther and Hoppe (2014), it is important to examine this relationship separately for different industries and sectors since each industry or sector has unique characteristics that may also be subject to different stakeholder interests. Lee and Park (2010) also argue that the relationship between CSR and FP varies by industry which requires more research to be done for each industry, as the relationship found within one industry cannot

simply be projected to other industries. However, relatively little research has been done on this relationship within an industry, in this case, the airline industry (Lee, Seo & Sharma, 2013; McWilliams & Siegel, 2001). Nonetheless, this sector is very interesting to investigate as it is considered one of the most difficult industries to implement sustainability initiatives in (McManners, 2016).

Only a limited number of studies have been conducted in recent years on the relationship between ESG performance and financial performance within the airline industry. Table 1 lists the various papers including the industry, datasource, dependent variables and control variables used. Subsequently, the various studies and their conclusions will be explained in more detail. In addition, a number of papers are included in the table which are not specifically focused on the airline industry, but which will be discussed in more detail as they are used to formulate the hypotheses.

Table 1

Overview of used literature for hypotheses formulation

Reference	Industry	Data	Dependent variables	Control variables
Abdi, Li & Càmara-Turull (2020)	Airline	Thomson Reuters	Market-to-Book ratio, Tobin's Q	ROA, Leverage, Dividend Payout ratio, Firm Size, Firm Age, Number of Years ESG Disclosure
Abdi, Li & Càmara-Turull (2022)	Airline	Thomson Reuters	Market-to-Book ratio, Tobin's Q	Firm Size, Leverage
Almeyda & Darmansya (2019)	Real estate	Bloomberg	ROA, ROC, Stock Price, P/E	Firm Size, Leverage, Country, Year
Aydogmus, Gulay & Ergun (2022)	Not specific	Refinitiv Eikon Datastream	ROA, Tobin's Q	Firm Size, Leverage
Bruna et al. (2022)	Not specific	Refinitiv Eikon Datastream	Computed FP_SCORE by five financial ratios	Firm Size, Industry
Duque-Grisales & Aguilera-Caracuel (2021)	Not specific	MSCI ESG	ROA	Firm Size, Leverage
Hartmann (2022)	Airline	Refinitiv Eikon Datastream	Enterprise Value/Total Assets	Market Capitalization, ROA, Total Assets
Kalia & Aggarwal (2022)	Healthcare	Thomson Reuters	ROA, ROE	Firm Size, Leverage, Market Capitalization, Current ratio
Kao, Ting, Chou & Liu (2022)	Airline	Refinitiv Eikon Datastream	ROA	Firm Size, Equity Multiplier
Kuo, Chen & Meng (2021)	Airline	Thomson Reuters	ROA	Firm Size, Leverage, Ownership Type
Lee & Park (2009)	Airline	KLD Rating	ROA, ROE, ROS, Average Market Value, Excess Market Value	Firm Size, Leverage, Year

Lee, Seo & Sharma (2013)	Airline	KLD Rating	Tobin's Q	Firm Size, Leverage, ROA, Dividend Payout ratio, GDP
Nollet, Folis & Mitrokostas (2016)	Not specific	Bloomberg	ROA, ROC, Excess Stock Returns	Leverage, Sales Revenue
Rodríguez-Fernández et al. (2019)	Tourism	Thomson Reuters	ROE, ROA, Tobin's Q	-
Tarmuji, Maelah & Tarmuji (2016)	Not specific	Thomson Reuters	Non-financial based economic indicator	-
Theodoulidis et al. (2017)	Tourism	MSCI ESG	ROA, Tobin's Q	Industry specific FE
Xie et al. (2019)	Not specific	Bloomberg	ROA, Tobin's Q	Firm Size, Leverage
Yang & Baasandorj (2017)	Airline	Thomson Reuters	ROA, Tobin's Q	Firm Size, Firm Age, Leverage

Theodoulidis, Diaz, Crotta and Rancati (2017) examine the relationship between ESG performance and financial performance within the tourism industry. Besides airlines, they also considered hotels, restaurants, and casinos. The stakeholder theory discussed earlier provides the theoretical basis for this research. Here, three hypotheses are constructed to examine the three different models of Berman et al. (1999) being the direct, moderated, and intrinsic model. Since they highlight the relationship in the different approaches, they provide a relevant contribution to the existing literature within the tourism industry. They only found support for the moderated model, which is derived from the instrumental perspective of stakeholder theory. Lee and Park (2010) were among the first to conduct research on the relationship between CSR and FP within the airline industry in 2010. They argue that the results from previous not-industry-specific research might have been more unambiguous if non-linear relationships had also been examined. This study thus examines potential linear, quadratic, and cubic relationships between CSR and FP. For FP, they use average market value (AMV) and excess market value (EMV) in addition to the commonly used variables ROA, ROE, and ROS. These variables respectively express the average market value created by using one dollar value of assets and the excessive portion market value of a company on top of the value of its physical assets. The dataset was obtained from KLD and contains data from U.S. airlines in the period 1991-2006. Significant results were found only for the linear model, namely they found a significant positive relationship between CSR and value performance (AMV and EMV), but not for accounting performance (ROA, ROE and ROS).

Lee, Seo and Sharma (2013) also examined the relationship between CSR and FP for airlines. In their paper, they distinguish between operational and non-operational CSR activities.

Thereby, they also consider the moderating role of oil prices in the relationship between CSR and FP. Only for the relationship between operational CSR activities and FP they found a significant positive relationship. For this relationship, they additionally found a positive moderating effect of oil prices.

Abdi, Li and Càmarà-Turull (2020) analyse the relationship between ESG and FP for 27 airlines worldwide during the period 2013-2019. In this study, they examine whether it is relevant for subsequent research to distinguish between different types of airlines, so they conducted regression models for different panels distinguishing between Low-Cost carriers (LC) or Full-Service airlines (FS). The results show a significant and positive relationship between the Environmental and Governance pillars and FP. On the basis of this data, they found no significant differences between the different types of airlines, although they argue that further research is needed. Two years later, Abdi, Li and Càmarà-Turull (2022) re-examined the ESG-FP relationship within the airline industry and, more specifically, the potential moderating roles of firm size and firm age within this relationship. For this, they used a larger dataset, as it contained data from 38 airlines for the period 2009-2019. They found a significant positive relationship between ESG and FP, but no significant moderating role for the previously described variables.

Kuo, Chen and Meng (2018) were the first to investigate the effect of ownership type on the relationship between the implementation of CSR initiatives and short-term financial performance within the airline industry. They found a significant moderating effect for ownership type, this led to the conclusion that private-owned airlines benefit the most from CSR initiatives followed by public-owned airlines. Airlines with mixed ownership benefit the least, the reason given being that within these companies a conflict of interests occurs more often. However, the relationship between CSR activities and financial performance was found to be U-shaped for each type, indicating that airlines only benefit from CSR investments in terms of improved FP from a certain level of CSR activities onwards. In contrast, the study that is conducted in this paper focuses only on U.S. airlines, since the U.S. government does not own any airlines there is no need to specifically check for this.

Yang and Baasandorj (2017) examined the relationship between Environmental and Social CSR activities and FP in the airline industry. For this purpose, they use a dataset containing data from 13 airlines over the years 2006-2015. They contribute to the existing literature by distinguishing between different types of airlines, which is also done in this present study. They additionally examine the moderating roles of firm size, age and the amount of leverage of an

airline. For both Environmental and Social CSR scores, they found significant positive correlations with the financial performance for all types of airlines.

Hartmann (2022) conducted research on the influence of ESG scores on the firm value of airlines which was expressed as the ratio enterprise value to total assets. The study focuses on airlines from Europe and North America and distinguishes between Low-Cost carriers and Full-Service airlines. The relationships found between the ESG score and firm value were positive for all groups of airlines, but not significant. For the relationship between the Environmental score and firm value, a negative value was found which was also not significant.

Kao, Ting, Chou and Liu (2022) studied financial structures, production efficiency, and the relationship between CSR and production performance within the airline industry. In doing so, they distinguished between FS and LC airlines. They showed that LC carriers are more profitable and efficient, but that FS carriers invest more in CSR activities. They also showed that implementing environmental and social CSR initiatives is positively correlated with production efficiency. For this study, they used data from 23 airlines from the period 2013-2017. Within this period, they saw that LC carriers increasingly outperformed FS airlines in financial and efficiency terms.

2.4 Hypotheses formulation

According to neoclassical economists, investing in ESG activities has a negative effect on a company's financial performance because of the costs associated with these investments (Derwall, Guenster, Bauer & Koedijk, 2005; Hassel, Nilsson & Nyquist, 2005). On the other hand, theoretical support for the positive relationship can be found in the stakeholder theory discussed earlier. This theory states that when companies consider everyone affected by the company's actions, it creates support both from within the company and externally. This improves the long-term performance of the company and creates a competitive advantage over competitors (Kalia & Aggarwal, 2022; Belkaoui, 1976; Godfrey, 2005; McWilliams & Siegel, 2001). This allows companies to operate in the best interest of shareholders as well as other stakeholders (Mackey, Mackey & Barney, 2007).

Park (2019) showed that implementing CSR activities improves customer satisfaction, which benefits the reputation of the airline. In addition, companies with high ESG scores are well aware of the issues and developments in society and within the industry in which they operate.

The long-term goals to be able to operate sustainably in the future can be effectively set with this knowledge (Barnett & Salomon, 2012).

The study by Aydogmus, Gulay and Ergun (2022) examined the relationship between firm value, profitability and ESG for 1720 companies from different industries worldwide. As a proxy of firm value they used the Tobin's Q as a proxy for profitability they used the ROA. The associations found with the combined ESG score was significant and positive for both indicators.

Abdi, Li and Càmara-Turull (2022) expected a positive relationship in their study on the relationship between ESG and FP within the airline industry. In doing so, similar to Lee and Park (2010), they acknowledge that the activities may decrease FP in the short term, but the effect will be significant and positive in the long term. Kao, Ting, Chou and Liu (2022) also showed that the implementation of CSR activities leads to increased efficiency and thus better financial performance of airlines. Based on the studies described and in line with stakeholder theory, the first hypothesis reads:

H1: For U.S. airlines, implementing ESG initiatives has a positive effect on financial performance.

Besides the effect of the composite ESG score on financial performance, this study also examines the specific effect of the Environmental score. Like the composite ESG score, this individual Environmental score was obtained from the Bloomberg database.

Global warming is one of the biggest challenges humanity has to face, and therefore, this also has a major impact on the industry in which a company is involved as it is also affected by this. In fact, the aviation industry is facing changing regulations regarding emissions, and climate activists calling for more sustainable operations. These factors have a direct effect on the industry and therefore the way airlines operate (Almeyda & Darmansya, 2019). As a result, the demand for Environmental initiatives within the airline industry is most prominent relative to Social and Governance initiatives. It is therefore very important to examine the specific effect of the Environmental score in addition to the effect of the composite ESG score. When considering only the composite score, it is possible that any effects of the Environmental score are weakened or strengthened by the effects of the Social and Governance score. In order to use the insights from this study to determine a proper sustainability strategy, it is important to understand the different effects of the various factors. Accordingly, this study provides a further insight into the effect of the Environmental score.

There may be several reasons why companies with higher Environmental scores perform better financially compared to competitors with lower scores. For example, it is possible that with a sustainable image, they create a higher willingness of consumers to pay for their product. This idea was confirmed by the results of the study by Hagmann, Semeijn and Vellenga (2015). In addition, a sustainable operation may provide lower costs for waste disposal and emission rights (Aragón-Correa, Hurtado-Torres, Sharma & Garcia-Morales, 2008). On the other hand, the transition to a sustainable operation involves investment in technology, human capital, and resources. According to Zeng, Meng, Zeng, Tam and Jin, (2011), it is possible that the cost of these investments may exceed the potential positive financial results of a sustainable operation discussed earlier, resulting in a negative net result. Theoretical support for the positive relationship between environmental initiatives and FP can be found in the Porter hypothesis. This hypothesis assumes that environmental regulation is a source of value creation as it stimulates innovation which makes it possible to create additional revenues that exceed additional costs. The innovation, therefore, leads to greater efficiency and thus to an improved competitive position (Porter, 1991). Previous studies within the airline industry also found positive and significant relationships between the Environmental score and FP (Abdi, Li & Càmara-Turull, 2022; Duque-Grisales & Aguilera-Caracuel, 2021). Therefore, the second hypothesis reads:

H2: For U.S. airlines, implementing Environmental initiatives has a positive effect on financial performance.

In order to approach the true relationship between sustainability performance and financial performance, it is relevant to zoom in on the different types of airlines, in addition to the specification of the industry and geographic area. This is relevant because, in the transportation sector, ESG performance depends in part on the type of activities fulfilled by airlines (Borghesi, Houston & Naranjo, 2014). This study will distinguish between two types of airlines, namely Low-Cost airlines (LC) and Full-Service airlines (FS). This is consistent with the current literature that distinguishes between these different types (Cowper-Smith and de Grosbois, 2011; Borghesi, Houston and Naranjo, 2014). LC airlines are characterized by their leadership in cost minimization, which gives them a potential competitive advantage. FS airlines try to be competitive in terms of the quality they provide, furthermore, they also try to minimize the costs for this in order to be able to compete (Seo, Moon & Lee, 2015). According to Cowper-Smith and de Grosbois (2011) and Borghesi, Houston and Naranjo (2014), large Full-Service

carriers invest the most in environmental CSR initiatives. This is possibly due to the fact that these airlines in general have a larger cash flow available to invest. In addition, it may also be that these airlines benefit more from such investments compared to Low-Cost carriers.

Hartmann (2022) states that FS airlines are investing more in ESG-related initiatives, and this claim is confirmed in the study by Hagmann, Semeijn and Vellenga (2015). Nidumolu, Prahalad and Rangaswami (2009) argue that a possible reason for this is that FS airlines are generally larger than LC carriers. Drempetic, Klein and Zwergel (2020) showed that large airlines benefit more from CSR investments. Therefore, this present study will control for firm size so that a potential difference between different types of airlines is not attributable to other factors.

Yang and Baasandorj (2017) used three different panels in their study of the relationship between ESG and FP within the airline industry, i.e., a full panel, a panel with FS airlines and an LC airline panel. In doing so, they also look at the moderating roles of firm size, firm age and the amount of leverage. For both FS and LC carriers, significant positive relationships were found between CSR and FP. In this study, FP was expressed both in terms of ROA and Tobin's Q. For FS carriers, a positive and significant relationship is found for both indicators. For the LC carriers, only a significant relationship was found for the Tobin's Q. Thereby, it appears that the effect of firm size on the relationship CSR-FP and Environmental score-FP is significantly larger for Low-Cost carriers and the effect of leverage and firm age, in contrast, is larger for Full-Service carriers. Thus, the study of Yang and Baasandorj (2017) shows a positive relationship for both types of airlines, however, the fact that no significant relationship was found for LC carriers for ROA may indicate that the positive CSR-FP relationship is stronger for FS carriers. In addition, Nidumolu, Prahalad and Rangaswami (2009) state that Low-Cost airlines invest maximally in operational efficiency to ensure minimal costs. As a result, they invest less compared to Full-Service airlines in non-operational sustainability initiatives. This implies that LC carriers may benefit less from higher financial performance as a result of implementing sustainable initiatives compared to FS airlines. Therefore, the third hypothesis reads:

H3: For U.S. airlines, the effect of the implementation of ESG initiatives on financial performance is stronger for Full-Service carriers compared to Low-Cost carriers.

2.5 Contribution to the literature

This study contributes to the current literature in several areas. Much research has already been done on the relationship between ESG performance and FP, however, the relationship within the airline sector is limited (Lee, Seo & Sharma, 2013). In contrast, according to Endrikat, Guenther and Hoppe (2014), it is important to investigate the relationship by sector or industry as they have different characteristics which may be associated with different stakeholder interests. This study thus contributes to the limited existing research on the ESG-FP relationship within the airline industry.

This study only considers U.S.-based airlines, where many studies focus on airlines worldwide (Kao, Ting, Chou & Liu, 2022; Kuo, Chen & Meng, 2021; Abdi, Li & Càmara-Turull, 2022; Yang & Baasandorj, 2017). However, the industry has developed differently in different markets. For example, deregulation policies have resulted in varying impacts on different regions. These differences complicate comparing these markets and attributing any results found to the effect being examined (Williams, 2017). It is therefore important to conduct more research on the relationship between ESG performance and financial performance within a geographical market, in this case the U.S. airline market.

As described earlier, the results of previous research are mixed. One possible explanation for this is the limited use of control variables in the analysis, creating the risk of finding confounding effects. In this study, all control variables considered relevant in previous research in this area are included to approximate the true effect as closely as possible.

This study examines the difference in the ESG-FP relationship for different types of airlines. This was already done a number of times before, leading to different results. For instance, Abdi, Li and Càmara-Turull (2020) found no significant differences between different types of airlines, while Yang and Baasandorj (2017) found a stronger relationship between ESG and FP for FS airlines. In contrast, Hartmann (2022) found non-significant negative relationships for both types of airlines. Consequently, based on the current literature, no conclusion can be drawn on the difference between the different types of airlines in terms of the ESG-FP relationship, this study therefore constitutes a relevant contribution.

For the financial performance, two different indicators are used in this study, being the Return On Assets (ROA) and the Tobin's Q (TQ). The ROA is an accounting-based measure and is mostly used to measure short-term FP or profitability. In contrast, Tobin's Q is market-based and is commonly used to express firm value, reflecting the long term value. Different research done previously is limited to only one of these indicators, while the choice of FP indicator can result in different findings (Yang & Baasandorj, 2017).

In previous research a U-shaped relationship was found between ESG performance and financial performance (Xie, Nozawa, Yagi & Managi, 2019; Bruna, Loprevite, Raucci, Ricca & Rupo, 2022; Adegbite, Gunney, Kwabi & Tahir, 2019; Barnett & Salomon, 2012; Nollet, Folis & Mitrokostas, 2016). However, these studies did not specifically examine the airline industry. Within this particular industry, only Lee and Park (2010) investigated a possible non-linear relationship, but this did not follow from the results. This study thus contributes by controlling for a possible quadratic relationship in the ESG-FP relationship within the airline industry. This enables an assessment of whether the effect of ESG/Environmental performance on FP differs for different levels of ESG/ENV performance.

Finally, it is suggested that it takes time for ESG investments to translate into improved financial performance (Lee & Park, 20210). However, no research on the relationship between this within the airline sector has controlled for lagged effects. Bruna, Loprevite, Raucci, Ricca and Rupo (2022) and Nollet, Folis and Mitrokostas (2016) did use this in their non-industry-specific research and found significant results. This study thus contributes by controlling for possible lagged effects.

2. Data

This research uses data obtained from the ESG database of Bloomberg. This database provides both ESG and financial data for more than 15,000 companies worldwide, obtained from the annual reports, sustainability reports and press releases of the companies. The database contains 120 different ESG factors, enabling a very precise analysis of ESG performance per category (Almeyda & Darmansya, 2019). The database gives scores on a scale of 1 to 10 for the various categories. Both ESG and financial data were obtained for 10 U.S. airlines for the years 2015-2021, resulting in a balanced panel dataset. Table 2 lists the airlines considered, specifying whether the airline is a FS or LC carrier.

Table 2

Overview U.S. airlines and their business model

<u>Airline</u>	<u>Business model</u>
Alaska Airlines	Full-Service
American Airlines	Full-Service
Delta Airlines	Full-Service
Hawaiian Airlines	Full-Service
SkyWest Airlines	Full-Service
United Airlines	Full-Service
Allegiant Air	Low-Cost
Jetblue Airways	Low-Cost
Southwest Airlines	Low-Cost
Spirit Airlines	Low-Cost

Data source: Lu, Yang & Huang (2015)

3.1 Considered period

For this study, it was decided to use as much available data as possible, hence the period from 2015 to 2021 was analysed. However, in 2020 and 2021, the airline industry was confronted with the government measures imposed in response to Covid-19. As these measures had a major impact on this industry and thus on its financial performance, it is also interesting to analyse the data without the effect of Covid. In the sensitivity analysis, the study will therefore be conducted based on the data from 2015-2019. This will include a concise discussion of the

differences between the results of the different datasets. However, by using the larger dataset, the effect of ESG initiatives at the time of reduced financial performance is also included. Hence, this can also provide additional insights, which may be relevant for the future as this sector is naturally sensitive to external factors.

3.2 Dependent variables

To analyse the relationship between ESG performance and financial performance, this study uses two different FP indicators, the ROA and Tobin's Q. By using these two different indicators, an attempt is made to get a complete understanding of the effect of CSR performance on different aspects of FP. In previously done research, Returns On Assets (ROA) is commonly used as an indicator of FP (Velte, 2017). ROA is an accounting-based measure and is often used as a proxy for profitability. Therefore, this indicator gives a good indication of a company's short-term performance. For this study, in line with the existing literature, the ROA was computed in the following way:

$$ROA = \frac{Net\ Profit}{Total\ Assets}$$

In addition, in line with much previous research, this study uses Tobin's Q (TQ) (Fatemi, Glaum & Kaiser, 2018; Bhaskaran, Ting, Sukumaran, & Sumod, 2020). This is a market-based FP indicator, which is used to express firm value. This indicator is suitable to analyse long-term FP. There are various formulations for this indicator in the literature. This study follows the formulation of Xie et al. (2019) and Abdi, Li and Càmarà-Turull (2022), which is as follows:

$$Tobin's\ q = \frac{Market\ value}{Total\ Assets}$$

In this study, in line with Abdi, Li and Càmarà-Turull (2020), the natural logarithm of the Tobin's Q is used to eliminate the effect of outliers.

3.3 Independent variables

This study looks at both the effect of the ESG score (ESG) on FP and the individual effect of the Environmental score (ENV) on FP. The ESG score is the average of the scores obtained on the pillars of Environment, Social and Governance. Environmental performance refers to the implementation of policies and investments made in the context of the polluting control measures. Next, social performance refers to the policy regarding stakeholders and is formed for instance by the performance on job safety and equal employment opportunities. Finally,

governance performance is measured on the basis of factors such as diversity on the board, the quality of administration processes and whether decisions are made in the interest of shareholders (Husted & Sousa-Filho, 2017).

3.4 Control variables

In order to minimize the chance of finding confounding effects, several control variables are added which were considered relevant in previous literature. To control for firm size (SIZE), as in Yang and Baasandorj (2017), the natural logarithm of total assets is used. It is argued that large firms perform better as they benefit from economies of scale and are more efficient. In addition, differences in purchasing power between different airlines play a role in the extent to which they can invest in ESG initiatives, which is also related to firm size (Ortas, Alvares & Garayar, 2015).

It is also important to control for firm age (AGE) as younger companies generally invest more in activities directly related to financial performance rather than CSR (Yang & Baasandorj, 2017). The firm age is calculated from the year the airline started to operate.

The leverage ratio (LEV) is commonly used to control for the capital structure of airlines as it is argued to be related to FP (Kraus & Litzenberger, 1973). Furthermore, according to Pires & Fernandes (2012), within the airline industry, it is important to control for this since this industry is characterized by a lot of high debt and negative equity. In line with the existing literature, the ratio is defined as total liabilities over total assets (Yang & Baasandorj, 2017).

The dividend payout ratio (DIV) is used to control for the company's attitude towards shareholders and the signals the company sends to investors regarding its financial situation (Moon, Lee & Dattilo, 2015). Gordon (1959) argues that higher dividends imply higher firm value, thus a positive relationship between FP and dividends is expected.

In addition, market capitalization (MCA) is also used to control for the size and value of the airline in the market (Hartmann, 2022).

In line with Kalia & Aggarwal (2022), this study also checks for the current ratio, it is formulated as the current assets over the current liabilities of an airline. This ratio is used in the literature as a proxy for the liquidity of a company.

Thomsen and Pedersen (2000) argue that it is important to control for the type of ownership when examining the relationship between CSR and FP. This is in line with what is stated by Koa, Yeh, Wang and Fung (2018) in the context of the airline industry, as different types of airlines have different motives for investing in CSR initiatives. The research by Zhang, Tong,

Su and Cui (2015) suggests that participation in CSR initiatives has a positive effect on FP for private-owned companies, whereas it has a negative effect for public-owned companies. However, this study focuses only on U.S. airlines, which are all privately owned, therefore no control variable is used.

Table 3 provides a complete overview of the variables used.

Table 3
Overview variables

Variable Definition		Description
ROA	Return On Assets	Defined as net profit over total assets
TQ	Tobin's Q	Defined as market value over total assets
ESG	ESG score	Average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg
ENV	Environmental pillar score	Bloomberg score for the Environmental pillar
SIZE	Firm Size	Defined as the natural logarithm of total assets
AGE	Firm Age	The number of years since the airline started doing business
LEV	Leverage Ratio	Defined as total liabilities over total assets
DIV	Dividend Payout Ratio	Defined as dividend per share over earnings per share
MCA	Market Capitalization	Defined as the total value of the firm's shares of stock
CUR	Current Ratio	Defined as current assets over current liabilities

3. Methodology

This study uses a panel data analysis, this method has previously been used by several researchers to investigate the CSR-FP relationship (Abdi, Li & Càmarà-Turull, 2022; Yang & Baasandorj, 2017; Kuo, Chen & Meng, 2021; Nollet, Folis & Mitrokostas, 2016). First, it is examined which model best fits the data, a fixed effects (FE), random effects (RE) or mixed effects (ME) model can be used. In the airline industry specific literature, several models are used. Yang and Baasandorj (2017) use an FE model, while Lee, Seo and Sharma (2013) use RE. Like Abdi, Li & Càmarà-Turull (2022), this study follows the econometric strategy of Torres-reyna (2010). This means that the Breusch-Pagan Lagrangian Multiplier (LM) test is first conducted to choose between a Pooled OLS model and a Panel Data estimation and the results are presented in Table 4. These results imply the presence of panel effects for all four models at a 10% significance level, therefore Panel Data estimation will be used in this study. Subsequently, the Hausman test is used to choose between the FE and RE models. The RE model is more efficient and can therefore give more precise estimates. However, the model will be inconsistent in the presence of correlations between unobserved random effects and regressors (Yaffee, 2003). The results of this test are presented in Table 5 and are significant at a 1% level for all regressions, therefore it is chosen to use Panel Data estimation with fixed effects.

Table 4

Results of the Breusch-Pagan Lagrangian Multiplier (LM) test

Model	Var	Sqrt (Var)
ROA ~ ESG	0.00549	0.0740949
e	0.0017556	0.0418994
u	0.0002028	0.0142392
Test Var(u) = 0	chibar2(01) = 2.14	
	Prob > chibar2 = 0.0716*	
ROA ~ ENV	0.00549	0.0740949
e	0.0014892	0.1468506
u	0.0002302	0.0151715
Test Var(u) = 0	chibar2(01) = 4.03	
	Prob > chibar2 = 0.0224**	
TQ ~ ESG	0.1167109	0.3416298
e	0.0215651	0.1424546
u	0.0393571	0.1983863
Test Var(u) = 0	chibar2(01) = 15.51	
	Prob > chibar2 = 0.0000***	
TQ ~ ENV	0.1167109	0.3416298
e	0.02156	0.1468331
u	0.0510291	0.2258963
Test Var(u) = 0	chibar2(01) = 15.50	
	Prob > chibar2 = 0.0000***	

Note. The table presents the results of the Breusch-Pagan LM test. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar

P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

Table 5

Results of the Hausman test

Model	Prob > chi2
ROA ~ ESG	0.0001
ROA ~ ENV	0.0000
TQ ~ ESG	0.0036
TQ ~ ENV	0.0021

Note. The table presents the results of the Hausman test. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar

Data source: Bloomberg

For hypotheses 1 and 2, different regression equations are used to prevent high multicollinearity, as this potentially leads to incorrect or inaccurate estimates. The first hypothesis suggests a positive relationship between a U.S. airline's ESG score and financial performance. As discussed earlier, this study uses two different indicators for the FP, namely

the ROA and Tobin's Q. Hence, to answer the first hypothesis, the following regression equations are used.

Model I

$$ROA = \alpha + \beta_1 ESG_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 DIV_{it} + \beta_6 MCA_{it} + \beta_7 CUR_{it} + \varepsilon_{it}$$

Model II

$$TQ = \alpha + \beta_1 ESG_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 DIV_{it} + \beta_6 MCA_{it} + \beta_7 CUR_{it} + \varepsilon_{it}$$

For the second hypothesis, similar regression equations apply. However, the relationship between a U.S. airline's Environmental score and financial performance is examined instead.

Model III

$$ROA = \alpha + \beta_1 ENV_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 DIV_{it} + \beta_6 MCA_{it} + \beta_7 CUR_{it} + u_{it}$$

Model IV

$$TQ = \alpha + \beta_1 ENV_{it} + \beta_2 SIZE_{it} + \beta_3 AGE_{it} + \beta_4 LEV_{it} + \beta_5 DIV_{it} + \beta_6 MCA_{it} + \beta_7 CUR_{it} + u_{it}$$

In these models, the values for the various variables are represented for airline i at time t . The u_{it} term contains both the idiosyncratic error term ε_{it} and a_i which controls for unobserved firm and time effects.

In order to answer the third hypothesis which suggests that the effect of the implementation of ESG initiatives on financial performance is stronger for Full-Service carriers than for Low-Cost carriers, the above models are estimated for different panels. The reason for using different panels, instead of for example a dummy variable, is that the type of business model of an airline is time-invariant and a fixed effects model cannot estimate the effect of constant variables over time. Therefore, the above models are estimated in this study for 3 panels, the first panel is the Full Panel, which includes all 10 airlines. Panel 2 and 3 contains only data from the FS and LC airlines respectively. Results from the different panels are compared to answer the hypothesis, a method previously used by Yang and Baasandorj (2017) and Abdi, Li and Càmarà-Turull (2022).

In order to be able to draw a correct conclusion regarding the different effects of the implementation of ESG initiatives on financial performance for the different types of airlines, it is important that these effects are not attributable to other differences between the FS and LC business models. For this purpose, descriptive statistics from these panels are compared first, which gives a good impression of the differences. If the business models differ significantly on

several factors, this suggests that there may be more differences between these business models that are not controlled for in this study. In that case, it is not possible to draw accurate conclusions regarding studied effect by comparing the panels.

As previously described the use of fixed effects is chosen based on the Hausman test. The sensitivity analysis examines whether the results of the comparison of the different business models might be due to the choice of using fixed effects. Consequently, the analysis is repeated, but random effects are used instead. By using random effects, it is possible to compare the business models by using a dummy variable, eliminating the risk that the differences can be attributed to other factors.

In line with Yaffee (2003), a correlation matrix and variance inflation factor (VIF) were derived to detect high multicollinearity issues between the variables. Table 6 shows the correlation matrix, in which a couple of high values can be observed. The correlation between the ROA and TQ are relatively high, which makes sense since they are both indicators of FP. In addition, a high value can be observed between the ESG and the ENV score, again this is logical since the ESG score includes the ENV score in addition to the SOC and GOV score, as these variables are not used in the same regression equation this does not pose any problems. Furthermore, the correlations between the variables SIZE-ENV and SIZE-LEV are relatively high. However, these high correlations are not problematic if the VIF values are lower than 10 (Almeyda & Darmansya, 2019).

Table 6
Correlation matrix

	ROA	TQ	ESG	ENV	SIZE	AGE	LEV	DIV	MCA	CUR
ROA	1.0000									
TQ	0.5331	1.0000								
ESG	-0.2835	-0.3701	1.0000							
ENV	-0.1724	-0.3387	0.8346	1.0000						
SIZE	-0.2284	-0.3627	0.5762	0.6733	1.0000					
AGE	0.0159	-0.0501	0.1258	0.2980	0.3394	1.0000				
LEV	-0.4869	-0.2743	0.2404	0.3585	0.5404	0.2392	1.0000			
DIV	0.3688	0.4165	-0.0182	-0.0103	-0.0447	0.0571	-0.0578	1.0000		
MCA	0.1417	0.0442	0.3357	0.4411	0.7943	0.3640	0.2294	0.2116	1.0000	
CUR	-0.2632	0.0048	-0.2024	-0.3070	-0.4441	-0.2900	-0.1909	-0.3924	-0.4340	1.0000

Note. The table presents the correlation matrix of the variables used in this research. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities.

Data source: Bloomberg

Table 7 shows the VIF, this test helps to detect multicollinearity issues in the specified model. Since all values are smaller than 10, it can be assumed in this study that the data does not suffer from multicollinearity (Abdi, Li & Càmarà-Turull, 2022). Finally, robust standard errors are used in estimating the models to control for any heteroscedasticity.

Table 7

Results of the variance inflation factor (VIF) test

VIF Panel with ESG	
SIZE	8.23
MCA	4.69
LEV	1.88
ESG	1.75
CUR	1.67
DIV	1.61
AGE	1.22
Mean VIF	3.01
VIF Panel with ENV	
SIZE	7.93
MCA	4.51
ENV	2.03
LEV	1.80
CUR	1.65
DIV	1.58
AGE	1.26
Mean VIF	2.96

Note. The table presents the results of the variance inflation factor test (VIF). The variables are ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities.

Data source: Bloomberg

As an extension to the static panel analysis, dynamic analysis is also performed by using time lags. This is important as some literature suggests that ESG scores do not translate directly into financial performance, but that there is some lag in this (Lee & Park, 2009). This method has also been used by Nollet, Folis and Mitrokostas (2016) and Bruna, Loprevite, Raucci, Ricca and Rupo (2022). In line with Scholtens (2008) and Velte (2017) a first-order time lag of the variable of interest relative to the other independent variables is used. This first-order time lag indicates the effect of ESG and Environmental performance from one year ago on present financial performance. In this way, any delays in the effect of implementing sustainability initiatives on the FP can be identified.

Finally, the literature suggests that the effect of implementing sustainability initiatives differs for different levels of such initiatives. Therefore, the linear analysis is extended to include a quadratic analysis because several studies suggest a U-shaped relationship (Adegbite, Gunney, Kwabi & Tahir, 2019; Barnett & Salomon, 2012). The fact that in most studies only a linear relationship is investigated is mentioned in the literature as one of the main reasons for the variety in previously found results (Nollet, Folis & Mitrokostas, 2016). Consequently, the following regressions are estimated.

Model V

$$ROA = \alpha + \beta_1 ESG_{i,t-1} + \beta_2 ESG_{i,t-1}^2 + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 MCA_{it} + \beta_8 CUR_{it} + \varepsilon_{it}$$

Model VI

$$TQ = \alpha + \beta_1 ESG_{i,t-1} + \beta_2 ESG_{i,t-1}^2 + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 MCA_{it} + \beta_8 CUR_{it} + \varepsilon_{it}$$

Model VII

$$ROA = \alpha + \beta_1 ENV_{i,t-1} + \beta_2 ENV_{i,t-1}^2 + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 MCA_{it} + \beta_8 CUR_{it} + \varepsilon_{it}$$

Model VIII

$$TQ = \alpha + \beta_1 ENV_{i,t-1} + \beta_2 ENV_{i,t-1}^2 + \beta_3 SIZE_{it} + \beta_4 AGE_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 MCA_{it} + \beta_8 CUR_{it} + \varepsilon_{it}$$

4. Results

The descriptive statistics of the data are presented in Table 8. For the 10 airlines included in this study, 7 years of data are used, namely the period 2015-2021. The average ROA of the sample is relatively low, at 0.04. This implies that the airlines are struggling to convert invested capital into operating profit. Tobin's Q (TQ) ranges from 0.35 to 2.31, with an average of 0.86. This means that on average, an airline's replacement cost is less than the value of its assets. The average ESG score is 3.99, which is significantly higher than the average Environmental score (ENV) of 2.44. This means that on average, the airlines in the sample score better on the social and governance pillars. In addition, the variation in age (AGE) of the airlines is substantial, as the youngest airline operates for 17 years in 2015, while the oldest airline has been operating for 90 years by then. Also noticeable is a relatively high maximum value for the dividend payout ratio (DIV) of 36.09, as the mean value is 6.52 with a standard deviation of 8.83.

Table 8

Summary of descriptive statistics

	ROA	TQ	ESG	ENV	SIZE	AGE	LEV	DIV	MCA	CUR
N	70	70	70	70	70	70	70	70	70	70
Mean	.0398831	.8647165	3.987143	2.443571	9.471544	62.90000	.7449068	6.518571	12352.89	.9580000
Std. de	.0740949	.3416298	1.038074	1.553699	1.177811	29.46683	.1291837	8.831199	11794.85	.4495589
Min	-.1720234	.3535877	2.100000	.0000000	7.213989	17.00000	.5157874	.0000000	852.2000	.3400000
Max	.1796334	2.307958	6.440000	6.200000	11.19078	97.00000	1.110744	36.09000	39603.10	2.200000

Note. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. N refers to the number of observations.

Data source: Bloomberg

The results of the Full Panel analysis for Models I and II are presented in Table 9. For the first hypothesis, the effect of an airline's ESG score on financial performance is studied. For both indicators for FP, the effect is not significant at a 10% level. Thereby, the coefficient of ESG is very small in Model I compared to the coefficient of Model II, which makes sense because the mean value of ROA is significantly lower than the mean value of TQ. On average, an increase in the ESG value by 1 causes the ROA to increase by about 3% and the TQ to decrease by 2% compared to the sample mean. These results lead to a rejection of the first hypothesis. In contrast, the effect of firm size (SIZE) does have a significant effect on FP. These results imply when an airline is larger, this lowers its financial performance in terms of ROA and TQ.

In addition, for both indicators, the effect of the leverage ratio (LEV), which controls for an airline's capital structure, is significant at a 1% level. Finally, for both indicators, a significant effect is visible for market capitalisation (MCA) and current ratio (CUR). Market capitalisation has a positive effect on FP, while the effect for current ratio is negative.

Table 9
Results regression analysis Full Panel hypothesis 1

Variable	Coefficients	t-value	p-value
M1: ROA ~ ESG			
ESG	0.0012801	0.16	0.873
SIZE	-0.0845306	-2.57	0.030**
AGE	-2.190e-06	-0.10	0.922
LEV	-0.5829457	-7.12	0.000***
DIV	-0.0000448	-0.06	0.950
MCA	2.440e-06	3.20	0.011**
CUR	-0.0370435	-2.10	0.065*
M2: TQ ~ ESG			
ESG	-0.0248508	-0.89	0.399
SIZE	-0.7900831	-5.26	0.001***
AGE	-0.0001614	-1.80	0.105
LEV	1.1795250	3.34	0.009***
DIV	-0.0042007	-1.20	0.261
MCA	0.0000172	2.11	0.064*
CUR	-0.2187548	-3.14	0.012**

Note. The table presents the results of the regressions of Return On Assets (ROA) and Tobin's Q (TQ) on ESG score. The panel consists of data from 10 U.S. airlines of the period 2015-2021. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities.

P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

Table 10 shows the results of Models III and IV for the Full Panel to test the second hypothesis of this study. Here it can be seen that the effect of Environmental score on Return On Assets is positive and statistically significant at a 1% level. The coefficient is relatively high in this regard, it can be concluded that an increase in the Environmental score of 1 causes a 48% increase in ROA compared to the mean value for ROA. However, this effect is not visible for the Tobin's Q, the coefficient of the Environmental score in model IV is negative and insignificant. A possible explanation for this difference could be that the score has a particularly short-term impact on financial performance since the ROA is considered an indicator of short-term profitability. However, this is not in line with the expectation that it takes time for

environmental investments to translate into improved financial performance. Therefore, this finding will be further examined in the extension of this study in which time lags are used to control for possible lagged effects. The coefficient is comparable in absolute value to the coefficient of the composite ESG score, so it can be said that the effect of the Environmental score on the TQ is not significantly different from the effect of the composite ESG score. Although the coefficient found for model IV is negative and insignificant, based on the results the second hypothesis cannot be rejected. In addition, in line with Models I and II, a significant negative effect can be observed for variable firm size (SIZE) and a significant positive effect for market capitalisation (MCA). In addition, the leverage ratio (LEV) is significant at a 1% level in both models, however, the effect is negative in the model where ROA is the financial indicator and positive in the model with Tobin's Q, consistent with the results of hypothesis 1. Finally, the current ratio (CUR) has a significant effect on FP only in Model IV.

Table 10
Results regression analysis Full Panel hypothesis 2

Variable	Coefficients	t-value	p-value
M3: ROA ~ ENV			
ENV	0.0195906	4.18	0.002***
SIZE	-0.1174205	-4.40	0.002***
AGE	-0.0000173	-0.82	0.435
LEV	-0.5729047	-7.75	0.000***
DIV	0.0002070	0.33	0.750
MCA	3.720E-06	3.06	0.014**
CUR	-0.0321866	-1.79	0.107
M4: TQ ~ ENV			
ENV	-0.0188318	-0.91	0.387
SIZE	-0.8063967	-5.54	0.000***
AGE	-0.0001543	-1.64	0.136
LEV	1.2794580	3.94	0.003***
DIV	-0.0041499	-1.15	0.281
MCA	0.0000175	2.25	0.051*
CUR	-0.2317266	-3.51	0.007***

Note. The table presents the results of the regressions of Return On Assets (ROA) and Tobin's Q (TQ) on Environmental score. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.0

Data source: Bloomberg

For the third hypothesis, it is examined whether the type of business model influences the effect of ESG and environmental performance on financial performance. As described in the methodology section, this is analysed by running the regressions for two different panels, one containing the FS airlines and one containing the LC airlines. The results of these panels are subsequently compared. This method is used as the Hausman test showed that using fixed effects is most appropriate for the specific data. However, to attribute differences in the relationship between ESG/ENV and FP to the difference in business model, it is important to first verify that there are no other major differences between the panels that are not controlled for in the study. For this purpose, the descriptive statistics of the different panels are compared, and these are presented in Tables 11 and 12.

In comparing the descriptive statistics of both panels, it is noticeable that the mean of the variable AGE is significantly different. This can be explained by the fact that the Low-Cost business model became possible only after the 1978 deregulation (Chan, 2017). So that the average Full-Service airline in the sample is 83 years old, while for the Low-Cost airlines this is 32.5 years. Furthermore, while differences can be seen between the panels, these differences are not sufficient to give a strong indication of more significant differences between the panels. This strengthens the assumption that differences found in the effect of ESG/ENV performance is due to the difference in business model and not to other differences between the panels. In order to verify that the choice for this method does not yield fundamental differences in the results found, in the sensitivity analysis the study is repeated using random effects. The use of random effects makes it possible to compare the panels without the risk of the effect being distorted by differences between the panels.

Table 11

Summary of descriptive statistics of Panel 2 – FS airlines

	ROA	TQ	ESG	ENV	SIZE	AGE	LEV	DIV	MCA	CUR
N	42	42	42	42	42	42	42	42	42	42
Mean	.0314879	.7481729	4.080238	2.730238	9.814381	83.16667	.8017535	6.865952	13847.95	.8161910
Std. de	.0761634	.2008278	1.123719	1.741653	1.191096	17.14062	.1264937	8.807034	12074.78	.3026465
Min	-.1720234	.3535877	2.100000	.0000000	7.819998	43.00000	.6307810	.0000000	852.2000	.3400000
Max	.1796334	1.456294	6.440000	6.200000	11.19078	97.00000	1.110744	36.09000	39603.10	1.810000

Note. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. N refers to the number of observations.

Data source: Bloomberg

Table 12

Summary of descriptive statistics of Panel 3 – LC airlines

	ROA	TQ	ESG	ENV	SIZE	AGE	LEV	DIV	MCA	CUR
N	28	28	28	28	28	28	28	28	28	28
Mean	.0524759	1.039532	3.847500	2.013571	8.957287	32.50000	.6596368	5.997500	10110.29	1.170714
Std. de	.0703372	.4291807	.8959109	1.115023	.9663005	13.24834	.0760511	9.003141	11199.65	.5469845
Min	-.1009995	.4756487	2.680000	.5300000	7.213989	17.00000	.5157874	.0000000	1621.900	.5400000
Max	.1622616	2.307958	6.180000	4.860000	10.50012	54.00000	.7854184	27.95000	36167.90	2.200000

Note. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. N refers to the number of observations.

Data source: Bloomberg

Table 13 shows the results of Models I-IV again, but now for the different panels. The left side of the table shows the results of Panel 2, which includes airlines that qualify as a Full-Service airline, and the right side shows Panel 3 for airlines that qualify as Low-Cost airlines. Whereas no significant results were found in the Full Panel for the effect of the ESG score on the FP, this is the case when subdivided into the two different panels. The effect of the ESG score on the TQ in the panel containing data from the Full-Service airlines is significant at a 5% level. This is a negative effect, implying that better ESG performance has a negative effect on the FP of Full-Service airlines. Regarding the effect of the Environmental score on the FP, similar results are observed for the different panels. For both panels there is a significant positive effect of the score on the Return On Assets (ROA) at a 5% level. In addition, it is noticeable that the effect of the variable of interest on the TQ differs for the panels in both Models II and IV. The effect of the ESG and ENV score on the TQ, is negative in the case of the Full-Service airlines, while this effect is positive for the Low-Cost airlines although this effect is not significant. It is also noticeable that the effect of sustainability initiatives are a considerable stronger for the ROA compared to the TQ. The relative coefficients to the sample means are all quite different for the different FP indicators. For Model III, an increase in the Environmental score of 1 causes an increase in the ROA by 67% and 58% relative to the sample means for the panels respectively, ceteris paribus. For Model IV, where TQ is used as the FP indicator, an increase in the Environmental score causes a 5% decrease and a 2% increase over the sample means, respectively.

In addition, no major differences can be observed between the two panels. These results lead to the conclusion that the third hypothesis, implying that the effect of ESG performance on financial performance is stronger for FS airlines compared to LC airlines, should be rejected.

Table 13

Results regression analysis for Full-Service and Low-Cost airlines

Variable	Coefficients	t-value	p-value	Coefficients	t-value	p-value
	Panel 2 – FS			Panel 3 – LC		
M1: ROA ~ ESG						
ESG	0.0062209	0.55	0.605	0.0171065	0.79	0.489
SIZE	0.0102374	0.13	0.904	-0.1051379	-4.80	0.017**
AGE	-0.0115170	-1.03	0.351	-0.0000116	-0.50	0.651
LEV	-0.8634188	-9.68	0.000***	-0.4445920	-16.8	0.000***
DIV	-0.0008213	-1.63	0.163	0.0007841	0.77	0.499
MCA	-5.310E-07	-0.33	0.752	3.340E-06	1.64	0.200
CUR	0.0070179	0.22	0.832	-0.0536682	-2.62	0.079*
M2: TQ ~ ESG						
ESG	-0.0977013	-2.62	0.047**	0.0381910	0.79	0.485
SIZE	-1.0391790	-5.03	0.004***	-1.0829470	-5.07	0.015**
AGE	0.0699622	2.77	0.039**	-0.0003276	-2.22	0.114
LEV	0.5081449	1.24	0.269	2.1985240	3.70	0.034**
DIV	-0.0011507	-0.62	0.560	-0.0152021	-2.68	0.075*
MCA	0.0000147	1.47	0.202	0.0000503	6.74	0.007***
CUR	-0.1886803	-1.62	0.167	-0.3355313	-4.14	0.026**
M3: ROA ~ ENV						
ENV	0.0228681	2.75	0.040**	0.0315785	3.24	0.048**
SIZE	-0.0125592	-0.15	0.884	-0.1091282	-5.20	0.014**
AGE	-0.0154802	-1.29	0.255	-0.0000104	-0.28	0.797
LEV	-0.8562720	-7.16	0.001***	-0.5485164	-9.95	0.002***
DIV	-0.0003188	-0.46	0.666	0.0011111	0.86	0.452
MCA	-5.050E-07	-0.20	0.847	6.440E-06	1.98	0.141
CUR	0.0192599	0.56	0.599	-0.0374508	-1.37	0.265
M4: TQ ~ ENV						
ENV	-0.0448848	-1.55	0.182	0.0219709	0.44	0.690
SIZE	-1.0668400	-5.49	0.003***	-1.0482310	-4.89	0.016**
AGE	0.0550486	3.37	0.020**	-0.0003080	-2.21	0.114
LEV	0.6329337	1.33	0.241	2.0417110	4.13	0.026**
DIV	-0.0004590	-0.16	0.876	-0.0147249	-3.15	0.051*
MCA	0.0000136	1.79	0.134	0.0000512	5.14	0.014**
CUR	-0.1402716	-1.13	0.311	-0.2983789	-6.54	0.007***

Note. The table presents the results of the regressions of Return On Assets (ROA) and Tobin's Q (TQ) on ESG and Environmental performance for sub-panels 2 and 3. Sub-panel 2 consists of data from 6 Full-Service airlines of the period 2015-2021. Sub-panel 3 consists of data from 4 Low-Cost airlines of the period 2015-2021. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defined as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities.

P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

As described in the literature review, the results obtained from previous research are inconsistent. Various explanations are given for this; for instance, several researchers argue that improved ESG performance is not immediately reflected in the financial performance, but that there is a delay in this. In addition to the static panel analysis, a dynamic analysis using first-order time lags of the variables of interest is also performed for this reason. Finally, a quadratic term is added because of implications from previous researchers that the relationship examined may be U-shaped. This would imply that the effect of ESG/ENV initiatives differs for different levels of ESG/ENV performance. The results of Models VI-VIII are presented in Table 14. However, the results do not support the claims made in the earlier studies. None of the coefficients of lagged variables and quadratic variables obtained is statistically significant.

Table 14**Results extension regression analysis Full Panel**

Variable	Coefficients	t-value	p-value
M1: ROA ~ ESG			
ESG _{t-1}	-0.0200988	-0.30	0.769
ESG _{t-1} ²	0.0004759	0.06	0.952
SIZE	-0.0504836	-0.75	0.458
AGE	0.0039288	0.45	0.653
LEV	-0.6867872	-4.84	0.000***
DIV	0.0001378	0.12	0.901
MCA	8.690E-07	0.35	0.729
CUR	-0.0329044	-1.48	0.147
M2: TQ ~ ESG			
ESG _{t-1}	0.0020630	0.01	0.993
ESG _{t-1} ²	-0.0054887	-0.21	0.831
SIZE	-0.7826057	-3.55	0.001***
AGE	0.0004837	0.02	0.986
LEV	0.9910305	2.14	0.038**
DIV	-0.0055552	-1.54	0.131
MCA	0.0000176	2.16	0.037**
CUR	-0.1849507	-2.55	0.015**
M3: ROA ~ ENV			
ENV _{t-1}	-0.0234635	-0.76	0.453
ENV _{t-1} ²	0.0008734	0.17	0.865
SIZE	-0.0409585	-0.59	0.561
AGE	0.0035954	0.42	0.679
LEV	-0.6324092	-4.22	0.000***
DIV	0.0004436	0.46	0.646
MCA	1.790E-06	0.72	0.473
CUR	-0.0420625	-1.85	0.071*
M4: TQ ~ ENV			
ENV _{t-1}	0.0420292	0.40	0.693
ENV _{t-1} ²	-0.0069105	-0.40	0.693
SIZE	-0.7894215	-3.32	0.002***
AGE	-0.0079330	-0.27	0.789
LEV	0.8781491	1.72	0.093*
DIV	-0.0046665	-1.43	0.161
MCA	0.0000167	1.98	0.054*
CUR	-0.1595461	-2.06	0.045*

Note. The table presents the results of the regressions of Return On Assets (ROA) and Tobin's Q (TQ) on ESG and environmental performance (ENV) using first-order time-lags. A quadratic term of the ESG and ENV has also been added to check for potential non-linear relationships. The panel consists of data from 10 U.S. airlines of the period 2015-2021. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

5. Sensitivity analysis

In this section, a robustness test is conducted in order to analyze the sensitivity of the results found. To this end, in this section it is analyzed whether the choice of the research period and research method has a strong influence on the results found.

In line with Moneva, Bonilla-priego and Ortas (2020) and Song, Yeon en Lee (2021), the panel analysis is performed again using data from a different period compared to the original analysis. Hence, Models I-IV are used again for the period of 2015-2019. In this way, the possible influence of Covid-19 is excluded, as the pandemic could play a role as it had a major impact on the airline industry and therefore on the financial performance of airlines (Liew, 2020). Kuo, Chen and Meng (2021) also indicated that more research needs to be done on the possible effect of Covid-19 on the relationship between ESG performance and financial performance within the airline industry as it may have a large impact.

Table A1 (Appendix) provides the descriptive statistics of the Full Panel for the period 2015-2019. The impact of Covid-19 is evident, for example, the average ROA is almost 2 times higher than in the sample up to 2021. Furthermore, the average TQ is approximately 10% higher in this dataset and the average dividend payout ratio is also approximately 1.5 times higher compared to the dataset containing the Covid-19 period. For the other control variables, differences can be observed, however, these differences are not sufficiently remarkable.

The results of the regression analysis on the 2015-2019 dataset are presented in Table A2. From this, it can be observed that the coefficients of the variables are somewhat different from the results of the original dataset. It is noticeable that the relationship between the Environmental score and the Return On Assets is negative and insignificant, where it is positive and significant for the original dataset. As a result, based on this data, the second hypothesis would be rejected in contrast to the main analysis. Furthermore, no significant results are obtained from this analysis.

The results for hypothesis 3 for the 2015-2019 dataset are presented in Table A3. In comparison to the main analysis, what stands out here is that the coefficients found for ESG and ENV are all insignificant, whereas they were positive and significant for Model III in the main analysis. Furthermore, there are small differences observed in the coefficients compared to the main analysis, however, these differences do not give rise to different conclusions. In conclusion, also based on this dataset, hypothesis 3 would be rejected.

Finally, the regressions were also performed again for the 2015-2019 period, controlling for possible lagged effects and quadratic relationships. These results are presented in Table A4, which shows that, as in the main analysis, no such effects are observable.

In conclusion, some differences can be observed when the 2015-2019 period is analyzed compared to the 2015-2021 analysis. While in the main analysis some significant effects were found, these are not observable when the Covid-19 period is excluded from the dataset.

Additionally, it is examined whether the choice to use fixed effects had a strong influence on the results found. Several methods have been used in the literature, applying the Hausman test to choose between a panel analysis with fixed effects or random effects (Yang & Baasandorj, 2017; Lee, Seo & Sharma, 2013; Abdi, Li & Càmara-Turull, 2022). According to this test, it followed that a model with fixed effects is most appropriate for the data used in this study. However, using random effects has some advantages over fixed effects which are particularly relevant for comparing the different business models. In this section, the study is conducted again using random effects instead of fixed effects to examine the sensitivity of the results to the methodology choice.

Table A5 presents the results of the panel analysis with random effects. For hypothesis 3, which assumes that the effect of sustainability initiatives on financial performance is stronger for FS airlines, the dummy variable FS was added to the model. The variable has a value of 1 if the airline is considered an FS airline and a value of 0 if it is considered an LC airline. In addition, an interaction terms ESG*FS and ENV*FS are added. These variables indicate the difference for the effect of ESG and ENV on FP for an FS airline compared to an LC airline. From the Table A5, it is noticeable that in the models in which ROA serves as a financial indicator, no major differences can be observed compared to the results of the main analysis. However, there is a negative significant effect of ESG on ROA on a 1% level, while this effect is positive and insignificant when fixed effects are used. For the effect of Environmental score on ROA, the opposite is observed, the effect is positive and significant in the main analysis and negative and insignificant using random effects. In contrast to the models in which the ROA is used, the models with TQ show significantly different results compared the main analysis. The effects of ESG and ENV on FP are negative similarly to the main analysis, although by using random effects they are statically significant. Compared to the main analysis, the effect of an increase in the ESG or ENV score of 1 on the FP is approximately 8 times larger. For the third hypothesis, looking at the interaction term, the coefficient is positive and insignificant for both models with ROA. This means that having an FS business model has a positive effect on how the sustainability initiatives affect financial performance compared to

having an LC business model, although this effect is not statistically significant. For the models where TQ is used, different effects are observed for ESG and ENV. Having an LC business model has a significant positive effect on the ESG-FP relationship compared to the FS business model. In contrast, having a FS business model has a significant positive effect on the ENV-FP relationship compared to the LC business model. However, these findings did not follow from the main analysis. Therefore, it can be stated that the choice of financial indicator and the research method affect the results found. This should be taken into consideration for the interpretation of the results of this research in practice. For subsequent research, this is also important information to consider when preparing the design of the research.

Finally, Table A6 shows the results for Models IV-VIII, controlling for possible lag effects and quadratic relationships when random effects are used. As in the main analysis, these effects are not observed.

6. Discussion and conclusion

This study examined the effect of the ESG scores and the Environmental score of U.S. airlines on financial performance. Two indicators were used for financial performance, the Return On Assets (ROA) represents short-term financial performance and the Tobin's Q (TQ) represents long-term financial performance. In addition, it was investigated whether the relationship between the scores and the FP depends on the type of business model. This study used data obtained from the Bloomberg database, covering data from 10 U.S. airlines for the period 2015-2021. The results are discussed in this section.

The first hypothesis suggested a positive relationship between ESG performance and financial performance for U.S. airlines. The results found differ for the different FP indicators; the effect is positive for ROA and negative for TQ. However, both coefficients are not significant, resulting in the first hypothesis being rejected. There is no consensus yet in the current literature regarding the relationship between ESG performance and financial performance. The results of this study are in line with the findings of Abdi, Li and Càmara-Turull (2022) and Duque-Grisales and Aguilera-Caracuel (2015), but in contradiction with the results of Aydogmus, Gulay and Ergun (2022) and Kao, Ting, Chou and Liu (2022). It can be concluded that it is not yet clear how ESG performance affects the financial performance of airlines.

The results for the Environmental dimension differ for the FP indicators. The effect of environmental performance on the ROA is positive and significant while the effect on the Tobin's Q is negative and insignificant. The findings regarding the effect of the Environmental score on short-term financial performance are in line with the stakeholder theory. This theory implies that considering social interest when making investment decisions can act as a valued driver for a company. From this it can be concluded that investing in reducing emissions increases profitability, which is in line with the findings of Abdi, Li and Càmara-Turull (2022). The results of Aydogmus, Gulay & Ergun (2022) showed the same effect upon which they implied that profitability may be better at reflecting the impact of a firm's environmental performance on FP than firm value. However, this is not in line with the expectations outlined in the literature, namely that it takes time for an improvement in the Environmental score to translate into financial performance (Lee & Park, 2009).

Additionally, this study examined whether the type of business model affects the relationship between ESG/ENV performance and financial performance. Based on previous literature, it was hypothesized that the effect of the implementation of ESG/Environmental initiatives on financial performance is stronger for Full-Service airlines compared to Low-Cost airlines. The results found do not support this hypothesis. The effect of ESG performance on long-term

financial performance was found to be negative and significant for Full-Service carriers, while positive and insignificant for Low-Cost airlines. A possible explanation for the significant negative relationship for the Full-Service airlines are the costs associated with investing in ESG initiatives, which can cause a reduced financial performance (Branco & Rodrigues, 2006). Other than this, there were no significant differences between the two different panels. These results diverge from the findings of Abdi, Li and Càmarà-Turull (2022), who concluded that LC airlines are not able to make the gains from better ESG performance outweigh the costs, while FS airlines can.

With respect to the Environmental score, the LC and FS airlines are not significantly different. For the profitability (ROA) indicator, a positive significant relationship is found for both types of airlines. For the market-based measure (TQ), the effect is negative for FS airlines and positive for LC airlines, although these effects are not statistically significant. The findings regarding the long-term FP, which are reflected by the market-based measure, for the influence of Environmental score are consistent with the results of Yang and Baasandorj (2017). From this, it can be concluded that Low-Cost airlines are better in transforming Environmental investments into improved financial performance, expressed in TQ, compared to Full-Service airlines.

Finally, the possibility of quadratic relationships or lagged effects regarding the relationship between ESG performance and financial performance was examined. The results do not indicate such associations. Previously, Nollet, Folis and Mitrokostas (2016) found a U-shaped relationship between CSR investments and financial performance. When they looked at this relationship for the three ESG pillars separately, it was found to exist only for the Governance pillar. The fact that this study does not specifically look at the effect of the Governance score on FP provides a possible explanation for the difference in results. In addition, the study did not focus specifically on the airline industry, but used data from different types of companies. Thus, it is also possible that the U-shaped relationship is not applicable within the airline industry, where it might be in other industries. With respect to lagged effects, the line in the literature has been followed considering only first-order lagged effects (Nollet, Folis & Mitrokostas, 2016; Bruna, Loprevite, Raucci, Ricca & Rupo, 2022). As a result, it is not possible to conclude whether any lagged effects can be detected when multi-year lags are used.

Although much previous research has been done on the relation between ESG performance and financial performance, it is important to examine the relationship by industry as industry characteristics may play a role. This research therefore focuses on the airline industry, for

which the current literature is limited. In addition, the results differ from each other so there is no consensus on this topic at this point. This research therefore aims to provide more insights on the relevance for managers to implement ESG activities. It contributes to the current state of the literature by focusing on U.S. airlines, distinguishing between short-term and long-term financial performance and the different business models for airlines and finally by controlling for possible lagged effects and quadratic correlations.

Besides contributing to the current literature, this research is also relevant for managers and executives in the airline industry. In addition, insights from this research can be used in making investment strategies by investors.

For managers and executives of airlines, this research is relevant as they can use the insights when creating a sustainability strategy. Both the government and society are putting great pressure on the airline industry to become more sustainable. Moreover, since the emergence of the Low-Cost business model, this industry has been characterized by fierce price competition, with airlines trying to keep costs as low as possible in order to offer the most competitive prices. This makes it difficult to implement sustainability initiatives as they often involve high costs. Hence, it is important to understand the effects of the various ESG initiatives on financial performance. Investment decisions can therefore be adjusted to translate into improved ESG and financial performance. Finally, investors can take results emerging from this research into account when creating an investment portfolio.

There are several limitations to this study. The data used in this study cover a limited number of airlines and period of time. For future research it is relevant to expand the dataset to get a more comprehensive understanding regarding this topic. In addition, only data from U.S. airlines are used in this study. Since the airline market can vary considerably geographically, it is not clear whether the findings have external validity (Kalia & Aggarwal, 2022). Therefore, for follow-up research, it would be relevant to examine other geographic markets.

This research focuses on the effect of the individual Environmental score in addition to the composite ESG score. This choice was made because this pillar is considered most relevant in this industry (Abdi, Li & Càmara-Turull, 2022). Nevertheless, for follow-up research, it is relevant to elaborate on the effects of the individual Social and Governance scores. In this respect, it is relevant to elaborate on how the effects of the different components relate to each other.

The main analysis and sensitivity analysis of this study reveal that the choice of FP indicator has a strong influence on the results. Similarly, Yang and Baasandorj (2017) found different results for the different indicators used. Lee and Park (2009) conducted similar research in

which they used value performance indicators, namely average market value (AMV) and excess market value (EMV) in addition to the accounting-based measures ROA and Tobin's Q. They found no linear or quadratic relationship between CSR performance and financial performance for the accounting-based measures. However, for the AMV and EMV, they found a significant positive relationship, hence the chosen indicator may influence the results. For follow-up research, it would be interesting to replicate this study using other indicators to express financial performance.

Finally, it should be mentioned that although this study controlled for possible lag effects, this was only limited to 1-year lag, which is in line with previous research (Nollet, Folis & Mitrokostas, 2016; Bruna, Loprevite, Raucci, Ricca & Rupo, 2022). However, it is possible that there is a larger time-lag effect here and if it were included in the study, it would yield different findings. If a larger sample size is available, these possible delayed effects could be investigated more thoroughly.

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Appendix

Table A1

Summary of descriptive statistics of Full Panel for the period 2015-2019

	ROA	TQ	ESG	ENV	SIZE	AGE	LEV	DIV	MCA	CUR
N	50	50	50	50	50	50	50	50	50	50
Mean	.0757425	.9493118	3.745800	2.181600	9.367851	70.72000	.7143129	9.126000	13456.57	.8348000
Std. de	.0404729	.3505973	.9498637	1.366002	1.196822	67.16202	.1142668	9.248878	12583.54	.3984062
Min	-.0322684	.4735344	2.100000	.0000000	7.213989	17.00000	.5157874	.0000000	970.1000	.3400000
Max	.1796334	2.307958	5.740000	4.770000	11.07492	489.0000	1.014777	36.09000	39603.10	2.200000

Note. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. N refers to the number of observations.

Data source: Bloomberg

Table A2

Results regression analysis on the 2015-2019 dataset

Variable	Coefficients	t-value	p-value
M1: ROA ~ ESG			
ESG	-0.0039625	-0.41	0.691
SIZE	-0.0762935	-1.91	0.089*
AGE	-0.0000265	-1.08	0.309
LEV	-0.4745968	-3.79	0.004***
DIV	-0.0022224	-3.36	0.008***
MCA	0.0000017	1.20	0.259
CUR	-0.0623230	-1.92	0.088*
M2: TQ ~ ESG			
ESG	0.0670105	1.35	0.209
SIZE	-1.1937480	-4.50	0.001***
AGE	-0.0005422	-2.67	0.026**
LEV	1.0373360	2.42	0.038**
DIV	-0.0126627	-2.60	0.029**
MCA	0.0000310	2.99	0.015**
CUR	-0.8179995	-2.54	0.032**
M3: ROA ~ ENV			
ENV	-0.0040036	-0.37	0.722
SIZE	-0.0746816	-1.62	0.139
AGE	-0.0000251	-0.88	0.400
LEV	-0.4578979	-4.05	0.003***
DIV	-0.0022635	-3.55	0.006***
MCA	0.0000017	1.08	0.309
CUR	-0.0611587	-1.82	0.102
M4: TQ ~ ENV			
ENV	0.0477365	1.09	0.304
SIZE	-1.1880740	-4.24	0.002***
AGE	-0.0005489	-2.50	0.034**
LEV	0.7665211	1.76	0.112
DIV	-0.0120425	-2.24	0.052*
MCA	0.0000298	2.68	0.025**
CUR	-0.8406819	-2.67	0.026**

Note. The table presents the results of the regression of Return On Assets (ROA) and Tobin's Q (TQ) on ESG and Environmental (ENV) performance using data from 10 U.S. airlines from the period 2015-2019. Consideration of this period excludes the effect of Covid-19 to check whether the pandemic might affect the relationship between ESG and financial performance. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities.

P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

Table A3

Results regression analysis for Full-Service and Low-Cost airlines for the dataset 2015-2019

Variable	Coefficients	t-value	p-value	Coefficients	t-value	p-value
	Panel 2 – FS			Panel 3 – LC		
M1: ROA ~ ESG						
ESG	0.0062496	0.40	0.704	-0.0008020	-0.05	0.960
SIZE	0.0645899	0.62	0.564	-0.1017039	-2.55	0.084*
AGE	-0.0215069	-1.37	0.229	-0.0000421	-1.13	0.341
LEV	-0.6383821	-3.24	0.023**	-0.2304051	-0.69	0.538
DIV	-0.0018944	-1.83	0.127	-0.0021279	-0.92	0.426
MCA	0.0000002	0.06	0.957	0.0000029	0.99	0.394
CUR	-0.1001631	-1.44	0.209	-0.0502338	-0.55	0.624
M2: TQ ~ ESG						
ESG	-0.0933206	-1.02	0.353	-0.0843144	-1.06	0.368
SIZE	-1.0824780	-3.27	0.022**	-1.2562490	-5.34	0.013**
AGE	0.1275915	2.10	0.089*	-0.0007828	-2.87	0.064*
LEV	1.0870170	2.26	0.073*	0.3025110	0.24	0.824
DIV	-0.0174181	-3.49	0.018**	-0.0396975	-2.95	0.060*
MCA	0.0000207	1.80	0.131	0.0000281	3.21	0.049**
CUR	-0.1639424	-0.29	0.780	-0.9964811	-3.21	0.049**
M3: ROA ~ ENV						
ENV	-0.0137712	-1.07	0.334	0.0078074	0.72	0.523
SIZE	0.1044101	0.93	0.395	-0.1065391	-2.91	0.062*
AGE	-0.0162596	-1.19	0.287	-0.0000368	-0.90	0.436
LEV	-0.6428298	-3.67	0.014**	-0.2394133	-1.56	0.217
DIV	-0.0021480	-2.81	0.037	-0.0015494	-0.60	0.589
MCA	-0.0000138	-0.61	0.571	0.0000039	0.98	0.401
CUR	-0.0571228	-0.83	0.443	-0.0415489	-1.08	0.360
M4: TQ ~ ENV						
ENV	-0.0537684	-0.62	0.565	-0.0299404	-0.32	0.770
SIZE	-1.0732900	-2.82	0.037**	-1.2390360	-4.73	0.018**
AGE	0.1077327	2.67	0.044**	-0.0008392	-3.33	0.045**
LEV	1.2067730	2.62	0.047**	1.2644620	3.98	0.028**
DIV	-0.0170794	-3.50	0.017**	-0.0445662	-4.69	0.018**
MCA	0.0000237	1.99	0.103	0.0000246	1.84	0.163
CUR	-0.2632427	-0.54	0.614	-0.7892915	-3.30	0.046**

Note. The table presents the results of the regressions of Return On Assets (ROA) and Tobin's Q (TQ) on ESG and Environmental performance for sub-panels 2 and 3. Sub-panel 2 consists of data from 6 Full-Service airlines of the period 2015-2019. Sub-panel consists of data from 4 Low-Cost airlines of the period 2015-2019. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities.

P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

Table A4

Results extension regression analysis Full Panel for the dataset 2015-2019

Variable	Coefficients	t-value	p-value
M1: ROA ~ ESG			
ESG _{t-1}	-0.0030392	-1.54	0.150
ESG _{t-1} ²	-0.0018273	-0.67	0.518
SIZE	0.0083771	0.10	0.923
AGE	-0.0006037	-0.05	0.960
LEV	-0.4358054	-1.93	0.078*
DIV	-0.0027152	-2.55	0.026**
MCA	0.0000009	0.57	0.580
CUR	0.0069043	0.17	0.867
M2: TQ ~ ESG			
ESG _{t-1}	0.0076271	0.63	0.539
ESG _{t-1} ²	-0.0006068	-0.04	0.972
SIZE	-0.5595888	-1.08	0.301
AGE	0.0026392	0.04	0.971
LEV	-0.4898411	-0.36	0.728
DIV	-0.0164847	-2.54	0.026**
MCA	0.0000271	2.76	0.017**
CUR	-0.3159107	-1.28	0.223
M3: ROA ~ ENV			
ENV _{t-1}	0.0020972	0.96	0.354
ENV _{t-1} ²	0.0014285	0.76	0.465
SIZE	0.0007049	0.01	0.994
AGE	-0.0101472	-0.88	0.394
LEV	-0.5019716	-2.25	0.044**
DIV	-0.0031392	-2.46	0.030**
MCA	0.0000007	0.04	0.966
CUR	-0.0016599	-0.04	0.969
M4: TQ ~ ENV			
ENV _{t-1}	0.0195565	1.69	0.117
ENV _{t-1} ²	0.0061871	0.61	0.550
SIZE	-0.7737948	-1.58	0.140
AGE	0.0236108	0.39	0.706
LEV	0.2632845	0.22	0.829
DIV	-0.0221081	-3.25	0.007***
MCA	0.0000273	2.86	0.014**
CUR	-0.2592526	-1.16	0.268

Note. The table presents the results of the regressions of Return On Assets (ROA) and Tobin's Q (TQ) on ESG and environmental performance (ENV) using first-order time-lags. A quadratic term of the ESG and ENV has also been added to check for potential non-linear relationships. The panel consists of data from 10 U.S. airlines of the period 2015-2019. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

Table A5

Results regression analysis using random effects

Variable	Coefficients	t-value	p-value
M1: ROA ~ ESG			
ESG	-0.0207562	-1.71	0.088*
FS	-0.0460035	-0.98	0.325
ESG*FS	0.0147150	1.22	0.222
SIZE	-0.0302936	-2.41	0.016**
AGE	-0.0000133	-0.38	0.701
LEV	-0.2375408	-2.76	0.006***
DIV	0.0005266	0.74	0.459
MCA	0.0000032	3.11	0.002***
CUR	-0.0493103	-3.25	0.001***
M2: TQ ~ ESG			
ESG	-0.1686461	-2.81	0.005***
FS	0.1745166	3.54	0.000***
ESG*FS	-0.9499551	-3.57	0.000***
SIZE	-0.2530157	-1.92	0.054*
AGE	0.0000178	0.05	0.962
LEV	0.6129873	1.30	0.193
DIV	0.0052053	1.67	0.095*
MCA	0.0000202	2.41	0.016**
CUR	-0.0987334	-2.38	0.017**
M3: ROA ~ ENV			
ENV	-0.0097511	-0.75	0.456
FS	-0.0185677	-0.82	0.413
ENV*FS	0.0148488	1.35	0.177
SIZE	-0.0429126	-3.38	0.001***
AGE	0.0000016	0.05	0.959
LEV	-0.2283216	-2.53	0.011**
DIV	0.0002374	0.35	0.725
MCA	0.0000039	4.05	0.000***
CUR	-0.0524542	-3.46	0.001***
M4: TQ ~ ENV			
ENV	-0.1386160	-2.3	0.021**
FS	-0.5827762	-3.68	0.000***
ENV*FS	0.1419720	3.11	0.002***
SIZE	-0.2512777	-1.91	0.057*
AGE	0.0003661	1.34	0.179
LEV	0.5838636	1.29	0.198
DIV	0.0052504	1.74	0.082*
MCA	0.0000206	2.45	0.014**
CUR	-0.1163416	-2.00	0.045**

Note. The table presents the results of the regression with random effects of Return On Assets (ROA) and Tobin's Q (TQ) on ESG and Environmental (ENV) performance using data from 10 U.S. airlines from the period 2015-2021. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, FS = dummy-variable which has a value of 1 when the airline is considered a FS airline, ESG*FS = interaction variable, this variable indicates the difference in the ESG-FP relationship for the FS airline compared to the LC airline, ENV*FS = interaction variable, this variable indicates the difference in the ENV-FP relationship for the FS airline compared to the LC airline SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities.

P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg

Table A6

Results extension regression analysis Full Panel using random effects

Variable	Coefficients	t-value	p-value
M1: ROA ~ ESG			
ESG _{t-1}	-0.0286919	-0.52	0.606
ESG _{t-1} ²	0.0009479	0.14	0.887
SIZE	-0.0119047	-0.74	0.462
AGE	0.0001646	0.53	0.599
LEV	-0.2621315	-3.52	0.000***
DIV	0.0012493	1.35	0.176
MCA	0.0000018	1.51	0.130
CUR	-0.0519156	-2.80	0.005***
M2: TQ ~ ESG			
ESG _{t-1}	-0.2289571	-0.98	0.328
ESG _{t-1} ²	0.0243148	0.87	0.383
SIZE	-0.2699146	-3.70	0.000***
AGE	-0.0052702	-3.36	0.001***
LEV	0.8925387	2.55	0.011**
DIV	0.0033595	0.85	0.398
MCA	0.0000266	5.08	0.000***
CUR	-0.1187463	-1.50	0.134
M3: ROA ~ ENV			
ENV _{t-1}	-0.0121598	-0.75	0.453
ENV _{t-1} ²	-0.0006805	-0.21	0.835
SIZE	-0.0152148	-0.99	0.320
AGE	0.0004037	1.23	0.219
LEV	-0.2795435	-3.63	0.000***
DIV	0.0013767	1.56	0.119
MCA	0.0000020	1.71	0.086*
CUR	-0.0510012	-2.77	0.006***
M4: TQ ~ ENV			
ENV _{t-1}	-0.0673576	-0.92	0.358
ENV _{t-1} ²	0.0172135	1.22	0.223
SIZE	-0.3228035	-4.78	0.000***
AGE	-0.0055047	-3.49	0.000***
LEV	1.0008780	2.85	0.004***
DIV	0.0023614	0.64	0.523
MCA	0.0000291	5.67	0.000***
CUR	-0.1259974	-1.62	0.106

Note. The table presents the results of the regressions of Return On Assets (ROA) and Tobin's Q (TQ) on ESG and environmental performance (ENV) using first-order time-lags. A quadratic term of the ESG and ENV has also been added to check for potential non-linear relationships. The panel consists of data from 10 U.S. airlines of the period 2015-2019. The variables are ROA = Return On Assets, defined as net profit over total assets, TQ = Tobin's Q, defined as market value over total assets, ESG = average score on the pillars Environmental, Social and Governance of an airline obtained from Bloomberg, ENV = Bloomberg score for the Environmental pillar, SIZE = Firm size, defined as the natural logarithm of total assets, AGE = firm age, defines as the number of years since the airline started doing business, LEV = leverage ratio, defined as total liabilities over total assets, DIV = dividend payout ratio, defined as dividend per share over earnings per share, MCA = market capitalization, defined as the total value of the firm's shares of stock, CUR = current ratio, defined as current assets over current liabilities. P-values in parentheses: * P<0.1, ** P<0.05, *** P<0.01

Data source: Bloomberg