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Sustainable Development, Environmental Certification and the Financial Performance of the Road Passenger Transportation Sector

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ABSTRACT

Within the framework of sustainable development and environmental policy, environmental certification is regarded as a mechanism through which road passenger transport companies (RPTCs) could mitigate their adverse environmental impacts and attain competitive advantages that may enhance their financial performance. The objective of this study is to analyse whether the financial performance of RPTCs improves as a result of the influence that environmental certification exerts on passengers' perceived image, sustainable asset management and employees' environmental behaviour. Using panel data covering the period 2010–2019, a comparative analysis was conducted between certified and non-certified RPTCs, focusing on the routes they operate and their affiliation status. While the effect of certification on sustainable asset management strengthens financial performance, the improvement in passengers' environmental image has only a partial effect. Conversely, the influence of certification on employees' environmental behaviour has been found to exert a negative impact on financial performance.

1 | Introduction

The mobility of people and goods is a necessary activity for global economic development, with road transport being the most widely used mode in Europe in 2023 (EUROSTAT 2025a). However, the high levels of CO_2 it emits into the atmosphere make it one of the most polluting sectors, with particularly harmful effects on the environment. According to the European Environment Agency (EEA 2022), in 2021, the transport sector accounted for approximately one-quarter of the European Union's total greenhouse gas emissions. Of these, 71.7% originated from road transport. The sector faces increasing criticism from consumer associations, environmental groups and public and private organisations, which exert growing pressure to adopt environmentally responsible practices.

This pressure is particularly intense for road passenger transport companies (RPTCs) (EEA 2022), as this mode of transport is used daily by individuals to meet mobility needs related to work, education, leisure and tourism. It is the mode that most directly affects human beings, especially in urban areas, where air pollution has significant adverse effects on public health. Consumers of this service demand that both public and private collective passenger transport providers operate in an environmentally responsible manner, comply with environmental regulations and offer a viable alternative to private vehicles, which account for 60.6% of pollution in Europe (EEA 2022).

Environmental responsibility is a key strategic tool for RPTCs, capable of generating a triple win-win-win outcome: improving quality of life and social well-being, reducing negative

environmental impacts and achieving competitive advantages that strengthen the financial performance of organisations (Arimany-Serrat et al. 2019). In this context, one of the most widely adopted mechanisms by RPTCs to manage their environmental commitments and demonstrate alignment with sustainable practices is the certification of environmental management systems, such as ISO 14001, which facilitates the implementation of sustainable operational standards and the optimisation of resources (Kovac et al. 2020). According to these authors, there is broad consensus that environmental certification represents the most objective indicator for measuring the relationship between environmental proactivity and financial profitability.

The adoption of effective environmental certification can contribute to reducing negative environmental impacts while simultaneously improving societal quality of life. Moreover, organisations may gain competitive advantages through enhanced internal operations, increased employee efficiency, investment in technology oriented towards sustainable assets and ultimately, savings in both resources and costs (Abdallah 2023). In addition, certification improves companies' image and reputation, as it is perceived by customers as a sign of environmental commitment, thereby attracting more users and boosting sales (Khrutba et al. 2019). As a result, the competitive advantages gained may lead to increased financial profitability for organisations (Porter 1991; Porter and van der Linde 1995).

However, although there is consensus regarding the relevance of understanding the effect of environmental certification on financial performance (Salim et al. 2018), existing studies do not allow for definitive or conclusive findings (Benzidia et al. 2025; Zubeltzu-Jaka et al. 2024). According to these authors, further research is needed that adopts a more systematic approach, broadens perspectives and contexts and incorporates new variables and analytical dimensions.

In this regard, the objective of this study is to address these shortcomings and shed light on this relationship. Therefore, unlike previous studies, this work incorporates the competitive advantages arising from the improvement of companies' image and reputation, as well as enhanced internal operations, as mediating mechanisms in the relationship between environmental certification and financial performance. Three mediating factors have been considered: passengers' perceived green image, the sustainable management of assets and employees' ecological behaviour.

Furthermore, this is the first study of its kind to focus on a sector of such economic, environmental, social and human significance as RPTCs. To achieve this aim, a comparison was conducted between certified and non-certified Spanish RPTCs over the period 2009–2019. This longitudinal approach, spanning almost a decade, differs from previous cross-sectional studies that only identified relationships at a single point in time, enabling instead a more dynamic analysis. Using linear regression with panel data, it was possible to determine whether the impact of certification influences financial performance. Moreover, in line with Benzidia et al. (2025) and Zubeltzu-Jaka et al. (2024), key contingent factors specific to RPTCs were incorporated into the analysis to obtain more robust results. Accordingly, and following Pathak et al. (2021), the study examines whether the specific characteristics of RPTCs shape the effect of certification on financial performance. In this respect, companies were grouped according to whether they operate international routes, belong to a business alliance, or provide tourist passenger transport services.

The results obtained from the linear panel regression show, in general terms, that the impact of certification on sales does not lead to a decrease in the financial performance of certified RPTCs. In the case of the impact of certification on the sustainable management of assets, it has been found to improve financial profitability. In contrast, the effect of certification on employees' environmental performance does not, in any case, result in a positive outcome. These findings are useful for informing environmental decision-making processes, at various levels and scopes, by policymakers, public authorities, private entities, RPTCs managers, service users and environmental and consumer associations.

The remainder of the paper is organised as follows: After reviewing the relevant literature and formulating the research hypotheses, the methodology is presented. The subsequent sections outline the results, followed by a discussion of the implications and conclude with the main conclusions, limitations and avenues for future research.

2 | Literature Review and Hypotheses

2.1 | Economic, Social and Environmental Sustainability of Road Passenger Transport

The progressive growth of the global economy has been made possible by the parallel development experienced by the transport industry. Economically speaking, in 2023 the transport sector accounted for approximately 5% of the European GDP and 3.1% of total employment (EUROSTAT 2025b). In this regard, among the various types of transport, road transport holds a prominent economic role, as it accounts for the highest volume of both goods and passenger movement (Fernández Vázquez-Noguerol et al. 2018). According to EUROSTAT (2025a), nearly 25% of freight transport in 2023 and almost 80% of passenger transport in 2022 were carried out by road.

However, road transport is one of the most environmentally damaging sectors (Khrutba et al. 2019). As highlighted by the International Energy Agency (IEA 2024), in addition to being one of the main emitters of CO_2, responsible for 25% of emissions in 2022, it is also a major source of air, noise and thermal pollution, contributing significantly to environmental degradation. The negative effects of transport are particularly intensified in urban areas. The high population density and the intensive use of private vehicles are major sources of pollution, negatively affecting not only the environment but also public health and quality of life, as warned by the World Health Organization (2011).

This situation highlights the need, as recommended by the United Nations (UN 2020), for a collective passenger transport system that meets the population's mobility needs. The goal is to develop a sustainable collective transport sector that facilitates

human mobility while minimising negative environmental impacts (Sánchez Toledano et al. 2025).

For collective passenger transport, one of the most significant sources of differentiation in recent years has been the growing public demand to incorporate social and environmental improvements into their objectives, alongside economic goals. Achieving sustainability requires the integration of economic, social and environmental dimensions (United Nations General Assembly UN 2015). According to Laari et al. (2016), these three pillars must be addressed simultaneously in order to satisfy the requirements and expectations of contemporary society.

Evaluating the sustainability performance of the transport sector from social, economic and environmental perspectives has been the subject of increasing academic interest. It is evident that the three dimensions are closely interconnected, as a triple win-win-win outcome can be achieved across environmental, economic and social domains (Mewafarosh et al. 2024). Efforts aimed at achieving sustainable transport can reduce negative environmental impacts while also generating institutional cost savings and improving business profitability. From a social perspective, these efforts can lead to improvements in public health and quality of life. In this regard, some studies have shown that social and environmental initiatives can have a significant positive economic impact on transport companies (Oberhofer and Fürst 2012). However, the economic and social dimensions have received relatively limited attention (Fernández Vázquez-Noguerol et al. 2018).

In this scenario, private transport companies play a key role in the transition to a sustainable model. It is necessary to move towards modes of transport that align with social and economic requirements while minimising environmental impact (Naganathan and Chong 2017). In this sense, environmental management could be offered as an avenue of differentiation with great potential in the road passenger transport sector.

As stated by Marcilio et al. (2018), given that a large share of mobility relies on private passenger transport companies, it is essential to raise awareness among managers that adopting a proactive environmental stance can yield benefits that extend beyond the environmental realm, encompassing the financial performance of their businesses. Strategic environmental management may help companies develop competitive advantages by optimising operational efficiency, strengthening their reputation, improving community relations, increasing stakeholder satisfaction and enhancing employee motivation (Seroka-Stolka and Fijorek 2022).

2.2 | Environmental Certification of Road Passenger Transport Companies and Competitive Advantages

Environmental responsibility is a tool that transport companies can use to minimise the negative consequences of transport activity on the environment, while also obtaining economic benefits and improving quality of life, public health and safety (Tetteh et al. 2024). The implementation and certification of an environmental management system (EMS) by internationally recognised verification bodies is one of the most widely adopted and broadly accepted measures to reflect environmental proactivity. Environmental certification constitutes a key mechanism for translating corporate social responsibility (CSR) environmental commitments into verifiable and auditable business practices (Fonseca et al. 2022).

According to Abdallah (2023), holding environmental certification guarantees that the company has implemented a thorough EMS. Furthermore, companies with higher ecological efficiency are more likely to have adopted environmental certification. In this regard, many transport companies have successfully managed their environmental responsibilities through the adoption of certification, as it is a tool that enables them to structure their environmental endeavours and receive recognition for their sustainability initiatives (Kovac et al. 2020).

The adoption of environmental certification may allow RPTCs to achieve competitive advantages that could enhance their financial performance (Karaman et al. 2018). On the one hand, it can be considered a strategic source of differentiation that enables companies to gain approval and legitimacy from citizens, environmental associations, NGOs, consumers, suppliers and employees, all of whom are increasingly attentive and demanding regarding environmental behaviour. In this context, the emergence of new societal values positions environmental responsibility as a decisive factor influencing consumers' decisions when choosing transport services (Ferrón Vílchez 2017). Accordingly, RPTCs are becoming increasingly sensitive to any shortcomings that could damage their public image by running counter to stakeholder expectations (Oberhofer and Fürst 2012). Consequently, environmental certification, in addition to enhancing a company's reputation, could influence passengers' choices and increase demand and sales (Chen and Ho 2019).

Moreover, from an internal perspective, environmental certification may lead to cost reductions. Raising environmental awareness among employees can enhance the efficiency of human resources, while investment in green technology, sustainable asset management and effective internal operations can contribute to lower resource consumption and operational costs (Phillips et al. 2019). Consequently, this situation may lead to increased financial performance for RPTCs (Geerts 2014).

However, studies analysing the relationship between environmental certification and financial performance are not conclusive and do not establish an unambiguous impact (Benzidia et al. 2025; Zubeltzu-Jaka et al. 2024). While authors such as Camilleri (2022), Boiral (2011) and Arocena et al. (2021) found a positive effect of certification on financial performance, Riaz and Saeed (2020), Lee et al. (2017) and Wang et al. (2023) reported a negative impact and Wang and Mao (2020) and Chiarini (2019) identified no significant relationship. According to Salim et al. (2018), the scarcity of studies focusing on the economic effects of certification limits the ability to determine the direction of this relationship. Consequently, a more systematic approach is required, one that broadens the perspectives and contexts from which this topic is examined.

In the specific case of RPTCs, despite the attention paid in the literature to the environmental impact of road transport, studies

examining the relationship between environmental management and the financial performance of RPTCs remain limited (Fernández Vázquez-Noguerol et al. 2018). The objective of this study is to assess this relationship and provide empirical evidence. Specifically, this study examines the impact of environmental certification on the financial performance of RPTCs, considering three mediating factors: passengers' perceived green image, sustainable asset management and employees' ecological behaviour.

From the Resource-Based View (RBV) theory (Barney 1991), these three mediating factors can be interpreted as distinct types of firm-specific resources and capabilities. Passengers' perceived green image is associated with the development of reputational and relational capital, sustainable asset management reflects the configuration of tangible and technological resources and employees' ecological behaviour captures the contribution of human capital and organisational routines. Within this framework, the degree to which environmental certification becomes embedded in these resources and capabilities will determine its potential impact on financial performance (Khanra et al. 2022).

2.2.1 | Passengers' Perceived Green Image, Environmental Certification and the Financial Performance of RPTCs

The implementation of an EMS in accordance with recognised environmental certification standards involves integrating environmental sustainability into corporate strategy, provided that it reflects a genuine environmental commitment and does not merely constitute regulatory compliance (Iatridis and Kesidou 2018; de Martin- Castro et al. 2017). Environmental certification acts as a mark of environmental quality that strengthens stakeholder trust and projects an image of commitment to sustainability, thereby enhancing the organisation's credibility among its customers. Certification not only improves perceptions of transparency and corporate responsibility but also reduces uncertainty in consumers' decision-making processes (Testa et al. 2018).

Moreover, environmental certification not only has a positive effect on customer perceptions but also helps to consolidate a more competitive and long-term sustainable business model and reinforces the coherence between the image projected by the organisation and its actual environmental performance (Baumeister et al. 2022).

According to Khrutba et al. (2019), environmental certification enables passenger transport companies (RPTCs) to gain competitive advantages in the market, thereby enabling them to differentiate themselves from their competitors. It serves as a credible signal of a company's environmental commitment, legitimising its environmental performance. The advantages derived from certification can foster customer approval and social legitimacy, thereby exerting a positive influence on corporate image and reputation. Environmental certification has also been shown to affect customer satisfaction and loyalty, leading to changes in passengers' attitudes and decision-making processes (Chittaie 2012).

Certification can influence consumer purchasing decisions in favour of certified companies, increasing demand and sales, which in turn may enhance corporate profitability (Chen and Ho 2019). Consequently, a company's environmental image becomes a key component of passenger satisfaction, with customers more willing to pay a premium for products and services offered by certified firms. Environmental certification thus plays a strategic role in strengthening the impact of these elements on financial performance (Arocena et al. 2021). Based on the foregoing discussion, the following hypothesis is proposed:

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

2.2.2 | Sustainable Asset Management, Environmental Certification and the Financial Performance of RPTCs

Environmental certification can act as a catalyst for technological innovation within companies. The adoption of sustainable technology encourages organisations to align their operational practices and techniques with environmental objectives (Abid et al. 2022). This approach enables the optimisation of internal operations and the enhancement of asset management efficiency, facilitating enhanced resource utilisation and cost reduction (Camilleri 2022).

Moreover, certification involves the systematic evaluation of resource consumption and usage, promoting the adoption of advanced environmental management practices that are directly related to the mitigation of negative environmental impacts (Ferrón Vílchez 2017). This approach, grounded in a process of continuous improvement, also contributes to increased operational efficiency.

However, investment in sustainable technology has internal effects within the organisation and generates external synergies that amplify positive economic outcomes. In this regard, to ensure that certification positively influences the sustainable management of assets, it is essential to collaborate with companies that have also adopted sustainable practices. Such alignment throughout the supply chain helps to create a more efficient network committed to sustainability, while simultaneously improving traceability and operational control (Wu et al. 2025).

Furthermore, environmental certification requires investment in the digitalisation and automation of production processes oriented towards sustainability, as well as in advanced monitoring and process-control technologies that enhance environmental innovation capacity. These tools enable more precise asset management and the early detection of inefficiencies, facilitating strategic decision-making based on objective, real-time information (Feroz et al. 2021).

In this regard, investment in technologically sustainable assets and improvements in operational efficiency may result in competitive advantages that enhance the financial performance of the organisation (Baumgartner 2014). Such investments may include the acquisition of electric or hybrid vehicles with greater

fuel efficiency, the reduction of greenhouse gas emissions and the adoption of efficient energy management systems (Arocena et al. 2021). Based on these arguments, the following hypothesis is proposed:

H2. *The effect of environmental certification on sustainable asset management increases the financial performance of RPTCs.*

2.2.3 | Employee Ecologic Behaviour, Environmental Certification and the Financial Performance of RPTCs

Human resources contribute significantly to the effective implementation of environmental certification by facilitating the integration of sustainability into organisational culture and aligning operations with environmental objectives (Kallmuenzer et al. 2023). When adopting environmental certification, companies are not only required to meet environmental targets but must also equip their workforce with the necessary competencies to align their activities with sustainability principles. This process involves training employees in environmental management practices, thereby fostering active and long-term commitment to sustainability (Delmas and Pekovic 2013).

The impact of environmental certification on human resources may generate significant competitive advantages for companies (Mustafa et al. 2023). Environmental training substantially increases employees' knowledge and skills, leading to improved performance and greater work efficiency. Furthermore, such training reinforces employees' engagement in responsible practices and encourages their active involvement in audits and regular evaluations (Camilleri 2022). This contributes to a cycle of continuous improvement in business operations, optimising resource use and reducing operating costs, with positive effects on financial performance (Delmas and Pekovic 2013).

Environmental certification entails the standardisation of environmental procedures, thereby enabling employees to identify difficulties and propose operational improvements in sustainability-related management. It will foster a culture of shared environmental responsibility and a collaborative working environment, which will in turn allow the optimisation of critical processes, the reduction of operational errors and the enhancement of process quality and efficiency (Kallmuenzer et al. 2023). In this way, the firm will consolidate a sustainable competitive advantage that positively affects financial performance (Khan et al. 2020).

In line with Ogiemwonyi et al. (2023), human capital becomes a strategic factor. The organisation will focus on further professionalising the management of environmental talent, redefining job profiles and retaining employees who possess environmental awareness and technical capabilities and are committed to the continuous improvement of sustainability.

According to Kallmuenzer et al. (2023), the influence of employees' ecological behaviour extends beyond internal operations, as it also shapes the external perception of the organisation. Active employee involvement enhances the organisation's capacity to embed ecological sustainability, strengthening its corporate reputation and increasing stakeholder trust. This reputational enhancement facilitates access to new markets and attracts investment, thereby boosting the company's financial performance.

Based on these considerations, employees' ecological behaviour is expected to contribute to greater financial profitability, leading to the following hypothesis:

H3. *The effect of environmental certification on employees' ecological behaviour increases the financial performance of RPTCs.*

2.2.4 | RPTCs Characteristics, Environmental Certification and Financial Performance

As Pathak et al. (2021) have noted, the environmental behaviour of passenger transport companies is influenced by their specific characteristics. Therefore, in order to enhance the relevance of the findings, it is essential to incorporate these characteristics into the hypotheses:

As Delmas and Pekovic (2013) state, companies engaged in international operations tend to exhibit more environmentally responsible behaviour. In this regard, Oberhofer and Fürst (2012) note that a key factor influencing the implementation of environmental measures in transport firms is whether they operate internationally. According to these authors, the most environmentally sustainable companies typically operate on a global scale. Increasingly, both national regulations and international trade agreements require transport companies to certify their environmental management systems in accordance with international standards. Failure to comply may result in the loss of competitive advantage in international markets. Consequently, the following hypotheses are formulated:

H1.1a/H1.1b. *The effect of environmental certification on passengers' perceived green image increases the financial performance of international/national RPTCs.*

H2.1a/H2.1b. *The effect of environmental certification on sustainable asset management increases the financial performance of international/national RPTCs.*

H3.1a/H3.1b. *The effect of environmental certification on employees' ecological behaviour increases the financial performance of international/national RPTCs.*

Secondly, the formation of groups or alliances is a common practice among transport companies (Marcilio et al. 2018). Belonging to a larger group provides access to greater resources, which can positively influence the implementation of environmental measures. While environmental concerns may be similar regardless of group membership, firms that are part of an alliance tend to demonstrate better environmental performance (Oberhofer and Fürst 2012). Considering the arguments presented, the following hypothesis is proposed:

H1.2a/H1.2b. *The effect of environmental certification on passengers' perceived green image increases the financial performance of group/no group RPTCs.*

H2.2a/H2.2b. *The effect of environmental certification on sustainable asset management increases the financial performance of group/no group RPTCs.*

H3.2a/H3.2b. *The effect of environmental certification on employees' ecological behaviour increases the financial performance of group/no group RPTCs.*

Finally, another defining characteristic of RPTCs is the type of service they provide. In Spain, coastal tourism represents the most significant sector of the national economy (Organisation for Economic Cooperation and Development OECD 2024). Among the various services offered by RPTCs, discretionary coastal tourism transport accounts for the highest number of passengers, far exceeding school, corporate, leisure or medical transport (KPMG 2021). Given the economic significance and dependency of RPTCs on coastal tourism, this characteristic has been incorporated as a key differentiating factor in the development of the following hypotheses:

H1.3a/H1.3b. *The effect of environmental certification on passengers' perceived green image increases the financial performance of coast/no coast RPTCs.*

H2.3a/H2.3b. *The effect of environmental certification on sustainable asset management increases the financial performance of coast/no coast RPTCs.*

H3.3a/H3.3b. *The effect of environmental certification on employees' ecological behaviour increases the financial performance of coast/no coast RPTCs.*

3 | Methodology

3.1 | Sample

The sample is composed of collective road passenger transport companies (RPTCs) in Spain during the period 2009 to 2019, which provide discretionary services. Although collective passenger transport services may be provided privately, publicly, or through public-private partnerships, user choice is only possible in discretionary transport. As Flores-Ureba et al. (2024) state, discretionary transport services are provided almost exclusively by private road transport companies. In this context, users are able to choose from a range of alternatives, making differentiation a key factor in the process of decision-making.

In this sense, Regulation 1073/2009 of the European Parliament and of the Council of the European Union, discretionary services are defined as those that do not ensure the transport of persons at a specified frequency and along a predetermined route, collecting and setting down passengers at pre-established stopping points, and whose main feature is the transport of groups formed either at the request of the customer or on the initiative of the transport operator.

According to Dong (2022) and Redelmeier and El-Geneidy (2024), the number of years included is sufficiently large to support a longitudinal analysis. The study concludes in 2019 in order to avoid the distorting effects of COVID-19 on RPTCs. From 2020 onwards, the sector experienced an unprecedented collapse in mobility, substantial changes in operating conditions and temporary regulatory interventions, which introduced extreme distortions and structural breaks in firms' financial statements. As noted by CONFEBUS (2023), pre-pandemic demand levels were not restored until mid-2023. Including the financial years 2020–2023 would therefore incorporate extraordinary, non-representative effects that compromise the validity of the longitudinal analysis.

The poulation selection process was conducted in two stages. As shown in Table 1, in the first stage, following the methodology of Segarra-Oña et al. (2012), the Iberian Balance Sheet Analysis System (SABI) database (Bureau Van Dijk 2024) was used. The number of active companies listed in the database under the Statistical Classification of Economic Activities in the European Community (NACE), code H4931 "Urban and suburban passenger land transport", was obtained. From the 2858 companies identified, those without information for all the years in the analysed period, with unavailable or incomplete data for the variables used, not meeting the requirements for analysis, or presenting unreliable accounting data, were excluded. From the resulting 611 companies, private firms providing discretionary road passenger transport services were selected. Companies which carried out other principal activities alongside the analysed activity or whose main activity did not correspond with discretionary road passenger transport services, were removed. The resulting population of RPTCs from this first stage was 297.

TABLE 1 | RPTCs population selection process.

Search criterion	*N*° of excluded RPTCs	*N*° of valid RPTCs
Code NACE H4931		4.415
RPTC is not in active operation	1.557	2.858
Annual reports not available for all the periods	1.324	1.534
Incomplete RPTCs data for all the periods	348	1.186
Incomplete accounting data	344	842
Incoherent accounting data	169	673
Unreliable annual reports	62	611
NACE H4931 in conjunction with other NACE's	133	478
RPTC activity did not correspond with discretionary road passenger transport services	181	297

In the second stage, RPTCs certified under ISO 14001 during the period 2009 to 2019 were identified. For this purpose, it was verified whether the RPTCs were registered in the databases of the main certification bodies in Spain: Asociación Española de Normalización y Certificación (AENOR), Bureau Veritas, TÜV Rheinland Ibérica Inspection, Certification & Testing, S.A. and SGS ICS IBÉRICA. Additionally, the websites of the RPTCs were visited, as this is where companies display their environmental commitment and publish their certification. In some cases, it was necessary to contact the RPTCs directly to confirm whether the company was certified. The resulting classification yielded 90 certified RPTCs (990 observations) and 207 non-certified RPTCs (2277 observations).

3.2 | Data and Variables

To assess whether the impact of the certification of an Environmental Management System (EMS) on asset and labour efficiency, as well as on passengers' perceived green image of RPTCs, translates into improved financial performance, the economic variables detailed in Table 2 have been employed.

In line with prior literature, Return on Assets (ROA) is regarded as the most reliable and widely used indicator by researchers for assessing firms' financial profitability. Studies such as Segarra-Oña et al. (2012) highlight ROA as the preferred metric for evaluating financial performance in research concerning environmental management.

Consistent with Treacy et al. (2019), Asset Turnover (AT) is used as a proxy for the sustainable management of assets. Investment in sustainable assets is expected to reduce resource consumption and enhance asset performance in RPTCs, effects that are reflected in higher asset turnover.

Furthermore, previous studies have shown that environmental management may positively influence employees' ecological behaviour, potentially leading to improved performance and cost savings. In this regard, and following Delmas and Pekovic (2013), net operating income per employee (NOIPE) is used as a proxy for employees' ecological behaviour.

Finally, it is reasonable to assume that environmental certification enhances passengers' perceived green image of the company, influencing their choice of transport provider and, consequently, the company's sales revenue. Accordingly, following Segarra-Oña et al. (2012) and Wang and Lin (2022), revenue growth (RG) has been selected as a demand-side proxy consistent with passengers' perceived green image, capturing revenue dynamics potentially linked to reputation and customer choice.

As outlined above, Table 2 provides a definition of these four variables, with ROA being the dependent variable and AT, NOIPE and RG the independent or explanatory variables. To account for the individual characteristics of the RPTCs described earlier, three control variables in dummy form have been included: INT, COAST and GROUP. In addition, the dummy variable CERT has been introduced to indicate whether the RPTC is certified or not. Finally, to capture the effect of firm size, the continuous variable SIZE has been introduced. These variables enable the models to adjust for potential structural differences between companies and ensure a more robust analysis.

TABLE 2 | Variables analysed.

Variables	Description	Abbreviation
Return on assets	Earnings Before Interest and Taxes/ Total assets	ROA
Asset turnover	Revenues/ Total assets	AT
Net operating income per employee	Net operating income/Number of employees	NOIPE
Revenue growth	(Revenues year^{t} − Revenues year^{t-1})/ (Revenues year^{t-1})	RG
Size of the company	Logarithm of total assets	SIZE
Environmentally certified	Yes = 1 if the RPTCs is environmentally certified No = 0 otherwise	CERT
Routes operated	Yes = 1 if the RPTCs operates international routes No = 0 otherwise	INT
Location	Yes = 1 if the RPTCs operates coast routes No = 0 otherwise	COAST
Group	Yes = 1 if the RPTCs belongs to a group No = 0 otherwise	GROUP

Table 3 presents the number of observations and certified and non-certified RPTCs for each classification based on the defined individual characteristics.

In line with Karaman et al. (2018), the proposed hypotheses will be tested through multivariate linear regression using ordinary least squares (OLS) with panel data, and statistical inference relies on Driscoll–Kraay robust standard errors. ROA is used as the dependent variable and AT, NOIPE and RG are the explanatory variables. The hypotheses will be accepted if the certification effect on AT, NOIPE and RG increases ROA. Since the effect of these variables on financial performance may differ between certified and non-certified RPTCs, a certification dummy (CERT) and interaction terms (CERT ×

TABLE 3 | Distribution of road passenger transport companies in the sample.

Variables		CERT Observations (RPTCs)	CERT %	NoCERT Observations (RPTCs)	NoCERT %	Total Observations (RPTCs)	Total %
INT	Yes	429 (39)	43.33%	803 (73)	35.27%	1.232 (112)	37.71%
	No	561 (51)	56.67%	1.474 (134)	64.73%	2.035 (185)	62.29%
GROUP	Yes	539 (49)	54.44%	979 (89)	43.00%	1.518 (138)	46.46%
	No	451 (41)	45.56%	1.298 (118)	57.00%	1.749 (159)	53.54%
COAST	Yes	363 (33)	36.67%	715 (65)	31.40%	1.078 (98)	33.00%
	No	627 (57)	63.33%	1.562 (142)	68.60%	2.189 (199)	67.00%
POOLED SAMPLE		990 (90)	100.00%	2.277 (207)	100.00%	3.267 (297)	100.00%

AT, CERT × NOIPE, CERT × RG) are included in the model (Hardy 1993). A positive and statistically significant interaction coefficient indicates that environmental certification strengthens the effect of the corresponding variable on ROA, thus supporting the hypothesis.

The hypotheses will be tested for the pooled sample and separately for the groups defined by the individual characteristics of the RPTCs (INT, GROUP and COAST), by estimating the same regression model for each subgroup. Statistical inference is based on Driscoll–Kraay robust standard errors, as described in Section 4.2.2.

4 | Results

4.1 | Descriptive Statistics and Univariate Analysis

The financial ratios for each RPTC were calculated using the financial statements available in the SABI database (Bureau Van Dijk 2024). Table 4 presents the median, mean and standard deviation values for the full sample of certified and non-certified RPTCs, as well as for each grouping based on the individual characteristics of the companies. The table also includes the differences in means and the results of the statistical significance based on the Student's t-test.

As shown in Table 4, the mean differences obtained for the variables ROA (0.68%), RG (0.65%) and NOIPE (1078.57) are higher and statistically significant for the group of certified RPTCs, and this pattern is consistent across all firm segmentations analysed. Certified RPTCs outperform non-certified firms among those operating international routes (0.60%; 0.70%; 859.99), national routes (0.74%; 0.92%; 1257.79), those belonging to a group (1.01%; 0.62%; 1531.45) and those not belonging to a group (0.33%; 0.74%; 549.75), as well as among companies operating in coastal areas (0.81%; 0.64%; 1178.57) and those operating in non-coastal areas (0.64%; 0.69%; 1046.85).

However, the mean differences in AT are negative for certified RPTCs. These differences are statistically significant for the pooled sample (−0.047), for firms operating international routes (−0.019), for those belonging to a corporate group (−0.082) and for companies operating in coastal areas (−0.110). In contrast, the mean differences in AT for non-coastal firms (−0.015) and for non-group firms (−0.007) are not statistically significant.

Accordingly, it can be concluded that while the effect of certification on passengers' perceived green image and employees' ecological behaviour translates into higher sales and a greater contribution of labour to performance, the investments associated with certification do not appear to increase asset turnover, suggesting that certified firms may not achieve greater efficiency in the utilisation of their assets. Nevertheless, financial profitability is consistently higher among certified RPTCs.

4.2 | Multivariate Analysis

The proposed hypothesis aims to determine whether environmental certification influences passengers' perceived green image, sustainable asset management and employees' ecological behaviour, and whether this influence translates into improved financial performance for RPTCs. To test the hypothesis and following the work of Karaman et al. (2018), a multivariate linear regression has been conducted using the Ordinary Least Squares (OLS) method. Accordingly, ROA serves as the dependent variable, while RG, AT and NOIPE are the explanatory variables.

Given that the effect of the explanatory variables on the dependent variable may vary according to certification status, in line with Hardy (1993), a dummy variable (CERT) has been included in the model to account for the certification effect. By introducing interaction terms between CERT and the explanatory variables (CERT × RG; CERT × AT; CERT × NOIPE), it is possible to assess whether the influence of sales, asset turnover and employee performance on financial profitability depends on certification.

A statistically significant positive β coefficient would support the corresponding hypothesis, indicating that the effect of certification on passengers' perceived green image, sustainable asset management, or employees' ecological behaviour leads to higher financial profitability for certified RPTCs.

TABLE 4 | Descriptive statistics, mean differences and student-*t* test.

Variables		Ratio	CERT			NoCERT			Difference student-*t* test
			Mean	Median	Std. dev.	Mean	Median	Std. dev.	
INT		ROA	4.98%	4.30%	4.70%	4.37%	4.03%	4.03%	0.60%*
	Yes	RG	1.92%	1.25%	9.54%	1.22%	0.54%	9.25%	0.70%***
		NOIPE	4879.28	3406.31	5695.93	4019.29	3350.12	4415.17	859.99*
		AT	0.890	0.880	0.298	0.909	0.859	0.332	−0.019*
		ROA	5.07%	4.02%	4.71%	4.33%	3.68%	4.06%	0.74%*
	No	RG	2.74%	2.66%	9.42%	1.82%	1.35%	9.49%	0.92%**
		NOIPE	5297.25	4313.19	5497.80	4039.46	3244.33	4467.77	1257.79*
		AT	0.793	0.745	0.259	0.867	0.840	0.325	−0.074
		ROA	5.29%	4.26%	4.68%	4.28%	3.73%	4.10%	1.01%*
	Yes	RG	2.13%	1.55%	8.89%	1.51%	1.05%	9.35%	0.62%***
		NOIPE	5677.70	4346.58	5825.85	4146.24	3448.68	4786.51	1531.45*
		AT	0.803	0.755	0.279	0.885	0.849	0.356	−0.082*
GROUP		ROA	4.73%	3.93%	4.71%	4.40%	3.88%	4.01%	0.33%***
	No	RG	2.47%	2.29%	10.19%	1.73%	1.20%	9.45%	0.74%***
		NOIPE	4499.83	3283.82	5257.97	3950.08	3163.53	4187.19	549.75**
		AT	0.872	0.836	0.277	0.879	0.841	0.306	−0.007
		ROA	4.90%	4.27%	4.24%	4.09%	3.51%	4.13%	0.81%*
	Yes	RG	2.00%	2.33%	9.68%	1.36%	1.19%	9.58%	0.64%***
		NOIPE	5017.93	4332.61	5075.12	3839.36	2933.92	4591.96	1178.57*
		AT	0.802	0.760	0.259	0.912	0.854	0.360	−0.110*
COAST		ROA	5.11%	4.05%	4.95%	4.47%	4.02%	4.01%	0.64%*
	No	RG	2.45%	1.48%	9.40%	1.76%	1.14%	9.33%	0.69%***
		NOIPE	5166.93	3748.03	5879.98	4120.08	3461.14	4379.46	1046.85*
		AT	0.854	0.817	0.290	0.868	0.841	0.312	−0.015
		ROA	5.03%	4.10%	4.70%	4.35%	3.81%	4.05%	0.68%*
POOLED SAMPLE		RG	2.29%	1.90%	9.50%	1.64%	1.15%	9.41%	0.65%**
		NOIPE	5110.77	3923.70	5587.84	4032.20	3274.58	4447.88	1078.57*
		AT	0.835	0.796	0.882	0.882	0.845	0.328	−0.047*

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

Conversely, a statistically significant negative β coefficient, or a lack of statistical significance, would lead to the rejection of the hypothesis. This would imply that the effect of certification on that mediating factor results in, respectively, lower or unchanged financial profitability compared with non-certified RPTCs.

As the interaction terms apply only to certified RPTCs, the total effect of the explanatory variables on financial profitability must be calculated by adding or subtracting the statistically significant interaction β to or from the individual β coefficients of RG, AT and NOIPE. To examine the influence of certification in relation to company size, the model also includes the variable SIZE and the interaction term CERT × SIZE. Therefore, the regression equation for RPTC *i* in year *t* is defined as follows:

$$\begin{aligned} ROA_{it} = {} & \alpha_0 + \beta_1 RG_{it} + \beta_2 AT_{it} + \beta_3 NOIPE_{it} \\ & + \beta_4 SIZE_{it} + \beta_5 CERT + \beta_6 CERT \times RG_{it} \\ & + \beta_7 CERT \times AT_{it} + \beta_8 CERT \times NOIPE_{it} \\ & + \beta_9 CERT \times SIZE_{it} + e_{it} \end{aligned}$$

As previously noted, the model includes the dummy variables INT, GROUP and COAST to quantify the impact of operating internationally, belonging to a corporate group and operating in coastal areas on RPTCs.

To test the hypotheses for the full sample and for each of the groupings, the same regression equation will be applied. However, as indicated in Table 3, the data and number of observations vary between the full set of RPTCs and the subgroups defined by each individual characteristic.

4.2.1 | Panel Data Regression Model

According to Karunakaran et al. (2023), since the sample includes a heterogeneous set of RPTCs observed over multiple years, the analytical approach employed is panel data estimation using Ordinary Least Squares (OLS). This method is well-suited to datasets featuring repeated measurements over time for the same units, enabling a detailed examination of the relationship between the outcome variable and its predictors.

In selecting the appropriate model, it is essential to consider the potential presence of stationarity, multicollinearity, autocorrelation, heteroscedasticity and correlations among the independent variables, as these factors may affect the accuracy of the results. In this instance, a series of tests has been conducted to ensure the validity of the model's assumptions and the robustness of the findings.

4.2.2 | Model Robustness Tests

Given the panel structure of the dataset (firms observed over multiple years), we performed a set of diagnostic checks to assess potential non-stationarity and deviations from classical OLS assumptions. As a preliminary assessment of unit roots, we applied Augmented Dickey–Fuller (ADF) tests. As shown in Table 5, *p*-values are below 0.05, suggesting that the variables do not exhibit unit-root behaviour in first differences.

To assess potential multicollinearity among the independent variables, Variance Inflation Factors (VIF) and condition indices (not tabulated) were calculated. The values obtained for the explanatory variables were below 4 and 10, respectively. According to Menard (2002), this suggests that multicollinearity does not pose a significant concern.

Residual serial correlation was assessed using the Breusch–Godfrey test. The results consistently rejected the null hypothesis of no autocorrelation, with *p*-values below 0.01 across all specifications, indicating the presence of positive serial correlation in the error terms.

To evaluate heteroscedasticity, the Breusch–Pagan test was applied to determine whether the variance of the residuals remained constant across observations. The results indicated *p*-values under 0.05 in all models, pointing to significant heteroscedasticity.

To address these issues and produce robust estimates, Driscoll–Kraay standard errors (Driscoll and Kraay 1998) were applied, following the approach of Sultana and Rahman (2024). This correction accounts simultaneously for serial correlation, heteroscedasticity and cross-sectional dependence, thereby providing more reliable inference and enhancing the statistical validity of the estimated coefficients.

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

Variables	z.lag.	Coefficient	*t*-value	*p*
ROA	1	−0.2768	−14.1128	0.0000
RG	1	−0.9009	−31.7790	0.0000
RG × CERT	1	−0.9690	−34.122	0.0000
AT	1	−0.0229	−3.7602	0.0002
AT × CERT	1	−0.0293	−4.3671	0.0000
NOIPE	1	−0.2540	−13.4733	0.0000
NOIPE × CERT	1	−0.2085	−12.2067	0.0000
SIZE	1	−0.0005	−1.6622	0.0050

4.2.3 | Environmental Certification and the Financial Performance

As shown in Table 6, with the exception of RG for RPTCs operating internationally, those belonging or not belonging to a corporate group and those not operating in coastal areas, the coefficients for RG, AT and NOIPE are positive and statistically significant. The positive values indicate that sales, as well as the contribution of assets and employees to company performance, exert a favourable influence on the ROA of RPTCs. These effects apply equally to both certified and non-certified companies.

4.2.4 | The Mediating Effect of Passengers' Perceived Green Image

As shown in Table 6, the main effect of RG on ROA is positive and statistically significant for the pooled sample of non-certified RPTCs (0.010), for those operating on national routes (0.013), and for those operating on coastal areas (0.021). This indicates that, in these groups, higher revenue growth, used as a proxy for passengers' perceived green image, is associated with stronger financial performance for non-certified firms. For the remaining segmentations, the coefficient of RG is not statistically significant, meaning that RG does not exert a measurable influence on ROA in non-certified RPTCs.

However, the interaction CERT × RG shows that certification modifies this relationship for several companies. In columns A, B, E and G, the interaction term is positive and statistically significant. This result indicates that certification strengthens the positive association between RG and ROA for certified RPTCs (0.017), for certified firms operating on international routes (0.038), for those not belonging to a group (0.018) and for those operating on non-coastal areas (0.032). In these cases, the total effect of RG on ROA for certified RPTCs is obtained by adding the main coefficient and the interaction term. For example, for the pooled sample, the combined effect (0.010 + 0.017 = 0.027) suggests that RG contributes more strongly to financial performance when the company holds an environmental certification. These results support hypotheses H1, H1.1a, H1.2b and H1.3b.

TABLE 6 | Results of regression analysis.

	Certified vs. non-certified						
	Pooled sample	**International**	**No international**	**Group**	**No group**	**Coast**	**No coast**
Variables	**Column A**	**Column B**	**Column C**	**Column D**	**Column E**	**Column F**	**Column G**
Intercept	−0.016 (−9.465)***	−0.019 (−8.749)***	−0.0178 (−10.061)***	−0.013 (−5.904)***	−0.022 (−12.126)***	−0.016 (−4.917)***	−0.019 (−10.451)**
RG	0.010 (1.838)*	0.009 (0.115)	0.013 (2.246)**	0.013 (1.508)	0.006 (1.093)	0.021 (2.293)*	0.006 (0.900)
AT	0.027 (10.966)***	0.026 (10.186)***	0.028 (10.249)***	0.029 (8.759)***	0.027 (12.957)***	0.021 (7.614)***	0.030 (12.220)***
NOIPE	8.06E-06 (49.628)***	8.44E-06 (37.799)***	7.89E-06 (54.550)***	7.27E-06 (31.957)***	8.82E-06 (38.035)***	7.31E-06 (29.468)***	8.46E-06 (32.235)***
SIZE	−0.015 (−9.255)***	−0.012 (−8.128)**	−0.016 (−6.149)***	−0.013 (−6.495)***	−0.012 (−17.573)***	−0.016 (−4.757)***	−0.010 (−10.797)***
RG × CERT	0.017 (2.417)**	0.038 (2.607)**	0.004 (0.363)	0.011 (0.761)	0.018 (2.205)*	−0.006 (−0.424)	0.032 (2.459)*
AT×CERT	0.008 (2.417)*	0.005 (2.210)*	0.014 (3.428)***	0.007 (2.223)*	0.019 (3.040)**	0.018 (3.600)***	0.005 (1.387)
NOIPE × CERT	−7.08E-07 (−2.566)*	−9.27E-07 (−2.888)**	−7.28E-07 (−1.975)*	−1.06E-06 (−2.420)*	−9.91E-08 (−0.718)	6.96E-07 (1.635)	−1.42E-06 (−6.444)***
SIZE × CERT	−0.007 (−4.400)***	−0.007 (−3.802)***	−0.007 (−3.626)***	−0.017 (−6.142)***	0.020 (5.478)**	0.009 (2.304)*	−0.012 (−4.057)***
CERT	0.0008 (0.2891)	0.001 (0.473)	−0.002 (−0.516)	0.108 (2.451)*	−0.139 (−2.286)**	−0.013 (−3.108)**	0.005 (1.428)
INT	−0.002 (−2.140)***			−0.002 (−3.593)***	−0.004 (−6.164)***	−0.001 (−1.238)	−0.003 (−4.630)***
COAST	−0.002 (−1.848)	−0.001 (−0.726)	−0.003 (−2.413)*	−0.003 (−2.726)**	−0.002 (−1.774)*		
GROUP	−2.50E-04 (−0.273)	−4.52E-04 (−0.427)	−1.46E-04 (−0.115)			0.001 (0.956)	−1.45E-05 (−0.012)
N	3.267	1.232	2.035	1.518	1.749	1.078	2.189
R^2	0.719	0.722	0.723	0.682	0.785	0.731	0.723

Note: Pooled OLS panel estimates. Driscoll–Kraay *t*-statistics in parentheses. Significance: *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

By contrast, in columns C, D and F, the interaction coefficients are not statistically significant. This means that, for RPTCs operating on national routes, for those belonging to a business group and for those operating in coastal areas, certification does not alter the effect of RG on ROA. In these subgroups, RG either has no impact on financial performance, or its influence is identical for certified and non-certified firms. As a result, the improvement in passengers' perceived green image associated with certification does not translate into greater financial performance through revenue growth for these RPTCs. These findings lead to the rejection of hypotheses H1.1b, H1.2a and H1.3a.

4.2.5 | The Mediating Effect of Sustainable Asset Management

As can be observed in Table 6, the main effect of AT on ROA is positive and statistically significant in all models. This coefficient reflects the effect of sustainable asset management on non-certified RPTCs. The values are positive for the pooled sample (0.027), for RPTCs that operate on international routes (0.026) and national routes (0.028), for those belonging to a group (0.029) or not belonging to a group (0.027) and for those that operate in coastal areas (0.021) and non-coastal areas (0.030). These results indicate that, across all segmentations, AT is associated with higher financial performance among non-certified RPTCs.

The interaction CERT × AT show whether certification modifies this relationship. In all cases except for RPTCs operating on non-coastal areas (column G), the interaction coefficient is positive and statistically significant. This means that certification strengthens the positive AT on financial performance for the pooled sample of RPTCs (0.027 + 0.008 = 0.035), for RPTCs operating on international routes (0.026 + 0.005 = 0.031), for RPTCs operating on national routes (0.028 + 0.014 = 0.042), for RPTCs belonging to a group (0.029 + 0.007 = 0.036), for RPTCs not belonging to a group (0.027 + 0.019 = 0.046) and for RPTCs operating on coastal areas (0.021 + 0.018 = 0.039). Therefore, all the corresponding hypotheses are accepted, except for H2.3b, which is rejected due to the lack of statistical support.

4.2.6 | The Mediating Effect on Employees' Ecological Behaviour

The main effect of NOIPE on ROA is positive and statistically significant across all models, as reported in Table 6. This coefficient, which reflects the effect of employees' ecological behaviour on financial performance among non-certified RPTCs, shows positive and statistically significant values for the pooled sample (8.06E−06), for firms operating on international routes (8.44E−06) and national routes (7.89E−06), for those belonging to a group (7.27E−06) and those not belonging to a group (8.82E−06) and for companies operating in both coastal (7.31E−06) and non-coastal areas (8.46E−06).

The coefficient of interaction CERT × NOIPE reveals that certification alters this relationship in several cases. In columns A, B, C, D and G, the interaction coefficients are negative and statistically significant, meaning that certification weakens the positive effect of employees' ecological behaviour on ROA. Although the main effect remains positive, certification attenuates its strength for the pooled sample of RPTCs (8.06E-06 − 7.08E-07 = 7.35E-06), for operators on international routes (8.44E-06 − 9.27E-07 = 7.51E-06), for those operating on national routes (7.89E-06 − 7.28E-07 = 7.16E-06), for companies belonging to a group (7.27E-06 − 1.06E-06 = 6.21E-06) and for RPTCs operating on non-coastal areas (8.46E-06 − 1.42E-06 = 7.04E-06). Accordingly, hypotheses H3, H3.1a, H3.1b, H3.2a and H3.3b are rejected.

In contrast, no significant interaction is observed in columns E and F. This means that, for certified RPTCs operating in coastal areas and for those that do not belong to a group, certification does not modify the relationship between employees' ecological behaviour and financial performance. In these segments, the effect of NOIPE on ROA remains the same for certified and non-certified companies. Consequently, hypotheses H3.2b and H3.3a are also rejected.

4.2.7 | Effect of the Individual Characteristics of the RPTCs

Regarding the effect of certification (CERT), significant coefficients are observed in columns D, E, F of Table 6. Certification is positively associated with financial performance for RPTCs that belong to a group (0.108). Conversely, certification negatively affects financial performance for RPTCs that do not belong to a group (−0.139) and for those operating along the coast (−0.013). These results highlight that the effect of certification on financial performance varies depending on group membership and geographic location. For the remaining cases, including RPTCs overall and those operating on international or national routes, certification does not have a significant influence on financial performance.

With regard to the values of the variables that include the individual characteristics of the RPTCs, in all columns from A to G of Table 6, the value of SIZE is negative and statistically significant. This suggests that the financial performance of large RPTCs may be lower for all the RPTCs (−0.015), that operate international (−0.012) or national routes (−0.016), that belong (−0.013) and don't belong to a group (−0.012) and operate (−0.016) and not operate on the coast (−0.010). Regarding the interaction between SIZE and CERT, statistically significant effects are found in all groups and all the RPTCs. In columns E and F, the interaction is positive and statistically significant, indicating that for RPTCs that do not belong to a group (0.020) and those that operate along the coast (0.009), certification mitigates the negative impact of firm size and contributes positively to financial performance. In contrast, in columns A, B, C, D and G, it is negative and statistically significant. This indicates that for all RPTCs (−0.007), those that operate international (−0.007) or non-international routes (−0.007), belong to a group (−0.017) and for those not operating along the coast (−0.012), certification amplifies the negative effect of size on financial performance. These results suggest that the role of firm size in certified RPTCs varies depending on group affiliation and geographic location.

The variable INT exhibits negative and statistically significant values in columns A, D, E and G of Table 6. These results suggest that operating on international routes adversely affects the financial performance of all RPTCs (−0.002), as well as those that belong (−0.002) and do not belong to a group (−0.004) and do not operate on the coast (−0.003).

For the variable COAST, negative and statistically significant values appear in columns C, D and E of Table 6. This indicates that operating in coastal areas tends to lower the financial performance for RPTCs operating on national routes (−0.003) and for those that belong (−0.003) and do not belong to a group (−0.002).

Finally, for the GROUP variable, the coefficients are not statistically significant for all segments. It implies that belonging to a group doesn't affect financial performance.

5 | Discussion

As highlighted in this study, environmental certification can function as a tool for achieving sustainable competitive advantages by combining external legitimacy, internal efficiency and employee engagement. Provided that it reflects a genuine environmental commitment rather than a mere administrative formality (Citterio 2025), certification becomes a strategic resource that generates legitimacy, operational improvements and differentiation, thereby strengthening firms' competitiveness in the medium and long term (Iatridis and Kesidou 2018).

However, environmental certification does not automatically guarantee improvements in financial performance. Its competitive impact depends on the alignment between the design of the certification scheme, the internal capabilities of the firm and the market context in which it operates (Pathak et al. 2021; Citterio 2025). In the case of RPTCs, firm size, degree of internationalisation, group membership and geographical location condition the extent to which certification translates into financial returns, making it necessary to adapt competitive strategies to the profile of customers in each context.

First, regarding the relationship between certification, passengers' perceived green image and financial performance, the results show that the first hypothesis is supported in the pooled sample and in specific subgroups, particularly for RPTCs operating international routes, those not belonging to a group and those serving non-coastal areas. In these companies, certification reinforces the positive effect of revenue growth on financial performance. However, for the remaining segmentations, certification does not modify this relationship. Therefore, certification strengthens the effect of passengers' perceived green image only under specific operational conditions, and it is through this effect that financial performance improves.

The fact that this effect appears exclusively in RPTCs operating international routes, not belonging to a group and located in non-coastal areas suggests the presence of a passenger segment that is particularly sensitive to sustainability and incorporates environmental considerations as an additional criterion in their choice of transport provider, alongside traditional factors such as schedules, fares, or service quality. In line with Oliveira and Gomes (2025) and Mkono and Hughes (2020), this result indicates that environmental certification can promote competitiveness by strengthening a company's image and increasing booking intentions among certain consumer groups. Moreover, these findings are consistent with Camilleri (2022), as certification does not appear to be associated with lower competitiveness or reduced demand. Although factors such as price remain decisive for competitiveness, the evidence suggests that, when basic service conditions are reasonably similar, a portion of passengers is willing to bear the additional costs associated with environmental management and to pay a higher fare to operators perceived as environmentally responsible (Baumeister et al. 2022).

Consistent with Arocena et al. (2021), these results align with the idea that environmental certification may play a particularly relevant role in enhancing competitiveness when firms operate in markets characterised by greater environmental awareness. These authors argue that the economic impact of certification is stronger in countries and contexts with high environmental consciousness than in those where environmental protection is less salient. Since RPTCs operating international routes tend to serve demand segments with higher sustainability awareness, our findings suggest that certification may become a competitive requirement for accessing certain markets and increasing visibility on international tourism platforms, thereby attracting customers who prioritise environmentally responsible transport options. In this context, certification may enhance passengers' trust, as it can signal that they are choosing a service that complies with environmental regulations across the different countries in which the company provides services (Karlsson and Dolnicar 2016).

However, for RPTCs operating national routes, belonging to a group or serving coastal areas, certification does not appear to consolidate itself as a competitive lever grounded in environmental image. One possible explanation is that, within group-affiliated firms, individual environmental initiatives are subordinated to the group's overarching strategy, which may restrict the flexible development of firm-specific environmental practices and hinder the design of a competitive strategy directly aligned with customers' environmental concerns (Chinese et al. 2021). Moreover, although RPTCs integrated into groups may benefit from economies of scale and share the costs associated with certification, their room to pass these additional costs on to customers may be more limited, thereby reducing the extent to which certification can translate into improved profitability.

In coastal areas, where demand is largely driven by occasional tourism, passengers tend to place greater emphasis on factors such as price and budget constraints than on environmental sustainability, unlike frequent travellers or business passengers (Tran-Thi et al. 2024). In this type of tourism, package holidays with integrated services and low-cost offers are particularly relevant. By contrast, in non-coastal markets, sustainability may operate as a differentiating competitive factor that helps attract demand and sustain revenue, as some passengers are more willing to pay slightly higher prices for environmentally responsible

services that reflect the internalisation of environmental costs (Baumeister et al. 2022; Ozbekler and Ozturkoglu 2020).

Second, the results regarding sustainable asset management show that certification generally exerts a positive effect on financial performance, with all hypotheses being accepted except in the case of RPTCs operating non-coastal areas. For the full sample and most of the subgroups analysed, certification strengthens the contribution of asset management to financial outcomes, underscoring the importance of operational efficiency as a pathway to competitive improvement. These findings are consistent with previous studies showing that, when environmental certification is substantively integrated into organisational processes and accompanied by investment in sustainable technologies, it can promote more efficient resource use, reduce waste and reinforce innovation and cost-control capabilities (Younis and Sundarakani 2019; Duque-Grisales et al. 2020; Song et al. 2024). Taken together, these elements reinforce the notion that sustainable assets can constitute a source of improved financial results and a strengthened competitive position (Ai et al. 2024).

Finally, although various authors argue that environmental certification, when accompanied by green internal capabilities and specific human resource management practices, can improve sustainable performance (Oyelakin et al. 2025; Yue et al. 2023; Yusliza et al. 2020), this study rejects all hypotheses proposing that certification enhances financial performance through employees' ecological behaviour. In the pooled sample, and for certified RPTCs operating on international and national routes, belonging to a group and operating in non-coastal areas, the interaction results indicate a negative certification-related effect through the channel captured by employees' ecological behaviour. By contrast, for non-group and coastal firms, this interaction is not statistically significant. Contrary to expectations, environmental certification does not necessarily translate into more productive environmental behaviour among RPTCs personnel. In line with Iatridis and Kesidou (2018), greater environmental awareness does not automatically lead to efficiency gains and may, in some contexts, be associated with lower financial performance. In this context, human-capital adjustments linked to certification may place certified firms at a competitive disadvantage relative to non-certified competitors.

The mere adoption of certification does not imply that the workforce becomes more competitive. Insufficient training may limit the development of environmental skills, attitudes and knowledge, thereby constraining the achievement of more efficient operations (Delmas and Pekovic 2013). Training must convey to employees that their work contributes meaningfully to environmental sustainability and that their engagement is essential. It must also be taken into account that investment in environmental training entails costs, which may be substantial in the short term and financial performance may decline if these costs are not rapidly offset by operational savings. Furthermore, certification requires substantial changes in work practices, which may initially encounter employee resistance (Cao et al. 2024). A period of transition and adjustment is necessary before the new environmental practices can improve working conditions and, consequently, competitiveness and operational efficiency. During this period, productivity may decrease, which temporarily affects financial performance (Ma et al. 2020).

6 | Implications

6.1 | Theoretical Implications

At the theoretical level, this study contributes to expanding the literature on the relationship between environmental certification and financial performance. Unlike previous works that examine this relationship only directly, the analysis explicitly introduces the role of competitive advantages in differentiation, derived from improvements in corporate image and reputation, as well as cost advantages linked to the optimisation and efficient management of internal processes. Following Seroka-Stolka and Fijorek (2022), these dimensions are approached as mechanisms through which environmental certification may affect financial performance. The study considers three mediating factors: passengers' perception of the company's green image, the sustainability of asset management and employees' ecological behaviour.

The study also offers novel evidence in a sector with very limited prior research like road passenger transport. In line with Pathak et al. (2021), the analysis is strengthened by segmenting companies according to their operational characteristics. Distinguishing between firms that operate international or national routes, belong or do not belong to business alliances and operate in coastal or non-coastal areas indicates that the effects of certification are context-specific and cannot be assumed to be uniform.

From a methodological perspective, the use of panel data for the period 2010–2019 and the incorporation of interaction terms between certification and the explanatory variables make it possible to obtain more precise results than studies relying solely on direct effects. This longitudinal approach captures relevant temporal dynamics that cannot be observed through cross-sectional analysis.

Finally, the study builds a bridge between the literature on sustainability, competitiveness and innovation and the Resource-Based View. Environmental certification is interpreted as a strategic resource whose potential depends on its combination with appropriate internal capabilities. According to Khanra et al. (2022), such capabilities can foster process innovation and strengthen institutional legitimacy. The results show that certification is not, in isolation, a VRIN resource (valuable, rare, inimitable and non-substitutable) but instead acquires strategic relevance when integrated with complementary assets and capabilities, such as sustainable asset management or environmental staff training. Moreover, its impact depends on how it is embedded within the organisation and its coherence with the competitive environment, as highlighted by Citterio (2025).

6.2 | Practical Implications

From a practical perspective, the results provide clear guidance for managers seeking to use environmental certification as a management tool. First, the analysis suggests that certification should be integrated into organisational strategy rather than treated as a mere administrative requirement. When it strengthens passengers' perceived green image, it can

influence their purchasing decisions and encourage the selection of certified services over less environmentally responsible alternatives. To leverage this potential, managers should enhance the visibility of the environmental seal across corporate communication channels, in line with previous evidence on the role of environmental reputation and perceived quality in fostering customer loyalty (Chen and Ho 2019; Chittaie 2012; Geerts 2014).

Second, the results indicate that the most stable channel through which certification is associated with improved performance is sustainable asset management. For managers, this implies planning investments in more efficient technologies, modernising fleets and facilities and adopting maintenance systems that reduce consumption and operating costs. The literature notes that adopting sustainable technologies and assets is linked to greater efficiency and cost reductions (Abid et al. 2022) and that, in asset-intensive sectors such as passenger transport or manufacturing, the renewal of machinery, facilities or processes based on environmental criteria becomes a necessary condition for medium- and long-term competitiveness (Ma et al. 2024). In this regard, having a certified environmental management system provides managers with a structured framework for organising processes, setting objectives and assessing performance, which leads to operational and organisational improvements (Arana-Landín et al. 2025). In addition, evidence shows that many companies adopt international standards not only for compliance but also to strengthen their position relative to competitors and to respond to the expectations of customers and other stakeholders (Benzidia et al. 2025).

Third, managers should recognise that certification does not automatically induce changes in employees' environmental behaviour. To activate this mechanism, certification must be accompanied by training programmes, internal communication and culture-change initiatives. Employee motivation in environmental matters is insufficient if not supported by specific training and appropriate incentives (Delmas and Pekovic 2013). Certification can become a driver of efficiency and motivation when it is integrated into organisational culture and human resource management systems (Seroka-Stolka and Fijorek 2022), but its impact may be limited if insufficient resources are allocated to training and the development of environmental competencies (Cao et al. 2024). When employees perceive the organisation's environmental commitment as genuine and coherent, their engagement, satisfaction and efficiency increase. This is particularly relevant in human-capital-intensive sectors (Ma et al. 2020).

Fourth, the study highlights that the effects of certification are not uniform across companies. Managers should therefore consider the specific characteristics of their operations. Assessing whether the company operates international or national routes, provides services in coastal or non-coastal areas, or belongs to a business group allows for the design of environmental strategies that are better aligned with the competitive context of each organisation (Oberhofer and Fürst 2012). This need for adaptation is also applicable to other sectors with heterogeneous structures, where certification may generate different impacts depending on the activity segment.

Beyond the specific case of RPTCs, these results also offer useful guidance for managers in other sectors. As noted by Arimany-Serrat et al. (2019), companies that invest in environmental initiatives aimed at strengthening corporate image and responding to customer expectations may, in certain contexts, achieve improvements in external reputation and service perception, with corresponding positive effects on sales and financial performance. At the same time, the implementation of certification schemes provides a framework that helps organise processes, plan and evaluate environmental investments and manage resources and assets more efficiently. This leads to better internal organisation and improved financial results (Arana-Landín et al. 2025). The evidence from this study suggests that when managers combine these two dimensions coherently, that is, the external projection of a green image and the sustainable management of assets, certification can contribute to improved financial performance. However, if the implementation of the certified system requires changes in work organisation and employee routines that are not supported by adequate internal planning, training and resources, these adjustments may generate additional costs and offset part of the expected benefits. For this reason, in practical terms, the decision to certify should be accompanied by explicit consideration of which dimensions of the environmental strategy will be prioritised, such as customer-oriented image, asset improvement or process reorganisation. It should also involve clarification of how employees will be engaged in its implementation, thereby avoiding the treatment of certification as a standardised model that can be applied uniformly regardless of sector, business model or organisational structure.

It is also important to note that certification carries significant regulatory and financial implications. In certain regulated and international markets, holding a recognised certification has become a requirement for accessing tenders, contracts or commercial networks. Consequently, firms that fail to obtain certification may be excluded from key business opportunities (Arocena et al. 2021). Furthermore, certification strengthens relationships with stakeholders, facilitates the development of strategic alliances and creates opportunities for cooperation between companies. At the same time, it helps consolidate competitive position and organisational legitimacy in the market (Benzidia et al. 2025).

Finally, although this study does not directly examine the behaviour of investors and consumer associations, existing evidence shows that both groups increasingly value corporate environmental commitment and incorporate it into their investment and consumption decisions (Chen and Ho 2019; Dienes et al. 2016). In sectors subject to strong social and regulatory pressures, such credibility may reduce legal and reputational risks and improve access to financing, thereby reinforcing the role of certification as a tool for aligning environmental objectives with stronger financial performance.

7 | Conclusions, Limitations and Research Lines

Environmental certification does not translate into improved financial profitability through passengers' perceived green image, as captured by revenue growth, for all RPTCs. However, the

findings indicate that certification strengthens the relationship between revenue growth and financial performance in specific contexts, particularly among RPTCs operating international routes, those not belonging to a group, and those operating in non-coastal areas. This pattern is consistent with the view that passengers may favour companies that are proactive in environmental matters when making travel decisions. For these groups, certification appears to strengthen corporate image and increase bookings, thereby acting as a factor that enhances financial performance.

In the case of the impact of certification on assets, investments in sustainable technology, cost savings and operational efficiency improve financial profitability for all RPTCs and, except for those operating in non-coastal areas, for almost all segmentations. Certification typically involves the acquisition of environmentally friendly vehicles, improvements in internal efficiency and the adoption of more systematic and sustainable asset management practices. These elements contribute to value creation and to higher financial returns (Arocena et al. 2021).

In contrast, the effect of certification on employees' environmental performance does not, in any case, result in a positive impact on the financial performance of RPTCs. On the one hand, this effect is negative in several groups of RPTCs; on the other, in certain subsectors, financial performance is not significantly affected. Overall, the environmental commitment and engagement of employees in certified RPTCs do not appear to lead, within the period analysed, to greater operational efficiency and may, in some cases, even contribute to reduced financial profitability when the organisational changes associated with certification are not accompanied by adequate resourcing, training and internal support (Cao et al. 2024).

In conclusion, it can be stated that the effect of environmental management system certification on passenger perception and sustainable asset management has enabled RPTCs to achieve competitive advantages and improve their financial performance. However, the impact on the ecological behaviour of employees has not been sufficient, or the effects have not met expectations, leading to a decline in financial performance.

Despite efforts to ensure methodological rigour, this study has several limitations that should be considered when interpreting the results and that point to avenues for future research. This study has focused on private RPTCs that provide discretionary services. Determining which RPTCs met the conditions to be included in the population was not an easy task. In some cases, it was not possible to obtain the necessary and reliable information to decide whether a RPTC offered discretionary transport services. That is, services without a fixed frequency and route, collecting and dropping off passengers at previously arranged stops and whose main feature is the transport of groups formed at the request of the client or on the initiative of the transport operator. Moreover, in some cases the RPTC simultaneously provided both types of transport and even operated in various sectors of activity. Similarly, the available information did not always make it possible to determine whether the RPTC operated on international routes, in coastal areas, or belonged to a group. This situation led to the exclusion of a considerable number of companies.

It is also important to note that although environmental certification of the EMS has been used in this study, it is not the only variable that can be employed to represent environmental activity. Although EMS certification is a widely used indicator of environmental proactivity, there are alternative ways of adopting an EMS. Certification does not necessarily imply that a company has an environmental vision. It is possible that its adoption is largely symbolic and does not reflect a genuine internalisation of the EMS.

These limitations open several avenues for future research. With regard to measuring environmental proactivity, it would be worthwhile to incorporate additional variables that capture more accurately the degree of EMS internalisation, such as system maturity indices, process-based environmental performance indicators, internal audit results, evidence on the effects of specific environmental actions or more advanced mechanisms for monitoring and continuous improvement. From a temporal and contextual perspective, an important line of inquiry would be to extend the period of analysis to include the COVID-19 pandemic and the subsequent economic crisis, in order to examine whether the role of certification and environmental management has changed in contexts characterised by high uncertainty and demand disruption. It would also be valuable to conduct international comparative studies that examine the situation of RPTCs across different countries and regulatory frameworks, and assess whether the impact of certification on financial performance varies according to the institutional environment. Finally, the approach developed in this study could be applied to freight transport, to other transport modes and to other sectors, either individually or from a comparative perspective, with the aim of determining whether the channels identified here, in particular those related to user perception, sustainable asset management and employees' ecological behaviour, operate in a similar manner in other sectoral contexts.

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