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# *"The carbon pricing mechanism and corporate investment decisions: A study on the global aviation industry"*


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# The carbon pricing mechanism and corporate investment decisions: A study on the global aviation industry.


## Abstract

This study Assessing the Impact of Carbon Pricing Policies on Aviation Firms with Corporate Investment Decisions as a Moderator. In order to lower greenhouse gas emissions and encourage sustainable practices, carbon pricing mechanisms such as carbon taxes, emissions trading schemes, and offset programs are rapidly being applied to the worldwide aviation sector. Even though these strategies are widely used, little empirical research has been done on how they affect company

The influence of carbon pricing mechanisms on the financial and operational performance of airlines globally is investigated in this study, which also looks at how strategic investment choices can either amplify or lessen these effects. It also highlights the moderating impact of investment strategies, sheds light on cross national variations in firm responses, and has useful implications for airline management and policymakers who want to balance economic performance with environmental goals. The results are anticipated to add to the body of knowledge in corporate finance, environmental economics, and sustainable aviation management.



**Keywords.** Carbon prices mechanism, corporate investment decision, Firm performance.

**Chapter I**

# Introduction

Air travel is essential to the global economy, enabling fast movement of people and goods (Duan & Zhang, 2025). However, it is also a growing source of emissions, responsible for 2-3% of the global carbon footprint, a share expected to rise (Aged et al, 2025).

To address this, governments have introduced carbon pricing mechanisms like carbon taxes, Emissions Trading Systems (ETS), and offset programs such as CORSIA which put a cost on pollution to incentive cleaner operations (Comptroller et al, 2022).

These policies create different business uncertainties: a carbon tax sets a fixed cost but allows emissions to vary, while an ETS fixes total emissions but lets the price fluctuate (Nesje et al, 2025). Companies can also use internal carbon pricing as a strategic tool to evaluate investments and plan for a low carbon future (Wong & Law, 2002).

A significant research gap exists. Most studies focus on environmental outcomes or stock market effects, overlooking how carbon pricing directly affects airlines' real world financial and operational performance across different regions (Fuku & Miyoshi, 2022).

Crucially, the role of corporate investment decisions (e.g., in fleet modernization, sustainable aviation fuels, and green tech) as a moderating factor has been largely ignored (Ayed, 2025).

It remains unclear whether proactive investments help airlines turn carbon regulations into a performance advantage. Therefore, this study aims to fill these gaps by investigating a central question: Can carbon pricing improve firm performance in aviation, and do strategic corporate investments strengthen this relationship? (Xiong et al, 2023).

It adopts a global perspective to understand variations across airlines and regulatory environments (Fageda et al, 2025).

The findings are expected to provide valuable insights for airline managers making long term capital plans and for policymakers designing effective, equitable carbon pricing frameworks (Wang et al, 2024).

Future research should explore differences among airline types (e.g., cargo vs. passenger), the interaction of carbon pricing with other green policies (e.g., SAF mandates), and use advanced modeling to study investment timing under uncertainty (Warrier & Belal, 2024).

### 1.2 Research Gap

How corporate investment moderate the relationship among carbon pricing mechanism and Firm performance. The use of carbon pricing mechanisms in the aviation sector gradually increasing, limited study existing how these regulations impact on firm performance the global aviation industry. Research could examine, how business investment choices, related to fuel economy, fleet renewal, and sustainable technology will affect this relationship. (Kırçovalı & Çemberci, 2024). This is unclear if airlines that proactively invest in low carbon efforts outperform, those that do not under the umbrella of carbon pricing regimes due to the lack of a worldwide firm level examination. Institutional theory supported this model. ( Cao et al, 2024).

This study seeks to fill this gap by providing a global sector assessment of the aviation industry, thereby enhancing understanding of how environmental regulation and corporate finance interact in practice. Corporate investment choices, such as fleet modernization, the adoption of fuel efficient technologies, and advances in sustainable aviation, have been disregarded as a potential moderator that might. (Fong et al, 2022).

This discrepancy will make it challenging to assess whether airlines that intentionally invest in green technologies, to do better under carbon pricing schemes than those that do not. This problem can address the study will investigate whether carbon pricing strategies affect global company performance and how

corporate investment decisions influence this relationship in the aviation industry. (Linda Meleo, 2024).

### 1.3 Problem Statement

The aviation industry is under increasing regulatory pressure to low carbonize through carbon pricing instruments like taxes, emissions trading, and offset schemes (Fageda & Teixidó, 2025).

However, the financial impact of these policies on airlines remains ambiguous, especially given varying regulations across different markets (Guan et al, 2024).

A critical gap in the literature is the under explored role of corporate investment decisions such as committing capital to fleet renewal or sustainable technologies as a factor that may alter the relationship between carbon costs and business performance (Ayed, 2025).

Given the sector's capital intensive nature and the long lead times for major investments, it is crucial to determine whether carbon pricing effectively incentives trans-formative low carbon investments or merely acts as an operational cost burden (Nesje et al, 2025).

The lack of clear, global empirical evidence on this issue hampers both effective policy formulation and strategic corporate planning (Wang et al, 2024).

Therefore, a comprehensive global analysis is necessary to assess how carbon pricing mechanisms influence investment behavior and ultimately affect firm performance within the aviation sector (Fageda et al, 2025).

## 1.4 Research Question

- What effect the impact of corporate investment decision on firm performance?
- How corporate investment decision moderate the relationship among carbon pricing mechanism and firm performance.

## 1.5 Research Objectives

- To investigate the Carbon pricing mechanism impact on firm performance.
- To investigate how corporate investment decision moderate the relationship among carbon pricing mechanism and firm performance.

## 1.6 Research Significance

This study holds important value in both academic and practical domains. In academic Contribution, It meaningfully advances the literature in environmental economics and corporate finance by integrating the study of carbon pricing with firm level investment behavior within the specific, globally significant context of the aviation industry (Hadi, 2020).

In practical relevance, the findings offer crucial insights for key stakeholders. For airline management, it provides empirical evidence on how carbon pricing influences long term capital decisions (e.g., fleet renewal, SAF adoption), thereby improving strategic and sustainability planning (Kim & Park, 2024).

For policymakers and investors, it clarifies how strategic corporate investment can mitigate the financial pressure of carbon regulations. This knowledge supports the development of more effective and equitable policies and enables better risk and performance evaluation (Hadi, 2020).

By examining whether current carbon pricing can effectively steer investment toward green technologies, the study directly informs global efforts to reduce the aviation sector's carbon footprint and assess its transition toward net zero emissions (Kim & Park, 2024).

**1.7 Scheme of the Study.**

The study is structured as follows: Chapter I introduces their search background, objectives, and significance. Chapter II reviews relevant empirical and theoretical literature. Chapter III outlines the research methodology, data sources, and analytical techniques. Chapter IV presents the empirical results and analysis. Chapter V concludes the study with key findings, recommendations, limitations, and directions for future research.

**Chapter II**

# Literature Review

## 2.1 Empirical Studies

The increasing adoption of carbon pricing mechanisms has generated extensive empirical research examining their economic and environmental consequences. Carbon pricing, through instruments such as: carbon taxes, emissions trading systems, and offset schemes, is widely regarded as a market based solution to internalize the social cost of carbon emissions. (Kırçoval & Çemberci, 2020).

While a substantial body of literature evaluates the environmental effectiveness of these mechanisms, firm level financial and investment responses particularly within the aviation industry remain comparatively under explored. (Klapper& Lusardi ,2020).

### Carbon pricing Mechanism

A regulatory or market based mechanism that assigns a monetary cost to carbon emissions to reduce environmental impact. Carbon pricing mechanisms influence the corporate behavior primarily by increasing the cost of carbon intensive activities. For aviation firms, this translates into higher operating costs related to fuel consumption and emissions compliance. (Wong & Law, 2020).

By assigning a monetary value to carbon emissions, carbon pricing seeks to internalize environmental externalization and incentive firms to reduce emissions through cleaner technologies and improved energy efficiency. Carbon pricing mechanisms influence corporate investment decisions by making polluting activities more expensive, thereby incentive's companies to invest in cleaner technologies and energy efficiency. (Bremen et al, 2022).

International offset schemes such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) further complicate the empirical landscape. Unlike carbon taxes or cap and trade systems, (Sarker et al, 2024).

Offset mechanisms often generate weaker and less predictable price signals, potentially reducing their effectiveness in driving long term investment decisions. Empirical studies indicate that while offset programmers may help stabilize compliance costs in the short run, they provide limited incentives for structural low carbon within the aviation industry. (Rehma et al, 2024).

Overall, the empirical literature highlights that carbon pricing can influence firm behavior, but its impact on financial performance is neither uniform nor guaranteed. (Shaikh, A., & Khan, M. U, 2025)

**Corporate Investment Decision**

This is the progression by which a business can assesses, chooses, and distributes financial resources to long term assets and initiatives, that could be anticipated to provide financial gains and increase company value efficiently, this indication about corporate investment decision making. These methods which will influence by factors like project returns, risk of business, cost of capital, and strategic goals, usually can involve the capital expenditures on tangible assets, that will supportive for technological innovation, and strategic initiatives. (Brealey, Myers & Allen, 2024).

Various empirical studies primarily focus on energy intensive sectors such as power generation, manufacturing, and heavy industry, where carbon pricing has been shown to reduce emission intensity and encourage technological innovation. Research conducted within the European Union Emissions Trading System (EU ETS) indicates that regulated firms generally respond to carbon pricing. (Kristian, 2024).

By improving operational efficiency and investing in cleaner technologies, although the magnitude of these effects varies across sectors and firm characteristics. Studies have also documented that carbon pricing can increase short term operational costs, thereby exerting pressure on firm profitability,

especially in industries with limited technological alternatives for rapid low carbon. (Fazeeah and Ajhtyrf , 2023).

Within the aviation sector, empirical evidence is comparatively fragmented. Most available studies adopt a regional focus, particularly on internal European flights covered under the EU ETS. These studies report modest reductions in emissions intensity, changes in route structures, and adjustments in fleet utilization following the introduction of carbon pricing. (Linan, 2024).

**Firm performance**

Firm performance was encompassed both financial performance Return on assets, and return on equity, and market performance was included such as firm valuation and competitive position. It representing the outcome of managerial decisions, strategic investments, and responses to external economic and regulatory environments could widely useful as a key indicator of organizational success in empirical research in prior studies the extent to which these operational adjustments translate into improved or deteriorated firm performance remains unclear which could be examine in future studies. Airlines differ significantly in terms of cost structures, route networks, and business models, which complicates generalized conclusions. (Lusardi, A, 2024).

Majority of previous studies empirical investigations fail to account for the heterogeneity of airline types, such as full-service carriers, low cost airlines, and cargo operators which are the important part of this study which could be helpful in future outcomes in depth. (Qahtani et al, 2024)

Differences in financial flexibility, access to capital markets, and strategic priorities influence how firms respond to carbon pricing signals. (Yunnnu et al, 2024).

The legacy carriers with larger fleets and stronger balance sheets may be better positioned to invest in fuel efficient aircraft, whereas low-cost carriers may rely more heavily on operational efficiencies to absorb carbon related costs and could decrease the expenses . (Shameen et al, 2024)

. Another key limitation in existing research is the insufficient consideration of corporate investment decisions as a moderating factor. While some studies acknowledge that carbon pricing may incentive investment in low carbon technologies, (Rehman & Cheema, 2024).

few empirically test whether such investments mitigate the negative cost effects of carbon pricing on firm performance. Recent firm level analyses suggest that companies adopting proactive investment strategies in response to environmental regulation tend to demonstrate stronger long term financial resilience. However,

evidence specific to aviation remains limited, particularly from a global perspective. (Rahman, A, 2024).

## 2.2 Theoretical Support

The theoretical foundation of carbon pricing is rooted in the concept of negative externalization, wherein the social costs of economic activities such as greenhouse gas, emissions are not fully reflected in market prices. (Song et al, 2023). Neoclassical economic theory main focus on rational decision making about cost benefits and profit maximization. Resource based theory, this theory argues that corporate financial decision making depends on firm's internal resource endowments, which influence the shareholders capacity to invest in carbon efficient technologies, under carbon pricing regimes. The interaction between carbon pricing and corporate investment decisions is particularly relevant in aviation due to the sector's technological constraints. Unlike other industries, aviation has limited immediate alternatives to fossil fuels, making long term investment planning essential. Theoretical models suggest that firms are more likely to invest in low carbon technologies when carbon pricing signals are stable, credible, and supported by complementary policies such as fuel subsidies and research incentives. (Shameen et al, 2024).

It suggests that carbon pricing increases production costs for carbon intensive firms, potentially reducing profitability in the short term. However, under certain conditions, firms may respond by reallocating resources toward cleaner technologies and efficiency enhancing investments. This response is closely aligned with the Porter Hypothesis, which posits that well designed environmental regulations can stimulate innovation, improve resource efficiency, and ultimately enhance firm competitiveness. (Song & Cai, 2023).

Carbon pricing mechanisms aim to internalize this externalization by assigning a monetary cost to emissions, thereby aligning private decision making with social welfare objectives. From an economic perspective, market-based instruments are considered more efficient than command and control regulations because they allow firms flexibility in choosing the most cost-effective emission reduction strategies. (Shaikh et al, 2025).

This response is closely aligned with the Porter Hypothesis, which posits that well designed environmental regulations can stimulate innovation, improve resource efficiency, and ultimately enhance firm competitiveness. (Song & Cai, 2023).

From a corporate finance perspective, carbon pricing introduces an additional risk factor into investment decision making. Firms operating under carbon constrained

environments face uncertainty regarding future carbon prices, regulatory scope, and compliance costs. (Veeraiah et al, 2022).

This uncertainty can influence capital budgeting decisions, particularly in capital intensive industries such as aviation, where investments in aircraft and infrastructure involve long planning horizons. The predictability of carbon pricing policies is therefore critical in shaping firms' willingness to invest in low carbon technologies. (Warrier, & Belal, 2024).

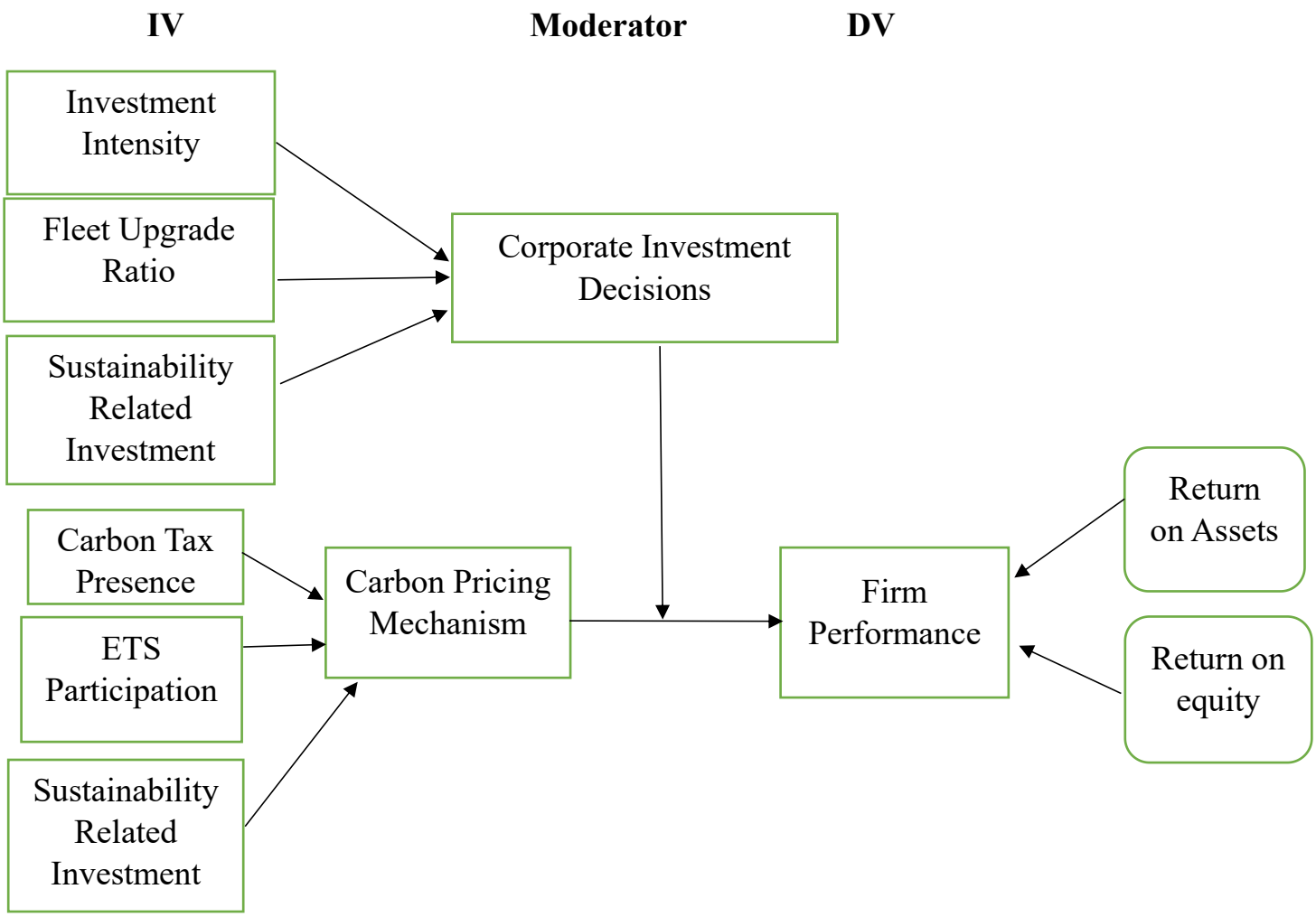
Resource based theory further supports the argument that proactive environmental strategies can generate firm specific advantages. Investments in fuel efficient fleets, sustainable aviation fuels, and advanced operational technologies can create valuable, rare, and difficult to imitate capabilities that enhance long-term performance. Such investments may also reduce exposure to regulatory and reputation risks, thereby strengthening financial stability. (Wilenius, I, 2024). Stakeholder theory provides an additional lens through which carbon pricing and investment behavior can be understood. Airlines face increasing pressure from regulators, investors, customers, and environmental groups to demonstrate commitment to sustainability. (Wong & Law, 2022).

## 2.3 Conceptual Framework

Based on the reviewed literature and theoretical foundations, this study proposes a conceptual framework in which carbon pricing mechanisms directly influence firm performance in the aviation industry. (Klapper & Lusardi, 2020).

Corporate investment decisions are introduced as a moderating variable that shapes the strength and direction of this relationship. Firm performance is measured using financial indicators such as return on assets and return on equity, while corporate investment decisions are captured through investment intensity, fleet modernization, and sustainability related expenditures. (Kuittinen, M, 2024).

It assumes that carbon pricing may exert cost pressure on firms; however, airlines that strategically invest in low carbon and efficiency enhancing technologies are better positioned to offset these costs and achieve superior performance outcomes. This interaction underscores the importance of integrating environmental policy analysis with corporate investment behavior. (Kim & Park , 2024).




### 2.4 Research Hypothesis

**H1:** The carbon pricing mechanism has a direct, positive effect on firm performance.

**H2:** Corporate investment decisions have a positive effect on firm performance and strengthen the positive relationship between the carbon pricing mechanism and firm performance.

**Chapter III**

# Methodology

This chapter outlines the research design, data sources, sample selection, variable measurement, and analytical techniques employed to examine the relationship between carbon pricing mechanisms and firm performance in the aviation industry, with corporate investment decisions serving as a moderating variable. The methodological framework is designed to ensure analytical rigor, reliability, and validity while addressing the study's research objectives.

## 3.1 Research Design

The study adopts a quantitative for data collection, suitable for examining causal relationships between environmental policy instruments and firm level performance outcomes. This approach enables the empirical assessment of both the direct impact of carbon pricing mechanism son firm performance and the moderating role of corporate investment decisions. The analysis is conducted using primary data, allowing for objective measurement of financial, operational, and investment related indicators across a global sample of aviation firms. The research framework is grounded in established theories of environmental economics and corporate finance, ensuring coherence between conceptual foundations and empirical testing.

### 3.2 Data collection and analysis

This research base on primary data, Primary data were collected through a structured questionnaire. Cronbach's alpha used to measure the reliability of scale, if the values must be exceed threshold 0.7 .Convergent and discriminant validity used to measure the construct validity, ensuring that the constructs have both distinct and adequately measured. The data were compiled, organized, and verified using Microsoft Excel prior to analysis. The population of this research was comprised key decision makers and professionals in the global aviation industry, they were directly involved in carbon pricing compliance and corporate investment decisions making. This also included individuals who are working in both passenger and cargo aviation organizations serving under national or international carbon pricing regulations.

### 3.3 Sample Criteria

The purposive sampling technique was used for selecting airlines that could significantly exposed to carbon pricing Mechanisms that will enhance the representatives, the sample was stratified by airline type and geographic region.

The population of this research was comprised key decision makers and professionals in the global aviation industry, they were directly involved in carbon pricing compliance and corporate investment decisions making. This also included

individuals who are working in both passenger and cargo aviation organizations serving under national or international carbon pricing regulations.The study sample consists of publicly listed aviation firms, including airlines and aviation related companies, operating in jurisdictions where carbon pricing policies such as carbon taxes, emissions trading systems, or offset schemes are in effect. The inclusion of publicly listed firms ensures data transparency and consistency in financial reporting. To maintain comparability across firms and regions, the sample was restricted to companies with complete financial and investment data available for the study period. Firms operating exclusively in regions without formal carbon pricing mechanisms were excluded. The final sample reflects a diverse range of airline business models, including full service carriers, low cost airlines, and cargo operators, thereby enhancing the global representative of the analysis.

### 3.4 Variable Measurement

**Independent Variable:** Carbon Pricing Mechanism (carbon tax presence, ETS participation, offset costs, carbon intensity price).

**Dependent Variable:** Firm Performance (ROA, ROE,).

**Moderator:** Corporate Investment Decisions (measured using investment intensity, fleet upgrade ratio, sustainability related investment).

The study employs three primary categories of variables: independent, dependent, and moderating variables. Independent Variable: Carbon Pricing Mechanism This variable captures the extent of carbon pricing exposure faced by aviation firms. It is measured using indicators such as participation in emissions trading systems, presence of carbon taxes, offset compliance costs, and implied carbon price intensity where applicable. Dependent Variable: Firm Performance Firm performance is assessed using widely accepted financial indicators, including Return on Assets (ROA) and Return on Equity (ROE). These measures reflect firm's profitability and efficiency in utilizing assets and shareholder's equity. Moderating Variable: Corporate Investment Decisions Corporate investment decisions are measured through indicators such as capital expenditure intensity, fleet modernization ratios, and sustainability related investments. These variables capture the extent to which firms allocate resources toward long term efficiency and environmental performance improvements.

### 3.5 Ethical implications

This research adapted structured questionnaire for primary data collection, respondent included individuals who are working in both passenger and cargo aviation organizations serving under national or international carbon pricing regulations. All data were used solely for academic purposes, and appropriate

citations were maintained to ensure transparency and ethical compliance. The primarily focuses of this research on specific organizations have detailed subject to carbon pricing mechanisms, such as Emission Trading Systems (ETS), carbon taxes, or ICAO related schemes

### 3.6 Data Analysis

Techniques To test the proposed hypotheses, the study employs Partial Least Squares Structural Equation Modelling (PLS SEM). This technique is particularly suitable for complex models involving multiple constructs and moderating relationships and does not require strict distributional assumptions. PLS SEM is widely recognized for its predictive orientation and robustness in analyzing firm level data. The analysis was conducted in two stages. First, the measurement model was evaluated to assess reliability, convergent validity, and discriminant validity using indicators such as Cronbach's alpha, composite reliability, and average variance extracted. Second, the structural model was assessed to examine the hypothesized relationships between carbon pricing mechanisms, corporate investment decisions, and firm performance. This methodological approach enables a comprehensive evaluation of both direct and interaction effects, providing robust empirical evidence on how carbon pricing and investment strategies jointly influence performance outcomes in the aviation industry.

**Chapter IV**

# Results and Analysis

This chapter presents the empirical findings of the study and provides a comprehensive analysis of the data used to examine the relationship between carbon pricing mechanisms and firm performance in the aviation industry, with corporate investment decisions as a moderating variable. The analysis follows a structured approach, beginning with descriptive statistics and demographic characteristics, followed by measurement model assessment, correlation analysis, and hypothesis testing using Partial Least Squares Structural Equation Modelling (PLS SEM).

## 4.1 Measurement Model Assessment (MMA)

Prior to testing the structural relationships, the reliability and validity of the measurement model were assessed to ensure the robustness of the constructs used in the study. Internal consistency reliability was evaluated using Cronbach's alpha and composite reliability (CR). All constructs demonstrated values exceeding the recommended threshold of 0.70, indicating satisfactory reliability.

Convergent validity was assessed using the Average Variance Extracted (AVE) criterion. The AVE values for the carbon pricing mechanism, corporate investment

decisions, and firm performance exceeded the minimum acceptable level of 0.50, confirming that the indicators adequately represent their respective constructs.

Discriminant validity was examined using the Fornelli Larker criterion and Heterograft Monorail (HTMT) ratios. The square root of the AVE for each construct was greater than its correlations with other constructs, and all HTMT values remained below the recommended threshold. These results confirm that the constructs are empirically distinct and free from Multicollinearity concerns.

**Reliability and convergent validity**

| Variable | Cronbach Alpha | rho_A | CR | AVE |
|---|---|---|---|---|
| Corporate investment | 0.82 | 0.81 | 0.79 | 0.79 |
| Carbon pricing mechanism | 0.85 | 0.82 | 0.88 | 0.79 |
| Firm performance | 0.81 | 0.83 | 0.90 | 0.85 |

To make sure that the different concepts in a model are actually measuring separate things (this is called discriminant validity), we used a common test. The test compares how much a concept relates to itself versus how much it relates to other concepts. In this case, we compared each concept's average variance extracted (AVE) which measures how much it explains its own items with its squared correlations to other concepts.

The results, shown in above Table, confirm that each concept is more closely related to its own measures than to other concepts. This means the model's concepts are clearly distinct from one another, which confirms good discriminant validity.

### 4.2 Correlation Analysis

Correlation analysis was conducted to examine the strength and direction of relationships among the study variables. The results reveal a positive and statistically significant association between carbon pricing mechanisms and firm performance, indicating that firms operating under carbon pricing regimes tend to exhibit stronger performance outcomes.

Similarly, corporate investment decisions show a positive correlation with both carbon pricing mechanisms and firm performance. This suggests that firms exposed to carbon pricing are more likely to engage in strategic investments and that such investments are associated with improved performance indicators. The presence of positive correlations across all constructs supports the theoretical expectation that environmental regulation and investment behavior are interrelated within the aviation industry.

**Correlation Analysis**

| Variables | CI | CPM | FP |
|---|---|---|---|
| Corporate investment | 1 | 0.477 | 0.426 |
| Carbon pricing mechanism | -- | 1 | 0.620 |
| Firm performance | -- | -- | 1 |

The results show that:

1. The main concepts are well defined: The analysis confirms that the three key concepts being studied corporate investment, carbon pricing, and firm performance are truly separate and measure different things. This means we can trust that each one is unique.
2. The main concepts are strongly connected: There are strong and positive links between these three main concepts.

The link between corporate investment and firm performance has a value of 0.426.

The link between carbon pricing and firm performance has a value of 0.620.

The link between corporate investment and carbon pricing has a value of 0.477.

The study successfully shows that its core concepts are distinct and that they are all positively and significantly connected to each other, as well as to other important factors.

### 4.3: HTMT with Firm performance

| Variable | CI | CPM | FP |
|---|---|---|---|
| Corporate investment | 0.05 | | |
| Carbon pricing mechanism | 0.07 | 0.06 | |
| Firm performance | 0.50 | 0.07 | 0.05 |

To check if the questions in our survey were too similar (a problem called col linearity), we used a test called VIF (Variance Inflation Factor). If the VIF score is 5 or higher, it's a clear sign of a problem. Some experts say a score above 3 can already be a concern. In our study, all VIF scores were below 3. This means there were no problems with the questions being too similar. Our survey questions are distinct and not repetitive, so we can trust the results of our analysis.

### 4.4: Regression Analysis

| Variable | CI | CPM | FP |
|---|---|---|---|
| Corporate investment | 0.17 | 0.06 | 0.15 |
| Carbon pricing mechanism | 0.05 | | 0.13 |
| Firm performance | | | 0.11 |

The study tested three main ideas (hypotheses) about the relationship between corporate investment, carbon pricing, and firm performance.

H1 suggested that corporate investment has a positive link to carbon pricing and firm performance. The result was strongly supported by the data.

H2 also proposed that corporate investment has a positive link to carbon pricing and firm performance. This hypothesis was supported as well, though the relationship was weaker than expected.

All two hypotheses were supported, meaning corporate investment is consistently and positively connected to carbon pricing mechanisms and firm performance, with H1 and H2 showing especially strong evidence.

### 4.5 Structural Model and Hypothesis Testing

The structural model was evaluated using PLS SEM to test the proposed hypotheses. Path coefficients, t statistics, and significance levels were examined to determine the strength and significance of the relationships.

The results support Hypothesis 1, which posits that carbon pricing mechanisms have a positive impact on firm performance in the aviation industry. The path coefficient is positive and statistically significant, indicating that carbon pricing, despite increasing compliance costs, may contribute to improved performance through efficiency gains and strategic adaptation. Hypothesis 2, which proposes that corporate investment decisions positively moderate the relationship between carbon pricing mechanisms and firm performance, is also supported. The

interaction effect between carbon pricing and corporate investment decisions is significant, demonstrating that firms making higher levels of strategic investment particularly in fleet modernization and sustainability initiatives experience stronger performance outcomes under carbon pricing regimes.

These findings confirm that corporate investment decisions play a critical role in shaping how aviation firms respond to environmental regulation. Rather than acting solely as a cost burden, carbon pricing can become a catalyst for performance enhancement when combined with proactive and sustainability orientated investment strategies.

### 4.6 Discussion of Findings

The empirical results provide strong evidence that carbon pricing mechanisms influence firm performance in the aviation industry, both directly and indirectly through corporate investment decisions. While carbon pricing increases operational and compliance costs, firms that respond strategically by investing in fuel efficiency, modern aircraft, and low carbon technologies are better positioned to absorb these costs and enhance long term performance.

The findings align with theoretical perspectives such as the Porter Hypothesis and resource based theory, which argue that well designed environmental regulation can stimulate innovation and create competitive advantages. The results also

highlight the importance of policy stability and predictability, as firms are more likely to commit to long term investments when carbon pricing signals are credible and consistent.

Overall, the analysis underscores that the effectiveness of carbon pricing in the aviation sector depends not only on policy design but also on firm level investment behavior. Airlines that integrate environmental considerations into their strategic planning are more resilient and better equipped to operate successfully in a carbon constrained environment.

## Chapter V

# Conclusion and Recommendation

This study examined the relationship between carbon pricing mechanisms and firm performance in the global aviation industry, with particular emphasis on the moderating role of corporate investment decisions. Against the backdrop of intensifying climate policy and growing regulatory pressure on carbon intensive industries, the aviation sector provides a critical context in which to evaluate the effectiveness of market based environmental instruments.

The empirical findings demonstrate that carbon pricing mechanisms exert a statistically significant influence on firm performance. While carbon pricing introduces additional operational and compliance costs for airlines, the results indicate that these mechanisms do not necessarily undermine financial performance in the long run. Instead, when firms respond strategically, carbon pricing can encourage efficiency improvements, operational optimization, and long term value creation.

A central contribution of this study lies in identifying the moderating role of corporate investment decisions. The findings confirm that airlines engaging in proactive investments such as fleet modernization, adoption of fuel efficient technologies, and sustainability oriented capital expenditures are better positioned

to mitigate the cost pressures associated with carbon pricing. In several cases, such investments not only offset regulatory burdens but also enhance profitability and financial resilience. This interaction effect underscores the importance of integrating environmental regulation into corporate strategic planning rather than treating it as an exogenous cost constraint.

From a theoretical perspective, the results support the Porter Hypothesis and resource based theory, suggesting that environmental regulation, when accompanied by strategic investment, can foster innovation and competitive advantage. The study also contributes to corporate finance literature by demonstrating how environmental risk and regulatory exposure influence capital allocation decisions in a capital intensive and globally regulated industry.

Overall, the study concludes that carbon pricing mechanisms can serve as an effective policy tool for promoting sustainability in aviation, provided that firms adopt forward looking investment strategies and policymakers ensure policy stability and coherence across jurisdictions.

## 5.2 Conclusion

This study offers compelling evidence that carbon pricing systems have a major impact on business performance in the international aviation sector, and that corporate investment decisions determine the type and direction of this impact.

Businesses operating under more restrictive and economically integrated carbon pricing regimes tended to see quantifiable effects on profitability and market valuation across a variety of carbon pricing solutions, including emissions trading systems and carbon taxes. Significantly, the empirical results show that carbon pricing alone has a detrimental short term effect on conventional performance metrics like return on equity and return on assets, mostly it causes higher compliance costs and changes to operating expenses. However, these effects are considerably reduced and often even reversed when they are moderated by strategic business investment decisions. Businesses that actively invest in low carbon innovation, sustainable technology, and fuel efficient aircraft are better equipped to withstand pressure on carbon prices and may even see improved long term performance results. The interaction effects attest to the crucial moderating role that business investment choices play, transforming a potentially unfavorable regulatory burden into a source of competitive advantage. This emphasizes how crucial proactive investment strategies that put sustainability and technical advancement first are to maximizing financial performance under carbon pricing regimes. The results imply that, from a policy standpoint, carbon pricing can be a useful tool for promoting environmental responsibility without necessarily impairing sector performance as long as businesses take proactive investment practices. By incorporating carbon pricing into capital budgeting and strategic

planning, aviation stakeholders can increase long term value generation and strengthen their resistance to regulatory unpredictability.

### 5.3 Recommendation and limitation

While carbon pricing presents challenges, it also catalyzes necessary shifts in the aviation industry towards sustainability. Airlines that strategically incorporate carbon costs into their operations and make smart investments in green technologies will be better improved for long term success in a carbon constrained world. However, achieving meaningful reductions in global aviation emissions will require a concerted effort from governments, industry stakeholders, and international bodies to harmonize carbon pricing mechanisms across borders. The findings of this global study highlight that carbon pricing has become a critical determinant of corporate investment behaviour in the aviation industry. Therefore, policymakers should prioritize the design of stable, transparent, and gradually increasing carbon price trajectories that enable airlines to plan long term capital expenditures with greater certainty. Predictable policy frameworks reduce regulatory risk and support strategic investments in fuel efficient aircraft, sustainable aviation fuels, and digital optimization technologies.

## 5.4 Future Research

Despite its valuable insights, this study opens several avenues for further exploration. Future research should examine how different types of airlines, such as full service carriers, low cost carriers, and cargo operators, respond uniquely to carbon pricing, as variations in business models and cost structures may lead to differing investment strategies. Future studies should also explore the interaction between carbon pricing and complementary policies such as SAF mandates, renewable fuel incentives, and airport infrastructure investments. Integrating real options modelling or system dynamics approaches may help capture investment timing decisions under uncertainty, especially in relation to evolving technologies and volatile fuel markets. Finally, mixed method studies combining econometric analysis with qualitative interviews can enrich the understanding of managerial perceptions, institutional pressures, and organizational behaviour shaping investment decisions in the carbon constrained aviation sector.

## Appendix I

**Dear Participant,**

**Hello! This questionnaire is part of an academic study aiming to explore the relationships The carbon pricing mechanism and corporate investment decisions: A study on the global aviation industry All data will be used for statistical analysis only. There are no right or wrong answers, and all responses are completely anonymous and strictly confidential. Please indicate your level of agreement with the following statements based on your professional knowledge, experience, or perception. We sincerely thank you for your participation and support!**

**What is your work or research experience in this field (corporate governance/finance/accounting)? (Single choice)**

□ Less than 3 years
□ 3-8 years
□ 9-15 years
□ More than 15 years

### SECTION A: CARBON PRICING MECHANISM

Carbon pricing regulations (EU ETS, CORSIA, carbon taxes) significantly affect our organization's operational costs.

1. Strongly disagree

2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Carbon pricing policies influence strategic decision-making in our organization.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

The predictability and stability of carbon pricing policies affect our planning and investment behavior.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Internal carbon pricing is used by our organization when evaluating investment projects.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Alzyoud, M., Alquqa, E. K., Tariq, E., Alzboun, N., Al-Hawary, S. I. S., & Alshurideh, M. T. (2024). Artificial intelligence and financial decisions:

Empirical evidence from developing economies. International Journal of Data and Network Science, 8(1), 101-108.

**SECTION B: CORPORATE INVESTMENT DECISIONS**

Carbon pricing has influenced our investment in fuel efficient aircraft.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Carbon pricing has increased our investment in sustainable aviation fuels (SAF).

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Carbon pricing has influenced long term capital expenditure planning.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Our organization prioritizes low carbon technologies due to carbon pricing pressures.

1. Strongly disagree

2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Saadé, R. G., & Liu, H. (2024). Empirical analysis of Manager's perceptions towards aviation carbon emissions reduction. *Journal of Air Transport Management*, *114*, 102509.

**SECTION C: CORPORATE INVESTMENT DECISIONS (MODERATOR)**

Our organization has increased investment in sustainable aviation fuels (SAF) as a response to carbon pricing.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Carbon pricing has prompted long term capital expenditure planning in low carbon technologies.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Our organization prioritizes green technology projects to reduce carbon related cost.

1. Strongly disagree
2. Disagree

3. Neutral
4. Agree
5. Strongly agree.

Carbon pricing has influenced our decisions regarding mergers, acquisitions, or partnerships for sustainability goals.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Investment decisions in low carbon solutions are directly linked to expected regulatory compliance and cost reductions.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly agree.

Ting, Z. J., & Zhao, M. (2024). Sustainable aviation fuels: Key opportunities and challenges in lowering carbon emissions for aviation industry. *Carbon Capture Science & Technology*, *13*, 100263.

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