

The Drivers of Green Practices Adoption in Air Cargo Carriers

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Abstract

Environmental problems are becoming increasingly severe, and the air transportation industry significantly impacts the environment. Although green practices are available for air carriers, more research is needed to understand the factors that drive their adoption. Therefore, this article aims to investigate the factors that drive the adoption of green practices in air cargo carriers. The researchers collected data from the environmental reports of various airlines and analyzed it using the content analysis method through the lens of institutional isomorphism theory. The results reveal that coercive and normative pressures are the main drivers of green practice adoption in air cargo carriers. In contrast, mimetic pressure was not found to be a significant factor. This article contributes to the current literature by providing a framework for studying airline green practices from an institutional theory perspective and insight into air carriers adopting green practices. The authors also identify the limitations of this study and provide suggestions for future research.

Keywords: Green Practices; Air Transport; Green Drivers

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Introduction

The environmental issue has become a spotlighted issue in global schemes. The environmental effect of aviation is gaining global attention from the industry and related entities such as the United Nations and the governments of each country. There are some proposed practices to mitigate the environmental effects of air transport; however, few studies are dedicated to air transport. This article explores the factors that drive air cargo carriers to adopt green practices for reducing emissions from air cargo operations. The content analysis approach based on stakeholder and institutional theory was employed to extract and analyze data from environmental reports of different air cargo carriers.

Environmental Effects from Air Transport

Air transportation is the dirtiest mode of transport compared to trucks, vans, railways, or ships (McKinnon, 2010). The by-products of aircraft combustion of jet fuel include carbon dioxide (CO₂), water vapor (H₂O), nitrogen oxide (NO_x), Sulphur dioxide (SO₂), and particle matter (PM) (EASA, 2016). These gases are emitted from aircraft both at low altitudes, during the landing and take-off phase, and at high altitudes, during cruising, and the effect of these gases is different depending on the size (Miyoshi & Mason, 2009). According to EIA (2018), CO₂ and water vapor are greenhouse gases that foster global climate change.

Among those previously mentioned gases, CO₂ is the most important and has always been highlighted by scientists (Olivier et al., 2017). It remains in the atmosphere longer than other greenhouse gases (Union of Concerned Scientists, 2017). IATA (2013) revealed that CO₂ emission from air transport accounts for 2 percent of total global emissions and can grow up to 3 percent due to air traffic growth. It is also important to mention that the measurement of CO₂ emission purely from air cargo is difficult since up to half of the cargo volume is shipped by the passenger flight in the cargo compartment of the aircraft (Howitt et al., 2011; Kupfer et al., 2017)

Green Practices in Air Carrier

Several scholars have revealed several green practices in use now and some possible practices that might be used in the future. Sarkar (2012) mentioned that the critical success factors of green aviation transport are biofuel use, fleet renewal, aircraft technology improvement, and operational efficiency. The study by Lin (2013) also confirmed that aircraft improvement, alternative fuels, and engine efficiency are critical success factors for green aviation transport. Firstly, alternative fuels are suggested by many studies (Janić, 2018; Kousoulidou & Lonza, 2016; Yilmaz & Atmanli, 2017). These alternative fuels emit less CO₂ from combustion and have less carbon footprint from their production. Second, air fleet upgrade is also mentioned by several studies (Baharozu et al., 2017; Dray et al., 2014; Khoo & Teoh, 2014; Müller et al., 2018). Since newer aircraft models are more fuel efficient, they consume less fuel, emitting less CO₂. Operational efficiency is also mentioned as the practice of reducing CO₂ emission in air transport. Dalmau and Prats (2015) proposed the continuous cruise climbing method to improve the flight's operational procedure. Xu and Prats (2017) also suggested the linear holding method to mitigate extra fuel consumption from flight delays. Freight consolidation is also a possible practice for CO₂ reduction (Zhou & Zhang, 2017). Apart from these measures, other measures, such as one engine take-off, weight reduction, and core engine wash, can improve environmental performance. Table 1 contains the summary list of green practices for air cargo.

Table 1: Summary List of Green Practices for Air Cargo

Areas of practice	Initiatives	Authors (year)/[practitioners]
Alternative Fuels	Biofuels Liquid Hydrogen	Sakar (2012); Lin (2013); Janić (2017) Kousoulidou and Lonzo (2016); Yilmaz and Atmanli (2017) [United Airlines]
Innovation and Technology Development	Green technologies, Green fleet, Fleet renewal, Aircraft retrofitting, Cryoplane, Aerodynamic improvement, Airframe development	Sakar (2012); Lin (2013); Muller et al. (2018); Dray et al. (2014); Khoo and Theoh (2014); Baharozu et al. (2017); [Airbus]
Operational Practices	One engine off taxi, weight reduction from taking off unnecessary equipment, Core engine wash, Consolidation, Linear holding, Continuous cruise climbing, Speed limit cancellation.	Sakar (2012); Dalmau and Prat (2015) Xu and Prat (2017); Zhou and Zhang (2017); Mitchell et al. (2012); [Emirates]; [Cathay Pacific]; [Qatar Airways]; [Cargolux]

Literature Review

Driver of Green Practices Adoption

Cost Reduction has been mentioned as a driver of green practices adoption (Walker et al., 2008; Wang et al., 2018). Morrison et al. (2010) stated that fuel cost becomes the most essential cost of flight operation. It represents about 20 to 35 percent of operating costs, depending on fuel price (IATA, 2015). As a result, any measures that can reduce fuel consumption (which also reduces emissions from fuel burning) are considerable (Pagoni & Psaraki-Kalouptsidi, 2017; Sakar, 2012). These measures include aircraft upgrading and retrofitting, fleet renewal, and operational measures (Lin, 2013; Khoo & Theoh, 2014; Xu & Prat, 2017). In addition, the extra cost may come from fines or emission credits of environmental schemes if airlines cannot control their emission under the limit of such tasks. The EU-ETS may cost the airlines 100 Euros for every ton of exceeding emission over the cap that airlines are allocated (Chao, 2014).

External government and industry association support are also significant drivers of the adoption of green practices (Kim & Lee, 2012; Zhang et al., 2014). Zhang et al. (2014) suggested that pressure from external organizations such as transport associations can impact the environmental behavior of a firm. Support from the government is also needed to accelerate the adoption of biofuels in aviation (Smith et al., 2017). As the aviation industry's primary association, IATA has set environmental goals such as increasing fuel efficiency by 1.5 percent per year, CO₂ emission neutral growth by 2020, and reducing carbon emission by half in 2050 (IATA, 2017). ICAO (2016) also supports clean technologies and alternative fuel usage in aviation.

Government regulations and policies are significant drivers of the adoption of green practices (Walker et al., 2008). Porter and Linde (1995) claimed that regulation triggers environmental protection. Some studies even mentioned that regulation is the most critical driver (Govindan et al., 2015; Zhu et al., 2007). The study by Lynes (2004) on the environmental commitment of the airline industry also identified regulation as one of the significant drivers. Scheelhaase et al. (2018) suggested that the EU Emission Trading Scheme (EU-ETS) and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) are the two main regulations for CO₂ reduction in air transport. It is also suggested that the emission cap from EU-ETS positively influences the airlines to upgrade their aircraft (Muller et al., 2018). While the EU-ETS has been applied among EU countries, CORSA, the global scheme, is currently voluntary and will become mandatory in 2027. The CORSA mechanism differs slightly from the EU-ETS. Under CORSA, a company can offset its carbon emissions by initiating or participating in environmentally friendly initiatives, such as growing forests or donating to environmental conservation organizations (ICAO, 2023). This capability is not available under EU-ETS.

Institutional Isomorphism

DiMaggio and Powell (1983) argued that there is a power that drives firms in the same field toward homogeneity. Firms in the same field hereby refer to the firms that interact with the same entities or have similar positions in the supply chain network (DiMaggio & Powell, 1983; Sayed et al., 2017). According to DiMaggio and Powell (1983), a firm is forced by institutional pressures: coercive, normative, and mimetic. When firms perceive these pressures, they execute some actions to respond to the pressures (Clemens & Douglas, 2005; Oliver, 1991). Meyer and Rowan (1977) suggested that firms conform to these pressures to maintain legitimacy. Legitimacy is “the belief that certain behaviours or practices are something that everyone in the same environment should engage in” (Lee et al., 2013). Therefore, firms under similar pressure shall execute similar actions, and they call such a phenomenon institutional isomorphism.

Coercive pressure stems from other organizations that firms depend on (DiMaggio & Powell, 1983). It usually contains the organizations that formally or informally hold some power over the focal firms; for example, government and regulators can legislate specific standards that mandate firms to do or not to do some actions (Sarkis et al., 2011). As a result, the firms must comply with such standards to maintain their legitimacy (DiMaggio & Powell, 1983; Oliver, 1991). In addition, firms may perceive risk if they cannot comply with laws and regulations, so they comply with those standards to avoid the danger that might occur (Oliver, 1991).

DiMaggio and Powell (1983) explain that normative pressure stems from professionalization as “the collective struggle of members of an occupation to define the conditions and methods of their work.” In other words, firms struggle to be legitimate regarding the standards established by their peer in the same network of professions (Sayed et al., 2017). In addition, normative pressure can stem from other entities. Customers, NGOs, or industry associations can also exert normative pressure through their expectations toward the firm, i.e., they may have certain expectations that a firm in a particular field should or should not do something and how the firm should operate its business (Chen et al., 2018). It differs from coercive pressure since it guides the firms to execute some actions through social or ethical obligation rather than legal obligation (Glover et al., 2014; Sayed et al., 2017). In short,

normative pressure is the pressure that a firm perceives when seeking non-legal legitimacy (DiMaggio & Powell, 1983).

Mimetic pressure stems from firms' uncertainty when there is ambiguity or poor understanding of new circumstances (DiMaggio & Powell, 1983). When firms deal with uncertainty, they tend to imitate other firms' actions (DiMaggio & Powell, 1983). Glover et al. (2014) suggested that a successful firm in the same industry is the primary model for imitation. Uncertainty can occur from many perspectives. New regulations can place a firm in uncertainty if the regulation is unclear (Walker et al., 2008). New technology and management approaches that the firm is unfamiliar with are a source of ambiguity (DiMaggio & Powell, 1983; Yang, 2018).

The institutional pressures have been used in research areas of sustainable management and green supply chain management (GSCM) to study the driver of sustainable management and GSCM and to find the relation between environmental performance and other entities related to sustainable management and GSCM (Sarkis et al., 2011). Chen et al. (2018) conducted a study with 100 top companies in China and found that coercive and normative pressure fosters the adoption of green innovation. Yang (2018) also found that all institutional pressures positively affect the internal green practices of Taiwanese container shipping companies internal green practices affect the green performance of companies. Glover et al. (2014) studied sustainable practices in the dairy supply chain and found that all institutional pressures are drivers of adopting sustainable practices in the dairy supply chain. Hoejmose et al. (2014) conducted research with companies in the UK and suggested that coercive pressure is the significant driver of green supply chain practices. Sancha et al. (2015) identified mimetic pressure as the sole driver of sustainable supplier development and found that the other two drivers do not significantly affect sustainable supplier development. Therefore, institutional pressures were used as the framework of this study because it has been proven that these pressures are significant drivers of the adoption of green practices in many other industries and businesses.

Research Methodology

Data Collection

The researchers collected data from 5 different cargo carriers' environmental reports from 2018 to 2022. The five carriers are the air cargo service carriers listed in the IATA's top 15 ranking air cargo carriers in terms of freight volume (IATA, 2022). The five carriers were selected based on their environmental performance according to their environmental, social, and governance (ESG) score and the volume of freight tons carried ranked by IATA. According to S&P Global (2023), all 5 airlines got their environmental score higher than the industry mean of 26. Considering both their substantial freight volumes and commendable environmental scores, these five carriers emerge as frontrunners in adopting sustainable practices within the air freight industry. It is anticipated that these leaders have implemented a range of green initiatives, making them more inclined to transparently report their environmental performance in public documents. Therefore, the authors purposively selected them. From a qualitative research perspective, 5 samples are suitable since they have provided sufficient information to answer the research question (Bengtsson, 2016). The annual environmental reports are obtained from the carriers' websites. Table 2 contains the details of each selected carrier.

Table 2: Selected Carriers

Carriers	World Ranking	ESG's Environment Score
Federal Express	1	42
United Parcel Service	3	46
Korean Air	5	46
Cathay Pacific Airways	9	50
China Airline	11	87

Data Analysis

The data were analyzed by content analysis. The researchers followed the guidelines Bengtsson (2016) and Krippendorff (2004) provided.

1) Decontextualization: The researchers first read through the documents to familiarize themselves with them, followed by selecting the unit of analysis. The unit of analysis is the smallest unit that contains the insight or detail that gives information to the researchers; it can be words, sentences, paragraphs, or themes. For this study, the sentences that express the drivers of the adoption of green practices are taken as the unit of analysis. The sentence is selected to be a unit of analysis because the sentence should be able to be interpreted with full understanding, i.e., the reader can have a full understanding of the message given by a sentence without the necessity of further information from other contents. In this step, the sentences are labeled under different categories, which are defined prior to the coding process (table 3). The categories are defined according to the theoretical framework of the study. The authors separately extracted the sentences and cross-compared the collected data to make sure that there was no missing data.

Table 3: Categories, Concept and Code Rule

Categories	Concept	Code Rule
Coercive Pressure	The pressure stems from legal or regulatory obligation.	The sentence express that the carrier comply to mandatory environmental laws or regulations.
Normative Pressure	The pressure stems from professional, social or ethical obligation.	The sentence express that the carrier adopt green practices for customer or society sake or to comply with non-mandatory environmental guidelines or standards.
Mimetic Pressure	The pressure stems from uncertainty or ambiguity and force a firm to mimic other firms.	The sentence express that the carrier face with uncertainty and mimic other firms.

2) Recontextualization and categorization: The researchers carefully read the documents again and mainly focused on the un-coded sentences. The researchers needed to finalize if the un-coded sentences provided the necessary information for the analysis of this study or not, and if the un-coded sentences provided such information, the researchers then needed to code such sentences accordingly. This study used the deductive content analysis method, so the categories were determined based on institutional pressure prior to the coding process. Two coders separately coded the data. After each coder finished coding, the

researchers measured the agreement rate using Kappa's coefficient. The results show good agreement rate at 0.72 for category coding and 0.79 for sub-category coding. Then, the researchers recontextualized the extracted data again by looking for the homogeneity of each sentence and categorized the sentences that express similar meanings in the same sub-categories (table 4).

3) Compilation - the researchers seek the essence of the extracted data to answer the research question. The result is presented in a descriptive statistical manner to provide a clearer picture and easy understanding for readers.

Table 4: Categories and Sub-categories

Categories	Sub-categories	Examples
Coercive Pressure	Law and Regulation.	“Our policy is to comply with all applicable laws, rules, and regulations in the more than 220 countries and territories where we operate..”
Normative Pressure	Social Responsibility	“As a good neighbour, Cargolux has long ago accepted its responsibility to limit the impact of its operations on the environment and the surrounding communities.”
	Customers Expectation	“Customers and staff are increasingly environmentally conscious.”
	Industry Associations	“According to a 2020 survey conducted by the International Air Transport Association (IATA) on global airline passengers, 72% of the passengers answered that “the airline industry must make efforts to reduce carbon emissions in the process of recovering from COVID-19.”
Mimetic Pressure	N/A	N/A

Research Findings

Descriptive Statistics

After the researchers categorized each sentence into categories and sub-categories, the researchers presented descriptive statistics showing the frequency of sentences in each category and sub-category and calculated the percentage that each category and sub-category accounted for. Unfortunately, the researchers did not find any sentences that express the insight of mimetic pressure, so the mimetic pressure category was excluded from the results. The data did not present any new categories, so only 2 categories remained. Table 5 revealed that coercive pressure and normative pressure both appeared in carriers' environmental reports. The sentences that express coercive pressure account for 33.33 percent of total institutional pressure that appeared in the reports. There is only one sub-category for coercive pressure, which is laws and regulations, so laws and regulations also account for 33.33 percent of institutional

pressure appearing in the reports. The sentences that express normative pressure account for 66.67 percent of the total institutional pressure that appeared in the reports.

For normative pressure, there are 3 sub-categories, which are non-mandatory standards, customers, and industry associations. The sentences express non-mandatory standards account for 24.69 percent of total institutional pressure that appeared in the reports and 37.03 percent of normative pressure that appeared in the report. The sentences that express customers' expectations account for 16.05 percent of total institutional pressure that appeared in the reports and 24.07 percent of total normative pressure that appeared in the reports. Lastly, the sentences express industry associations account for 25.93 percent of total institutional pressure that appeared in the reports and 38.89 percent of total normative pressure that appeared in the reports.

Table 5: Categories and Sub-categories

Categories	Sub-categories	Frequency	Percentage
Coercive Pressure	Laws and Regulations	27	33.33 (100)
	Total	27	33.33
Normative Pressure	Non-Mandatory Standard	20	24.69 (37.03)
	Customers Expectation	13	16.05 (24.07)
	Industry Associations	21	25.93 (38.90)
	Total	54	66.67
Grand Total		81	100

Discussion

The result of this paper revealed that air cargo carriers have adopted some green practices. All carriers implemented similar practices including blending biofuel with traditional jet fuel, air fleet upgrades, air fleet renewal, and some other operational practices such as flight route optimization, one engine off taxi, and turning off auxiliary power unit (APU) on the ground. The researchers focused on the institutional pressures that drive the carriers toward green practices adoption and found that coercive pressure and normative pressure are both spotted in environmental reports of the carriers. This result is in line with a previous study that also found that institutional pressure positively affects green practices adoption, as Lin and Sheu (2012) found that institutional pressure fosters the adoption of green supply chain initiatives.

Coercive pressure was spotted in the environmental reports, so the carriers adopted green practices to comply with laws and regulations. In other words, they are mandated to adopt green practices. This result conforms with the study by Govindan et al. (2015), which suggested that regulation and government support are primary drivers of the adoption of green practices. The coercive pressure is a significant and effective driver because the carriers must follow the regulations from regulators and state governments, even if they disagree with such regulations. Moreover, air cargo service usually operates internationally, i.e., the shipments are shipped from one state to another state, so it often needs to deal with local regulations of different states.

Normative pressure was also spotted in the carriers' environmental reports. This finding is similar to previous studies suggesting that normative pressure drives the adoption of green practices. The interesting finding is that the environmental reports of the airlines mentioned normative pressure more than coercive pressure. This finding contrasts with earlier studies (Chen et al., 2018; Zhang et al., 2014), which reported that coercive pressure plays a more important role in adopting green practices. The rationale for undertaking this finding may lie in the growing recognition of environmental impacts among customers and industry associations. In addition, the increasing global initiatives on reducing environmental impact could urge the airlines to improve their environmental performance.

Mimetic pressure was not found in the environmental reports of the six carriers. This result is different from previous studies, which indicated that mimetic pressure also positively affects the adoption of green practices (Lin & Sheu, 2102; Yang, 2018). Since the mimetic pressure stems from the uncertainty, it forces a firm to mimic other firms in the same industry, so, unusually, any firm would put in their official reports that they copy the actions of other firms. In addition, the researchers only focused on the leading carriers in the industry so they would rather lead other firms than mimic them.

Conclusion

The environmental impact of air transport has become an important issue for the industry. Air cargo also plays an important role in air transport, so it must take part in reducing environmental impact. There are many ongoing initiatives and practices to achieve cleaner and greener air transport both at micro and macro levels. For example, the EU-ETS is the major mandatory scheme of Europe to tackle the CO₂ emission problem, and CORSIA – is the specific scheme for reducing CO₂ emission from air transport proposed by the ICAO. At the firm level, the air cargo carriers have adopted some green practices, such as bio-jet fuel, fleet upgrades, and other fuel efficiency programs. These initiatives and practices can improve environmental performance in air cargo; however, the industry is growing, and its environmental impact is also increasing accordingly. Therefore, a driving force must drive the industry toward a green future. This study has revealed two types of pressure that drive air cargo carriers to adopt green practices: coercive pressure and normative pressure. As a result, laws and regulations are important drivers to foster the adoption of green practices in air cargo carriers. Therefore, the government and regulators are the primary stakeholders who drive the industry toward the green goal. In addition, pressure from the industry itself via the norm that emerged from the industry community and industry standards, i.e., IATA and ISO, also encouraged air cargo carriers to adopt green practices. Customer pressure also plays an important role in the carriers' adoption of green practices.

Limitations and Directions for Future Research

This study has some limitations. Firstly, this study selected only five airlines, which are the leading airlines in environmental performance. Therefore, future studies can include more airlines with different environmental performance levels to provide a more comprehensive understanding. Secondly, future studies can implement quantitative analysis to confirm the relation between institutional pressures and green practices adoption among airlines. Lastly, future studies could use primary data to examine the relation between each driver and the insight behind each driver.

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