

Low-cost carrier development under airline-within-airline strategy: Bibliometric analysis and systematic literature review

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ABSTRACT

With the advent of aviation deregulation, the rapid development of low-cost carriers (LCCs) has posed significant competitive pressures to established airlines, particularly full-service carriers (FSCs). In response to these challenges, FSCs have undergone substantial operational strategy reforms. One such response has been adopting the airline-within-airline (AWA) strategy, wherein FSCs establish subsidiary LCCs. These subsidiary LCCs are either utilised as fighting brands to compete with major LCC competitors directly or to expand the market coverage of the parent airline. However, not all subsidiary LCCs have succeeded, and their impacts on the market competition structure and outcomes have varied significantly. We aim to provide a thorough review of existing studies and address a series of vital questions, including the market impact of AWA, incentives for adopting such strategy, and the successful operation patterns of subsidiary LCCs under the AWA framework. To ensure the breadth and depth of our review, we construct an article database and employ semantic analysis to capture relevant studies' titles, keywords, and abstracts. We summarise and report the adopted research methodologies, aviation markets studied, keywords and author co-occurrence networks, as well as research trends and gaps in previous literature. Through bibliometric analysis, we identify the importance of subsidiary autonomy and coordinating labour policy between low-cost and full-service group members. Meanwhile, the changing dynamic of airline competition requires flexible adjustment in route configuration, and up-to-date empirical investigation is necessary to understand airline group strategy. The significant disruption brought by the COVID-19 pandemic has not been detailedly studied for AWA. Our literature review could provide insights into the current state of research in this area while also identifying future research opportunities.

1. Introduction

Pioneered by Southwest Airlines in the late 1970s, low-cost carriers (LCCs) have expanded to different aviation markets worldwide, gained considerable market share and become a powerful competitor of full-service carriers (FSCs). LCCs' success can be attributed to several innovations in their business mode: removing cabin "frills" like free meals and entertainment, single cabin class, using less congested airports and such measures consequently let LCCs achieve much lower average costs, higher frequencies and turnover rate compared to FSCs (Homsombat et al., 2014). As a result of aviation deregulation, LCCs first appeared in North America and Europe, which brought substantial competitive pressure to incumbent FSCs. For example, British Airways and Lufthansa's short-haul business was greatly challenged by LCCs (Dennis,

2007), while in the United States, Southwest Airlines further expanded to long-haul routes, which were conventionally served by FSCs (Boguslask et al., 2004; Ito & Lee, 2003). It is also widely reported that these markets' average fare level was lowered by LCCs (Alderighi et al., 2004; Daraban & Fournier, 2008; Dresner et al., 1996; Huettinger, 2006). In Asia-Pacific, LCCs also achieved considerable growth in market share and traffic volume, although the liberalisation of the aviation market still lags behind that of Europe and North America (Fu et al., 2015; Homsombat et al., 2011; Zhang et al., 2008).

Facing the rapid growth of LCCs, managers of FSCs must make reforms to defend their market share. Morrell (2005) first proposed two strategies that FSCs can adopt to respond to LCCs' competition: reducing the cost while keeping cabin services that distinguished them from LCCs and/or creating low-cost divisions that follow the business model of

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LCCs. The latter is known as “Airlines-within-Airlines” (AWA or AinA). The key feature of such a strategy is that two divergent business models, FSC and LCC, operate simultaneously in the same group. Most early attempts at AWA, which mainly emerged in North America and Europe where FSCs first encountered competition from LCCs, were yet ineffective, and many LCC subsidiaries finally remerged into the parent company (Graf, 2005; Homsombat et al., 2014; ICAO, 2017; Morrell, 2005). Graham & Vowles (2006) proposed the risk of market cannibalism, which was already warned by management literature (e.g., Markides & Charitou, 2004; Porter, 1996) and could be a possible reason for these failures. Other explanations include the lack of autonomy of the subsidiary, the lack of clear differentiation between products, and the mismatch between management and the LCC business strategy (Graf, 2005; Morrell, 2005). Table 1 gives information about some LCCs established by American and European FSCs, most of which already ceased operation.

Remarkably, there is no longer a subsidiary LCC in American airline groups in the recent decade, showing the obvious failure of AWA in the US. Existing subsidiaries are mainly regional carriers. These regional subsidiaries are used as feeder carriers in thin regional routes to supplement the parent airlines’ mainline operation, driven by the wide existence of regional routes in the US. Due to relatively low demand, regional carriers use small aircraft to achieve a reasonable load factor, which differs fundamentally from LCCs, as the latter mainly adopt narrow-bodied aircraft to serve mainline markets (Chen et al., 2023). Deployment of LCCs on regional routes would be less cost-effective. As suggested by Morrell (2005) and Graham & Vowles (2006), AWA refers to operating two different business models FSC and LCC simultaneously, hence regional subsidiaries are ruled out from being genuine AWA. Surprisingly, AWA’s eye-catching performance in Asia-Pacific seemed unexpected given their American and European counterparts’ failure. Table 2 shows currently operating AWA systems by markets, and those from Asia-Pacific make up a notably large proportion, while other regions apparently lag and the US is absent. Some representative cases in Asia-Pacific are the Qantas group in Australia, the Singapore Airlines group in Singapore, and the Korean Air group in South Korea (Creedy, 2008; Homsombat et al., 2014; Khan et al., 2022; Raynes & Tsui, 2019). Such a phenomenon indicates that implementing an AWA strategy is a complex problem. It could vary according to time and markets, hence requiring more studies on its determinants.

Under such context, we report the market performance of FSCs, LCCs

and airline groups in three typical AWA markets: Australia, South Korea and Japan in Figs. 1 to 3. Traditional FSCs generally maintained their dominant status in these markets. However, this is not achieved by the parent airlines. Instead, most of them were shrinking. The long-time monopolist in Australia, Qantas, experienced a continuing market share drop, while the share of its subsidiary LCC Jetstar remained steady. The decline of Qantas was caused by regional carriers, including those in the Qantas group like QantasLink and Sunstate and unaffiliated ones like Alliance and Rex. In the Japanese domestic market, most LCCs are affiliated with ANA or JAL. For airlines serving the mainline market, there are only two carriers: one LCC and one hybrid carrier that are considered to be independent: AirAsia Japan and Skymark. The former only has a minimum share while the latter struggled to survive under the two duopoly AWA groups (Ng et al., 2022). Change in the ANA group is particularly remarkable. The parent airline lost some market share amid the COVID-19 pandemic, yet Peach expanded during the same period, offsetting its parent’s loss. In South Korea, two Independent LCCs and one subsidiary LCC of Korean Air, namely Jeju Air, T’way Air and Jin Air, grew substantially. The data is consistent with Khan et al. (2022): though AWA has grown over time, independent LCCs still hold more market share. Jin Air surpassed its parent, becoming the “main force” in the group. Overall, these three markets are favourable to LCCs (Wang et al., 2017. Plus regional carriers in the case of Australia). With the advent of deregulation, FSCs would naturally face competition from new entrants with business models more in line with local demand. Creating similar offshoots to meet the demand and utilising the long-established brand image to support the subsidiary and compete with new entrants would possibly be a feasible strategy.

Despite the large amount of literature on the competition between FSCs and LCCs, effort dedicated to explaining the contrasting fate of independent and subsidiary LCCs as well as AWA attempts in different markets is relatively limited. Knowledge related to AWA operation and management is scattered in articles covering various subjects. It can be concluded that AWA is not being fully comprehended, and future research is necessary. The status quo necessitates systematic studies reviewing the motivations behind AWA strategies or examining the factors contributing to their success and their impacts on the market competition.

This study aims to fill this research gap through a comprehensive bibliometric approach. We expect to contribute in the following ways. First, we provide a thorough review and analysis of existing literature,

Table 1
AWA cases in the US and Europe.

LCCs	Parent company	Entry	Cessation	Note
America				
Continental Lite	Continental	1993	1995	
Shuttle by United	United	1994	2002	
Delta Express/Song	Delta	1996	2006	Delta Express was replaced by Song in 2003
Metrojet	US Airways	1998	2002	
Zip	Air Canada	2002	2004	
Ted	United	2003	2009	
Europe				
Blue1 oy	SAS Group	1987	2016	It was a member of SAS Group, which also owns Scandinavian Airlines. Finally sold to CityJet
Deutsche BA	British Airways/Air Berlin	1992	2008	
Go Fly	British Airways	1998	2003	Acquired by EasyJet (independent LCC)
Basiq Air (Transavia)	KLM	2000	2005	Basiq was an LCC subsidiary of Transavia, the two remerged in 2005
Buzz	KLM	2000	2004	Acquired by Ryanair (independent LCC)
Germanwings	Lufthansa	2002	2020	Ceased operation due to COVID-19
Bmibaby	British Midland	2002	2012	Ceased operation with its parent company
Snowflake	SAS Group	2003	2004	
FlyNordic	Finnair	2003	2008	
Centralwings	LOT Polish Airlines	2004	2009	
Swiss European	Swiss International	2005	2018	Rebranded as Swiss Global in 2015. Not considered as LCC by ICAO

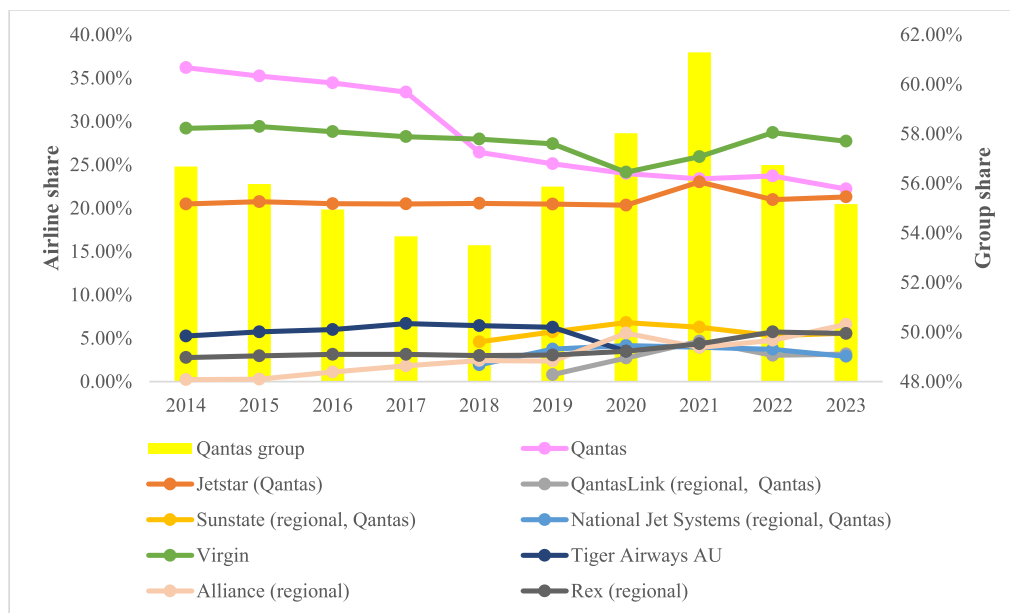
Source: Homsombat et al. (2014) with supplemented data from Cirium database.

Table 2

List of current AWA groups.

Region	Country/Region	Group LCC	Group FSC	Notes
Asia and Pacific	Australia	Jetstar	Qantas	<p>The FSC is the subsidiary.</p> <p>Codeshare and frequent flyer program with JAL.</p> <p>Low-cost long-haul subsidiary, commenced operation in 2020.</p> <p>Low-cost long-haul subsidiary, established 2022.</p> <p>Another subsidiary LCC of ANA, Vanilla Air, merged into Peach in October 2019.</p> <p>19 % owned by Temasek.</p> <p>Vietnam Airlines bought 70 % in 2012 and 100 % in 2020. Suspend services March to June 2024. Now resumed.</p>
	China	9 Air	Juneyao Air	
	China	Chengdu Airlines	Sichuan Airlines	
	China	China West Air	Hainan Airlines	
	China	China United	China Eastern	
	China	Lucky Air	Hainan Airlines (86.68 %)	
	Hong Kong	HK Express	Cathay Pacific	
	India	Air India Express	Air India	
	Indonesia	Citilink	Garuda Indonesia	
	Indonesia	Lion Air	Batik Air	
	Japan	Jetstar Japan	JAL and Qantas (each 33.3 %)	
	Japan	Zipair Tokyo	JAL	
	Japan	Air Japan	ANA	
	Japan	Peach Aviation	ANA (77.9 %)	
	Japan	Air Do	ANA (13.61 %)	
	Singapore	Jetstar Asia	Qantas (49 %)	
	South Korea	Jin Air	Korean Air	
	South Korea	Air Busan	Asiana Airlines	
	South Korea	Air Seoul	Asian Airlines	
	Singapore	Scoot	Singapore Airlines	
	Taiwan	Tigerair Taiwan	China Airlines	
	Vietnam	Pacific Airlines	Vietnam Airlines	
Central Asia	Kazakhstan	FlyArystan	Air Astana	
	Germany	Eurowings	Lufthansa	
	Austria/Malta	Eurowings Europe	Lufthansa	
Europe	Russia	Pobeda	Aeroflot	
	Turkey	SunExpress	Turkish Airlines and Lufthansa	
	France	Transavia France	Air France-KLM	
	Netherlands	Transavia.com	Air France-KLM	
	Spain	Vueling	IAG group	
	Sweden	SAS connect	SAS	
North America	Canada	Sunwing	WestJet	
Latin America	Panama	Wingo	Copa Airlines	
Africa	Egypt	Air Cairo	Egyptair (60 %)	
Middle East	UAE	Air Arabia Abu Dhabi	Etihad Airways (51 %)	

Source: Cirium database.

**Fig. 1.** Domestic share of Australian airlines. (Source: Cirium database).

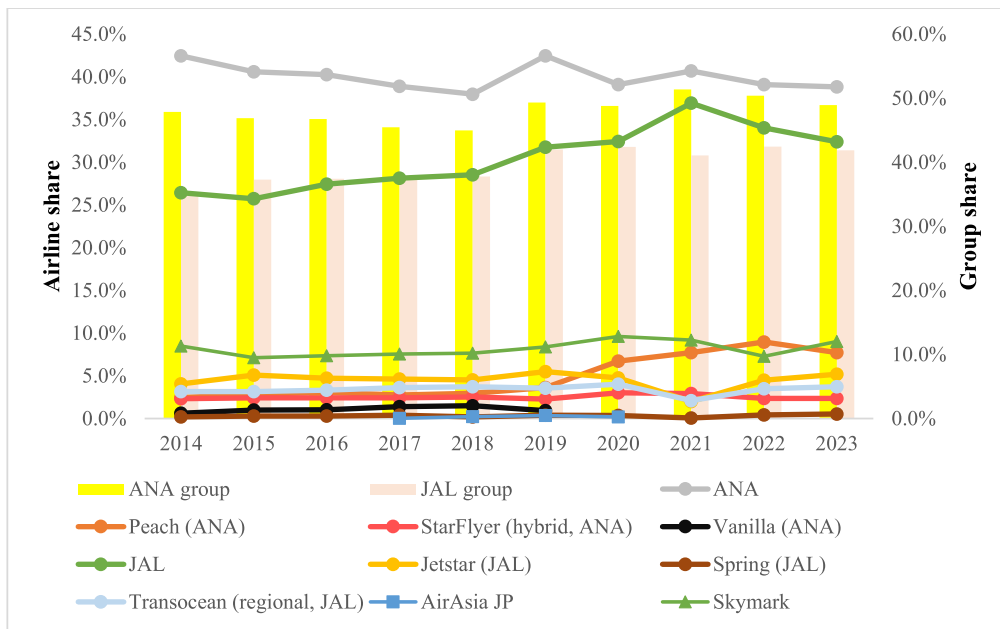


Fig. 2. Domestic share of Japanese airlines. (Source: Cirium database).

Note: (1) Vanilla Air merged with Peach in October 2019.

(2) Following Ng et al. (2022), Skymark is not considered as a subsidiary of ANA.

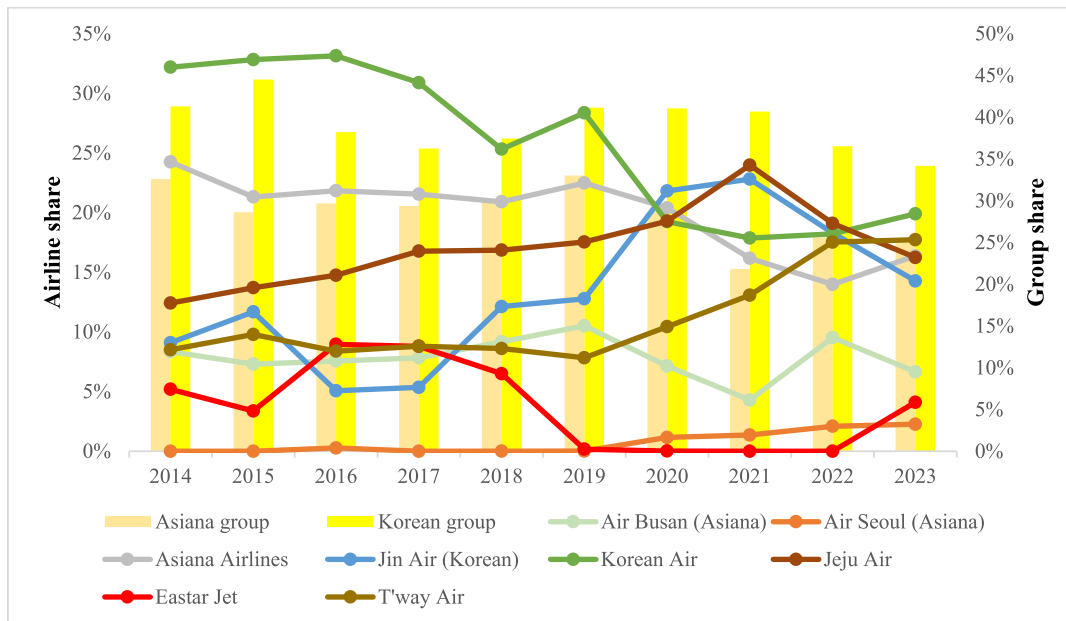


Fig. 3. Domestic share of Korean airlines. (Source: Cirium database).

encompassing various aspects of AWA's formation incentives and its impacts on market outcomes, such as airline network configurations, airfare, profitability, and airline competition intensity. Second, we summarise the diverse viewpoints on the successful strategies employed by AWA groups considering different market circumstances. Finally, we discover some latest trends in LCC development under the AWA framework and problems to be further addressed.

Following current literature review in transportation and aviation sector (Lau et al., 2017; Liu et al., 2024; Wang, Tsui, et al., 2024), we organise the remaining part of this article as follows: Section 2 introduces methods of searching literature; Section 3 presents bibliometric analysis from various aspects, including publication time, methodology

and network analysis. The above two sections are fundamental parts of a systematic literature review. Then the next two sections provide implications of the findings: Section 4 discusses two key subjects in AWA research; Section 5 summarises future research directions. Finally, Section 6 gives concluding remarks.

2. Corpus construction and literature search

In this section, we first introduce the procedure of constructing a literature corpus for our analysis and provide some direct information on the selected articles. To screen out articles related to AWA, we search titles, abstracts and keywords using the advanced document search

Table 3
Searching methodology.

Database	Method	Explanation	All results	Unrelated
Scopus	TITLE-ABS-KEY ("aviation" OR "airline" OR "carrier") AND TITLE-ABS-KEY ("airline-within-airline" OR "airline-in-airline" OR "dual brand" OR "carrier-within-carrier")	First restrict literature's topic to the aviation industry; then search for literature on AWA.	22	5
	TITLE-ABS-KEY ("aviation" OR "airline" OR "carrier") AND TITLE-ABS-KEY ("airline-within-airline" OR "airline-in-airline" OR "dual brand" OR "airline group" OR "subsidiary" OR "internal low-cost carrier") AND TITLE-ABS-KEY ("low-cost") AND (SUBJAREA (busi) OR SUBJAREA (deci) OR SUBJAREA (econ))	1. Include new keywords discovered previously; 2. Due to the large number of irrelevant results, other keywords and subject restrictions are added.	40	27
	TITLE-ABS-KEY ("Qantas" AND "Jetstar") AND (SUBJAREA (busi) OR SUBJAREA (deci) OR SUBJAREA (econ))	Separately search Qantas Group.	9	3
	"horizontal integration" and "diversification" and "low-cost carrier"	Search for articles using uncommon terms.	1	0
Google scholar	"Qantas Jetstar" and "Australia low-cost carriers"	Separately search Qantas Group.	9	0

Note: Scopus advanced search provides fixed searching syntax and subjects choices. "TITLE-ABS-KEY" refers to searching in title, abstract and keywords; "busi", "deci" and "econ" are abbreviations of three related subject areas: business, decision science and economics.

function of the Scopus database. The most challenging part of literature research is that various terms could refer to the same concept, AWA. To address this problem, we first adopt relatively strict constraints with precise words, then relax them by adding more possible terms we discovered in articles found previously to extend our search. The detailed syntax and explanations are reported in Table 3. Finally, we use Google Scholar to check if any articles can be added since some terms might be uncommon, mentioned by only a few authors and easily omitted. They include integration and group diversification.

In addition to the above searching methods, we separately searched for literature studying the Qantas Group of Australia to reduce omission.¹ Besides its success as discussed before, the competition and price war between the group and an external LCC, Virgin Australia, are particularly fierce and frequently covered by media and academia (Ma et al., 2019). We aim to capture articles mainly focusing on two airlines' competition while mentioning AWA apropos. The citation number is universally modified according to Google Scholar. All data are updated until 31 July 2024.

Some results are unrelated or repeated. For instance, some engineering articles were also presented by search engines; and working

paper and its published version could be found at the same time. The formally published one is selected and the number of citations is the sum of both versions. Total 47 articles are identified.

3. Analysis on the selected articles

3.1. Citation, journal and time

We rank the papers obtained according to citation number and report the 10 most cited ones with their methodology, objects and major conclusions in Table 4. A list of all articles can be found in the appendix. The total citation count is 1877. Referring to Journal Citation Report (JCR) database, we also specially identified seven journals in the transportation sector: Case Studies on Transport Policy (CSTP), Journal of Air Transport Management (JATM), Research in Transportation Economics (RTE), Transport Policy (TP), Transport Reviews (TRANS REV) and Transportation Research Part A and Part E (TRA and TRE). They are dedicated to transportation studies and can provide the most professional insights into the operation pattern and economic effects of AWA. Since controlling labour costs is vital for running the low-cost business model, labour policy also needs to be carefully considered by AWA managers therefore other articles are mainly from human resources management journals and take the management of LCCs as background. Figs. 4 and 5 illustrate the source distribution of the 10 most cited papers and sources and the number of publications in each year.

The ten most cited articles were published relatively early, before 2015 and mainly from 2005 to 2008. Half of them were published on JATM, and the only one from non-transportation journal is Harvey & Turnbull (2006) on European Management Journal. Their objects particularly concentrate on Europe and the US, discussing the management of the low-cost business model under the AWA framework (e.g., Gillen & Gados, 2008; Graf, 2005; Graham & Vowles, 2006; Morrell, 2005). Regardless of being independent or subsidiary, managing LCC is definitely different from that of FSC in order to control costs. Performing well in this regard is the key to ensure the success of an LCC, but many early AWA attempts in America and Europe failed to do so. Another research focus is Qantas Group in Australia. Established in 2003, Qantas' subsidiary LCC, Jetstar, expanded internationally with joint ventures in other Asia-Pacific countries and outperformed many independent LCCs in the region (Homsombat et al., 2014). Notably, Graham & Vowles (2006), who argued that market cannibalisation could be a significant risk for AWAs and were generally pessimistic about such a strategy, predicted that it could succeed in markets with specific characteristics like Australia. Qantas group can separate price-sensitive leisure markets (connecting Gold Coast, Tasmania, and major cities) and high-yield business markets (Sydney–Melbourne–Brisbane triangle). Due to the closeness between airports, such a trajectory is not easy to follow in European and North-eastern American markets.

With the development of AWA, new research objects and topics emerged. More airline groups in Asia-Pacific received attention from academia. For example, subsidiary LCCs of Korean carriers kept growing over time. They can be a valuable tool for FSCs to compete with LCCs, though they are less stable under disruption, and not all subsidiaries have acquired large market share (Sun, 2017; Khan et al., 2022). In Japan, most LCCs are more or less affiliated with the two duopoly FSCs: ANA and JAL. Their dominant status is expected to be strengthened due to the following reasons: other independent carriers were more severely affected by the pandemic; the two FSCs continued to take more control of LCCs, and the widely existing AWA curtails the latter's ability to promote competition (Ng et al., 2022).

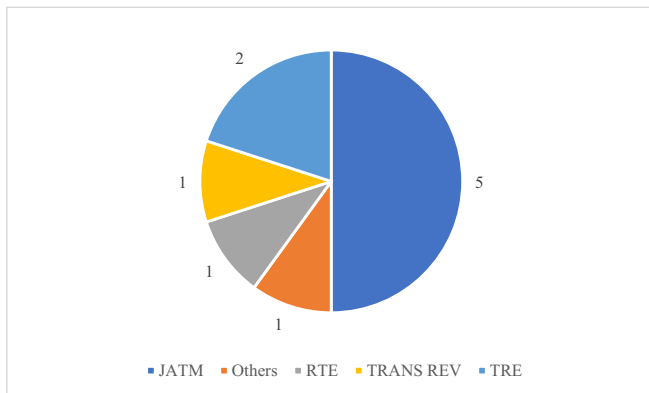
Some articles did not restrict their research object to a particular market or airline group. Instead, they adopt an economic modelling approach to investigate generalised market situations (Ko, 2016; Ko & Hwang, 2011; Lin, 2012). They advocated that setting up a subsidiary LCC can increase the profit of an FSC and offered some suggestions on

¹ Singapore Airlines group was also tested in an individual search, since it is compared with Qantas in one article as another example of prominent and successful AWA (Raynes & Tsui, 2019). We did not find new outcome directly related to airline operation therefore it is not displayed in Table 3.

Table 4

Summary of 10 most cited papers.

Author	Year	Object	Methodology	Major findings	Citation
Morrell	2005	US AWA	Case study	Many early US AWA attempts failed due to the unclear differentiation between group members, no enough autonomy for the subsidiary and high labour costs imposed by the trade union.	192
Graham and Vowles	2006	Global AWA	Case study	Market cannibalisation is a significant risk for airline groups. Still, the AWA strategy may work under certain conditions. The authors predicted that Australia is a market place for adopting such strategy.	165
Dennis	2007	European AWA	Case study	Lufthansa's Germanwings is efficient to serve different market niches, but most AWA failed. One example is Snowflake under SAS, which directly employed parent company's fleet and staff, consequently cannot save costs yet affected the business of the parent company.	153
Graf	2005	European AWA	Case study, survey	There are substantial incompatibilities between the LCC and FSC models within the same group. Germanwings was successful due to less labour restrictions than the parent company and high autonomy.	120
Gillen and Gados	2008	Global AWA	Case study	The parent company must have a strong market dominance. Singapore Airlines and Cathay Pacific established subsidiaries to enter markets while Qantas and Lufthansa did so to meet LCC competition.	107
Pearson et al.	2015	49 Asian airlines	Survey	Various resources of competitive advantages were identified. All LCCs ranked slots as the first resource; subsidiary LCCs and FSCs should emphasis more on managerial competence and experience.	103
Homsombat et al.	2014	Australian market	Econometric analysis	The FSC Qantas established subsidiary LCC Jetstar to serve as a "fighting brand", competing with another LCC, Virgin Australia.	102
Pearson and Merkert	2014	Global AWA	Case study	Many subsidiary LCCs had low load factors, hence cannot offset low yields by high traffic. Other problems are late entrance, tight control and low dissimilarities from the parent company.	100
Lin	2012	No specific object. Qantas Group and ANA Group are two examples	Modelling	FSC's hub-spoke network is preferred if passenger differentiation between one-stop and point-to point services and transit time are small. If not, establishing point-to-point subsidiary LCC is better.	69
Harvey and Turnbull	2006	British AWA	Case study	The article focused on labour policy and management. Go (under British Airways) avoided adversarial labour-management relation. It also combined low fare and "service surprise" to compete on short-haul routes.	49

**Fig. 4.** Source distribution of the 10 most cited papers.

how to carry out such a strategy. Specifically, [Lin \(2012\)](#) further used the Qantas group and ANA group as examples to support that an FSC can use its subsidiary LCC to provide non-stop services to supplement the FSC's hub-and-spoke network with an LCC on the network's rim routes.

Generally, the total research output increases gradually over year, but there are not many specialised transportation studies focusing on AWA as both two kinds contributed about half of the selected articles (24 from transportation and 23 from human resource management). This can be a future research direction and a detailed research gap will be investigated in [Section 5](#).

3.2. Methodology

The majority of the selected articles, especially the most cited ones were qualitative, doing a case study questionnaire survey and data analysis. These articles deeply investigated the sources of competitiveness of the low-cost business model and compared the performances of independent LCCs and subsidiary LCCs in these areas (e.g., [Morrell,](#)

[2005](#); [Graf, 2005](#); [Graham & Vowles, 2006](#); [Pearson & Merkert, 2014](#)), which we would discuss in detail later.

Quantitative methods have been more widely applied in the last decade. The topics of the empirical articles in our collection primarily covered fare determination and airlines' route choice, and half of them investigated the Australian market. [Homsombat et al. \(2014\)](#)'s work is the most cited empirical article. The authors examined market average fare and Jetstar's route entry trajectory and, to our knowledge, were the first to discover the "fighting brand" approach (Qantas uses Jetstar to compete with independent LCCs) through empirical analysis. Many other econometric articles investigated the change in airfare in a competitive market. As expected, with more airlines entering the market, the price war intensifies, and FSCs tend to reduce prices dramatically pending and upon LCCs' entry ([De Roos et al., 2010](#); [Ma et al., 2019](#); [Zhang et al., 2018](#)). In some cases, airline groups adopting AWA can maintain their fare at the expense of their independent rival's significant discount. For example, Japan's ANA and JAL forced down the fare of the independent carrier Skymark through AWA strategy on routes with direct competition. ANA and JAL's duopoly power was even enhanced by introducing subsidiary LCCs ([Ng et al., 2022](#)). This effect was not observed in China, where subsidiary LCCs are jointly owned by FSCs and local governments. The mixed ownership prevented close co-ordination between the subsidiary and the parent airline and hence could not increase the group's profitability; FSCs' average fare was also estimated to drop if implementing AWA, possibly because of the economy of scale achieved by airline groups ([Su et al., 2020](#)). In terms of route choice, empirical studies adopted binary dependent variable regression to examine if an airline serves a route/airport or not (e.g., [Klein et al., 2015](#); [Zhang et al., 2017](#); [Wang et al., 2020](#); [Wang, Wu, et al., 2024](#)). There is no universal result on which type of routes are generally served by subsidiaries, revealing the importance of case-by-case investigation. Details will be demonstrated in the next section. One special issue is estimating consumer perception, contributed by [Danaher et al. \(2011\)](#). Improved services and cost-effectiveness are critical for the growth of Jetstar under changed market preferences. It became not only a defender of Qantas from the attack by Virgin Blue but

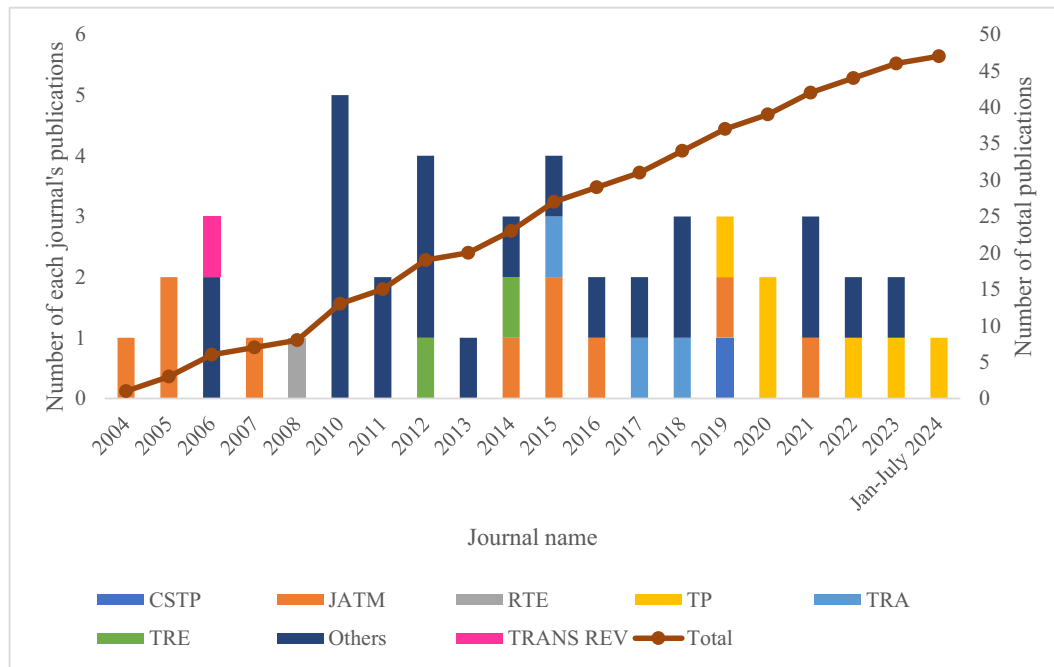


Fig. 5. Sources and number of publications in each year.

also a pioneer of overseas expansion and the majority of the group's profit.

Furthermore, modelling is adopted by seven articles and supply-demand modelling based on utility maximisation is the most common methodology. Khan et al. (2022) used the Lotka–Volterra (LV) model to simulate the competition between an airline group and an independent LCC. These articles generally proved that AWA is a useful strategy for incumbent FSCs to compete with LCCs (e.g., Ko & Hwang, 2011; Sun, 2017; Ko, 2016; Ko, 2019; Khan et al., 2022), which seems to be a conflict with the conclusions of early qualitative articles. Conceivably, this is caused by different regions focused on these studies. Modelling articles are derived from the scenarios in South Korea and Australia, where both independent LCCs and subsidiary LCCs have gained significant success. Still, there is disagreement on the route choice of subsidiary LCCs. Fageda & Flores-Fillol (2012) found that subsidiary LCCs were especially used on long-haul, thin and leisure routes. Meanwhile, Ko (2016) concluded that the FSC and its subsidiary LCC should focus on medium-haul and short-haul routes, respectively.

Overall, qualitative studies are still the primary method in AWA research. They help to learn the experiences of previous AWA practice. Empirical research mostly revealed airlines' pricing behaviour in the competition but lacked information regarding the practical operation strategies of AWA. Economic modelling can somewhat compensate for this gap, but the number of such studies is relatively low.

3.3. Keywords network

Using VOSviewer, we plot the co-occurrence network of keywords that emerged in the articles. Here, thesauri with the same connotation but different expressions should be combined to avoid splitting knowledge (e.g., singular or plural form, with or without hyphens; Lau et al., 2017; Liu et al., 2024). We use one unified term to represent each meaning that has diverse expressions as shown in Table 5. After the above processing, there are a total of 134 keywords that appeared at least once, but due to the limited number of literature, only 15 appeared twice or more (see Table 6).

The network of all keywords and those that appeared at least twice are presented in Figs. 6 and 7, respectively. Node size reflects occurrence, and colour reflects average publication year. "LCC" is the centre

Table 5

Keywords harmonisation.

Original keywords with same meaning	Replaced by
Airline within airline; Airline(s)-within-airline(s); Airlines-within-Airlines strategy; Carrier-within-a-carrier; Multi-brand strategy	AWA
Legacy carrier(s); Network airlines; Full-service airline(s); Full-service carrier	FSC
Low-cost carrier(s); Low-cost airlines; Low cost carrier(s); Low-cost business model	LCC
Airline competition; Competition	Competition
Airline entry; Market entry; Entry	Entry
Fare; Airfare pricing; Airfare	Airfare
Airline(s); Airline industry	Airline
Airline business models; Business model	Business model
Australian domestic market; Australian airline market; Australia	Australia

Table 6

Frequency statistics.

Times of appearance	Number of keywords
≥1	134
≥2	15
≥3	10
≥4	6
≥5	6

of both figures, with "AWA" and "Competition" being closely connected and having similar occurrences. This is an intuitive result since AWA is our core subject, and many FSCs carried out many AWA attempts as a response to LCCs' competition. "Australia", "China", and "Northeast Asia" emerged as three notable region-related keywords. As aforementioned, AWA was effectively implemented in Australia, Japan and Korea. With the continuing deregulation of the Chinese aviation market, LCCs are gradually growing in China and subsidiary LCCs were first set up in private airline groups, e.g., Juneyao Airlines group and Hainan

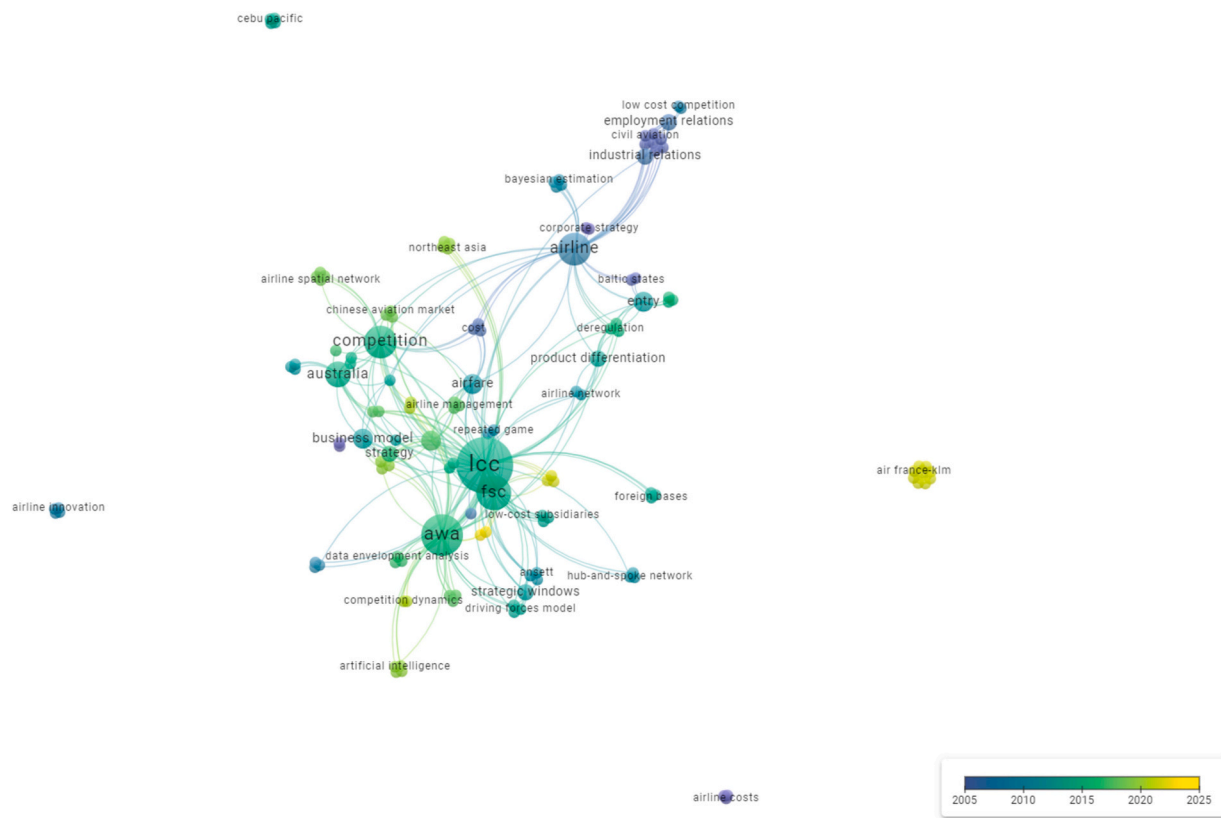


Fig. 6. Co-occurrence network of all keywords.

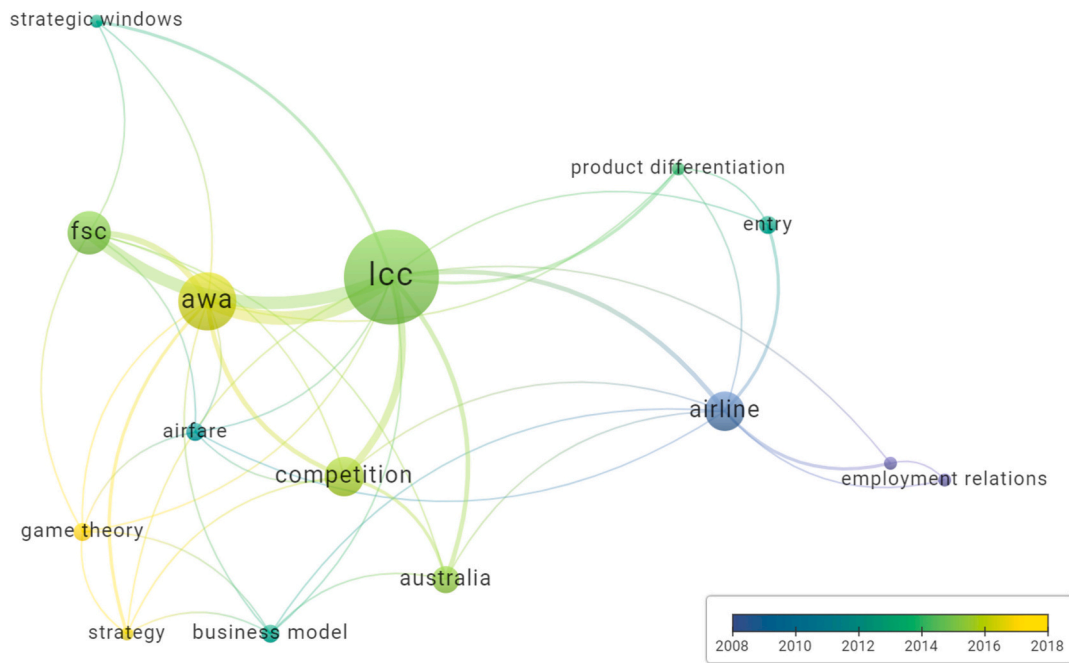


Fig. 7. Co-occurrence network of keywords with at least 2 appearances.

Airlines group.² Therefore, there is no surprise that research on LCC competition and AWA in China is rising (Fu et al., 2015; Wang et al., 2018). Given China's broad-covered high-speed rail network, LCC-rail competition in China is also a popular topic (Su et al., 2020). There has been an increasing presence of keywords in economic research, such as "Airfare", "Entry", and "Game theory", replaced earlier interests like "Employment relations". As illustrated in Section 3.2, Asian carriers' AWA strategy is a huge success compared to European and American counterparts and thus was extensively studied (Creedy, 2008; Homsombat et al., 2014). Duopoly in Korea and Japan, and a relatively low degree of deregulation in China make Northeast Asia distinct from Australia, resulting in different situations in price competition (Khan et al., 2022; Ng et al., 2022; Su et al., 2020). Academia's focus has turned to market competition and economics, with more quantitative articles published in the last decade.

Some keywords are not connected in Fig. 6, indicating that they belong to articles with unique subjects. "Air France-KLM" is from Rüger & Maertens (2022), who analysed the sustainability of the five largest European airline groups. Regarding business strategy, full-service parent airlines use subsidiary LCCs to supplement their hub-and-spoke network in holiday markets. It is concerning whether the more costly sustainable marketing approach fits LCCs. Tightening environmental regulations would be more harmful to them. "Cebu Pacific" is from O'Connell & Vanoverbeke (2015). In a market with the world's highest domestic LCC penetration rate (mainly the independent LCC, Cebu Pacific), Philippine Airlines' decision seems unwise: it rebranded its subsidiary LCC, AirPhil, to full-service PAL Express. As a result, Philippine Airlines lost the advantages of AWA in competing with other LCCs and its short-haul markets were severely affected. The transformation might be explained by the group's interest in the Middle East, but enormous competition from foreign carriers and lack of domestic connectivity lowered its yield.

3.4. Collaboration network

Similar to the previous section, here we illustrate the co-authorship relationship among researchers in the field of AWA. For the literature reviewed, there are a total of 89 authors, but most of them (78 out of 89) have only been published once. Figs. 8 and 9 depict the network of all authors and those who have published at least two articles, respectively. In these two figures, the size of each node represents the number of papers published by that author; lines connecting authors represent their co-authorship.

Collaboration on AWA research is rather fragmented, with multiple unconnected clusters of authors. In the centre of Fig. 8, some East Asian researchers formed a close community. Fu, Zhang and Wang are also the main contributors shown in Fig. 9. This research group began to pay attention to AWA in recent years and contributed various empirical examinations. Ko is an independent researcher who has published three articles, using economic modelling to simulate the competition between the AWA group and independent airlines. American and European researchers did their work earlier, but most only have one publication related to AWA since it was believed to be a failure. Notably, Harvey and Turnbull discussed the labour policy, and Whyte investigated the AWA strategy of Qantas group and Virgin's response.

² The Hainan Airlines group was jointly founded by local investment companies and the provincial government. Later the provincial government's share was transferred to other private companies. Being severely hit by the COVID-19 pandemic, the latter went bankrupt and was restructured in 2021 (though airline services maintained normal). The new owner of the aviation components of the group is Liaoning Fangda, a private industrial conglomerate. Therefore, both Juneyao and Hainan can be classified as private now.

3.5. Summarise on bibliometric features

In this section we report various bibliometric features of reviewed articles, here we summarise the evolution of AWA research which would lay a foundation to further analysis. The topic emerged as academia noticed the failure of US AWA attempts. Early literature focused on the context of extensive FSC-LCC competition in the US market and regarded AWA as FSCs' response to LCC expansion. Some suggested that AWA is an unworkable strategy (Graf, 2005; Graham & Vowles, 2006; Morrell, 2005). However, AWA in other markets witnessed great success. Later studies tend to compare such contrasting fates in different regions and try to explain the causes. How to deal with the conflict of managing different business models within the same group remains to be a featured research direction, as it is also a key determinant of a group's success. Traditional view on the purpose of AWA was challenged as well. Most recently, some articles addressed the unprecedented COVID-19 disruption and discovered its asymmetric impact on LCCs and FSCs and national heterogeneity (Ng et al., 2022; Wang, Wu, et al., 2024). Overall, this section provides information on the current research landscape and concentrated topics of articles, and we will analyse their findings in detail in the proceeding section.

4. Key questions in AWA research

In this section, we will discuss some important research questions of the reviewed articles and summarise their findings, aiming to propose managerial insights for airline groups and future research opportunities.

4.1. Purposes of setting up AWA

Airline groups might have different motivations to adopt the AWA strategy. The most direct incentive is to respond to independent LCCs' competition (Chiambaretto & Combe, 2023; Dennis, 2007; Graham & Vowles, 2006; Gillen & Gados, 2008; Morrell, 2005), which is also reflected by the keywords co-occurrence network. Though such an attempt experienced many failures, as we documented before, it did work under some circumstances, especially for the Qantas group. Homsombat et al. (2014) found that though Jetstar did not completely follow the route choice of the parent airline Qantas, once the latter was facing competition from other LCCs on a certain route, Jetstar would have a higher chance to serve that route as well. Zhang et al. (2017) also proposed the "fighting brand" function of Jetstar. The authors specially examined airlines' airport choice patterns in the regional market of Australia. The presence of Qantas discouraged the entry of Jetstar into the same airports, and the latter provided services at all airports that were served by Virgin, indicating that Qantas used Jetstar to compete with rival LCC. Srisaeng et al. (2014) noticed another low-cost competitor in the Australian market, Tiger Airways, deemed a considerable threat by the Qantas group notwithstanding the relatively small fleet size. Qantas group was forced to make a complete change in its strategy. After Tiger Airways started services on routes exclusively served by Qantas (e.g., triangle, a prosperous business centre of Australia), Jetstar also entered to help its parent company resist the new entrant. Considering the findings of the above researchers, it is not 100 % confirmed if Jetstar would be more likely to serve routes simultaneously with Qantas, where the latter is facing LCC competition, especially in regional markets. What can be inferred from these articles is that a "fighting brand" strategy might increase route overlap between group members but it does not mean serving identical markets. The key is to snatch the rival airline's market share, whether on routes solely operated by the rival or competed by the parent airline and the rival. In fact, the Qantas group experienced loss caused by cannibalisation. LCCs, including Jetstar, were so successful on Trans-Tasman routes that Qantas had to suspend its service (Gross & Lück, 2011).

The above studies, despite having solid empirical evidence and presenting some real cases (Cairns-Melbourne; Sydney-Melbourne-



Fig. 8. Collaboration network of all authors.

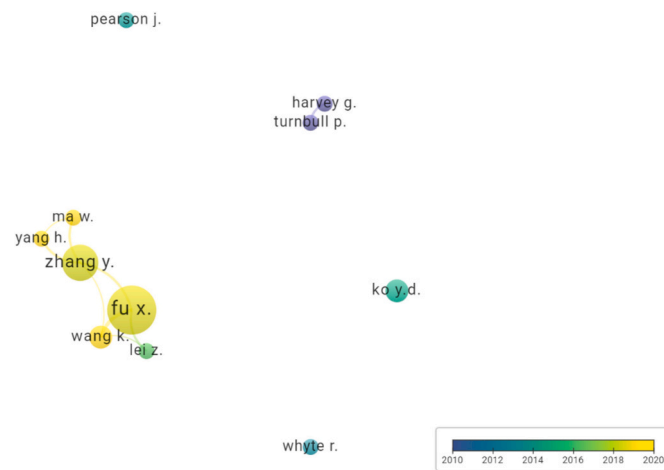


Fig. 9. Collaboration network of authors with at least 2 publications.

Brisbane) to substantiate their conclusion, cannot define the actual function of a subsidiary LCC. Another motivation can be called complementation or expansion, which means the airline group uses its different branches to serve distinct markets, like leisure and business routes, respectively (Douglas, 2010; Gillen & Gados, 2008; Graham & Vowles, 2006). Gillen & Gados (2008) identified the Singapore Airlines and Cathay Pacific groups as belonging to this category. The former's subsidiary, Tiger Airways, was modeled after the ultra-low-cost carrier Ryanair to complement its parent company's premium services. Raynes & Tsui (2019) argued that both the Qantas group and Singapore Airlines group followed a supplementation pattern since LCC and FSC within the same airline group separate their markets and avoid overlap to the fullest extent. Singapore Airlines group consists of 4 members, each focusing on a distinguished market: from short-haul to long-haul, and from low-cost to high-value. The parent FSC, Singapore Airlines, also faces intensive competition from foreign LCCs. But instead of using

subsidiary LCC as a "fighting brand", it chose to enhance its services and additional products, emphasising its position as a premium airline. The Qantas group experienced two stages in their AWA practice. The first subsidiary in the group is an FSC with only economy class cabin, the Australian Airlines. It aimed to complement the existing Qantas mainline service by flying to the destinations where the mainline could not gain enough return. This carrier ceased operation due to external shocks like SARS and the tsunami in 2004. The second subsidiary, Jetstar, was designated to serve tourism routes using a low-cost business model. Both groups managed to reduce overlap, unless on routes with significantly large demand, enough to operate two brands at the same time without causing market cannibalisation. On the other hand, the FSC needs to face competition from other LCCs independently. It should not be neglected that compared to those advocating "fighting brand", articles advocating this incentive were fewer and lacked empirical evidence.

The purpose of AWA might also depend on the status of the parent airline in market competition. Ma et al. (2021) identified different roles played by subsidiary LCCs in ANA and JAL groups. In Japan's duopoly domestic market, ANA has a competitive advantage; hence, its subsidiary, Peach, focuses on the international market. The relatively small JAL introduced its subsidiary Jetstar Japan to the country's domestic market. Wang, Wu, et al. (2024) discovered a similar situation in Indonesia. The national FSC Garuda Indonesia founded a subsidiary, LCC Citilink, as a "fighting brand" after its market share was considerably seized by a private LCC, Lion Air. On the other hand, Lion Air founded a full-service subsidiary Batik Air. Such LCC-led AWA is unparalleled, with no comparable cases being found in other countries. Being in advantageous status in the competition, Lion Air did not use Batik Air as a "fighting brand". The two carriers served different market segments to enlarge the source of customers for the group. Sometimes, the function of the subsidiary is not an either-or situation. On the trans-Tasman market, Jetstar's New Zealand branch, Jetstar NZ, tried to avoid head-to-head competition with FSC Air New Zealand. At the same time, it competed directly with the other LCC, Virgin, by precisely targeting low-cost travellers. Jetstar Australia then further connected these passengers to its international and/or Australian domestic destinations. Such collaboration and network synergy allow the group to expand its international

services (Wang et al., 2020). This is consistent with Whyte & Lohmann (2015)'s discovery that Jetstar transitioned from a domestic carrier to an international medium- and long-haul carrier and Qantas relied more on its subsidiary for its growth of market share.

4.2. Drivers of success

Some common factors were put forward to explain in which areas the early American and European AWA performed badly, compare them with the successful Qantas, and suggest how could the successors improve. They include differentiation between the parent airline and the subsidiary, autonomy and independent decision-making of the subsidiary, utilising the market power of the parent company and the ability to avoid cannibalisation (Graf, 2005; Graham & Vowles, 2006; Gillen & Gados, 2008; Taneja, 2016; Pearson & Merkert, 2014; Whyte & Lohmann, 2015). Differentiation and independence are both closely associated with lowering costs. By way of illustration, some pioneering subsidiary LCC offshoots in the US in fact kept multiple cabin classes just like traditional FSCs and were subjected to similar strict labour union constraints (Morrell, 2005). Established as a strategic business unit (SBU), Snowflake of the Scandinavian Airlines group directly adopted the parent company's staff and aircraft, consequently not being able to save enough costs (Dennis, 2007). Despite the overall negative evaluation of the AWA strategy, Graham & Vowles (2006) considered the market characteristics of Australia, including the duopolistic domestic market, high motivation of overseas expansion combined with the demand from international tourists, distinction between leisure and business markets etc. The difference between the Australian and US market could lead to the contrasting fate of their AWA.

Graf (2005) proposed ten recommendations to control the negative impact of creating a subsidiary LCC. To summarise, the fundament is that different branches serve each's targeted markets and customers. It is necessary to differentiate products and separate markets according to customer segments and regions. Furthermore, informing customers and employees about the differences in the products is also indispensable. This can secure expectations and avoid confusion and disappointment. Different branches should maintain independence, especially concerning branding and resources, and be granted a high degree of autonomy in operational decision-making. Meanwhile, independence should be restricted regarding strategic decisions to avoid competition between different business models and conflicting corporate strategies. Gillen & Gados (2008) attributed the successful implementation of AWA by Qantas, Lufthansa and Singapore Airlines to 5 reasons, which are consistent with Graf (2005)'s suggestions. FSC and LCC in the same group should separate in terms of operation without entering each other's business model, but not at the strategic level. They additionally mentioned the strong dominance power of the three airlines in each country's market. Such dominance results from historical reasons, such as government protection towards flag carriers and the international bilateral process, and it appeared to be another important basis for successful AWA. Khan et al. (2022) pointed out that though AWA effectively helped South Korean FSCs expand their markets, it only performed well in growing markets and was vulnerable to external disturbance because it did not fully follow the above-mentioned strategies. Heiets et al. (2021) investigated this problem from another standpoint: elements of collaboration in the same group. The case of the Qantas group indicated three areas of collaboration: network and scheduling, pricing and distribution, and fleet acquisition and engineering. Collaboration, to a certain extent, could promote brand images and make the group appealing to joint venture partners. The group did not avoid route overlap intentionally, instead, it managed to deploy the right mix of FSC and LCC capacity to meet customers' demands. This conclusion is supported by Ma et al. (2019) and Zhang et al. (2021), who argued that Qantas set up Jetstar as a "fighting brand", but the two group members simultaneously present in 95 markets out of Australia's top 144 domestic routes in August 2017. AWA strategy has allowed

maximum capture of consumer surplus of different customer segments.

The existence of a parent airline seems to be a double-edged sword. The previous paragraph emphasised the importance of the subsidiary's autonomy and independent decision-making. Parent airlines' intervention and control also curtail the subsidiary LCC's likelihood and/or speed of entering foreign markets, as the subsidiary has difficulty in implementing its own management decisions (Klein et al., 2015). However, an FSC that has already established strong market power to some extent can help its subsidiary achieve success. Air New Zealand created Freedom Air to compete with Kiwi Air. With endless resources provided by the parent company, Freedom Air can offer extremely low fares and fly at a loss, while Kiwi Air must make money (Gross & Lück, 2011). Qantas is the market leader in Australia and has the engineering, technical, planning, financial and marketing resources to support its subsidiary. Passengers taking either Qantas or Jetstar can enjoy the same frequent flyer programme. The group remained the leader for all outbound travel from Australia, even under the competition from Asian and Gulf airlines (Whyte et al., 2012; Whyte & Lohmann, 2015; Bamber, 2018). Using DEA window analysis, Hong & Domergue (2018) evaluated Korean airlines' efficiency and identified LCCs subsidised by other conglomerates or local governments, in addition to "independent" and "backed by parent FSCs (AWA)". Their results showed that subsidiary LCCs owned by FSC and conglomerates had higher efficiency than other LCCs owing to the halo effect. Many such subsidiaries nevertheless failed to seize a dominant market share because of cannibalisation within the group.

Labour policy is another critical perspective. Harvey & Turnbull (2006, 2010) and Sarina & Lansbury (2013) argued that well-organised employee groups in a subsidiary LCC would easily be dissatisfied with the "low road" employee relations (regimented jobs, strict hierarchy and antagonism between the parties), which are common for LCCs in order to reduce costs, especially when the parent FSC is adopting the very antithesis or the "high road" approach. Go, the subsidiary LCC of British Airways, avoided the "low road" employee relations and added emphasis on services while following the basic element of the low-cost business model. Go competed simultaneously on both price and service quality, achieving a higher degree of employee satisfaction with their work than the LCC easyJet. However, British Airways finally sold Go as the subsidiary was too successful in short-haul business markets, causing significant cannibalisation. Germanwings was another symbolic positive example of doing well in both labour policy and maintaining autonomy. It had its own brand, staff, and fleet (Graf, 2005; Lindstädt & Fauser, 2004). Owing to Lufthansa's limited participation in Germanwings, the latter was not restricted by the parent company's collective labour agreement and a strong labour union. The human resources management policy of Germanwings was a mixture of both "soft" and "hard" model, helping the airline achieve lower labour costs and higher job security than other LCCs. Like Go, its position is "premium LCC" or "best value for money" instead of pursuing the lowest price to attract leisure and business travellers. Route overlap did exist between Germanwings and Lufthansa, but in all other areas like branding, pricing, organisation, and staff, Germanwings was the most independent and separated subsidiary in Europe (Barry & Nienhueser, 2010; Graf, 2005). Oxenbridge et al. (2010) argued that the establishment of Jetstar provided Qantas with a way of reducing wages, work conditions, and the power of the trade union. First, the existence of the subsidiary LCC could justify wage reduction in the parent airline. Second, Qantas had ceded many of its leisure-oriented routes to Jetstar, which flies with fewer paid employees, hence lowering total wage expenses. From this perspective, reducing route overlap is beneficial in controlling labour costs.

In addition to the discussion above, Pearson et al. (2015) conducted a comprehensive study on the role of 36 intangible resources of competitive advantage for Asian airlines adopting different business models: FSCs, their subsidiary LCCs and independent LCCs. Overall, slot, brand, and product or service reputation were considered the most important

factors, while the three types of airlines each had their own core resource bundles. Regardless of being independent or attached to an FSC, all LCCs deemed slots to be a greater source of advantages as most of them are new entrants and slots are often considered to be the preserve of established airlines, predominantly FSCs. This is proved by Wang et al. (2017) that regulatory factors such as government regulation, slot and airport access are the main impediment to LCC growth in Asia. Instead, incumbent FSCs' competition did not play a significant role. Market characteristics also have a large impact. Subsidiary LCCs from service-oriented South Korea (i.e., Air Busan and Jin) notably emphasise service reputation to cater to customers' preferences. The importance of brand is a result of service homogenisation, especially at the basic service level (i.e., economy class or low-cost mode). The clear relationship between brand preference and purchase intention has already been empirically proved in both mainland China and Taiwan (Chen & Chang, 2008; Choe & Zhao, 2013).

5. Latest trends and future research directions

After having analysed the main questions in Section 4, a few articles also discussed the latest changes and trends (e.g., the impact of the pandemic) of AWA, implying future research directions. Recent literature shows that the impact of the COVID-19 pandemic remains unsure since its influence on different airlines/business models is possibly asymmetric, and the equilibrium in the long-run requires continuous attention and up-to-date assessment. Some researchers proposed the function of new technologies in airline management, which could be useful to address the risks in AWA operations. The application of such technologies and its effect should be further discussed in depth.

Ng et al. (2022) discovered the asymmetric fare-lowering effect of the pandemic on FSCs, LCCs and regional carriers. The impact is the least on FSCs and strong on regional carriers. Since being more slightly affected by the pandemic, the two duopoly FSCs, JAL and ANA, took aggressive actions and further controlled more LCCs. JAL increased its share in Spring Airlines Japan to become a major holder, and a new long-haul subsidiary, LCC, Zipair Tokyo, commenced operation in June 2020 when the pandemic was still at its peak. ANA founded a similar subsidiary, Air Japan, in 2022 to serve the long-haul low-cost market. The situation in Japan after the pandemic seems to have subverted the conventional belief that LCC is suitable on short-haul routes. Soyk et al. (2018) already suggested that there is no revenue disadvantage for North Atlantic long-haul LCCs when compared to FSCs in the same market, while the long-haul point-to-point operation is discovered to be more competitive in a post-pandemic era, with higher seat-load factors, yields, and network flexibility according to Bauer et al. (2020). The market effect of the two Japanese long-haul LCCs and their relationship with parent airlines are well worth continuing attention and further investigation. Khan et al. (2022) argued that since the negative economic impact of COVID-19 could make passengers shift from FSCs to LCCs, adopting AWA can bring many FSC customers struck by the pandemic crisis back to the same airline group. These passengers value the reputation of established airlines and prefer their subsidiary LCCs rather than independent LCCs. The LV model also proved that AWA performed better in a growing market, and may stimulate growth. Such a conclusion indicates that the pandemic may be an opportunity for AWA operators as they could introduce subsidiaries on more routes. In addition, there are already some papers examining the changes in market competition amid the pandemic (Zhang et al., 2023), and they suggested that airlines tended to be aggressive after being struck by such an external disruption as they wanted to invade their rival's market segment. These changes would also make airline groups change their AWA strategy to survive the intensified competition, as Indonesian airline groups showed (Wang, Wu, et al., 2024). It should be noted that the Indonesian market has a special case: Lion Air group, which has a LCC parent airline and a FSC subsidiary. There are probably some differences in terms of operation strategy between traditional FSC-led and

LCC-led airline groups, yet the details need to be confirmed by future research.

Despite the common opinions on how to ensure the success of AWA proposed by Graf (2005) and Gillen & Gados (2008), some airline groups did not fully follow them as doctrine yet still survived the competition and even prospered (Heiets et al., 2021). The exact operation pattern of each airline group requires empirical examination. Whose work comprehensively elaborated the Australian market: how Qantas used Jetstar to compete with Virgin and took back the lost market share and the change of each carrier's fare level. A deeper investigation into each airline group's behaviour is essential to understand the market structure and special characteristics of a specific country. Furthermore, Zhang et al. (2021) observed the route overlap between Qantas and Jetstar, and proposed some advantages of developing artificial intelligence (AI) into yield management systems. For example, helping airlines better understand supply and demand at each fare bucket, offering personalised fare, and capturing and transferring consumer surplus from passengers of each segment to the airline. These would be helpful to avoid market cannibalisation and maximise profit. By far, research on AI applications in yield management, especially for AWA groups is still limited. Exploring the effect of the new technology could offer valuable management implications to airline groups.

6. Conclusions

This paper reviewed 47 pieces of literature on AWA published before the fourth quarter of 2024. With focus on two core questions: the determinants of successful AWA practice and the purpose of setting up AWA, this study reveals the complex nature of such strategy, the incompleteness of traditional views on its operation approach, the impact of each market's unique features and the need of carrying out more empirical research.

Our primary contribution is providing an up-to-date and thorough evaluation of existing literature on AWA. We summarised various opinions on the reasons for previous AWA practice's failure or success, the intentions of establishing a subsidiary with different business models and their cases. Seeking consensus among the literature, the subsidiary should be granted an appropriate degree of autonomy as the low-cost and full-service business models require independent decision and operation management. Meanwhile, the parent airline keeps its decisive power with regard to strategic decision-making to guarantee strategic consistency in the group. If an airline group wants to compete with another independent LCC, the low-cost member in the group must control its costs sufficiently to gain competitiveness. The low-cost and full-service business model should not intervene with each other, making sure each of them is pursuing their distinguished position. Cannibalisation is unavoidable even for successful AWA practices like Qantas. The fundamental concern in route planning is flexibly adjusting their services according to profitability instead of adhering to route separation or overlap. Therefore, even for a well-examined airline group, conclusions of current literature might vary depending on time, methodology or routes/markets examined. Experience from one country might not fit another country. Finally, though not a core area of attention, slot and regulation were found to be a constraint for all LCCs, including those subsidiaries of established airlines. Further deregulation is necessary. We propose a drawback of the current publication is that they did not fully consider the nuances between different markets. Future research should concentrate on certain market contexts. We also identified some research gaps and the latest trends on this subject: lack of attention on LCC-led AWA, changes in market competition and airline group operation after the pandemic and the emergence of long-haul LCC in AWA.

Our literature review is not without its limitations. Firstly, despite the systematic review process and incorporating all existing keywords known to the authors, there is a possibility of selection bias and omissions. Also, some selected papers did not focus on AWA but just

mentioned it while discussing other subjects. Secondly, due to the complex nature of the AWA business model, our literature review cannot give a universal conclusion on the best AWA operation strategy. Besides, the scarcity of publications on the latest trend of AWA makes our analysis regarding this area insufficient. The above-mentioned issues are left for other researchers to address them further. Still, we believe that this literature review could serve as a foundation for future studies and can help the industry and academia navigate through the assorted AWA literature and outline key outcomes about the topic.

CRedit authorship contribution statement

Weicheng Wang: Writing – original draft, Formal analysis. **Xiao-wen Fu:** Writing – review & editing, Validation, Supervision. **Kun Wang:** Writing – review & editing, Writing – original draft, Data

Appendix A. Appendix

Table A.1

Complete list of all articles selected in the literature review.

Author	Year	Object	Methodology	Major findings	Citation
Morrell	2005	US AWA	Case study	Many early US AWA attempts failed due to the unclear differentiation between group members, no enough autonomy for the subsidiary and high labour costs imposed by the trade union.	192
Graham and Vowles	2006	Global AWA	Case study	Market cannibalisation is a significant risk for airline groups. Still, the AWA strategy may work under certain conditions. The authors predicted that Australia is a market place for adopting such strategy.	165
Dennis	2007	European AWA	Case study	Lufthansa's Germanwings is efficient to serve different market niches, but most AWA failed. One example is Snowflake under SAS, which directly employed the parent company's fleet and staff, consequently cannot save costs yet affected the business of the parent company.	153
Graf	2005	European AWA	Case study, survey	There are substantial incompatibilities between the LCC and FSC models within the same group. Germanwings was successful due to fewer labour restrictions than the parent company and high autonomy.	120
Gillen and Gados	2008	Global AWA	Case study	The parent company must have a strong market dominance. Singapore Airlines and Cathay Pacific established subsidiaries to enter markets while Qantas and Lufthansa did so to meet LCC competition.	107
Pearson et al.	2015	49 Asian airlines	Survey	Various resources of competitive advantages were identified. All LCCs ranked slots as the first resource; subsidiary LCCs and FSCs should emphasise more on managerial competence and experience.	103
Homsombat et al.	2014	Australian market	Econometric analysis	The FSC Qantas established subsidiary LCC Jetstar to serve as a "fighting brand", competing with another LCC, Virgin Australia.	102
Pearson and Merkert	2014	Global AWA	Case study	Many subsidiary LCCs had low load factors, hence cannot offset low yields by high traffic. Other problems are late entrance, tight control and low dissimilarities from the parent company.	100
Lin	2012	No specific object. Qantas Group and ANA Group are two examples	Modelling	FSC's hub-spoke network is preferred if passenger differentiation between one-stop and point-to-point services and transit time are small. If not, establishing point-to-point subsidiary LCC is better.	69
Harvey and Turnbull	2006	British AWA	Case study	The article focused on labour policy and management. Go (under British Airways) avoided adversarial labour-management relation. It also combined low fare and "service surprise" to compete on short-haul routes.	49
Lindstädt and Fauser	2004	Lufthansa group	Case study	FSC can transfer unutilised aircraft to its subsidiary; both carriers should have clear focus and adequate operation and cost structure on their dedicated segments.	48
Whyte and Lohmann	2015	Jetstar	Case study	Jetstar benefited from clear differentiation and strong parent company. Despite the overall success, there was also a sign of cannibalising Qantas mainline services.	47
Zhang et al.	2017	Australian regional market	Econometric analysis	Jetstar served as a "fighting brand". It entered an airport only if the airport was also served by Virgin Australia.	44
Barry and Nienhueser	2010	Germanwings	Case study	Germanwings' labour policy is unlike that of Ryanair, which adopts hard labour cost cutting. Instead of being the lowest cost, Germanwings sought to provide the best value for money. The employment relations are devolved to the establishment level to seek higher flexibility in wages, staffing and labour utilisation.	40
Fageda and Flores-Fillol	2012	Impact of regional jet and subsidiary LCC on networks	Modelling, econometric analysis	Subsidiary LCCs are used by network airlines on long-haul routes with high proportion of leisure travellers.	40
Harvey and Turnbull	2010	Go Fly (under British Airways)	Case study	Subsidiary LCCs may face more pressure from organised employee groups than independent LCCs; Go's strategy is adding emphasis on services while following all basic elements of the low-cost model.	40

(continued on next page)

curation. **Xiaoqian Sun:** Resources, Project administration, Investigation, Conceptualization. **Sebastian Wandelt:** Methodology, Formal analysis, Data curation. **Jianda Wang:** Visualization, Validation, Supervision. **Xiangru Wu:** Formal analysis, Validation, Writing – review & editing.

Declaration of competing interest

None.

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Table A.1 (continued)

Author	Year	Object	Methodology	Major findings	Citation
Ko	2016	3-carrier market (FSC, its subsidiary and LCC. Same hereafter)	Modelling	An FSC can make more profits when colluding with its subsidiary LCC and positioned as a Stackelberg leader. Subsidiary LCC and FSC can focus on short-haul and medium-haul routes respectively in both collusion and the Stackelberg game.	36
Ng et al.	2022	Japanese market amid COVID-19	Econometric analysis	LCCs' entry could further promote the duopoly of ANA and JAL due to their affiliation with FSCs.	35
Su et al.	2020	LCC-HSR competition in China	Econometric analysis	AWA reduced Chinese airline groups' fare and profitability, probably due to the mixed ownership of the subsidiaries in a less deregulated market.	24
Oxenbridge et al.	2010	Employment relations in Qantas and Aer Lingus	Case study and survey	Qantas used the competition from Virgin and the low-cost model of Jetstar as a spur to make trade union reduce relative wage costs and working conditions; Jetstar followed the management model of Ryanair.	23
Douglas	2010	Entry, fleet choice and cabin composition of airlines	Case study	Jetstar's route entry pattern followed a "phased separation" strategy proposed by Markides and Charitou (2004).	21
Raynes and Tsui	2019	Singapore Airlines group and Qantas group	Case study	The routes of the subsidiary and parent company should be separated.	21
Taneja	2010	Airlines worldwide	Case study	Main success factors of AWA lie in implementation without compromising the brand, and management's ability to execute innovation. Other strategies include unbundling both products and the organisation into separate business units like Air Canada. The key of unbundling is that one's labour force has no access to others' cash and resources.	21
Huettinger	2006	Baltic and North European AWA	Case study	SAS, while still positioned as FSC with a developed network structure, reduced its services and fare. It owns Air Baltic, a "mixed" airline fitting the specific Baltic market conditions and serving selected profitable routes.	20
De Roos et al.	2010	Australian market	Econometric analysis	The competition between Qantas and Virgin amplified fare variation. Such effect was not observed in the competition between Jetstar and Virgin.	19
Srisaeng et al.	2014	Australian LCC	Case study, data analysis	Discounts raised with the increase of the number of airlines on the route. Initially, Qantas and Jetstar's routes were separated. But later overlap increased to compete with Virgin and Tiger Airways. Virgin rebranded itself and added services, competing more with Qantas instead of Jetstar.	19
Wang et al.	2020	Trans-Tasman market	Econometric analysis	Jetstar NZ and Jetstar Australia's close collaboration allows the brand to connect its passengers across the Tasman Sea to long-haul destinations. Such effect was not observed for Qantas. Network synergy is more easily achieved by airlines of the same business model instead of the same group.	19
Zhang et al.	2018	Australian market	Econometric analysis	Virgin's fare adjustment is moderate, while Qantas and Jetstar adjust fare significantly in response to Virgin's pricing dynamic. There is no strong evidence of joint price-setting between Qantas and Jetstar.	19
Ma et al.	2019	Australian market	Econometric analysis	Increase in the major airlines' capacity and Qantas' 65 % market share commitment trigger price war. LCCs have not implemented consistent and independent pricing strategies.	17
Ko	2019	Fare and seat allocation in the 3-carrier market	Modelling	To maximise the group profit, FSCs may increase fare by adding business classes after its subsidiary LCC's entry. Rival independent LCC tends to lower its fare to secure its demand.	16
Danaher et al.	2011	Jetstar	Econometric analysis, survey	Jetstar evolved from an exclusive "low price" model to cost-effective improved services, which had a huge effect on consumer perceptions. Both the quality and price competitiveness gap with Virgin narrowed dramatically during the period of study.	15
Gross and Lück	2016	LCCs in Australia and New Zealand	Case study	LCCs in Australia and New Zealand differ from that of European and North American ones in level of services and geographical conditions of market served. Strong parent companies like Air New Zealand and enough deregulation contribute to the success of AWA.	15
Sun	2017	Korean market (Jeju routes)	Modelling, econometric analysis	FSCs could compensate their losses after the entry of new independent LCCs by subsidiary LCCs, either by replacing their previous services with the subsidiary or operating simultaneously on the route.	15
Ma et al.	2021	Northeast Asian LCCs	Econometric analysis	Subsidiary LCCs play different roles in ANA and JAL groups.	15
Whyte et al.	2012	Virgin Australia	Case study	As a group, Qantas' AWA strategy has many advantages such as frequent flyer points and an extensive network Virgin finally moved from a traditional LCC status by improving services.	14
Hong and Domergue	2018	Korean LCCs	Case study, DEA	Subsidiary LCCs have higher efficiency than independent LCCs. Their parent companies are still the dominant forces in the market.	12
Ko and Hwang	2011	3-carrier market	Modelling	Under different types of demand fluctuation, sum profit of the airline group is larger than FSC alone. The entry of subsidiary LCC can lower the fare of rival independent LCC.	11
Klein et al.	2015	29 European LCCs	Econometric analysis	Subsidiary LCCs are subject to the control and intervention from the parent company and slow decision-making. As a result, they are less likely to expand overseas.	10
Heiets et al.	2021	Qantas Group	Case study	The strategy of Qantas group was based on disruption management, precision turn-around schedule and cross-utilisation with international aircraft.	8
OConnell and Vanoverbeke	2015	Philippine Airlines	Case study	Philippine Airlines converted its subsidiary LCC to a short-haul regional carrier in order to realign the service standards so that both airlines provide seamless products. But this is questionable as most of the growth on the domestic market is from low-cost markets and other LCCs are expanding.	8
Bamber	2018	Australian LCCs	Case study	Jetstar can enjoy support from Qantas in terms of buying planes, lobbying governments, and fuel hedging. But it also subject to work practices and	7

(continued on next page)

Table A.1 (continued)

Author	Year	Object	Methodology	Major findings	Citation
Sarina and Lansbury	2013	Qantas Group	Case study	high-wage costs associated with the contracts between Qantas and trade unions.	7
Chiambareto and Combe	2023	European airlines	Case study	As the external environment became turbulent, employment strategies of Qantas and Jetstar converged to “hybrid” instead of “high” or “low” mode. FSCs in Europe sought economic performance on short- and medium-haul routes by the creation of subsidiary LCCs since were unable to restructure themselves like US carriers due to legal reasons.	5
Khan et al.	2022	Korean market	Modelling	Subsidiary LCCs and independent LCCs tend to collude when the market is growing and compete in saturated or declining markets. Independent LCCs seem to be more stable under disruption.	3
Rüger and Maertens	2023	Sustainability of European airlines	Case study	Tightening environmental regulations bring more pressure on LCCs, given the usually greater price elasticity of private and leisure travel demand. FSCs use subsidiary LCCs in leisure markets to supplement their premium and hub-connection services.	3
Zhang et al.	2021	Airline yield management	Case study	All Australian carriers simultaneously served on most of the busy and profitable domestic routes. AWA strategy enabled maximal capture of consumer surplus of segmented customers.	2
Wang et al.	2024		Econometric analysis	Garuda Indonesia and Lion Air had different motivations to adopt AWA. COVID-19 intensified competition and both groups increased route overlap, having more inclination to use subsidiary as “fighting brand”.	0

Table A.2

Fleets of LCCs recorded in Tables 1 and 2.

LCC in AWA group	Fleet composition
Continental Lite	DC9, B737
Shuttle by United	B737
Delta Express/Song	B737
Metrojet	B737
Zip	B737
Ted	A320
Basiq Air (Transavia)	A320, B737
Buzz	B737, BAe146
Germanwings	A319, A320, B717, MD80
Swiss European	A220, B777, BAe 146
Go Fly	B737
Deutsche BA	B737, various regional aircraft
Bmibaby	B737
Centralwings	B737, MD80
Blue1 oy	B717
Snowflake	B737, MD80
FlyNordic	MD80
Jetstar	A320, A321, B787
9 Air	B737
Chengdu Airlines	A319, A320, A321, C909
China West Air	A319, A320, A321
China United	B737
Lucky Air	A320, A330, B737
HK Express	A320, A321
Air India Express	A320, B737
Citilink	A320, A330, ATR72 (one cargo B737)
Lion Air	A330, B737
Jetstar Japan	A320, A321
Zipair Tokyo	B787
Air Japan	B787
Peach Aviation	A320, A321
Air Do	B737, B767
Jetstar Asia	A320
Jin Air	B737, B777
Air Busan	A320, A321
Air Seoul	A321
Scot	A320, A321, B787, Embraer E-jet E2
Tigerair Taiwan	A320
Pacific Airlines	A321 (B737 before 2020)
FlyArystan	A320
Eurowings	A319, A320, A321
Eurowings Europe	A319, A320, A321
Pobeda	B737
SunExpress	A320, B737
Transavia France	A320, A321, B737
Transavia.com	A320, A321, B737
Vueling	A319, A320, A321

(continued on next page)

Table A.2 (continued)

LCC in AWA group	Fleet composition
SAS connect	A320
Sunwing	B737
Wingo	B737
Air Cairo	A320, ATR72, Embraer E-jet
Air Arabia Abu Dhabi	A320

Source: Cirium database and airlines' official websites.
Note: (1) Regional aircraft of Deutsche BA: Dornier 228, Fokker 100, Saab 2000 and Saab 340 A.
(2) Blue 1 oy initially operated regional aircraft and transferred to narrow-body aircraft since 2000s.
(3) A refers to Airbus and B refers to Boeing.
(4) Leased aircraft are displayed in italics.

Data availability

Data will be made available on request.

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