Identifying challenges of aviation growth within the South Pacific Region

A thesis presented in partial fulfilment of the requirements for the degree of

Doctor of Philosophy

in

Aviation

at Massey University, Manawatū Campus,

New Zealand

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2022

Dedication

to

my grandparents (rest in peace):

Sione Fifita and Kalolaine Latu Takau Fifita

and

Sione ‘Osamu and ‘Ana Sivai Paea ‘Osamu

Abstract

The aviation and tourism industries are major cornerstones of economic and social development within the South Pacific Region (SPR). The SPR is a tourism-dependent region with air transport as the primary mode of transport for inbound tourists, given its geographical isolation from the rest of the world. Despite the importance of the aviation industry for the tourism sector and economic development within the SPR, there are continual challenges for the aviation industry within the SPR to grow and be sustainable. This PhD thesis investigates three key and related challenges facing the aviation industry within the SPR during different stages of the COVID-19 era. Chapter 1 examines the effects of the aviation sector on tourism growth within the SPR via econometric estimation for data collected from 2008 to 2018. It was found that the aviation industry has positively influenced tourism growth within the SPR, which justified government support for aviation and tourism growth during the pre-COVID-era. Chapter 2 explores the perspectives of stakeholders on aviation subsidy programmes within the SPR through interviews and thematic analysis amid COVID-19 era. It was found that the SPR countries' aviation sectors are heavily reliant on aviation subsidies to operate and develop, but may also be subject to political influence and misuse. Because of the scale of the problem, it was noted that the SPR governments could not provide sufficient support for aviation operators during the COVID-19 pandemic. Chapter 3 systematically reviews the literature and publications (2010–2021) regarding the strategies for mitigating and controlling the impacts of pandemics on the air transport and tourism sectors during the post-COVID-19 era. The findings highlighted the importance of travel-related policies and measures (e.g., border closures and travel restrictions, quarantine and isolation, hygiene measures, virus testing, contact tracing, airport screening and other measures) for mitigating and controlling future pandemics that may happen within the SPR. Overall, the three empirical studies comprising this PhD thesis contribute to the aviation and tourism literature of a under-researched region (SPR) by providing insights from multiple dimensions, including international inbound tourism, aviation subsidies, travel-related policies and measures for future pandemics. It also provides evidence-based policymaking, pragmatic and practical insights for policymakers and industry stakeholders to develop the SPR's aviation, tourism and economies.

Acknowledgements

"*Fakafeta'i 'Eiki 'i hono tataki 'a e vaka ni, pea kuo taulanga 'i he kelesi 'ata'atā pe 'a e 'Afiona. Ke ma'ae 'Eiki pe 'a e langilangi.*"

Firstly, I thank my main doctoral supervisor, Associate Professor Wai Hong Kan Tsui, Massey University (New Zealand) for your thorough, timely feedback and ongoing guidance throughout this journey, even during the lockdown periods. Additionally, I thank my co-doctoral supervisors, Professor Xiaowen Fu (The Hong Kong Polytechnic University, Hong Kong) and Associate Professor Andrew Gilbey (Massey University, New Zealand) for their ongoing support and guidance on this journey. I appreciate the support provided by the School of Aviation, Massey University. I acknowledge the support provided by my interviewees especially during the COVID-19 era.

I acknowledge the financial support provided by the Ministry of Foreign Affairs & Trade New Zealand Aid Scholarship to facilitate this research. This endeavour would not have been possible without this support. Additionally, the financial grant received from the Massey University Pasifika Doctoral Scholarships 2019 contributed to my research. The continuous support of the Massey University Pacific Student Success Office of the Provost, Massey University New Zealand Aid support team, the Massey University Graduate Research School team and the Pasifika communities here at Papaioea, especially my Tongan community (PN Tongan Methodist, THS ex-student Papaioea Chapter) and friends (Fonua and Siu's family). To my Palmy family, Tilisi and Faiva Tongatu'a and family, your continual support was instrumental for the completion of my PhD journey. To all my friends and family (especially in Tonga) and around the world for your encouragement and endless prayers.

Of course, a big *Malo 'Aupito* must be made to my parents, Lopini and Vaioleti Fifita. Whom I owe everything that I am. Thanks also to my second families, Takilisi (RIP) and Lilieta Nau and Peni and Mele Lefai and Salesi family (my in-laws), my mehikitanga, Melenaite Havea and family. *Malo lahi* to you all for your love. To all my siblings (Sione Tu'itupou, Melenaite, Sonia, Kalolaine, Katrina and Liliani) and your families, thank you for always being my circle of strength.

Finally, and above all, I must express my immeasurable gratitude and my love to my husband, Lei’ataua Salesi. This research would not have been possible without your sacrifice, support, dedication and love. I wish to acknowledge our Tite Jr, who alongside my husband, understand the magnitude of this venture and the demands it has made on our family life. Fakafeta’i ‘Eiki kuo tau ikuna.

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Introduction

The aviation and tourism industries are vital for the social welfare, wellbeing and economic development of the South Pacific Region (SPR) (Cheer et al., 2018; Taumoepeau, 2016). For example, tourism-related activities accounted for approximately 86.77% of the Cook Islands' gross domestic product (GDP), and 40% of the GDPs of Vanuatu and Niue (South Pacific Tourism Organisation (SPTO), 2018). In addition, the SPR is geographically isolated from key international tourism markets, and there is no real substitute transportation mode for aviation available to international tourists visiting SPR destinations (Prideaux & McNamara, 2013). Due to the remote geographical location of the SPR, the SPR countries' primary means of connection to the world is via air transport (Taumoepeau et al., 2017). Hence, the aviation industry plays a critical role in the region's tourism and economies. This particular situation presents a paradox, as the SPR countries rely heavily on international inbound tourism for their economic growth, but their aviation industries continue to face challenges to operate and grow, which have been amplified and devastated by the COVID-19 pandemic (e.g., Cheer et al., 2018; Connell, 2021; Craig et al., 2020; Gounder & Cox, 2021; Kissling, 2014). This PhD thesis examines the critical challenges to the sustainable growth of the aviation sector within the SPR and, ultimately, tourism and economic development during different stages of the COVID-19 era.

The SPR comprises 15 small island countries with emerging economies, limited natural resources and relatively small populations dispersed across the Pacific Ocean (Cheer et al., 2018). The SPR countries have a total population of about 11.8 million, with the majority of the population accounted for by Papua New Guinea (8.9 million) and Fiji (0.9 million). The remainder is distributed amongst the other 13 SPR countries. The SPR's small population implies small markets for trade and air travel, often leading to a lack of sustainability in the air services within the SPR (Taumoepeau et al., 2017). Due to limited population within the SPR, the SPR relies heavily on international tourism to support its tourism and aviation sectors and economies. Importantly, tourism is vital for the sustainability of air services and the economic development of the SPR. Before the COVID-19 pandemic began, the SPR's tourism sector had experienced an upward trend, with a 1.6% increase in the number of tourist arrivals from 2017 and 2018, and it received 2.14 million international tourists in 2018 (SPTO, 2018). The majority of international tourists to the SPR arrived from Australia (28.9%) and New Zealand

(21.8%), followed by the United States (US) (10.5%) and Europe (9.7%). However, the COVID-19 pandemic effectively ended international inbound tourism to the SPR countries.

Arguably, the SPR presents a unique opportunity for investigation in this PhD thesis, given the highly researched markets in developed countries, such as Australia, South Korea, the United Kingdom (UK) and the US. Importantly, the International Civil Aviation Organisation's (ICAO) "No Country Left Behind" initiative highlighted the need for inclusivity, particularly regarding small countries (e.g., the SPR countries) that may be neglected because of their size and geographical isolation (ICAO, 2015). Furthermore, the aviation industry in the SPR has received very little research exploring the challenges that affect its aviation growth. Prior literature on the SPR's aviation sector has argued that the main challenges for SPR airlines stem from the region's geographical isolation from the rest of the world and tourism source markets. Such challenges are not specific to the SPR's aviation industry but rather to the SPR region as a whole (Guthrie, 2013). A few studies have suggested that the SPR governments' excessive interference, attaching national pride to national airlines and perceiving the air transport sector as a public utility, often contribute to the challenge (Taumoepeau, 2014; Taumoepeau & Kissling, 2013). Emerging studies have also highlighted the devastating impacts of the COVID-19 pandemic on the SPR's aviation and tourism, as well as the SPR's economies and wellbeing (Connell, 2021; Scheyvens & Monovo, 2020; SPTO, 2020). Similarly, the Pacific Aviation Safety Office (PASO), the SPTO, and the ICAO recognised the shared challenges for the aviation and tourism sectors within the SPR (ICAO, 2021; PASO, 2021; SPTO, 2020), including being isolated from tourism source markets and inadequate government policies for supporting aviation (e.g., aviation subsidies) during the COVID-19 pandemic.

Therefore, this PhD thesis is motivated by examining multiple continuing challenges affecting the growth of the aviation and tourism sectors, as both are vital sectors for economic growth and sustainability in the SPR. This PhD thesis aims to address gaps in aviation and tourism research on the challenges to the SPR's aviation and tourism development. The findings of this PhD thesis may assist governments and other stakeholders in designing and implementing the most effective policies and strategies to facilitate and promote the growth of the SPR's aviation and tourism industries. Importantly, this PhD thesis aims to investigate three key but related

challenges facing the aviation sector and, ultimately, improve aviation, tourism and economic development within the SPR during pre, amid and after the COVID-19 era.

Research objectives

This PhD thesis recognises the significance of the SPR's aviation and tourism sectors to their economic development and wellbeing and analyses the critical challenges to the growth and sustainability of the aviation sector within the SPR (an under-researched region). Therefore, this PhD thesis sets out to fulfil the following three research objectives:

1. How do aviation and its key determinants affect tourism growth in the SPR?
2. What are the goals and effects of aviation subsidies on the SPR's aviation development?
3. What could be learnt from past and present pandemics so that the SPR can better cope with future pandemics?

As mentioned above, this PhD thesis empirically examines three key but related challenges to the development and growth of aviation within the SPR via three distinct chapters during the pre-, amid and post COVID-19 era. Chapter 1 investigates the aviation–tourism nexus in the SPR during the pre-COVID-19 era. Chapter 2 focuses on exploring the perspectives of aviation stakeholders on aviation subsidy programmes to support and sustain aviation and tourism growth within the SPR before and amid COVID-19 era. Chapter 3 reviews the literature and publications regarding travel-related policies and measures for mitigating and controlling the impacts of pandemics and proposes effective strategies and measures for the SPR to deal with future pandemics in the post-COVID-19 era.

Chapter 1 focuses on how aviation and its key determinants affected the inbound tourism growth of the SPR during the pre-COVID-19 era. This chapter uses the two-stage least squares (2SLS) model to empirically analyse the interactions between aviation and tourism within the SPR. This chapter found that the aviation industry positively influenced international tourists travelling to the region. However, international inbound tourism demand for the SPR is not sensitive to the income level of the source markets. In addition, this chapter recommends government support for the aviation sector through non-restrictive air transport policies and calls for regional cooperation between the tourism and aviation sectors.

Chapter 2 focuses on exploring how aviation subsidies affect the SPR's air transport and tourism development and wellbeing before and amid COVID-19 era. This chapter uses a qualitative methodology (interviews and thematic analysis) to explore the perspectives of key stakeholders about the issues of aviation subsidies and how they impact on aviation and tourism, and social, economic and environmental wellbeing within the SPR. This chapter found that SPR countries are heavily reliant on aviation subsidies for the development and sustainability of their aviation industries, but subsidies are subject to political influence and misuse. Additionally, aviation subsidies facilitate airfare affordability, flight accessibility and service sustainability within the SPR. This chapter also suggests a formal aviation subsidy framework to be established for the SPR and calls for a collective, regional and cross-sectional approach to help the SPR countries recover from the COVID-19 pandemic.

Chapter 3 focuses on identifying and proposing travel-related policies and measures to mitigate and control future pandemics in the SPR during the post-COVID-19 era. This chapter uses a systematic review, content analysis and meta-regression analysis to explore travel-related policies and measures for handling past and present pandemics, and thus identify effective travel-related policies and measures and policies for the SPR to cope better with future pandemics. This chapter found that short-term strategies (i.e., border closures and travel restrictions, quarantine and isolation, hygiene measures, virus testing, contact tracing, airport screening and other measures) and a long-term strategy (i.e., vaccination) should be implemented by the SPR governments and aviation and tourism sectors to tackle future pandemics within the SPR. Additionally, this chapter suggests that robust inter-governmental and regional collaboration and coordination, a risk-based approach and aviation subsidies are required to ensure the effective and efficient implementation of travel-related policies and measures for mitigating and controlling future pandemics within the SPR.

Contributions and managerial implications

This PhD thesis provides a number of contributions to the air transport and tourism literature, and the findings provide managerial insights and policy implications for the SPR's governments and key stakeholders (airlines, airports, tourism authorities and operators) to improve and safeguard the SPR's aviation and tourism growth, which will ultimately facilitate the SPR's economic growth:

1. Theoretically, this PhD thesis is among the first research studies to empirically examine the interactions between the aviation and tourism sectors within the SPR (an under-studied region). It identifies the key determinants of international inbound tourists to the SPR by air during the pre-COVID 19 era and, more importantly, it highlights key areas that should be prioritised when establishing or updating sustainable development policies and strategies for air transport and tourism within the SPR (see Chapter 1).

2. This PhD thesis is among the first research studies to empirically analyse aviation subsidy programmes within the SPR and explore the perspectives of key stakeholders on aviation subsidy programmes' impacts on aviation, tourism, and economic, social and environmental wellbeing. It should be noted that the majority of the aviation subsidy literature has focused on single-country analyses, but this PhD thesis conducts a cross-sectional and cross-national analysis of aviation subsidy programmes within the SPR via the qualitative approach (see Chapter 2).

3. This PhD thesis documents and provides insights into the impacts of the COVID-19 pandemic on the air transport and tourism sectors within the SPR. It explores the perspectives of key stakeholders on the impacts of the COVID-19 pandemic on the SPR's aviation and tourism and highlights the need for aviation subsidies for the sustainable growth of aviation and tourism amid and in the post-COVID-19 era (see Chapters 2 and 3).

4. This PhD thesis contributes to the limited contemporary research focusing on aviation, tourism and the COVID-19 pandemic in the SPR. The findings of this PhD thesis urge the SPR governments to implement both short-term travel-related policies and measures (i.e., border control and travel restrictions, quarantine and isolation, hygiene measures, virus testing, contact tracing, airport screening and other measures) and a long-term strategy (vaccination) to address future pandemics in the SPR (see Chapter 3).

5. This PhD thesis provides a platform for understanding the SPR's aviation and tourism during pre, amid and post COVID-19 era. Chapter 1 analyses the pre-COVID air transport and tourism relationships within the SPR. Chapter 2 explores the key stakeholders' perspectives of aviation subsidy programmes prior to and during the early phase of the

COVID-19 era. Chapter 3 proposes effective travel-related policies and measures to deal with future pandemics within the SPR during the post-COVID-19 era. Importantly, the findings of this PhD thesis provide evidence-based policies and suggestions, and pragmatic and practical insights for policymakers and industry stakeholders (e.g., government officials, regional organisations, executives of airlines, and tourism authorities and operators) to support aviation and tourism growth and manage future pandemics within the SPR by designing and implementing effective aviation subsidy programmes, and travel-related policies and measures to cope better with a future pandemic. Importantly, this PhD thesis highlights the importance of regional coordination within the SPR to promote aviation and tourism growth, and manage future pandemics (see Chapters 1, 2 and 3).

A formatting note

The studies presented in this PhD thesis have been reproduced as they were already published or submitted for publication. However, there have been some editorial changes made to all the studies in terms of formatting (e.g., tables and figures), referencing style (this PhD thesis uses APA 7), spelling and the use of third person to ensure consistency throughout the thesis. All the acknowledgements have also been removed from the studies. Accordingly, there may be superficial differences among the studies reproduced in this thesis. The versions given here have been published or are under review, but no changes have been made to the substance of the studies. Also note that when the term "chapter" is used, this refers to the whole chapter, including the preamble, whereas the term "study" is used when only referring to the work that has been published or is under review for publication. There may be repetition in many places in this PhD thesis. In accordance with the *Massey University Graduate Research School's Doctoral Thesis With Publication Guidelines*, it is noted that repetition in the thesis with publication pathway cannot be avoided.

Chapter One – Air transport and tourism within the South Pacific Region

Preamble

The air transport and tourism sectors within the SPR are critical for economic development. However, there is a lack of research on the aviation and tourism sectors within the SPR. This leaves not only gap in aviation and tourism research, but also prevents the SPR's governments and other stakeholders from developing and implementing the most effective policies and strategies to promote the growth of the aviation and tourism sectors. This chapter addresses the first research objective of the PhD thesis (i.e., how aviation and its key determinants affect tourism growth in the SPR and provides empirical evidence of the aviation–tourism nexus within the SPR during the pre-COVID-19 era. This chapter found that scheduled airline capacity positively influenced tourist numbers visiting and travelling to the SPR and contributed to tourism growth. A 2SLS model was used to examine key determinants of inbound tourists to four SPR countries (i.e., the Cook Islands, Fiji, Samoa and Tonga) originating from their largest tourism source markets (Australia and New Zealand). The four SPR countries represent different levels of economic development within the SPR, which provides a good representation of the SPR. This chapter contributes to the air transport and tourism literature featuring the SPR; evidently, the limited number of empirical studies related to the SPR is caused by the limited access to public data. More importantly, this chapter contributes to the ICAO's initiative known as "No Country Left Behind", and thus paves the way for more studies on the SPR's aviation and tourism that extend this chapter further, such as examining aviation subsidies within the SPR (see Chapter 2). Additionally, this chapter concludes that regional cooperation among the SPR's governments may help liberalise and expand aviation and tourism activities to emerging markets such as China.

Study One: The nexus of aviation and tourism in the South Pacific Region

Publication status and candidate contribution

This study was published in a highly ranked tourism journal, *Asia Pacific Journal of Tourism Research* in April 2021. The doctoral candidate is the first author of the publication, with the doctoral supervisors being co-authors. The doctoral candidate is the first and corresponding author of the publication who contributed the most to the work, with all the doctoral supervisors being co-authors.

1.0 Abstract

This study investigates the role of the aviation industry on tourism growth in the SPR by reviewing country-specific tourism market development in the Cook Islands, Fiji, Samoa and Tonga, and by econometric analysis on panel datasets collected for the four countries' tourism and aviation industries. Two-stage least squares regression is applied to monthly data of inbound tourists from New Zealand and Australia into the four countries and other key social-economic variables in the period of January 2008 to December 2018. The empirical findings of the study suggest that the aviation industry positively and significantly influences the number of tourists travelling into the region by air. Despite the relatively low-income levels, tourism demand in the region is not very sensitive to transport costs or income level in related markets, suggesting many trips are of high importance to travellers and thus the region must sustain and grow its aviation sector. Some but not all the external shocks reduced arrival tourist number. Overall, this empirical study justifies government support to SPR's aviation sector and calls for regional cooperation and coordinated policies between the aviation and tourism sectors of the region. Governments and the aviation industry may consider cooperative programs in disaster prevention, and regional aviation network development to consolidate tourism demand at the air route level.

1.1 Introduction

The aviation industry is one of the cornerstones of global economic development; for example, it had a total global economic impact of US$2.7 trillion in 2016 (ICAO, 2019). The aviation

sector's role as a primary catalyst for the growth of the tourism industry has been well recognised (Forsyth, 2006; Palhares, 2003). The United Nation World Tourism Organisation (UNWTO) (2015) reported that the majority of tourists prefer to travel via air transport as it becomes more affordable, efficient and accessible. Hence, sustained developments of the aviation industry, such as aviation liberalisation and the emergence of low-cost carriers (LCCs), is expected to substantially promote tourism demand and growth (Dimitriou et al., 2017).

The aviation industry is argued to be a vital catalyst for economic growth in developing countries (e.g., Bråthen & Halpern, 2012; Button & Yuan, 2012; Fageda et al., 2018; Smyth et al., 2012; Taumoepeau, 2014). The SPR comprises a number of small island countries with emerging economies, limited natural resources and relatively small populations that are scattered across the world's largest ocean, the Pacific Ocean. Tourism plays a vital role for the SPR economies and their service export industries. For example, tourism-related activities contributed about 86.99% of the Cook Islands' economy, whereas tourism earnings contributed about 38.9% to Fiji's GDP as of 2018 (South Pacific Tourism Organisation, 2018). These SPR countries' geographic isolation suggests that the aviation industry plays a critical role for the region's development of the tourism industry. However, this particular situation presents a paradox, as SPR countries rely heavily on the tourism industry for economic growth but their aviation industry continues to struggle to grow (e.g., Cheer et al., 2018; Craig-Smith, 1996; Kissling, 2014; Stanley, 2000). Importantly, the benefits of the tourism industry to the SPR's economies are yet to be fully explored (Purcell & Scheyvens, 2015).

The SPR presents a unique case in comparison to the highly researched markets in developed countries such as Australia, South Korea, the United Kingdom (UK) and the United States (US), and developing countries with large aviation markets such as China and Brazil. The SPR is geographically isolated from other international tourism markets, and there is no real substitute transportation mode to aviation for international tourists (Prideaux & McNamara, 2013). Likely due to their relatively small market size, there is a dearth of empirical research on the SPR region. Prior published articles are mostly descriptive, with few quantitative studies that have examined the relationship between air transport and tourism in the SPR (Cheers et al., 2018; Forsyth & King, 1996; Taumoepeau et al., 2017). This leaves not only gaps in academic research but also prevents governments and other stakeholders from designing the most effective policies to

promote growth in the tourism and aviation sectors. This study aims to contribute to a better understanding of these important issues by focusing on the following two research questions:

- *What are the key determinants of tourism growth in the SPR?*
- *What are the best policy options that would support the sustained growth of the aviation and tourism sectors in the SPR?*

This is achieved by empirically quantifying the effects of the aviation industry on tourism growth for the SPR using actual industry data. Such a study contributes to both the air transport and tourism literature, and also facilitates evidence-based policymaking in the following ways. First, our study is among the first quantitative empirical studies on the interactions of air transport and tourism development within the SPR. Based on historical industry data, the findings of this study are expected to provide sound, pragmatic and practical insights to policymakers and industry stakeholders (i.e., government officials, regional organisations, executives of airlines and tourism authorities and operators). Second, in conjunction with the empirical analysis, the author will document and examine the problems and opportunities faced by the aviation and tourism sectors within the SPR, which face continuing challenges and a significant shortage of rigorous research (Lawson, 2017). More importantly, our study on this severely understudied region (the SPR) contributes to the International Civil Aviation Organisation's initiative known as the No Country Left Behind. A notable contributing factor to the limited number of empirical studies within the SPR is the limited access to public data (Jayaraman, 2006). This investigation thus paves the way for more studies that extend the analysis of this study further. Furthermore, this study examines the impacts of the SPR's aviation industry on tourism growth in the selected countries (i.e., the Cook Islands, Fiji, Samoa and Tonga) examines the cases of different levels of economic development (i.e., more developed economies, mid-level economies and low-level economies within the SPR) and thus contributes to a general assessment of the region's future prospect.

The rest of this paper is structured as follows: Section 1.2 presents a literature review of the relationship between aviation and tourism, and the factors influencing tourism growth. Section 1.3 provides an overview of air transport and tourism development in the SPR countries, namely the Cook Islands, Fiji, Samoa and Tonga. Section 1.4 presents a description of the data and the methodology (the panel two-stage least squares (2SLS) model), which allows the

author to quantify the impacts of the aviation sector on inbound tourists for the Cook Islands, Fiji, Samoa and Tonga. Section 1.5 presents and discusses the empirical findings. Section 1.6 discusses the policy implications of the empirical findings; finally, Section 1.7 summarises and discusses the limitations and future research areas arising from this study.

1.2 Literature review

This section reviews previous studies on aviation and tourism so that their key findings can be summarised, and research gaps can be identified. Firstly, it provides an overview of the aviation and tourism literature, followed by a review of aviation factors and other key economic drivers impacting tourism demand from a global perspective. Finally, it focuses on the determinants of tourism demand from the SPR's perspective.

1.2.1 Aviation and tourism

Extant research supports the notion that the aviation and tourism industries are mutually dependent (e.g., Bieger & Wittmer, 2006; Dimitriou et al., 2017; Duval, 2013; Forsyth, 2006; 2008; Lohmann & Duval, 2015). Previous studies have explored the significant linkages between the aviation industry and tourism growth in terms of connectivity, distance, transportation costs and liberalisation policies (Bieger & Wittmer, 2006; Forsyth, 2008), the effects on tourism growth in terms of the number of inbound tourists by air, the effects of route development on the growth of the aviation industry, and the implications of government subsidy policies (Morley, 2003; Wittman, 2014; Wittman et al., 2016).

The positive relationship between the aviation industry and economic growth, as well as between the tourism industry and economic growth, are well documented (e.g., Alsumairi & Tsui, 2017; Button & Yuan, 2012; Hu et al., 2015; Tolkack et al., 2016; Wu, 2016). However, comparatively fewer studies have paid attention to examining the direct relationships between aviation and tourism. Indeed, Duval (2013) and Landre and Peeters (2011) argued that direct interactions between aviation and tourism are still in their infancy within academic scholarships. A recent systematic literature review conducted by Spasojevic et al. (2018) concluded that there is a lack of literature on the direct interactions between aviation and tourism. Their study analysed the Australian Business Deans Council (ABDC) journals published between 2000 and 2014 and found that only limited published research on aviation and tourism focused on aspects such as air route development, passenger experience and the

impact of LCCs. Recent studies have also extended their focus to the effects of tourism destinations (i.e., non-commercial routes or peripheral destinations) and government subsidies (Fageda et al., 2018; Law, 2017).

However, a few recent aviation and tourism research-based studies have touched on emerging and developing countries. Nevertheless, the SPR countries have rarely been the focus, probably because of their limited market size and roles in the global market (Dobruszkes & Graham, 2016; Hakim & Merkert, 2019; Saranga & Nagpal, 2016). This study aims to fill this gap in research with an empirical study for the SPR region.

1.2.2 Aviation liberalization policies and LCCs and economic factors impacting on tourism: the global perspective

From a global perspective, the impact of the aviation industry on the tourism industry has empirically analysed, and studies have considered several aviation factors (i.e., aviation liberalisation, route seat capacity and/or frequency, the emergence of LCCs) and other key economic factors (i.e., cost of transportation, tourist income, tourism prices and exogenous impacts) (Barros & Wanke, 2015; Duval & Schiff, 2011; Wu, 2016). However, there are inconsistencies in the results on the significance of each factor on tourism, possibly due to the different samples and timeframes used across the studies.

1.2.3 Aviation liberalisation policies and LCCs

A significant body of literature has argued that there is a link between tourism growth and demand and aviation liberalisation policy or an open-market concept (e.g., Donzelli, 2010; Forsyth, 2006; Graham & Dennis, 2010; Rey et al, 2011). The ramifications of an open-market concept or liberalisation policies on the airline industry have lifted restrictions on flight accessibility (destinations), capacity (aircraft size), frequency (schedules) and airfares, which has led to increased market competition and service quality, which naturally attract new tourists (Duval, 2013). Additionally, the liberalisation policies increased competition among airlines. This had resulted in lower airfares and higher service quality, which have positively influenced international tourists (Gillen & Hazledine, 2015). Airline competition is often measured by the Herfindahl–Hirschman Index (HHI), which is a market concentration indicator derived from airlines' market shares (Bamberger et al., 2004).

Another outcome of liberalisation policies has been the emergence of LCCs into the aviation industry (Doganis, 2002; Fu et al., 2010, 2015b). Indeed, substantial attention has been focused on the impact of LCCs on the tourism industry (e.g., Alsumairi & Tsui, 2017; Dobruszkes et al., 2016; Graham & Dennis, 2010; Tsui, 2017; Zhang & Lu, 2013). Conceptually, LCCs provide lower airfares and more frequent point-to-point air services, which have appealed to more price-sensitive tourists, consequently increasing tourism growth and demand (Alguilo et al., 2007). Previous studies have suggested that the introduction of LCCs is one of the critical drivers of tourism demand (e.g., Chung & Whang, 2011; Fu et al., 2011; Fu et al., 2015a; Halpern & Graham, 2015). Similar results were reported in studies on other countries in Africa (Njoya, 2016), Europe (Alvarez-Diaz et al., 2019; Donzelli, 2010; Rey et al., 2011; Vieira et al., 2019), New Zealand (Tsui, 2017) and South Korea (Young & Whang, 2011). Additionally, the introduction of the LCCs positively impacted on the tourism industry as it introduces robust competition to full-service carriers (FSCs) (Fu et al., 2015a; Khan et al., 2018, 2019). For example, two recent studies (Khan et al., 2018, 2019) investigated the impact of LCCs on South Korean tourism and its airline industry. Both studies found the impact of LCC in promoting South Korean tourism industry and the competitive dynamics between LCCs and FSCs in South Korea have evolved over time. In contrast to these studies, other studies of other countries found no evidence of any significant impact of LCCs on the influx of international tourists, notably Australia (Forsyth, 2003; Zhang, 2015), the UK (Civil Aviation Authority United Kingdom, 2006; Clave et al., 2015) and the Atlantic region (Hunt & Tryong, 2019). In general, there seems to be no conclusive evidence in the empirical literature on the impacts of the emergence of LCCs on tourism. In the context of South Korea, Khan et al. (2018) argued that different results of the impacts of LCCs on the tourism industry are due to the evolution of the competition between the LCCs and the FSCs.

1.2.4 Key economic factors

A significant body of literature has argued that the essential determinants of tourism growth and demand are socio-economic factors (Hakim & Merkert, 2019; Zhang, 2015) and geo-economic factors (Wang & Song, 2010). Other studies also argued that key economic determinants of tourism demand might include GDP per capita or income (Fraser & McAlevey, 2015; Garnin-Munoz, 2009; Zhang, 2015), population size and location elements (Dobruszkes et al., 2011), tourism price components and exchange rates (e.g., Duval & Schiff, 2011; Naude & Saayman, 2005; Prideaux, 2000; Schiff & Becken, 2011; Zhang, 2015).

The impact of income on tourism growth and demand had been the subject of much research (Duval & Schiff, 2011; Naude & Saayman, 2005; Zhang, 2015). Conceptually, the income factor, measured by GDP per capita of the country of origin, directly influences the ability of tourists to pay for tourism activities. Consequently, when income increases, this will positively impact on the number of tourists (Hu et al., 2015).

Extensive studies have been carried out on the impact of tourism prices on tourism growth and demand (Duval & Schiff, 2011; Narayan, 2004; Tsui et al., 2019). Wang and Song (2010) also provided a comprehensive literature review on studies published between 1950 and 2008, and found that tourism prices (including accommodation, food and wine) had a significantly negative impact on tourism growth and demand. Because of the unavailability of tourism-related prices, many previous studies have relied on various proxies to represent tourism prices. For instance, the exchange rate between the country of origin and country of destinations has been used as a proxy for tourism-related prices (Santana-Galleo et al., 2010; Zhang et al., 2017). Countries with a higher exchange rate are deemed to be less desirable destinations for international tourists (Khandaker & Islam, 2017).

Several studies have highlighted the vital role that transport prices (air, land and sea) play on tourism growth and travel demand (Borenstein & Rose, 2014; Lim, 1999; Naude & Saayman, 2005). Consequently, increasing transport prices will negatively impact the tourism industry (Efthymiou & Papatheodorou, 2015; Hakim & Merkert, 2019). Most studies acknowledged the sensitivity of information on transport costs, which has resulted in the majority of studies using aviation fuel price as a proxy (e.g., Hakim & Merkert, 2019; Mohammadian et al., 2019; Oum et al., 2005; Zhang, 2015). Aviation fuel prices drive costs of airline operations and airfares upwards, which adversely impact tourism demand (Wensveen, 2007), although at least one conflicting result showed that jet fuel price variable did not significantly influence international tourist numbers into Australia (Zhang, 2015).

Studies have also explored the role of location elements and the distance factor on tourism growth and demand (Dobruszkes et al., 2011; McKercher & Lew, 2003; McKercher et al., 2008). The flight distance is found to adversely and significantly impact tourism demand. Dobruszkes et al. (2011) found that distance was the major impediment for international

tourists into European urban regions. However, conflicting results were presented by Koo et al. (2017), which found that additional air services to remote destinations may increase tourism demand.

In addition, several studies analysed the consequences of unexpected events or exogenous shocks on tourism demand (Hofer et al., 2009; Morrell, 2011; Tsui et al., 2014), such as the global financial crisis 2008/09 (Franke & John, 2011; Alegre & Sard, 2015), the September 11 2001 terrorist attacks (Mantin & Wang, 2012; Weensveen, 2007), the severe acute respiratory syndrome outbreak in 2003 (Flouris & Walker, 2005) and other unexpected global challenges have drastically impacted the affordability of air travel and passengers' motivation to travel. Overall, most of the previous literature on aviation and tourism has focused on developed economies and large countries such as Australia, Europe, South Korea, New Zealand, Singapore, the UK and the US (Dobruszkes & Graham, 2016; Wang & Song, 2010). Recently, researchers had attempted to minimise this gap, by including developing countries such as China, India and African nations in their analysis (Barros & Wanke, 2015; Hakim & Merkert, 2019). Additionally, Naude and Saayman (2005) suggested that different factors impact tourism demand and highlighted that as market demand continues to evolve, so do the factors impacting on tourism demand.

1.2.5 Aviation and socio-economic factors impacting on tourism: the SPR's perspective

Prior studies on the SPR (e.g., Forsyth & King, 1996; Guthrie, 2013; Taumoepeau & Kissling, 2008; Taumoepeau et al., 2017) highlighted the importance of the air transport sector in supporting the growth of the tourism industry and economic growth within the region. The characteristics of the SPR include small island countries with small emerging economies, limited natural resources and small populations that are scattered across the world's largest ocean, the Pacific Ocean, as specified in Table 1 (e.g., Forsyth & King, 1996; Guthrie, 2013; Kissling, 2014; Taumoepeau & Kissling, 2008).

Table 1

Information on South Pacific Region Countries

South Pacific countries	Land size (km^2)	Population (2017) (thousands)	GDP (2017) (US$ million)	Income group
American Samoa	199	55.64	634	Low middle
Cook Islands	240	Not available	Not available	Lower middle
Fiji	18,272	905.50	5061.20	Upper middle, Low middle
French Polynesia	3,660	283.01	Not available	Not available
Kiribati	811	116.40	185.57	Lower middle
Micronesia	701	105.54	336.43	Lower middle
Nauru	21	13.65	113.88	Middle
New Caledonia	18,575	280.46	Not available	Not available
Niue	260	1.719	Not available	Not available
Papua New Guinea	452,860	8215.16	20,536.31	Not available
Samoa	2,934	196.44	840.93	Upper middle
Solomon Islands	27,540	611.34	1303.45	Lower middle
Tonga	718	108.02	427.66	Upper middle, Low middle
Tuvalu	26	11.19	39.73	Low middle
Vanuatu	12,200	276.24	862.88	Lower middle

Source: World Bank database website.

Taumoepeau et al. (2017) argued that such a small population market is heavily dependent on international tourist arrivals to support the region's airline and tourism industries. Additionally, the relative remoteness of the SPR poses an extra challenge for regional connections over the vast distances between islands throughout the SPR (Duval & Winchester, 2011; Forsyth & King, 1996). Furthermore, the SPR is relatively isolated from the global tourism markets, and most of international visitor arrivals are by air (Taumoepeau, 2010). Being located in the peripheral regions results in thin markets associated with high transport costs, which have affected the SPR's tourism (Scheyvens & Russel, 2009). In the past, the SPR's governments tried to provide financial subsidies (monetary contributions) to support non-commercial routes with anticipated benefits through the tourism industry (Hazledine & Collins, 2011). For instance, the government of the Cook Islands injected NZ$5 million as financial subsidies to Air New Zealand for potential tourism earnings of NZ$33 million from connecting the Cook Islands to the US.

Previous literature has also argued that the airline industry in the SPR has struggled to grow, and their operational difficulties have negatively impacted the growth of the tourism industry (Douglas & Douglas, 1996; Kissling, 2014). Most SPR-based airlines only operate domestically, except for Fiji, Papua New Guinea and Samoa. The aviation market between the SPR and the rest of the world has been dominated by foreign airlines from Australia and New Zealand (Hazledine & Collins, 2011), although a few local carriers such as Fiji Airways also play some important roles in selected routes. Consequently, most of inbound tourists to the SPR originate from Australia and New Zealand, which are the closest tourist source markets to the SPR (Pearce, 2002; Scheyvens & Russel, 2009). The substantial influx of tourists from Australia and New Zealand was suggested by Cheer et al. (2018), which also reflects the colonisation factor and previous histories.

The small island countries in the SPR are highly vulnerable to natural disasters, which contributes to the demand seasonality of the industry (Milne, 1992). For instance, exogenous shocks such as the political coup in Fiji and the Zika virus in the SPR negatively impacted the tourism industry in 2006.

In contrast to the global perspective, the SPR's air transport sector has restricted liberalisation schemes and policies (Kissling, 2014; Taumoepeau & Kissling, 2013). However, Taumoepeau (2014) and Taumoepeau et al. (2017) argued that the LCC model would significantly impact tourism demand in the SPR and further suggested that a hybrid LCC would be more suitable. These are the salient factors that had been raised by the minimal literature available on the SPR.

Overall, there is insufficient literature on the interactions between air transport and tourism in the SPR. Although many comments in prior literature seem to be intuitive and insightful, few empirical studies have been conducted in the region to test and validate hypotheses of the link between aviation and tourism. In the meantime, the SPR's tourism continues to receive 2.1 million tourists in 2017, which is a fairly large number, considering the region's very small population and economies (SPTO, 2018). Aviation and tourism are of critical importance to the SPR, which presents a compelling case that needs closer examination and analysis. The following section provides an overview of the SPR's major economies and serves as a background and justification for the model specifications in Section 1.4.

1.3 Overview of the aviation and tourism sectors of the Cook Islands, Fiji, Samoa and Tonga

This section provides an overview of four SPR countries selected in this study: the Cook Islands, Fiji, Samoa and Tonga. These four countries represent different levels of economic development within the SPR and, more importantly, an analysis of these four countries may provide a good representation of the SPR.

1.3.1 Cook Islands

The Cook Islands is one of the smallest countries within the SPR, with a population of approximately 17,000 in 2016. It comprises 15 small islands with a landmass of about 237 km^2. There is only one main gateway to the Cook Islands: the Rarotonga International Airport, which can handle Boeing B747, with a 2300m paved runway. There are only four countries offering direct air connections into the Cook Islands from Australia (Sydney), New Zealand (Auckland), the US (Los Angeles) and Tahiti (Papeete). It is served by foreign-based airlines, including Air New Zealand, Air Tahiti, Jetstar and Virgin Australia. Air New Zealand dominates (i.e., 25% of total available seat kilometres (ASKs) from Australia and New Zealand) flight connections to and from the Cook Islands, whereas the national carrier (Air Rarotonga) provides only domestic services. The Cook Islands are relatively isolated with limited connectivity to key global markets.

The majority of international inbound tourists choose and prefer to travel by air to visit the Cook Islands. In 2018, the total visitor arrivals by air reached 168,760, which was approximately 10 times its population. The majority of visitors by air were mainly from New Zealand, which accounted for 68% of total visitor arrivals. Australia followed this with 16% of total visitor arrivals. In 2018, 71% of inbound visitors by air travelled to the Cook Islands for vacation purposes and visiting family and friends living in the Cook Islands. The majority (41%) of visitors stayed in paid accommodation (i.e., hotels and motels) and 15% stayed in private accommodation. In the same year, the total contribution of the Cook Islands' tourism industry to its GDP accounted for 86.99%, which is the highest in the SPR (SPTO, 2018).

1.3.2 Fiji

Fiji is one of the most prominent island countries in the SPR and has the second-highest GDP within the region. Fiji consists of 333 small islands spread across 18,274 km^2. Fiji has the most direct connectivity to key global markets. The main gateway to Fiji is Nadi International Airport in the island of Viti Levu, which can cater for the largest commercial aircraft such as Airbus A380.

There are various direct flight connections to Fiji, including Australia (Brisbane, Melbourne and Sydney), New Zealand (Auckland, Christchurch and Wellington), Hong Kong, Hawaii, Singapore, and the US (Los Angeles and San Francisco). These international routes are currently served by 10 international airlines that provide direct air services to and from Fiji, including Air Caledonie, Air New Zealand, Air Niugini, Air Vanuatu, Fiji Airways, Jetstar, Korean Air, Qantas, Our Airline, and Virgin Australia. International air connectivity to Fiji is dominated by Fiji Airways, Fiji's national carrier (i.e., 30% of total ASKs from Australia and New Zealand). Fiji Airways is also dominating air services within the SPR.

Most international tourists arrived in Fiji by air in 2018. Fiji is the largest tourist destination in the SPR and has one of the highest numbers of tourists per capita in the world (Cheer et al., 2018). In 2018, the total number of visitors by air to Fiji was 870,309, which was a 3.3% increase from 2017. In 2018, inbound visitors by air were mainly from Australia (45.74%), followed by visitors from New Zealand (20.21%). During the same year, 75% of inbound visitors by air came for vacation purposes, followed by 9% for visiting family and friends. In addition, Fiji is the only South Pacific location with some of the world largest multinational hotel chains, such as the Sheraton Fiji, Hilton Fiji Beach Resort & Spa, Sofitel Fiji Resort, and Spa and Shangri La Fiji Resort. The majority of visitors to Fiji choose to stay in paid accommodation (i.e., hotels and motels). In the same year, the total contribution of Fiji's tourism industry to its GDP accounted for 38.90% (South Pacific Tourism Organisation, 2018).

1.3.3 Samoa

Samoa is one of the medium-sized economy countries within the SPR, with a population of approximately 196,000. Samoa is made up of 12 islands spread over 2,842 km^2 of the Pacific Ocean. The main gateway to Samoa is Faleolo International Airport, which can cater to commercial jet operations with a 3000m asphalt runway. There is limited international flight connectivity to Samoa. There are only four countries offering direct air connections to Samoa:

Australia (Brisbane, Melbourne, Sydney and Townsville), American Samoa, Fiji (Nadi) and New Zealand (Auckland). Five international airlines provide international air services to and from Samoa, including Air New Zealand, Fiji Airways, Samoa Airways, Talofa Airways, and Virgin Australia. Its international air connectivity is dominated by Air New Zealand (with 22% of total ASKs from New Zealand and Australia), despite having a national carrier, Samoa Airways.

International tourists by air accounted for approximately 97.2% of Samoa's total inbound international tourists in 2018, reaching 172,496 visitors. New Zealand was the leading tourist source country, with approximately 47% of its total visitor arrivals by air during the same year. This was followed by 21% from Australia. As of 2018, 44% of visitors by air travelled to Samoa to visit their family and friends, and 35.6% were for the sole purpose of vacations and holidays. The majority (57.7%) of visitors stayed in unpaid accommodation and 38% stayed in paid accommodation (i.e., hotels and motels). In the same year, the total contribution of Samoa's tourism industry to its GDP accounted for 30.42% (SPTO, 2018).

1.3.4 Tonga

Tonga is also one of the medium-sized economy countries within the SPR, with a population of about 103,252. It contains 176 small islands that spread across 748 km^2 of the South Pacific Ocean. The main gateway to Tonga, Fua'amotu International Airport, can accommodate larger aircraft such as Boeing B787, with a 2681m asphalt runway. There is limited international flight connectivity to Tonga, with only direct air links from Australia (Sydney), Fiji (Nadi, Suva), New Zealand (Auckland) and Samoa (Faleolo). There are five international airlines that provide direct air services to and from Tonga, including Air New Zealand, Fiji Airways, Real Tonga Ltd, Talofa Airways, and Virgin Australia. Its international air connectivity is dominated by Air New Zealand with 44% of total ASKs from Australia and New Zealand.

International tourists by air accounted for approximately 73.4% of total inbound international tourists to Tonga in 2018, reaching 58,130 visitors. New Zealand was Tonga's leading tourism source market, which took a share of 46.8% of its total inbound visitors by air. New Zealand was followed by 19.2% of inbound visitors by air from Australia. In 2018, 53.4% of inbound visitors by air travelled to Tonga to visit family and friends, and 33.1% came for vacation and

holiday purposes. In the same year, the contribution of Tonga's tourism industry to its GDP accounted for 25.35% (SPTO, 2018).

Overall, the aviation and tourism sectors play vital roles for these four major SPR countries' economies, and their performance and growth are key determinants of the economic development and social welfare of these sampled countries.

1.4 Data and methodology

Econometric analysis had been widely adopted by various aviation and tourism studies (e.g., Albayrak et al., 2020; Allen & Yap, 2009; Tsui, 2017; Tsui et al., 2017; Wang et al., 2017, 2020a, 2020b). In the context of the SPR, Narayan et al. (2010) used econometric analysis to investigate the impact of the tourism growth in the economic development of Fiji, Tonga, the Solomon Islands and Papua New Guinea. In addition, the panel data approach and/or 2SLS model have been used in various aviation and tourism studies (e.g., Baltaci et al., 2015; Boonekamp et al., 2018; Rey et al., 2011; Tsui, 2017; Tsui et al., 2016). For instance, Rey, et al. (2011) used the dynamic panel data approach to investigate the effects of the emergence of LCCs on the tourism market in Spain. This analysis was based on the number of inbound tourists from the 15 EU States for the period 2000 to 2009. Similarly, Baltaci et al. (2015) estimated a 2SLS regression model with panel data to investigate the impact of airport activity and traffic frequency on 26 subregions in Turkey between 2004 and 2011. The 2SLS regression model has also been used to provide a deep understanding of the impact of the LCCs on the domestic tourism demand within New Zealand based on panel data from five regions for the period of June 2009–July 2015 (Tsui, 2017). Additionally, the determinants of air demand for European countries for the year 2010 was examined using the 2SLS model, which led to the finding that LCCs significantly influenced tourism demand for European countries (Boonekamp et al., 2018). In terms of the methodological contribution of this study, the panel 2SLS regression model can accurately quantify the effects of the aviation industry and the key socio-economic factors on the tourism industry in the SPR, notably on tourism demand and growth in the four major SPR countries. This model enables the empirical model to provide a robust estimation with a good control of potential endogeneity, which could have confounded the causal relationship between air transport activity and tourism demand, an issue repeatedly cautioned by previous studies (e.g., Baltaci et al., 2015; Boonekamp et al., 2018; Tsui, 2017; Tsui et al., 2016).

1.4.1 Data sources

Collating relevant data for the SPR markets has always been a challenge (Schiff, 2014). With repeated efforts via different channels, we collected two balanced panel datasets of inbound tourists from Australia and New Zealand to four selected SPR countries: the Cook Islands, Fiji, Samoa and Tonga. Although some data were also available for analysing other smaller SPR countries, they were either incomplete or inconsistent across time. To ensure the reliability of the estimation and econometric results, we decided to restrict our focus to datasets that were of higher quality in this study.[1] The panel dataset of the four selected SPR countries covered from January 2008 to December 2018 and was assembled from a variety of sources (see Table 2). It should be noted that the number of international tourists from Australia and New Zealand to the four SPR countries followed the UNWTO's (2015) definition, which includes any visitors that stop for more than one night in a country where they are not residents.

1.4.2 Model specifications and econometric method

Prior literature collectively supports the notion that the aviation industry significantly supports international tourism demand and growth, but there is a lack of empirical evidence in the SPR, which has some unique features as discussed above. Previous studies (Leitao, 2009; Mervan & Payne, 2007; Witt & Witt, 1995) have measured tourism growth and demand by tourist arrivals, which we followed in this study. This study further specifies tourism demand and growth as functions of the following variables: ASKs of all scheduled airlines between the Cook Islands, Fiji, Samoa and Tonga, and their two main tourism source markets (Australia and New Zealand); GDP per capita for the origins (Australia and New Zealand) (a proxy for tourists' income); GDP per capita for the destinations (the Cook Islands, Fiji, Samoa and Tonga), which serves as a proxy to control for travel propensity, as well as aviation fuel prices (a proxy for transport costs); exchange rates (a proxy for tourism prices for accommodation, food and beverages at the destinations); exogenous shock variables (i.e., *Samoa/Tonga tsunami*, *GFC 2008/09*, *Cyclone Winston (Cat 5)* and *Cyclone Gita (Cat 5)*); the impact of LCCs on the SPR's tourism and the flying distance (measures the travel distance or remoteness of the SPR for

[1] The aviation policy variable was excluded from this study as there was no updated information of bilateral air services agreements between Australia, New Zealand and the sampled SPR countries for the study period of 2008–2018.

international inbound tourism). The definitions and sources of the variables of interest are presented in Table 2.

The model specified in Equation (1) is established to empirically investigate the impacts of various factors on tourism demand in the SPR (in the contexts of the Cook Islands, Fiji, Samoa, and Tonga), using the balanced panel data collected for the period of 2008–2018.[2]

$$\ln(Inbound\ \ tourists)_{ijt} = \beta_0 + \beta_1 \ln(ASK)_{ijt} + \beta_2 \ln(Aviation\ fuel\ price)_t + \beta_3 \ln(GDP\ per\ capita)_{it} + \beta_4 (Exchange\ rate)_{ijt} + \beta_5 (Samoa/Tonga\ tsumani)_{jt} + \beta_6 (GFC\ 2008/09)_t + \beta_7 (Cyclone\ Winston\ (Cat\ 5))_{jt} + \beta_8 (Cyclone\ Gita\ (Cat\ 5))_{jt} + \beta_9 (LCC\_share)_{ijt} + \beta_{10} \ln(Distance)_{ij} + \varepsilon_{ijt} \quad (1)$$

where the subscripts *i* and *j* denote the origin and destination, respectively; *t* denotes month *t*; β_s represents the coefficients of the explanatory variables and ε_{ijt} is the error term.

Apart from the four exogenous shock variables (*Samoa/Tonga tsunami*$_{jt}$, *GFC 2008/09*$_t$, *Cyclone Winston (Cat 5)*$_{jt}$ and *Cyclone Gita (Cat 5)*$_{jt}$), *LCC_share*$_{ijt}$ and *Exchange rate*$_{ijt}$, all other variables of interest were converted into logarithmic form. All the coefficient estimates of the variables in logarithmic form can be conveniently interpreted as elasticities. The Stata Version 15 software package was used for estimation. Table 3 provides a descriptive summary of all the variables of interest included in this study. The balanced panel dataset covers a fairly long period, overall, there was sufficient variance and heterogeneity across the sample, which justifies the validity of the sample.

[2] Facing the unprecedented COVID-19 global pandemic, it is extremely difficult to obtain the updated inbound tourist data (2019–2020) for all the sampled SPR countries from their respective government departments (e.g., Ministry of Finance & Economics Development – the Cook Islands, Samoa Bureau of Statistics, South Pacific Tourism Organisation, and Tonga Statistics Department). In fact, the author tried to contact these government departments but could not receive any responses because their priorities and efforts in dealing with the COVID-19 pandemic.

Table 2

Definitions and Source of Variables of Interest (2008–2018)

Time series and variables	Definitions	Data source
$\ln(Inbound\ tourists)_{ijt}$	The natural logarithm of the number of tourists and visitors for routes from origin *i* (Australia or New Zealand) to destination *j* (the Cook Islands, Fiji, Samoa and Tonga) in month *t*	Ministry of Finance & Economics Development – the Cook Islands; Samoa Bureau of Statistics; South Pacific Tourism Organisation; Tonga Statistics Department
$\ln(ASK)_{ijt}$	The natural logarithm of available seat kilometres (ASKs) scheduled by airlines between origin *i* (Australia or New Zealand) and destination *j* (the Cook Islands, Fiji, Samoa and Tonga) in month *t*	Calculated by authors from the Official Airline Guide (OAG) data
$\ln(Aviation\ fuel\ price)_{t}$	The natural logarithm of the average U.S. Gulf Coast kerosene-type jet fuel price per gallon in month *t* (in USD)	U.S. Energy Information Administration
$\ln(GDP\ per\ capita)_{it}$ [a]	The natural logarithm of gross domestic product (GDP) per capita for origin *i* (Australia or New Zealand) in month *t* (local dollars: AUD & NZD)	World Bank data website; Statistics New Zealand; Australian Bureau of Statistics
$Exchange\ rate_{ijt}$	The exchange rates between origin *i* (Australia or New Zealand) and destination *j* (the Cook Islands, Fiji, Samoa and Tonga) currency in month *t.*	Ministry of Finance & Economics Development – the Cook Islands; Reserve Bank of Fiji; Samoa Bureau of Statistics; Tonga National Reserve Bank official websites
$Samoa/Tonga\ tsunami_{jt}$	A binary variable that takes 1 for the period of the first Samoa/Tonga tsunami in September 2009 and 0 otherwise	Official government websites
$GFC\ 2008/09_{t}$	A binary variable that takes 1 for the period of the global financial crisis in 2008/09 and 0 otherwise	Calculated by authors
$Cyclone\ Winston\ (Cat\ 5)_{jt}$	A binary variable that takes 1 for the period of the Gita Category 5 cyclone in Fiji 2016 and 0 otherwise	Official government websites
$Cyclone\ Gita\ (Cat\ 5)_{jt}$	A binary variable that takes 1 for the period of the Gita Category 5 cyclone in Tonga 2018 and 0 otherwise	Official government websites
LCC_share_{ijt}	The share of scheduled seats by LCCs for origin *i* (Australia or New Zealand) and destination *j* (the Cook Islands, Fiji, Samoa and Tonga) in month *t* (in percentage)	Calculated by authors from the OAG data
$\ln(Distance)_{ij}$	The natural logarithm of the average flying distance between airports in origin *i* (Australia or New Zealand) and airports in destination *j* (the Cook Islands, Fiji, Samoa and Tonga)	Calculated by authors from the OAG data
$\ln(HHI)_{ijt}$	Airline market competition measured by the Herfindahl–Hirschman Index (HHI), which is computed from ASKs of scheduled airlines between origin *i* (Australia or New Zealand) and destination *j* (the Cook Islands, Fiji, Samoa and Tonga) in month *t*	Calculated by authors from the OAG data

Remark: [a] The monthly GDP per capita was interpolated and converted from the annual GDP per capita.

Table 3

Descriptive Summary of Variables of Interest (January 2008–December 2018)

Time series and variables	Australia					New Zealand				
	Obs	Mean	Std. Dev	Min	Max	Obs	Mean	Std. Dev	Min	Max
$\ln(Inbound\ tourists)_{ijt}$	528	8.013	1.347	5.976	10.516	528	8.501	0.728	6.841	12.303
$\ln(ASK)_{ijt}$	490	16.849	1.473	14.851	19.501	528	17.801	0.836	15.823	19.251
$\ln(Aviation\ fuel\ price)_{t}$	528	0.757	0.341	-0.073	1.357	528	0.757	0.341	-0.073	1.357
$\ln(GDP\ per\ capita)_{it}$	520	10.936	0.143	10.6	11.142	528	10.545	0.141	10.232	10.717
$Exchange\ rate_{ijt}$	528	0.712	0.278	0.404	1.360	528	0.763	0.172	0.5026	1.053
$Samoa/Tonga\ tsunami_{jt}$	528	0.006	0.075	0	1	528	0.004	0.0615	0	1
$GFC\ 2008/09_{t}$	528	0.163	0.370	0	1	528	0.114	0.318	0	1
$Cyclone\ Winston\ (Cat\ 5)_{jt}$	528	0.002	0.044	0	1	528	0.002	0.0435	0	1
$Cyclone\ Gita\ (Cat\ 5)_{jt}$	528	0.002	0.044	0	1	528	0.002	0.0435	0	1
LCC_share_{ijt}	528	15.647	33.793	0	100	528	4.945	10.293	0	53.204
$\ln(Distance)_{ij}$	528	8.283	0.154	1.101	2.481	528	7.847	0.161	7.603	8.011
$\ln(HHI)_{ijt}$	528	8.918	0.487	7.964	9.210	528	7.934	0.364	7.300	8.809

- ## Multicollinearity and Panel data unit root test

The multicollinearity and panel data unit root tests were conducted to ensure that the estimation for the model was robust. The multicollinearity test was applied to all the explanatory variables of interest (Alsumairi & Tsui, 2017; Pevalin & Robson, 2009; Wooldridge, 2014). The variance inflation factor (VIF) results showed there were no significant correlations amongst the explanatory variables in the dataset (see Table 4).

Table 4

Multicollinearity Test Results (variance inflation factor (VIF))

Time series and variables	Australia	New Zealand
$\ln(ASK)_{ijt}$	1.95	2.60
$\ln(Aviation\ fuel\ price)_{t}$	4.08	1.11
$\ln(GDP\ per\ capita)_{it}$	7.51	3.18
$Exchange\ rate_{ijt}$	2.16	1.28
$Samoa/Tonga\ tsunami_{jt}$	1.02	1.04
$GFC\ 2008/09_{t}$	3.78	2.20
$Cyclone\ Winston\ (Cat\ 5)_{jt}$	1.02	1.01
$Cyclone\ Gita\ (Cat\ 5)_{jt}$	1.01	1.01
LCC_share_{ijt}	2.45	2.17
$\ln(Distance)_{ij}$	3.16	2.21

Remark: The typical recommended maximum value of VIF is 10 (Wooldridge, 2014).

To estimate the panel data regression model as specified in Equation (1), all the variables of interest need to be stationary to avoid the problem of spurious correlation (Acock, 2008; Alba

& Papell, 2007; Wooldridge, 2014). Therefore, the panel data unit root was performed to check if the variables of interest were stationary. For the case of Australia, all the variables of interest were found to be stationary, except for ln(*Aviation fuel price*)$_t$, ln(*GDP per capita*)$_{it}$, *Exchange rate*$_{ijt}$ and *LCC_share*$_{ijt}$. For the case of New Zealand, all the variables of interest were found to be stationary, except for ln(*Aviation fuel price)*$_t$ and ln(*GDP per capita*)$_{it}$. First-order differencing was applied to convert the non-stationary variables to be stationary (see Table 5).

Table 5

Panel Unit Root Test Results (January 2008–December 2018)

Explanatory variables	Australia		New Zealand		Australia (first-order differencing)		New Zealand (first-order differencing)	
	ADF	PP	ADF	PP	ADF	PP	AFD	PP
ln(*Inbound tourists*)$_{ijt}$	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
ln(*ASK*)$_{ijt}$	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
ln*(Aviation fuel price*)$_t$	0.780	0.780	0.780	0.780	0.000***	0.000***	0.000***	0.000***
ln(*GDP per capita*)$_{it}$	0.999	0.999	0.993	0.993	0.000***	0.000***	0.000***	0.000***
Exchange rate$_{ijt}$	0.268	0.268	0.268	0.268	0.000***	0.000***	0.000***	0.000***
Samoa/Tonga tsunami$_{jt}$	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
GFC 2008/09$_t$	0.133	0.102	0.103	0.103	0.000***	0.000***	0.000***	0.000***
Cyclone Winston (Cat 5)$_{jt}$	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
Cyclone Gita (Cat 5)$_{jt}$	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
LCC_share$_{ijt}$	0.139	0.139	0.007***	0.007***	0.000***	0.000***	0.000***	0.000***
ln(*Distance*)$_{ij}$	0.934	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Remarks: The values indicate *p*-values. The test is shown for the constant only. ** and *** indicate the rejection of the null hypothesis (H_0) that the time series variable has a panel unit root at 5% and 1% significance level. Ho: All panels contain unit roots. Ha: At least one panel is stationary. ADF denotes Augmented Dickey-Fuller unit root test. PP denotes Phillips-Peron unit root test. Panel unit root test is not applicable to the time-invariant variable of ln(*Distance*)$_{ij}$ (Woodridge, 2014).

- ## Endogeneity test of the selected variable

An endogeneity test was also carried out to ensure that there is no underlying causal relationship between any two variables in this study, as recommended by previous studies in the air transport and tourism literature (Santos & Vieira, 2012; Tsui, 2017; Ullah et al., 2018). There are various techniques that have been used in prior tourism and aviation studies such as fixed effects and random effects models (Naude & Saayman, 2005; Rey et al., 2011; Zuidberg, 2014), the generalised method of moments (GMM) model (Schultz et al., 2010) and the time series modelling such as the Box-Jenkins SARIMA approach (Lim & McAleer, 2001; Tsui et al., 2014). Two key considerations prompted this study to use the panel 2SLS model: (i) this study is based on the panel data of the four SPR countries; panel data offers a more robust statistical identification and allows interferences from complex relations (Albayrak et al., 2020; Hakim & Merkert, 2016; Hsiao, 2014). Song and Li (2008) also argued that there is a need for more panel data approach research on tourism studies; and (ii) this study needs to address the

endogeneity problem of the key variable of interest, ln*(ASK*) during estimation. In this study, the possible endogeneity between ASKs (scheduled airline seat capacity) and the number of inbound tourists to the SPR countries may lead to inconsistent estimators or biased estimation results (Kohler & Kreuter, 2005; Pevalin & Robson; 2009; Prideaux, 2000). The 2SLS approach with an appropriate instrumental variable (IV) can address this endogeneity problem (Hsiao, 2014; Tsui et al, 2016; Wooldridge, 2014). The HHI variable is used as the IV for ln*(ASK*) in this study, which measures airline market competition in the SPR countries (the calculation of HHI is based on the market shares of each airline's total scheduled ASK serving each of the destinations) (Tsui, 2017; Tsui et al., 2016). The Sargant test result (*p*-value = 0.000), weak identification test (Cragg-Donald Wald *F*-statistic), and underidentification test (Anderson canon. corr. LM statistic) validate the use of $\ln(HHI)_{ijt}$ as a robust IV for $\ln(ASK)_{ijt}$.[3] The result showed that $\ln(HHI)_{ijt}$ was uncorrelated with the error term in the regression models for the case of Australia and New Zealand, so this IV should produce an unbiased coefficient estimate with which the causality between $\ln(Inbound\ tourists)_{ijt}$ and $\ln(ASK)_{ijt}$ can be inferred (Tsui et al., 2016).

In addition to the panel data regression model specified in Equation (1), this study attempted to identify any serial correlation between the current and previous periods of tourist arrivals ($\ln(Inbound\ tourists)_{ijt}$) to the sampled SPR countries by including a one-period lagged value on $\ln(Inbound\ tourists)_{ijt-1}$, as specified in Equation (2). In the tourism literature, a travel demand model often includes the lagged dependent variable (Balli et al., 2016; Garin-Munoz, 2009; Zhang, 2015). Furthermore, Leitao (2009), Mervan and Payne (2007) and Zhang (2015) argued that the lagged dependent variable should be interpreted as habit formation because knowledge about the destinations from their previous holiday experiences or their friends' visits would reduce any uncertainty associated with the destination country, which may lead to an increase in returning and new visitors. It should be also noted that the effect of ignoring post-travel trends will result in overstating the impact of other variables. Therefore, a dynamic panel 2SLS model is established in Equation (2):

[3] For the sake of brevity, the Sargant test, weak identification test (Cragg-Donald Wald *F*-statistic), and underidentification test (Anderson canon. corr. LM statistic) are not reported.

$$\ln(Inbound\ \ tourists)_{ijt} = \beta_0 + \beta_1 \ln(Inbound\ tourists)_{ijt-1} + \beta_2 \ln(ASK)_{ijt} + \beta_3 \ln(Aviation\ fuel\ price)_t + \beta_4 \ln(GDP\ per\ capita)_{it} + \beta_5 (Exchange\ rate)_{ijt} + \beta_6 (Samoa/Tonga\ tsumani)_{jt} + \beta_7 (GFC\ 2008/09)_t + \beta_8 (Cyclone\ Winston\ (Cat\ 5))_{jt} + \beta_9 (Cyclone\ Gita\ (Cat\ 5))_{jt} + \beta_{10} (LCC\_share)_{ijt} + \beta_{11} \ln(Distance)_{ij} + \varepsilon_{ijt} \quad (2)$$

1.5 Empirical results

The 2SLS models in Section 1.4 were applied to two panel datasets of inbound tourists from Australia and New Zealand to the four selected SPR countries (the Cook Islands, Fiji, Samoa and Tonga). The empirical results are summarised and discussed below.

1.5.1 Empirical results of panel 2SLS model

Table 6 shows the estimation results of the 2SLS model for Australia and New Zealand, respectively. The explanatory variables include a set of aviation factors and economic factors that may influence tourism demand or growth within the SPR countries from Australia and New Zealand. The estimated models indicated a robust explanatory power with high R^2 values of 91.9% and 79.2% for Australia and New Zealand, respectively. The primary variable of interest investigated in this study is $\ln(ASK)_{ijt}$ or seat capacity of scheduled airlines serving the sampled SPR countries. The estimation results confirmed a strong relationship between growth in scheduled airline services and tourism demand growth within the sampled SPR countries. The findings indicated that a 1% increase in $\ln(ASK)_{ijt}$ or scheduled seat capacity from Australia is associated with a 1.03% increase in monthly tourists to the four selected SPR countries. In the case of New Zealand, a 1% increase in $\ln(ASK)_{ijt}$ is associated with a 0.81% increase in the monthly tourist arrivals from New Zealand to the four SPR countries. These empirical findings suggested that the key variable of $\ln(ASK)_{ijt}$ for the cases of Australia and New Zealand played an essential role in transporting international visitors to visit the SPR countries and contributed to their tourism growth. The estimation results also implied that an increase in airline capacity positively increased the number of inbound tourists travelling to the sampled SPR countries from Australia and New Zealand.

Table 6

Estimation Results for Inbound Tourists from Australia and New Zealand

Dependent variable = ln(*Inbound tourists*)$_{ijt}$				
Explanatory variables	**Australia**		**New Zealand**	
	Coefficients	**Standard error**	**Coefficients**	**Standard error**
ln(*ASK*)$_{ijt}$	1.033***	0.017	0.812***	0.029
Δln(*Aviation fuel price*)$_{t}$	-0.555***	0.221	-0.416**	0.171
Δln(*GDP per capita*)$_{it}$	1.714	1.624	-0.339	0.816
Δ*Exchange rate*$_{ijt}$	0.331	1.002	-0.471***	0.094
***Samoa/Tonga tsunami*$_{jt}$**	-0.935	0.228	0.094	0.240
***GFC 2008/09*$_{t}$**	0.045	0.054	0.015	0.054
***Cyclone Winston (Cat 5)*$_{jt}$**	-0.183	0.391	-0.355	0.333
***Cyclone Gita (Cat 5)*$_{jt}$**	-1.24***	0.390	-0.919***	0.333
Δ*LCC_share*$_{ijt}$	-0.002	0.003	0.002	0.002
Δln(*Distance*)$_{ij}$	2.060***	0.164	-0.329**	0.137
R^2	0.919		0.792	
***F*-statistics**	515		162.02	
Observations	479		524	

Remark: *, ** and *** indicate that the variable is significant at the 10%, 5% and 1% significance levels, respectively. Δ represents the variable takes first-differencing to become stationary.

Conceptually, an increase in airfares would negatively impact tourism demand. Consistent with previous studies (Morley, 2003; Oum et al., 2005; Tsui, 2017), the variable of ln(*Aviation fuel price*)$_{t}$ as the proxy for airfares in this study and was found to negatively and significantly affect tourism demand for the SPR countries from both Australia and New Zealand. The findings indicated that a 1% increase in aviation fuel price reduced the number of tourists travelling from Australia by 0.56% and New Zealand by 0.42% to the selected SPR countries, respectively. Importantly, these empirical findings supported previous studies (Cheers et al., 2018; Taumoepeau, 2010), aviation fuel as a proxy of transport costs and airfares.

The estimation results also indicated that the coefficient estimates of ln(*GDP per capita*)$_{it}$ (the income level variable of Australia or New Zealand) were not statistically significant. These findings are contrary to some previous tourism and aviation studies (Crouch, 1994; Leitao; 2009; Zhang, 2015), even for less-developed countries (Naude & Saayman, 2005). The estimation results may be explained by the tourists' motivation and purposes for travelling to the sample SPR countries. This may include purposes such as attending annual religious conferences, family reunions, functions or local celebrations that may not be influenced by the tourists' income factor. Although this study followed the established definition of tourists used by the UNWTO, some travellers in our sample may be linked to religious and business purposes, which tend to be less sensitive to their income levels. Another possibility is that there

is a group of travellers who regard the SPR destinations as special or 'must-have' visits and thus care less about their income level.

There were interesting findings observed in relation to the estimation results for the d. *Exchange rates*$_{ijt}$ variable between the countries of origin (Australia and New Zealand) and the destination countries (the Cook Islands, Fiji, Samoa and Tonga). The estimation results indicated that the fluctuation of d.*Exchange rates*$_{ijt}$ variable significantly impacted tourists from New Zealand to the sampled SPR nations, but not Australian tourists. The results indicated that a 1% increase in exchange rate would reduce the number of inbound tourists from New Zealand to the Cook Islands, Fiji, Samoa and Tonga by 0.47%. This result supports previous studies which suggested that tourists are sensitive to tourism price in terms of accommodation, food and wine (e.g., Dobruszkes et al., 2011; Santana-Galleo et al., 2010; Tsui et al., 2019). On the other hand, Australian tourists were not significantly impacted by the fluctuation of exchange rate between Australia and the Cook Islands, Fiji, Samoa and Tonga, or tourism price offered in those four SPR countries. This result is consistent with Kotler, et al. (2006) and that majority of inbound tourists to Samoa and Tonga are categorised as tourists visiting friends and relative, who are likely to stay in private homes with family and friends and are insensitive to tourism prices. Similarly, Seetaram (2012) found that Australian tourists do not appear to be sensitive to tourism prices to visit overseas destinations.

The four exogenous factors (i.e., *Samoa/Tonga tsunami*$_{jt}$, *GFC 2008/09*$_{jt}$, *Cyclone Winston (Cat 5)*$_{jt}$ and *Cyclone Gita (Cat 5)*$_{jt}$) were included in the models to account for any significant unforeseeable events from 2008 to 2018 that might adversely impact tourism demand for the SPR countries. The significant negative impact on tourism demand for the sampled SPR countries from Australia and New Zealand was only found for the exogenous shock of *Cyclone Gita (Cat 5)*$_{jt}$. It is evident that *Cyclone Gita (Cat 5)*$_{jt}$ destroyed a significant amount of infrastructure, including Fua'amotu International Airport, the main gateway airport to Tonga, and hotels and restaurants, which adversely affected tourist numbers to the SPR countries. This is in line with Kissling (2014), who found that natural disasters had negative impacts on tourism demand to the SPR. The SPR is prone to natural disasters because of its geographical location (Taumoepeau, 2010).

The estimation results indicated that the coefficient estimate of the d.LCC_share_{ijt} variable were not statistically significant for Australia and New Zealand cases. These empirical results are conflicted with previous claims that LCCs was one of the main factors that contributed to the growth in the tourism industry in the SPR (Taumoepeau & Kissling, 2013; Taumoepeau et al., 2017). The estimation results are likely to be a reflection of LCCs' low share of total ASKs between Australia and New Zealand and the SPR during the study period. For instance, LCCs only accounted for 15.6% of total ASKs from Australia and 4.9% from New Zealand to the selected SPR countries during the study period. In other words, the tourism markets between Australia and New Zealand and the SPR was dominated by FSCs. For Australia, Fiji Airways, Qantas and Virgin Australia, dominated the Australian market into the Cook Islands, Fiji, Samoa and Tonga, with 30.9%, 30.7% and 31.1% of total ASKs, respectively. Additionally, this study recognised that although Virgin Australia first entered the SPR as an LCC, but it evolved into a FSC in 2011. For New Zealand, Air New Zealand and Virgin Australia dominated the markets of New Zealand and the Cook Islands, Fiji, Samoa and Tonga, with 22% of total ASKs and 14.4% of total ASKs, respectively.

The distance variable is one of the critical factors for understanding the nature of tourism demand and growth within the SPR. The ln($Distance$)$_{ij}$ variable measures the flying distance of the sampled SPR countries from Australia and New Zealand. The estimation results for ln($Distance$)$_{ij}$ for both countries are quite interesting. For Australia, the significant positive coefficient estimate of ln($Distance$)$_{ij}$ suggests a 1% increase in flying distance increased tourist numbers by 2.06% from Australia to the SPR countries. This estimation result suggested that this distance impediment did not deter inbound travellers from Australia to the SPR. In air transport studies, it is generally found that travel demands tend to decrease with distance because travel costs and time tend to increase with distance. For New Zealand, the d. ln($Distance$)$_{ij}$ variable between the SPR countries and New Zealand reported with a statistically significant and negative coefficient estimate, which shows its negative impact of distance on tourism demand for the sampled SPR countries. A 1% increase in the growth of flying distance reduced tourism demand by 0.33% from New Zealand to the SPR countries. This result supported previous studies (Ach & Pearce, 2009; Koo et al., 2012, 2017), which highlighted the distance factor as having a negative impact on tourism demand. Importantly, the distance variable from New Zealand followed the distance decay theory, which emphasises that the

longer the distance for tourists to travel, the less likely for tourists to travel this distance (McKercher et al., 2008; McKercher & Lew, 2003).

1.5.2 Empirical results of dynamic panel 2SLS model

Considering the likely effect of repeated tourist visits to the sampled SPR countries in this study, Table 7 shows the estimation results of the variable of ln(*Inbound tourists*)$_{it-1}$ (the lagged value of inbound tourists from Australia and New Zealand) and the same set of other explanatory variables included in the models. The models have good explanatory power as shown by the fairly high R^2 values. This new variable of ln(*Inbound tourists*)$_{it-1}$ aims to capture the dynamic information on tourist numbers to the sampled SPR countries (Balli et al., 2016; Zhang, 2015), which was confirmed to be an important factor for tourism growth in the SPR countries, with a statistically significant and positive coefficient estimate for Australia and New Zealand, respectively. Overall, the estimation results of Table 7 obtained with the dynamic panel 2SLS model produced similar results to Model 1, as reported in Table 6. A notable difference is that ln(*Distance*)$_{ij}$ became insignificant for the case of New Zealand, but still with the negative coefficient sign. Because the dynamic model controls for repeated travel behaviour, its explanatory power is likely to be better, as expected.

Table 7

Dynamic Panel 2SLS Model with the Lagged Dependent Variable

Dependent variable = ln(*Inbound tourists*)$_{ijt}$				
Explanatory variables	**Australia**		**New Zealand**	
	Coefficients	**Standard error**	**Coefficients**	**Standard error**
ln(*Inbound tourists*)$_{ijt-1}$	0.189**	0.084	0.571***	0.040
ln(*ASK*)$_{ijt}$	0.839***	0.091	0.349***	0.045
Δln(*Aviation fuel price*)$_{t}$	-0.522***	0.200	-0.254	0.150
Δln(*GDP per capita*)$_{it}$	1.647	1.461	-0.795	0.716
Δ*Exchange rate*$_{ijt}$	0.299	0.902	-0.221***	0.085
***Samoa/Tonga tsunami*$_{jt}$**	-0.111	0.205	-0.032	0.210
***GFC 2008/09*$_{t}$**	0.044	0.049	-0.012	0.048
***Cyclone Winston (Cat 5)*$_{jt}$**	-0.264	0.353	-0.365	0.292
***Cyclone Gita (Cat 5)*$_{jt}$**	-1.182***	0.352	-0.806***	0.292
Δ*LCC_share*$_{ijt}$	-0.005	0.002	0.002	0.002
Δln(*Distance*)$_{ij}$	1.681***	0.239	-0.148	0.123
R^2	0.934		0.840	
***F*-statistics**	606.61		236.28	
Observations	479		524	

Remark: *, ** and *** indicate that the variable is significant at the 10%, 5% and 1% significance levels, respectively. Δ represents the variable takes first-differencing to become stationary.

1.5.3 Robustness check

We further tested the models' robustness by aggregating the panel data of tourist arrivals from Australia and New Zealand into a one-panel dataset in two scenarios. The 2SLS estimation results are reported in Table 8 and are mostly consistent with those of Tables 6 and 7. Overall, although we observed some country-specific patterns for tourist arrivals from Australia and New Zealand together, the estimated patterns of are generally consistent for both scenarios.

Table 8

Estimation Results for Australia and New Zealand (Aggregated Dataset)

Dependent variable = ln(*Inbound tourists*)$_{ijt}$				
Explanatory variables	**Australia & New Zealand**		**Australia & New Zealand (lagged dependent variable)**	
	Coefficients	**Standard error**	**Coefficients**	**Standard error**
ln(*Inbound tourists*)$_{ijt-1}$			0.685***	0.033
ln(*ASK*)$_{ijt}$	0.797***	0.012	0.252***	0.032
Δln(*Aviation fuel price*)$_{t}$	-0.446***	0.153	-0.298***	0.119
Δln(*GDP per capita*)$_{it}$	0.139	0.875	-0.396	0.677
Δ*Exchange rate*$_{ijt}$	-0.201***	0.066	-0.618	0.051
***Samoa/Tonga tsunami*$_{jt}$**	0.048	0.186	-0.084	0.144
***GFC 2008/2009*$_{t}$**	0.046	0.049	0.007	0.038
***Cyclone Winston (Cat 5)*$_{jt}$**	-0.136	0.290	-0.382*	0.225
***Cyclone Gita (Cat 5)*$_{jt}$**	-1.123***	0.290	-0.914***	0.225
Δ*LCC_share*$_{ijt}$	-0.002**	0.001	-0.001	0.001
Δln(*Distance*)$_{ij}$	0.589***	0.056	0.182***	0.050
R^2	0.861		0.917	
***F*-statistics**	462.40		978.66	
Observations	1003		1003	

Remark: *, ** and *** indicate that the variable is significant at the 10%, 5% and 1% significance levels, respectively. Δ represents the variable takes first-differencing to become stationary.

1.6 Discussion and policy implications

This section focuses on discussing the empirical findings of this study, with an aim to identify the policy implications and the managerial insights for policymakers and aviation and tourism stakeholders within the SPR.

Given the increasing prominence of the aviation and tourism sectors in the SPR economies (SPTO, 2018), it is vital to empirically examine the impact of the aviation industry (particularly the airline industry) on the growth of the tourism industry. This study provides a comprehensive and thorough examination of how the aviation factors (i.e., scheduled seat capacity and the emergence of LCCs) and other vital economic factors (i.e., cost of transportation, income of

the origins and destinations, exchange rates and the exogenous factors) that might influence tourism demand for the SPR countries. The key observations and estimation results can be summarised as shown below.

1.6.1 Effect of the aviation industry on tourism growth within the SPR

The findings of this study suggest that the aviation industry significantly contributed to tourism growth in the SPR countries. In the models, $\ln(ASK)_{ijt}$ from Australia and New Zealand had a strong positive relationship with tourism demand within the sampled SPR countries (the Cook Islands, Fiji, Samoa and Tonga). This finding implies that airline capacity (aviation growth) leads to tourism growth (increasing tourism demand) in the SPR (i.e., small developing island countries). This study echoes prior studies that aviation growth is one of the driving forces of tourism growth in different countries and regions (Duval & Schiff, 2011; Raguraman, 1997). Similarly, the positive correlation between tourism and aviation and economic growth has been well documented (e.g., Bieger & Wittmer, 2006; Duval, 2013; Forsyth, 2006; Lohmann & Duval, 2015; Spasojevic et al., 2018). However, the case of small developing countries that are isolated and far away from other major economies, such as the SPR countries being investigated in this study, has not received any formal econometric analysis. Our investigation of the Cook Islands, Fiji, Samoa and Tonga for the period 2008–2018 thus provides a good complementary analysis.

Importantly, this study further suggests that improved aviation services will contribute to tourism growth. This implies that the SPR's governments' support for aviation services will trigger growth in their tourism sectors, which, in turn, lead to increased demand for air travel, creating a positive feedback loop. From the perspective of policymakers, such as civil aviation authorities, the SPTO and the national tourism authorities within the SPR, the findings of this study suggest that a meaningful first step would be to increase aviation services to start the positive loop. For example, low-cost measures and policies to be implemented by the government agencies may include increasing air access via more liberalised air service agreements and capacity to the SPR. Governments within the SPR might also consider route development strategies to develop more new destinations (not just Australia and New Zealand) and emerging tourism markets such as China (SPTO, 2018). These improvements can be embodied by reviewing their current restrictive bilateral air service agreements with foreign countries towards more liberalised or open skies agreements. Although the SPR supports the

air transport deregulation and open skies, but these policies have not been effectively implemented within the SPR. Additionally, Cheer et al. (2018) argued that air transport services within the SPR still rely on bilateral agreements and are more restrictive than in other parts of the world. Most SPR countries' aviation industries are operated under bilateral air agreement schemes (Kissling, 2014). For instance, Fiji is not a party to any multilateral agreements but instead has 28 bilateral air service agreements in place, with various restrictions on seat capacity, frequency and airfares. Improving airline capacity in the SPR would improve air connectivity, which would promote tourism and local and regional economies. Other commercial arrangements between airlines, such as code-sharing schemes, may also provide a more efficient and effective mechanism for fast aviation growth without substantial airline investments and costs. For instance, Singapore Airlines has had a code-sharing arrangement with Virgin Australia and New Zealand into the Pacific Region since 2012 (Virgin Australia, 2012). Additionally, Fiji Airways entered into a code-sharing partnership with British Airways in 2018, with an anticipated increased market from Europe and the UK (Fiji Airways, 2012). Government agencies in the SPR should facilitate or even promote such commercial arrangements.

From the airline executives' perspective, they should provide better connectivity and access for incoming tourists to reach the SPR through multiple stopovers and/or code-sharing schemes. Such schemes will facilitate the SPR expanding into a broader tourism market. For the case of Fiji, there are currently three departure points (Auckland, Christchurch and Wellington) from New Zealand and five departure points (Adelaide, Brisbane, Gold Coast, Melbourne and Sydney) from Australia. Although our study has not examined travellers' disutility towards more stopovers, we have identified evidence that tourists were not very sensitive to tourism prices. It is likely that air travel demand to the SPR region is fairly robust, which would allow airlines to use multi-stop flights to aggregate travel demand and reduce their operating costs.

1.6.2 Implications for close collaboration between aviation and tourism within the SPR

The SPTO (2013) reported that, international tourists to the SPR only accounted for 1% of total global tourists in 2012 and this has good potential to grow at an annual rate of 3.3% within the SPR. To promote the growth of the tourism industry in the SPR, the nature and characteristics

of inbound tourists should be further explored. Taumoepeau et al. (2017) claimed that the SPR's tourism needs international tourists to support the development of the aviation sector, as the small population size and market size within the SPR could not sustain aviation growth alone. The results of this study suggest that aviation and tourism demand in the SPR are highly correlated and that repeat visitors also played a significant role. Therefore, governments in the SPR may consider strategic policies and interventions, such as the establishment of a regional strategic plan to attract and bring opportunities to the SRP as a whole. Such a plan should facilitate the SPR countries to combine their travel demands and tourism resources so that aviation services can be sustained and increased. This may, among other steps, involve the creation of hub-and-spoke aviation networks in the region, so that international travel can be directed to a few selected gateway airports (e.g., Nadi International Airport or Samoa International Airport), then routed through the region's own network. This would require close cooperation among the SPR countries, especially competing airports and airlines, to work together.

Countries in the SPR may also cooperate on disaster prevention programs and infrastructure investment and financing cooperative programmes. The significant impact of natural disasters represented by Cyclone Gita puts forward the need for a coordinated policy for a response from the tourism and aviation industries. The SPR is prone to natural disasters, and aviation stakeholders should ensure that there are policies in place to rectify any damage caused by natural disasters to the aviation industry and tourism demand. For example, airport mutual aid agreements and programmes have been established in the US through which member airports can leverage each other's resources during natural disasters (e.g., the Southeast Airports Disaster Operations Group) (Airport Cooperative Research Program, 2012). Such practices are codified in the regulations for airport certification in the US and are recommended by the ICAO (2012). The SPR countries may consider similar cooperative programmes for the region's aviation sector.

From the airline executives and tourism authorities' and operators' perspectives, this study also highlights the need for closer and stronger partnerships between airlines and tourism stakeholders. With a clear synergy between the two sectors, as identified in this study, tourism authorities and civil aviation authorities within the SPR should focus on establishing a joint collaboration taskforce to develop joint policies that would both be beneficial for both

industries (Lawson, 2017). Besides, they should focus on the formation of a strong partnership to advertise and promote the SPR destinations cost-effectively to prospective international tourists via destination advertising and promotion campaigns by airlines, airports, and tourism authorities and operators. One of the excellent cases to look at is how Singapore's tourism agency worked closely with Changi Airport in the early days to promote transfer traffic through the airport and city tourism to facilities under the management of the tourism board (Henderson, 2006).

1.6.3 Implications of aviation and tourism growth for economic growth opportunities within the SPR

The tourism industry significantly contributes to economic growth in the SPR, allowing the SPR countries to reduce dependency on foreign aid (Everett et al., 2018). From the policymakers' perspective, the empirical results presented in this study highlight the need for the SPR's governments to prioritise their developing projects within the aviation and tourism sectors (i.e., favourable aviation and tourism policies, airport infrastructural developments, and hotel and accommodation development projects, etc.), which are both of critical importance to the region - especially as these are important to the region's welfare and growth in other sectors such as health, education and foreign business investment (Kissling, 2014; Milne, 1992; Taumoepeau et al., 2017). This study also finds that international inbound tourists are not very sensitive to income factors, suggesting that many trips are probably a "must-have" for them. Therefore, it is important for governments and aviation operators in the SPR to ensure that quality aviation services and necessary air connectivity are maintained for the region to continue to transport and attract tourists to the region (e.g., Button & Yuan, 2012; Everett et al., 2018; Hazledine & Collins, 2011; Tolkack et al., 2016).

1.7 Conclusion

This study aims to empirically investigate the effects of the aviation industry and key economic factors on tourism demand within the SPR. This was achieved by using a 2SLS estimation with the monthly panel datasets of inbound tourists from Australia and New Zealand to the four SPR countries (the Cook Islands, Fiji, Samoa and Tonga) for the period January 2008–December 2018. There are several key findings that can be drawn from this study. First, scheduled airline capacity positively and significantly increased tourism within the SPR countries, and the current period of tourism demand is significantly correlated with the previous period's tourism

demand. It was also found that other socio-economic factors have a statistically significant and negative impact on the growth of the SPR's tourism, including aviation fuel prices, the flying distance from Australia and New Zealand to the sampled SPR countries, and the exogenous shock (i.e., Cyclone Gita).

To be the best of the authors' knowledge, this is the first empirical study based on industry data to analyse the relationship between aviation and tourism in the SPR. Importantly, the identified factors highlighted distinct features of the SPR, as it is isolated from the rest of the world with limited resources and long distances from global tourism markets, except for Australia and New Zealand.

The empirical results of this study offer evidence of a strong link between aviation and tourism growth in the SPR, calling for regional cooperation and coordinated policies between the aviation and tourism sectors of the region, as well as the SPR's governments. In particular, the region's governments and the aviation industry should also consider cooperative programmes for disaster management and regional aviation network development to consolidate traffic demands at the route level.

Although this study has conducted one of the first quantitative empirical studies for the SPR region (a less researched area), some notable limitations are observed: (i) this study could not include all the 15 countries in the SPR because of limited data availability from other smaller island countries. In particular, there is rather limited access to data on the monthly inbound tourists to smaller SPR countries; and (ii) it was difficult to obtain airfare, revenue passenger kilometres (RPK), length of stay for tourists, and accommodation type data for all the four sampled SPR countries (and also other smaller countries in the SPR). If these variables become available and can be included in this study, the analysis would be more powerful for quantifying the effects of additional economic factors and analysing what could be done to further promote tourism growth in the SPR. Limited access to public data within the SPR is probably the key reason for the limited empirical studies for the region (Jayaraman, 2006). This study is a modest first step in the right direction but is far from perfect or conclusive.

This study highlights several interesting areas for future research as the extension of this study. In view of the impact of travel costs, an additional robust examination of the linkages between

air transport costs (airfare level or ticket prices) and tourism demand and growth could be carried out for the sampled SPR countries, if airfares and RPK data become available. It is commonly accepted that transport cost is a key element for total travel budget and expenditure. Other potential and worthwhile areas for future research may include investigations of market share dynamics and price competition between incumbent airlines and LCCs (i.e., Air New Zealand and Virgin Australia, Fiji Airways vs. Jetstar) serving the SPR, so that better insights can be obtained into market dynamics in the SPR and how they (including LCCs) affect the region's tourism growth and development. Another important area may also include the examination of the factors affecting the global tourism market's connectivity to the SPR, which would help the SPR governments to devise air transport policies to expand its markets beyond the traditional tourism source countries (Australia, New Zealand and the US) to other emerging tourism markets such as China and Asian countries. Lastly, due to the adverse impacts of COVID-19 global pandemic on aviation, tourism and economic development, future studies relating to the SPR's aviation and tourism sectors may review the current air transport subsidies offered in the SPR (if any) and examine whether international air transport subsidy frameworks can be applied by the SPR governments to support their economic growth, notably in the aviation and tourism sectors (when reliable and updated data are available for analysis). For example, international models such as Public Service Obligations in European countries showed evidence that air transport subsidies could improve air connectivity and access to landlocked developing countries and smaller island countries (ICAO, 2005), which facilitated their economic and tourism growth. However, limited empirical studies of the impact of air transport subsidies have been carried out so far in the SPR, despite the great efforts of academic community and international organisations.

1.8 References

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Chapter Two – Aviation subsidies within the South Pacific Region

Preamble

Now that the key determinants of tourism growth within the SPR in Chapter 1 during the pre-COVID-19 era have been identified, this chapter examines another key challenge facing the sustainable growth of the aviation industry within the SPR, namely, aviation subsidies in amid the COVID-19 era. As such, this chapter addresses the second research objective, which focused on the goals and effects of aviation subsidies on the SPR's aviation development (see the Introduction). Due to the limited publicly available data and information regarding aviation subsidies within the SPR's countries, this chapter uses a qualitative approach (interviews and thematic analysis) to explore the key stakeholders' perspectives on the underlying factors that affect aviation subsidy programmes and their impacts on the SPR's aviation, tourism and wellbeing (economic, social and environmental). It was found that countries in the SPR are heavily reliant on aviation subsidies for the development and sustainability of their aviation industries. This often leads to aviation subsidies being subject to political influence and misuse. Aviation subsidies facilitate airfare affordability, flight accessibility, and service sustainability and positively contribute to tourism development, social wellbeing and economies in the SPR, but adversely impact environmental wellbeing. This chapter contributes to the air transport literature as the first empirical study to explore the issues of aviation subsidy programmes within the SPR, and highlights the impacts of the COVID-19 pandemic on the SPR from the aviation subsidy perspective. Note that this important issue of COVID-19 pandemic and aviation industry is examined further in Chapter 3. Importantly, this present chapter highlights the importance of establishing a tailor-made aviation subsidy framework in the operating environments of each country in the SPR with transparent and fair processes to facilitate aviation and tourism growth and speed up the post-COVID-19 recovery.

Study Two: Stakeholder perceptions of the impacts of aviation subsidies in the South Pacific Region

Publication status and candidate contribution

This study was published in a highly ranked air transport journal, *Journal of Air Transport Management* in June 2022. The doctoral candidate is the first author of the publication, with the doctoral supervisors being co-authors. The doctoral candidate is the first and corresponding author of the publication who contributed the most to the work, with all the doctoral supervisors being co-authors. The doctoral supervisors provided minor contributions towards the methods, analysis and review of the study, however, the work is primarily that of the doctoral candidate.

2.0 Abstract

This study examines the impacts of aviation subsidy programmes in the SPR. Interviews and thematic analysis were conducted to understand the perspectives of key stakeholders of aviation subsidies in the SPR. It was found that SPR countries are heavily reliant on aviation subsidies for the development and sustainability of their aviation industries. Aviation subsidy programmes are nevertheless subject to political influence and misuse. It is well recognised that aviation subsidy programmes in the SPR facilitate airfare affordability, flight accessibility and service sustainability. They may also positively impact tourism development, social wellbeing and economic wellbeing in SPR countries, but adversely impact the region's environmental wellbeing. The findings of this study suggest that formal aviation subsidy frameworks (i.e., customized, environmentally friendly) should be established for SPR countries, possibly in a similar vein to those used in developed markets. Generally, the adverse impacts of COVID-19 on aviation, tourism and economic development in the SPR call for a collective, regional and cross-sectional approach to help SPR countries recover from the COVID-19 pandemic.

2.1 Introduction

Governments have attempted to promote the development of the aviation industry through various subsidy programmes and policies (Fragoudaki, 2000; Guo et al., 2018; Malina et al., 2012). Many governments continue to substantially subsidise or channel public funding

towards the air transport sector, partly because in many markets it is still regarded as a public utility; this is especially so for non-commercialised routes (Gossling et al., 2017). In other cases, subsidies may mitigate the environmental impacts of the aviation industry (Whitelegg & Williams, 2001) and be vital for economic development (Forsyth & Guiomard, 2019). As the aviation industry has evolved due to deregulation and liberalisation, different government subsidy programmes have emerged to improve air accessibility and support flight services to remote and regional destinations or non-commercial routes (Allroggen et al., 2013; Fu & Kim, 2016; Mills & Kalaf-Hughes, 2017). For example, the US introduced the Essential Air Services (EAS), the European countries introduced Public Service Obligation (PSO), and Australia introduced Regional Aviation Access Programme (RAAP). These programmes promote air services to rural and regional communities, including those routes that are otherwise non-commercially sustainable (Hromadka, 2017; OECD, 2004). The US' EAS was established as part of 1978 Airline Deregulation Act and had a 10-year remit. It has been renewed and refunded since 1988 after periodic reviews and monitoring by the US Department of Transportation and other government agencies (such as the General Accountability Office). The PSO was introduced during the deregulation process and was applicable since 1993. Although the RAAP was introduced in 1983 in Australia, the Australian government had already been subsidizing the remote air services since 1957. This indicates that the subsidies are addressing some essential and long-term needs, and aviation subsidy programmes continue to evolve as the aviation industry develops (Hazledine & Collins, 2011).

Aviation subsidy programmes collectively aim to support a sustainable aviation sector, and a wide range of aviation subsidy programmes have been implemented by different governments (Fageda et al., 2018; Gossling et al., 2017). Because of the nature of the aviation industry and its vulnerability to external factors, governments offer 'bailout' or 'stimulus subsidies' during financially difficult periods for aviation operations (Law, 2017). For example, the COVID-19 pandemic resulted in an unprecedented reduction in air travel demand (International Air Transport Association (IATA), 2020). This pandemic emphasised the vital role of government subsidies (e.g., direct cash capital injections, debt write-off programmes, and non-repayment obligation loans) to support the air transport sector. Aviation subsidies have attracted a lot of controversy and debate amongst airlines, airport operators, and academics (Abeyratne, 2017; Tretheway & Marhvida, 2014). There are concerns about unfair competition among airlines (Forsyth, 2007; Lumbroso, 2019; Santana, 2009) and airports (Duesterberg, 2018; Law, 2017)

that are related to various government subsidies. Therefore, the ICAO established guidelines to address these issues and encourage fair competition in both domestic and international markets (Abeyratne, 2016). Similar initiatives have been pursued at regional level.

Although there is a wide range of literature on various aspects of aviation subsidy or incentive programmes in different countries, attention is lacking within the Oceania region, including the SPR (Wu et al., 2020). Therefore, the impacts of aviation subsidies in this region are still unclear. Geographically, the SPR small island countries are isolated from the rest of the world. They also have emerging economies, limited natural resources and relatively small populations scatted around the Pacific Ocean. The SPR[4] is an under-examined region with a limited number of studies on aviation development compared to other well-studied regions such as Asia, the European countries, and the US. Rather limited data were available concerning government subsidy programmes related to the aviation sector in SPR countries. The air transport literature highlights the paradox of the significance of the aviation industry to remote, regional and isolated communities, although such services are often not financially viable for airlines and airport operations (Bowen, 2010; Metrass-Mendes et al., 2011). Prior studies within the SPR are primarily descriptive, with only three quantitative studies examining aviation development and government subsidies (Cheer et al., 2018; Forsyth & King, 1996; Taumoepeau & Kissling, 2008). In particular, Taumoepeau and Kissling (2008) suggested that the aviation industry of the SPR needs government subsidy programmes. However, to our best knowledge, no prior studies have proposed any practical government subsidy frameworks or approaches to support the SPR's aviation and tourism sectors and economies. This indicates significant gaps in air transport research in relation to aviation subsidies in the SPR and, more importantly, a lack of guidelines for implementing, updating and regulating the aviation subsidy programmes in general. This gap prompts this study to propose a framework for governments and stakeholders in SPR countries to formulate and design effective aviation subsidy programmes and policies, which is essential for the region to develop aviation services (airlines and airports) and promote tourism growth, as well as economies in SPR countries. Therefore, this study focuses on the following three research questions:

[4] This study follows the geographical boundaries used by South Pacific scholars, such as Cheer et al. (2018), Stanley (2000), Taumoepeau (2007), and Taumoepeau and Kissling (2013). It is noted, however, that the WHO lists 15 countries in this region including New Zealand, and the UN lists 16 countries including Australia and New Zealand.

- *What are the goals of the aviation subsidies within the SPR?*
- *What are the effects of aviation subsidies in the SPR?*
- *What are the preferable approaches to implement aviation subsidy programmes in the SPR*?

This study aims to contribute to the literature by conducting a cross-national and cross-sectional analysis via interviews with key stakeholders to examine the impacts of aviation subsidies in the SPR's aviation development and tourism growth. The study offers insights by examining views from various participants in SPR countries across multiple sectors, such as airlines, airports, aviation authorities, tourism authorities and operators, regional organisations, environmental experts and academics. Importantly, this study paves the way for future studies in the SPR's aviation subsidy.

To contextualise these questions further, the next section outlines how the existing literature fails to empirically examine aviation subsidies in the SPR on Section 2.2. Section 2.3 provides an overview of the SPR. Section 2.4 details the qualitative approach (i.e., interviews with key stakeholders of aviation subsidies). Section 2.5 presents the results of this study. Section 2.6 provides a discussion and the policy implications of the results. The final section summarises the results and indicates directions for future research.

2.2 Literature review

This section reviews the evidence supporting aviation subsidies and provides an overview of various forms of aviation subsidy programmes. It then reviews evidence of the impacts of aviation subsidy programmes on economic growth, development of aviation infrastructure, and air passenger and tourism flow.

2.2.1 Main reasons to prompt aviation subsidy

Since the inception of the aviation industry, many governments worldwide have been involved with establishing national carriers, building airports and air navigation infrastructures (Doganis, 2002; Fearon, 1985; Petrescu et al., 2017). This is one important reason why the aviation industry is often regarded as a public utility. As the aviation industry continued to develop, governments recognised the potential for the aviation industry to grow and flourish in

a more open and commercialised environment. Hence, many governments started to withdraw direct involvement (e.g., direct ownership of airlines, airports, and aircraft manufacturers), encouraged and prompted market competition to enhance air service quality through deregulation and liberalisation (Donzelli, 2010; Fu et al., 2015; Tsui, 2017). The commercialisation and privatisation of airlines and airports were first introduced in developed countries such as the US and European countries, followed by countries in Asia such as China, South Korea, and Singapore (Clayton, 2014; Lee, 2020). On the other hand, the SPR is still lagging behind this trend, governments of the 15 SPR countries are heavily involved in developing their air transport sector through establishing airlines and subsiding airport and infrastructure facilities as air transport is in early stage of development. For example, the government of Tonga owns 100% of the newly established national carrier, Lulutai Airline, while the Fijian government owns 100% of the Fiji Airport Limited.

2.2.2 Forms of aviation subsidy programmes in different countries

The definition of subsidy in the aviation industry is complicated (Forsyth & Guiomard, 2019; Tretheway & Andriulaiti, 2015; Wu et al., 2020), which has led to various classifications. The Organisation of Economic Co-operation and Development (OECD) defined aviation subsidy as any financial aid or in-kind support provided to the aviation sector (e.g., airlines, airports, and passengers) (OECD, 2021). Gossling and Humpe (2021) and Fichert (2020) categorised aviation subsidies in terms of the forms of support provided (e.g., direct cash payments, tax exemption, and restrictive agreements), the objectives of the subsidy (e.g., economic development, social obligation, and environmental protection), and potential beneficiaries (e.g., sector-specific subsidies, subsidies granted in certain regions, and subsidies granted to small- and medium-sized enterprises). In addition, there may be hidden/open subsidies (through indirect forms of taxation, trade barriers, no-obligation loans, etc.) that are linked to illegal subsidies (Malina et al., 2012; Wu et al., 2020). Illegal subsidy refers to any financial support provided to the aviation operators that may breach any trade agreement, national or multinational law (Sykes, 2005). For instance, government of Abu Dhabi subsidised Etihad with a total of US13.5 billion between 2004 and 2013 (Gossling et al., 2017). Bock et al. (2019) also argued that the Chapter 11 Bankruptcy Code should be considered as a subsidy.

Aviation subsidy can be broadly categorized as direct or indirect (Gossling et al., 2017). Direct subsidy programmes may include a direct capital subsidy from governments to establish

airlines or build high-cost capital infrastructures (e.g., airports and air navigation infrastructure) (Abreu et al., 2018). Some governments have also used various forms of direct subsidy to finance newly established airlines, infrastructure investments, and financial hardship funding to aviation organizations facing temporary financial challenges (Law, 2017). Indirect subsidy programmes may include fuel tax exemption and other policies that favour specific firms (e.g., restrictive air service agreement). In aviation markets that are not fully liberalized or commercialized, airlines and airports may still rely on aviation subsidy to operate (Hvass, 2014). Hence, there is a need for clearly defining government's role to address the concerns of subsidy as mentioned earlier (Malina et al., 2012).

The aviation industry (e.g., airlines and airports) facilitates economic growth and thus has, in many cases, received government support to promote its positive externalities (Ivanova, 2017). Table 9 shows a non-exhaustive list of direct and indirect aviation subsidy programmes across countries as government responses to COVID-19. The various forms or mechanisms of direct subsidies from governments to airline operators, including direct financial support made during the establishment stage (Abreu et al., 2018), capital and infrastructure investments and financial hardship funding (Law, 2017). Indirect subsidy programmes include liberalisation policies, loan guarantees, tax exemptions, fuel tax exemptions, debt write-offs and staff pension payments (Wittman et al., 2016). There is a significant body of literature on government subsidy programmes offered to regional and peripheral communities (see Table 10). Many airlines avoid serving non-commercially viable routes or they provide flight services to remote areas with higher ticket prices (Bitzan & Chi, 2004). However, air services are often regarded as a public utility (Calzada & Fageda, 2012). This prompts the need for governments to intervene and ensure that air services are provided to remote areas and isolated communities. Most of the literature reviewed aviation subsidy programmes on an individual country basis, such as Canada (Metrass-Mendes et al., 2011), Spain (Abreu et al., 2018) and the US (Matisziw et al., 2012; Park & O'Kelly, 2017), with a few cross-national studies as well (e.g., Brathen & Halpern, 2012; Fageda et al., 2018; Metrass-Mendes et al., 2013; Merkert & O'Fee, 2013).

Table 9

Examples of Government Responses to COVID-19 Subsidy

Countries	Forms of subsidy	Beneficiaries	Objectives	Sources
Direct subsidy programmes				
Argentina	Direct financial support: ARS21.5 billion	Aerolineas Argentinas	Direct grant (COVID-19 relief)	OECD (2021)
Belgium	Direct financial support: EUR2.9 million	Brussels Airlines	COVID-19 bail out	OECD (2021)
Croatia	Direct financial support: HRK88.5 million	Croatia Airlines	Direct-19 damages	OECD (2021)
France	Direct financial support: €4 billion recapitalisation and bailout (2021)	Air France	Reinforce Air France Equity and Coronavirus bail-out	European Commission (2021)
Greece	Direct financial support: EUR120 million (capital injection)	Aegean Airlines	Direct grant (COVID-19 relief)	OECD (2021))
Ireland	Direct financial support: EUR32 million	Cork Airport; Shannon Airport	Direct grant (COVID-19 relief)	OEDC (2021)
Latvia	Direct financial support EUR250 million (Capital injection)	Air Baltic Corporation	Direct grant (COVID-19 relief)	OEDC (2021)
New Zealand	Direct financial support: Equity (Wage subsidy Scheme WSS) bailout NZD165 million	Airways Corporation of New Zealand Limited	Wage subsidy Scheme (WSS)	OECD (2021)
Switzerland	Direct financial support: CHF500 million capitalisation	Skyguide	Avoid liquidity shortfall	The Federal Council (2021)
The US	Direct financial support: Payment of employee wages, salaries and benefits (PSP1) USD32 billion Bailout; PSP2 USD16 billion; PSP3 USD15 billion	Passenger air carriers; Cargo air carriers; Contractors	Payroll support as national relief programme	U.S. Department of the Treasury
Indirect subsidy programmes				
Australia	Fee waivers: Australia Airline Financial Relief Package AUD145 million charges waived	Airservices (domestic airlines)	Fee waivers (COVID-19 relief)	OECD (2021)
Belgium	Loan agreement: EUR287.1 million	Brussels Airlines	Loan (COVID-19 relief)	OECD (2021)
Brazil	Payment defers (contracts payment relief periods)	Airport and airline companies	Payments defers (COVID-19 relief)	
Croatia	State guarantee: EUR7.2 million for international airport	Croatia international airports	State guarantee (COVID-19 relief)	OECD (2021)
France	Government loan: €3 billion	Air France	Loan (COVID-19 relief)	OECD (2021)
Hungary	Tax concession: HUF115 million	Aeroplex of Central European Aircraft Technology Ltd	Tax exemption (COVID-19 relief)	OECD (2021)
Iceland	State guarantee: USD120 million	Icelandair Group	COVID-19 relief package to maintain head office in Iceland	OECD (2021)
Japan	Exemption and reduction: JPY120 billion	Domestic airlines & airports	Total 90% reduction of parking charge, landing charge and air navigation (2021); 50% exemption on fuel tax	OECD (2021)
Lithuania	Delay in profit distribution: EUR9.7 million	Lithuanian airports	COVID-19 relief	OEDC (2021)
Mexico	Airport tariffs exemptions: MXP 41 million	Airlines within Mexico	COVID-19 relief	OECD (2021)

2.2.3 Aviation subsidy programmes in SPR countries

Air transport financial supports are part of a package of ingredients to support economic growth and development. They are necessary but not sufficient conditions for sustainability and growth (Air Transport Action Group, 2005; Ministry of Transport, 2016). Only a few studies have touched upon air transport subsidy programmes in the SPR (Duval & Winchester, 2011; Hazledine & Collins, 2011). The Cook Islands, Samoan and Tongan governments subsidised Air New Zealand to sustain air services between these SPR countries and the US. Taumoepeau (2014) argued that without the regional subsidies, the aviation industry in the SPR would not have been viable. For instance, direct aviation subsidies have emerged in the form of public ownership of airlines, airports and air navigation services, and direct financial support in the SPR. The expansion of aviation via subsidies such as aircraft purchases and airport infrastructure are also seen in the SPR (Ministry of Foreign Affairs & Trade New Zealand & Ministry of Finance and National Planning Tonga, 2016; Thomas & Blackwell, 2011). The Tongan government received brand new aircraft from China through a foreign aid programme (Murray, 2015; Taumoepeau, 2016). The Fijian government also discussed subsidy programmes for public-owned airports and airlines in Fiji, and route discount schemes for isolated islands.

2.2.4 Impacts of subsidy programmes for economic growth

Many studies have identified a positive relationship between aviation services and regional economic growth (Allroggen & Malina, 2014; Appold & Kasarda, 2013; Fu et al., 2020). Because aviation subsidies facilitate aviation development (e.g., increased in flight movements and airport expansion), it is natural to expect that it would have positive effects on employment and income in regional communities (e.g., Button et al., 2010; Koo et al., 2017; Özcan, 2014b; Smyth et al., 2012). For example, 113 rural communities in the US that received the EAS subsidy programmes reported that a 1% increase in air passenger traffic resulted in a 0.12% increase in income per capita and employment in those communities (Özcan, 2014a). Similarly, the Route Development Framework positively impacted the tourism and business travel gateways in Scotland (Smyth et al., 2012). Aviation subsidies are instrumental in increasing trading volumes and business activities within the rural regions (Özcan, 2014a; Rymanov & Fomin, 2014; van Beers & van den Bergh, 2001). Italian manufacturers benefited from aviation subsidies (i.e., increased air links) as their exports increased between 1998 and 2010 (Alderighi & Gaggero, 2017). Similarly, the RASS subsidy programme in Australia benefited the mineral

industry, as it provided the only viable mode of transport for the regional areas (Donehue & Baker, 2012). On the other hand, Halpern (2008) found that aviation subsidies in Finland did not have any impact on employment levels. It seems that aviation subsidies are beneficial in most cases, this is not always guaranteed.

2.2.5 Impacts of aviation subsidy programmes on the development of aviation infrastructure

Despite various commercialisation and privatisation initiatives in recent years in many countries, aviation infrastructure remains a public utility and one of the essential facilitators of economic growth (de Juniac, 2018). Several studies argued that governments played critical roles in the transition of airports and airlines into fully privatised organisations using direct capital funding and upgrading of air navigation services and airport infrastructure (e.g., de Juniac, 2018; Forsyth, 2007; Jain & Natarajan, 2015; Sellner & Nagl, 2010). For the airport sector, Metrass-Mendes et al. (2011) claimed that without the government subsidy, Canadian airports would not have been sustainable. Similarly, Fichert (2020) suggested that some privatised airports still rely on state-aid to serve certain unprofitable but important regional markets. Forsyth (2007) also found that airport subsidies intensified economic growth in Australia. On the other hand, the Airports Council International (ACI) (2018) argued that airports should be operated as commercial enterprises.

2.2.6 Impacts of subsidy programmes on air passenger traffic and tourism flows, and efficient and affordable air services

The positive impacts of aviation subsidy programmes on air passenger traffic and tourism flows have attracted attention from researchers (Forsyth & Guiomard, 2019; Nunkoo & Smith, 2013; Özcan, 2014a). The tourists' access to some air services were only made available through aviation subsidies by governments (Fageda et al., 2018; Law, 2017; Merkert & Hensher, 2013). For instance, various aviation subsidy programmes were introduced to support airport development in the US domestic market (Metrass-Mendes & de Neufville, 2011). The Chinese government also subsidised its domestic airlines to operate to remote and rural areas such as Sichuan, Mongolia and Yunnan provinces (Law, 2017).

A number of studies have suggested that government subsidies are one of the critical factors for affordable airfares (Abreu et al., 2018; Calzada & Fageda, 2012). Aviation subsidies make

airfares more affordable for air passengers and thus increase traffic volumes. Indeed, the airfare discount programme increased the demand for air services in Spain (Canary and Balearic Islands) (Abreu et al., 2018; Calzada & Fageda, 2012). Similar results were reported for other European markets, including France, Germany, Italy, Scotland, and the UK (Calzada & Fageda, 2014). In particular, in Scotland some of the airfare may be paid by the government to ensure affordable connectivity with the rest of the country (International Transport Forum, 2021). Similar positive results were reported on the impact of the EAS programme on non-commercially viable routes in the US (Grubesic & Wei, 2013; Metrass-Mendes et al., 2013) and Canada's rural communities (Bråthen & Halpern, 2012). Aviation subsidy programmes also enable regional airlines to feed their traffic to major network carriers, as observed in Australia, China, Denmark, and the US (Graham, 1998). Interestingly, there are also claims that the robust growth of low-cost carriers in some markets has been significantly driven by the availability of government subsidies (Ivanova, 2017). Importantly, recent studies have highlighted that subsidy programmes allow rural and regional communities to have better access to social welfare (Solvoll & Hanssen, 2018), humanitarian facilities (Grubesic & Wei, 2013; Rymanov & Fomin, 2014) and better educational institutions (Button et al., 2010, Metrass-Mendes & de Neufville, 2011).

In summary, many prior studies have concluded that aviation subsidy programmes contribute to the availability of aviation infrastructure, help reduce airfares and grow traffic volumes, which, in turn, prompt regional accessibility, economic growth and regional development. However, significant benefits are not always guaranteed and there are concerns about the possible negative effects on competition and illegal subsidy. Although aviation subsidy programmes have been used in the SPR over the years, few studies have systematically examined such programmes' effects on SPR countries involved. The following sections describe the data and methods used in this study to fill such gaps in the literature.

Table 10

Government Subsidy Programmes for Regional and Peripheral Communities

Countries	Subsidy programmes	Forms of subsidy	Sources
Australia	Regional Aviation Access Programme Remote Air Service Subsidy International Aviation Support (IAS)	Financial support for regular weekly air transport services for passengers and goods such as medical supplies, educational tools and necessary supplies to remote and isolated areas. This programme provides services to 372 communities in remote and isolated areas in Australia Grants to support Australian international passenger airlines in maintaining core international aviation workforce and operational capability, enabling the airlines to quickly recommence international commercial flight as soon as practical	Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) (2020; 2021)
Australia	Remote Strip Upgrade	This project provides funding for airport upgrades to remote airstrips in isolated outback communities.	DITRDC (2020)
Canada	Airports Capital Assistance Programme	Government airport development projects amounting to CA$785.9 million for 904 projects at 182 airports	Government of Canada (2020)
France	Public Service Obligation (PSO)	Financial support (average seating capacity: 110–170 seats) Discount airfares, discount airport tax, secure minimum service requirements	Abreu et al., 2018; Merkert & O'Fee (2013)
India	Regional Connectivity Scheme	Remote development; Airfare caps (discounted airfares for Guwahati, Kathmandu, Yangon, Kuala Lumpur, Singapore, and Bangkok); Airport concessions	Airport Authority of India (2020)
Ireland	Route Development Fund (RDF) Ireland's Regional Airports Programme	Per-passenger discounts, limited to 75% of load factors for the first three years of operation to a new underserved destination. Examples of routes include new routes between Belfast and New York, Geneva, Berlin and Nice.	Christodoulou et al. (2009)
Japan	Risk-sharing programmes	Financial support through the local government for airports and airlines	Hihara (2014)
Scotland	Route Development Fund (RDF)	Focus on developing new routes and the aim of sharing risk between operators with a minimum of four weekly return trips throughout the year. It provided £14.4 million of support for routes to European cities such as Barcelona, Berlin and Prague. Funding is paid on the basis of the number of passengers and is available for the first three years of operation	Christodoulou et al. (2009)
Spain	Universal Service Policy (PSO)	Resident discount programme: during 2001–2007, residents of Canary and Balearic Islands and the cities of Ceuta and Mellila received 33–50% in airfare discounts	Calzada & Fageda (2012)
Spain	Universal Service Policy (PSO)	13 interisland routes in the Canary Islands and two interisland routes in the Balearic Islands, subject to continuity of flight frequency, timetable requirements, floors, seating capacity and price caps	Calzada & Fageda (2012)
Spain	Airport subsidies	40% lower airport fees on domestic routes that provide direct services to the mainland than other domestic routes	Calzada & Fageda (2012)
Spain	Regional Air Connectivity Fund (RACF)	Support new routes through risk-sharing between airports and airlines through public funding from regional bodies	Calzada & Fageda (2012)
The UK	Route Development Fund (RDF)	The Northern Ireland Development Fund was implemented in 2003; Development of new routes including Wales and northeast England. Support for new routes through risk-sharing between airports and airlines through public funding from regional bodies	Calzada & Fageda (2012)
The US	Small Communities Air Service; Development Programme	Financial support to smaller airports: US$14 million to 33 airports in 2012	Wittman (2014)
The US	Essential Air Services (EAS)	Financial support (provided through Federal Aviation Authority revenues from user fees): US$214 million to 163 communities, a subsidy of more than US$200 in remote communities in 2012	Bråthen & Halpern (2012); Wittman (2014)
Tonga	Community Service Obligation	Airfare caps	Thomas & Blackwell (2011)

2.3 Overview of SPR countries

Due to the remote and isolated geographical location of the SPR and it being surrounded by the world's largest ocean (as depicted by Figure 1), the SPR countries' primary means of connection to the world is via air transport (Taumoepeau et al., 2017; Salesi et al., 2021). Many of the world's smallest, least populated, and least developed countries are widely scattered across the Pacific Ocean. For instance, Kiribati's 33 coral atolls spread across 3.5 million square kilometres of ocean. In addition, the SPR's small population implies a small market for trading and air travel, often leading to the lack of sustainability of air services within the SPR. Hence, the tourism industry is vital for the sustainability of air services and the economic developments of the SPR. For instance, in 2018, the tourism industry accounted for about 87% of gross domestic product (GDP) of the Cook Islands and 40% of the GDP of Vanuatu and Niue, respectively (SPTO, 2018).

Before the COVID-19 pandemic, the SPR experienced an upward trend within the tourism industry, with a 1.6% increase from 2018 and 2017 (SPTO, 2018). The SPR received 2.14 million international tourists in 2018. The majority of international tourists to the SPR arrived from Australia (28.9%) and New Zealand (21.8%), followed by the US (10.5%) and Europe (9.7%). Table 11 provides the distance between all the 15 SRP countries and major tourism markets, namely Sydney (Australia), Auckland (New Zealand), Los Angeles (the US) and Beijing (China). Leisure travellers continued to dominate inbound arrivals with a 64.96% share, followed by VRF travellers (13.9%) and business travellers (12.1%). After the COVID-19 outbreak, there have been no inbound tourists travelling to SPR countries, except for the travel bubble between New Zealand and the Cook Islands and Rarotonga. Prior to the COVID-19 era, there were reliable year-round air services to SPR countries, with the peak periods being the December holiday season and the months of June–July. With respect to inter-islands flight connectivity, there were limited inter-island flights. Although Nadi International Airport (Fiji) has been playing a significant role in inter-island and hub air connectivity. Hence, there is limited intra-trading (via air) within the SPR.

Over the years, air transport links between the SPR and the rest of the world were mainly provided by major airlines from Australia, New Zealand and the Pacific Rim (Kissling, 1989). Currently, the SPR's air connectivity to key international markets is via airports in Australia, New Zealand or Fiji. These links are served by major airlines from Australia (Qantas and Jetstar), New Zealand (Air New Zealand) and Fiji (Fiji Airways). Most of SPR countries have their state-

owned airlines (wholly- or partly-owned), such as Air Kiribati, Air Rarotonga, Air Vanuatu, Fiji Airways, Nauru Airlines, Royal Tongan Ltd, Samoan Airways, and Solomon Airways. These state-owned airlines dominate their respective domestic aviation markets. Having small domestic aviation markets in SPR countries, most of their air transport sectors are heavily subsidised and supported by governments (Taumoepeau et al., 2017). It is evident that there are various reasons for government subsidy and financial support to the aviation sector in the SPR, although such support are commonly aimed for tourism growth and economic development and national pride (Kissling, 1989; Taumoepeau, 2007). Nevertheless, the SPR governments may have different development objectives for aviation subsidy compared with those of international development agencies. For example, the SPR governments may be more concerned with connecting remote areas/islands via air transport, whereas international institutions or development agencies may be more concerned with expansion of the international connectivity of their networks. For example, the New Zealand government provides air fare subsidy to Air New Zealand for routes linking New Zealand/Tonga/Samoa/United States (Hazledine & Collins, 2011). Table 11 also shows additional information on SPR countries.

Figure 1

Map of South Pacific Region's Countries

Source: Australian National University (2020).

Table 11

Information on South Pacific Region Countries

Countries	Land size (km^2)	Population (2019) (thousands)	GDP (2019) (US$ million)	GDP per capita (2018) (US$) (Rank)	Income group	Airport name/ Location	IATA code	Airport distance to Sydney	Airport distance to Auckland	Airport distance to Beijing	Airport distance– Los Angeles	Tourists (2018) (pre-COVID-19 era)	Tourism contribution to GDP (2018)
American Samoa	199	55.31	638	11,466 (n/a)	low middle	Pangopago Int /Pangopago	PPG	4,404km	2,884km	11,565km	7,695km	20,221	3.51%
Cook Islands	240	15.8	263	(n/a)	n/a	Aitutaki, Araura Is	RAR	5,120km	3,195km	10,815km	7,303km	168,760	86.99
Fiji	18,272	889.95	5,496.3	6,175.9 (93)	upper middle, lower middle	Nadi Int/ Nadi	NAN	3,170km	2,149km	8,978km	8,881km	870,309	15.80
French Polynesia	3,660	279.29	5887	(n/a)	n/a	Faa'a Int/ Pape'ete	PPT	6,126km	4,094km	11,563km	6,591km	216,416	18.41
Kiribati	811	117.61	194.65	1,655.1 (n/a)	lower middle	Bonriki Int/ Tawana Is	TRW	4,536km	4,254km	7,121km	7,9847km	6,826	13.21
Micronesia	701	113.81	408.06	3,568.3 (124)	lower middle	Pohnapei Int/ Pohnapei	ONI	4,590 km	5,167km	5,527km	8,974km	19,200	7.86
Nauru	21	12.58	118.22	9,397 (n/a)	middle	Nauru Int/ Yaren	INU	4,046km	4,117km	6,794km	8,636km	576,000	6.76
New Caledonia	18,575	287.80	34,942	12,579.6 (n/a)	high income	La tontourta In/Noumea	NOU	1,980km	1,856km	8,585km	10,095km	120,343	n/a
Niue	260	1.719	30.8	15,586 (n/a)	n/a	Niue Int/ Alofi	IUE	4,181km	2,484km	1,0027km	8,015km	10,448	3.63
Papua New Guinea	452,860	8,776.11	24,829.11	2,829.2 (136)	middle income	Jackson Int/ Port Moresby	POM	2,743km	4,125km	6,325km	10,995km	121,503	21
Samoa	2,934	197.10	852.25 (115)	4,324.1 (115)	lower middle	Faleolo Int/ Apia	APW	4,326km	2,884km	9,464km	9,822km	167,651	16.09
Solomon Islands	27,540	669.89	1,589.91	2,373.6 (144)	lower middle	Henderson Int/ Honiara	BIS	2,863km	3,397km	7,073km	9,822km	25,866	30.32
Tonga	718	104.49	512.35	4,903.2 (106)	upper middle, lower middle	Fuaamotu Int/ Fuaamotu	TBU	3,590km	2,001km	9,797km	7,754km	54,046	7.59
Tuvalu	26	11.65	47.27	4,055.9 (119)	lower middle	Funafuti Int/ Funafuti Atoll	FUN	4,020km	3,186km	8,371km	8,078km	2,700	n/a
Vanuatu	12,200	299.88	482,359.32	3,115.4 (133)	lower middle	Bauerfield Int Port Vila	VLI	2,481km	2,232km	8,342km	9,632km	115,634	48.2

Sources: Great Circle Mapper; SPTO Report 2018; United Nations Data; The World Bank database website.
Remarks: n/a denotes the information is not available. Tokelau is not included in this table, as they do not have any direct flights to/from Tokelau.

2.4 Methodology and interview data

This section presents the methodology and interview data used for this study. This study used a qualitative approach (i.e., interviews with different stakeholders) to analyse existing aviation subsidies and determine their impacts on the growth of aviation, tourism and the economies of SPR countries. It aims to provide insights into aviation subsidy programmes in the SPR, in particular contributes towards a framework of effective aviation subsidies in general. Section 2.4.1 presents an overview of the qualitative approach used in this study. Sections 2.4.2–2.4.4 describe the sources and the process of collecting the interview data. Section 2.4.5 presents the data analysis tool used for this study.

2.4.1 Qualitative approach

This study uses a qualitative methodology (i.e., interviews with key stakeholders) (Lohamann, 2014; Mootien, 2012; Suau-Sanchez et al., 2020) and thematic analysis (Fariduddin et al., 2019; Kotla et al., 2021; Mootien et al., 2013), which have been widely adopted in the aviation and tourism literature. Qualitative analysis offers critical insights on the issue investigated (Strauss & Corbin, 1998), and it may provide richer information than the quantitative data (Babbie, 2010), especially on topics and mechanisms that are not well understood. It also allows a better understanding of people's belief, opinion and attitude towards a specific idea (aviation subsidy programmes), particularly useful for designing aviation policies that affect multiple stakeholders in addition to a large number of passengers. Creswell (2013) also argued that qualitative analysis may explore the complex sets of factors surrounding a central phenomenon and describe the participants' various perspectives. Recognising the limited accessibility and availability of comparable data, well defined information, organized documentation and previous research on aviation subsidies in the SPR, the qualitative approach adopted in this study serves as an effective tool for collecting primary data and perspectives from key stakeholders in the exploration of potential issues related to aviation subsidy in this under-studied region (Cassell & Symon, 1994; Kelly et al., 2003). Importantly, it provides a comprehensive analysis of the existing aviation subsidies in the SPR and a good understanding of stakeholders' perspectives regarding how the aviation subsidy programmes should support, and have supported the SPR's aviation, tourism and economies.

2.4.2 Participants

A sampling frame of 128 potential interviewees were initially identified as potentially having substantial knowledge of aviation subsidies and a background related to the aviation sector in the SPR. Subsequently, 36 participants from 11 SPR countries were successfully recruited for interviews (see Table 12 for participant details). The identification of interviewees followed Creswell's approach (2013), which highlighted the importance of carefully selecting participants suitable for interviews. Participants were recruited for the interviews using the snowball technique. The snowball technique relies on the recruited participants referring other potential participants to be interviewed (Benfield & Szlemko, 2006; Wu & Tsui, 2020).

Participants included senior government officials who directly governed and involved in the implementation of the aviation subsidy programmes in SPR countries, such as officials in the Ministry of Finance/Treasury (or equivalent), airport and senior airline executives, as well as executives from the tourism authorities and environment specialists. Some (9) participants were representatives from regional organisations, namely PASO, South Pacific Airline Association, South Pacific Environment Community, and SPTO. Several (6) academics who conducted research (i.e., aviation and tourism) within the Pacific were also interviewed. The participants' years of experience in their respective expertise area range from 5 to 46 years. Some (10) participants moved around in various roles within the SPR. For example, a former executive of the national civil aviation authority moved to an executive role in airport; a former minister moved from public funding management to be the chairman of an airline; executives from the national civil aviation authorities moved to the regional organisations; an airline executive becomes an academic. Such a broad profile of participants shows the richness of the stakeholders' perspectives of aviation subsidies in the SPR, and interview data and information collected for this study. At the time of the study, all the participants were active employees except for one participant who recently left the job.

Table 12

Details of Participants

Participants (ID)	Background	Country of residence	Interview data sources	Duration (min)
Academic (A1)	Academic with expertise in the topic	Australia	Transcript	44.45
Academic (A2)	Academic with expertise in the topic	New Zealand	Transcript and notes	65.45
Academic (A3)	Academic with expertise in the topic	Fiji	Transcript	43.38
Academic (A4)	Academic with expertise in the topic	New Zealand	Transcript	41.37
Academic (A5)	Academic with expertise in the topic	New Zealand	Transcript	30.18
Academic (A6)	Academic with expertise in the topic	Japan	Transcript	59.22
Aviation operator: airline (AO1)	Senior manager	Papua New Guinea	Transcript	20.52
Aviation operator: airline (AO2)	Executive role	Fiji	Transcript	64.43
Aviation operator: airline (AO3)	Senior manager	Tonga	Transcript	24.32
Aviation operator: airline (AO4)	Executive role	Tonga	Transcript	28.53
Aviation operator: airport (AO5)	Executive role	Tonga	Notes only	N/A
Aviation operator: airport (AO6)	Executive role	Tonga	Transcript	31.23
Government official: aviation (G1)	Senior manager	Tonga	Transcript	36.39
Government official: aviation (G2)	Executive role	Vanuatu	Transcript	38.11
Government official: aviation (G3)	Senior official	New Zealand	Transcript	36.55
Government official: aviation (G4)	Senior official	Vanuatu	Transcript and notes	33.26
Government official: aviation (G5)	Executive role	Niue	Transcript	29.52
Government official: aviation (G6)	Senior official	Tuvalu	Transcript	27.37
Government official: aviation (G7)	Senior role	Fiji	Transcript	27.27
Government official: aviation (G8)	Executive role	Solomon Islands	Transcript and note	12.38
Government official: finance (G9)	Executive role	Fiji	Transcript	53.05
Government official: finance (G10)	Senior role	Nauru	Transcript	53.05
Government official: public enterprise (G11)	Executive role	Tonga	Transcript	49.03
Foreign aid institution (F1)	Executive role	Tonga	Transcript	40.02
Foreign aid institution (F2)	Executive role	Tuvalu	Transcript	29.52
Foreign aid institution (F3)	Executive role	Tuvalu	Transcript	27.37
Passenger (P1)	Passenger	Fiji	Transcript	N/A
Passenger (P2)	Passenger	Papua New Guinea	Transcript	25.44
Passenger (P3)	Passenger	Tonga	Transcript	34.36
Passenger (P4)	Passenger	Tonga	Transcript	21.04
Passenger (P5)	Passenger	Tuvalu	Transcript	11.36
Passenger (P6)	Passenger	Vanuatu	Transcript	15.59
Passenger (P7)	Passenger	Vanuatu	Notes only	N/A
Other – environment (E1)	Senior role	Kiribati	Transcript	37.28
Other – environment (E2)	Executive role	Samoa	Transcript	22.34
Other – tourism (T1)	Executive role	Fiji	Transcript	39.08

Remark: N/A represents Not Applicable.

2.4.3 Materials

Semi-structured interviews were conducted, with a set of questions asked systematically and consistently. The two sets of pre-set interview questions were used as the primary instrument for obtaining stakeholders' perspectives of aviation subsidies in the SPR, a technique widely used in the aviation literature (Bridges et al., 2014; Karimi & Sanavi, 2014; Yilmaz, 2014). Interview questions were validated with a pilot study to avoid any ambiguous statements. The pilot study was conducted with seven participants from 28 February 2020 to 6 March 2020 (details reported in Table 13). The interview questions were later modified after careful reflection on the feedback from participants of the pilot study as reported in Appendix A.[5]

Table 13

Participants in the Pilot Study

Country of Origin	Locations of interview	Categories
Fiji	Massey University Library	Passenger
Papua New Guinea	Massey University Library	Passenger
Papua New Guinea	Fale Pasifika, Massey University	Government official (finance)
Solomon Islands	Fale Pasifika, Massey University	Government official (environment)
Tonga	Fale Pasifika Massey University	Government official (finance)
Tonga	Massey University Library	Aviation industry (airport)
Vanuatu	Massey University Library	Aviation industry (airline)

The semi-structured questions allowed participants to express their views on aviation subsidies openly, without the possible bias associated with restricting responses to predefined alternatives (Malhotra, 2006). Interview questions focused on the following areas:

- The form(s) of existing aviation subsidies within the SPR
- The implementation processes of aviation subsidies
- The impacts of aviation subsidies on aviation and relevant sectors, particularly economic growth, tourism, social wellbeing and environment wellbeing
- Future outlook for government subsidies for the SPR's aviation sector

2.4.4 Interview Data Collection

[5] Appendices B–D provide additional information provided for participants.

All of the interviews were conducted remotely via telephone or online platforms (e.g., Facebook Messenger, Skype, and Zoom) between 26 March and 30 May 2020 (inclusive).[6] Interview durations ranged between 11.36 minutes and 65.45 minutes. All except two participants were interviewed in this way.[7] Interviews began with a basic question to seek background information on the participants. As needed, the researcher used follow-up questions or probing questions during the interviews to further clarify participants' responses. Interviews were voice-recorded, transcribed, coded and analysed for emerging themes regarding the participants' perspectives on the impact of aviation subsidy programmes in the SPR. Based on the transcripts of the interview recordings, thematic analysis was used to identify the key themes in the participants' responses. All interviews were conducted in English for consistency in transcription, coding and analysis of the participants' responses.

2.4.5 Interview Data Analysis

Thematic analysis in this study was conducted as per the guidelines of Braun et al. (2019). This process was achieved with the QRS-Nvivo software programme. Through the six steps of thematic analysis (i.e., familiarisation with the voice-recordings of the interviews, generating codes, constructing themes, revising and defining themes, producing themes and subthemes, and validating and testing the reliability of the study), this study explored the perspectives of different key stakeholders regarding aviation subsidies in the SPR and answered the two research questions as defined in the Introduction. Unlike the validation and reliability tests in many quantitative investigations, this study followed the steps suggested by Miles et al. (2014), which provides evidence to increase the credibility and dependability of this study. This study gathered the data from semi-structured interviews of key stakeholders in SPR countries, including governments (civil aviation authorities and financial institutions), airlines and airports, academics, foreign aid institutions, tourism organisations and environmental agencies, and passengers and travellers to attain cross-confirmation or data saturation. The themes and subthemes appeared in the interview data were verified as meaningful and consistent across participants from different stakeholder groups. The interview data were transcribed in greater detail and supported with direct quotations from participants. The interviews continued until

[6] Amidst the COVID-19 pandemic and the cyclone season within the SPR and the limited research budget, the author could not travel to all the 15 SPR countries for interview as planned. Most participants in the SPR countries were battling the adverse impacts of the COVID-19 pandemic (e.g., lockdowns, border closures and travel restrictions, etc.) and the cyclones, thus restricting the number of participants were interviewed.

[7] Two participants submitted their responses via email and Skype messenger because of bad internet connectivity.

no new information was forthcoming. As a result, a cross-confirmation or data saturation can be achieved. The data saturation was achieved on the 30th interview.

2.5 Results

Despite the heterogeneity of the sample (resulting from the geographical diversity of the sampled SPR countries and the different professions and backgrounds of the participants), this study found interesting patterns in the perceptions of stakeholders regarding the impacts of aviation subsidies on aviation, tourism and the economies of SPR countries. Figure 2 provides a word cloud of the words most frequently used during the interviews.[8] The following sections present the five themes and 24 subthemes extracted from the interview data and identified as being central to addressing the research questions in the Introduction. It should be noted that all quotations reported here are verbatim and have not been corrected for grammar (Brown, 2010; Eldh et al., 2020).

2.5.1 Word Frequency Queries

The word frequency queries run by the Nvivo software is to identify the words or phrases that used or occurred most often by participants during the interviews. The frequently used words and phrases from the participants' remarks are grouped to identify the words that are more important than others for our study (Sharma et al., 2020). These words are analysed for possible and frequent combinations. A word cloud contains the words in the list generated with a frequency of at least 100. As shown in Figure 2, the size of the words corresponds to the frequency of the words used by participants during the interviews. The most used words after excluding some stop words[9] and irrelevant words[10] were "government", "aviation", "subsidy", "airline", "airport", "Pacific", "tourism", "impact" and "development". Among the 100 words most frequently used by participants, a scattering of keywords stood out as reflecting the themes and subthemes identified for this study, including "economic", "social",

[8] The words used in the word cloud are created by automated text analysis.

[9] A stop word is a commonly used word (such as "and") which is irrelevant for search purposes in this study because it is commonly used in English interviews (Banks et al., 2018). Other words such as "may" or "however" were also filtered and removed when running the word frequency queries.

[10] Irrelevant words refer to words that are not relevant for search purposes. This study aimed to identify aviation subsidies and their impacts on the SPR's aviation, tourism and economies, etc. Hence, words such as "provide", "using", "allow", "case" and "need" were deemed to be irrelevant words and were filtered out when running the frequency queries.

"environment", "infrastructure", "access" and "COVID". These results suggest that stakeholders in SPR countries are mostly concerned about the aviation subsidy programmes' impacts on the aviation industry itself, the tourism sector and their economies. In addition to the economic implications, stakeholders are also concerned about social and environmental issues. Although the COVID-19 pandemic has clearly been a major shock to the SPR in the short term, stakeholders are also concerned about its long-term effects although the interviews were carried out at a time when the pandemic's impacts were far from clear.

Figure 2

Word Cloud of Interviews with Participants

2.5.2 Forms of aviation subsidy available within the SPR (Theme 1)

The current forms of aviation subsidy within the SPR extracted and identified from the interview data are presented in Table 14 The participants claimed that all SPR countries rely heavily on aviation subsidies for the development and sustainability of their aviation industries and related sectors.

Table 14

Current Forms of Aviation Subsidy within SPR Countries

Countries	Forms of aviation subsidy	Beneficiaries
Direct subsidy		
Cook Islands	• Direct financial support (full subsidised airport) • Route development • Airport infrastructure development project	• Cooks Islands Airports • Air New Zealand • Cook Islands Airports
Fiji	• Direct financial support (state-owned enterprise) • Route development • Airline equipment (aircraft) • Community Service Obligation (CSO) • Stimulus package	• Fiji Airports Limited & Fiji Airways • Fiji Airways • Fiji Airways • Fiji Airways • Fiji Airways
Kiribati	• Direct financial support (state-owned enterprise • and fully subsidised airport) • Airport infrastructures development (World Bank)	• Air Kiribati • Civil Aviation Authority Kiribati • Civil Aviation Authority Kiribati
Nauru	• Direct financial support (state-owned enterprise and • fully subsidised airport) • Route development (airfare discount) • Stimulus package	• Nauru Airlines • Nauru Civil Aviation Authority • Nauru Airlines • Nauru Airlines
Niue	• Direct financial support (fully subsidised airport) • Airport infrastructure development (NZ government) • Route development (airfare discount)	• Niue Airport • Niue Airport • Air New Zealand
Papua New Guinea	• Direct financial support (state-owned enterprise) • CSO: for domestic and regional routes • Airfare discounts for students (for specific provinces) • Stimulus package	• PNG Airports Corporation • Air Niugini • Air Niugini • Air Niugini
Samoa	• Direct financial support (state-owned enterprise) • Airport infrastructure development (World Bank) • Aircraft equipment upgrades • Stimulus package	• Samoa Airways • Samoa Airport Authority • Samoa Airports • Samoa Airways
Solomon Islands	• Direct financial support (state-owned enterprise) • Airport infrastructures development (NZ government) • CSO: domestic airfare discounts for regional routes	• Air Vanuatu • Vanuatu National Airports Corporation Limited • Air Vanuatu
Tonga	• Direct financial support (state-owned enterprise) • Airport infrastructure development (World Bank) • CSO: domestic and regional routes • Government public obligation	• Tonga Airports Limited • Tonga Airports Limited • Real Tonga Ltd • Tonga Airports Limited
Tuvalu	• Direct financial support (fully subsidised airport) • Airport infrastructure development (World Bank)	• Tuvalu Airport Limited • Tuvalu Airport Limited
Indirect subsidy		
Selected SPR countries	• Monopoly policy* • Restricted air service policies*	• SPR Airports • SPR Airlines
All SPR countries	• Fuel tax exemption for airlines • Tax exemption • International agreements	• SPR Airlines • SPR Airports & SPR Airlines • SPR Airports

Remark: * The subsidy classification is based on Wittman et al.'s (2016) definitions.

The interviews confirmed that the most common forms of direct aviation subsidies in the SPR were direct financial support (through state-owned enterprises or fully public-funded airports), airport infrastructure development through foreign aid institutions, Community Service Obligations (CSOs) and airfare discount programmes. The SPR governments are heavily involved with cost-intensive developments within their aviation industries. For example, most SPR governments essentially manage and support their respective airports (e.g., Fiji Airport Ltd, Samoa Airport, Tonga Airport Ltd, and Tuvalu Airport Ltd) either through the central governments (fully funded) or state-owned enterprises. In addition to airports, most of the existing SPR national carriers (e.g., Fiji Airways, Samoa Airways, and Nauru Airlines) are also financially supported as state-owned enterprises.

The SPR governments, in conjunction with foreign governments and foreign aid institutions such as the New Zealand government and the World Bank, supported and facilitated airport infrastructure developments in the SPR, including upgrades of airport terminals, runways and air traffic control towers. Additionally, the CSO programme of airfare subsidies for regional routes (e.g., Fiji and Tonga) is also common in SPR countries because of the small domestic aviation markets, which experience low travel volumes. The SPR governments also provided airfare discount support in the form of route development programmes to small islands such as Niue and the Cook Islands, with the aim of enticing inbound tourists.

The SPR governments also financially supported their national carriers by upgrading their aircraft fleets. For example, the SPR governments funded the purchasing of Embraer E190-E2 jets for Air Kiribati, Boeing 737 MAX 9s for Samoa Airways and Airbus A350 XWBs for Fiji Airways, respectively. Stimulus packages were also provided by the SPR governments to their national carriers to sustain their operations during difficult times, such as the 2008/09 global financial crisis and the SARS epidemic. However, during the COVID-19 global pandemic, no subsidy has been provided to aviation operators in the SPR at the time of the interviews.

Indirect aviation subsidy programmes in the SPR were also mentioned by participants, which included tax exemptions for airlines and airports on items such as fuel and technical equipment, airport taxes, and safety and security levies. Other forms of indirect aviation subsidy currently implemented in the SPR include restrictive aviation policies that give monopolistic rights to airports and domestic airline operations.

2.5.3 Underlying factors to prompting aviation subsidy programmes within the SPR (Theme 2)

This section illustrates the 10 underlying factors (subthemes) that prompt aviation subsidy programmes in SPR countries, which were identified by the participants (see Table 15). Overall, the participants highlighted the three most discussed or important factors that prompted aviation subsidy programmes in the SPR, including flight accessibility, airfare affordability, sustainability and limited funding.

Table 15

Underlying Factors Prompting Aviation Subsidies within the SPR

Subthemes (factors)	Governments (n = 11)	Airlines (n = 4)	Airports (n = 2)	Academics (n = 6)	Passengers/ Travellers (n = 7)	Foreign aid institutions (n = 3)	Tourism organisations (n = 1)	Environmental agencies (n = 2)	Average
1. Airfare affordability	82%	100%	100%	100%	100%	100%	100%	100%	98%
2. Airline equipment (aircraft)	54%	75%	0%	83%	28%	33%	100%	0%	47%
3. Airport infrastructure	63%	50%	100%	100%	71%	100%	100%	100%	86%
4. Foreign aid partners	81%	100%	100%	66%	57%	100%	100%	0%	76%
5. Flight accessibility	100%	100%	100%	100%	100%	100%	100%	100%	100%
6. International safety compliance	82%	50%	100%	33%	71%	100%	100%	0%	67%
7. National pride	36%	0%	0%	50%	28%	0%	100%	50%	33%
8. Political influence	63%	50%	100%	66%	71%	100%	100%	50%	75%
9. Public obligation	81%	75%	50%	66%	42%	0%	0%	0%	39%
10. Sustainability and limited funding	100%	100%	100%	100%	28%	100%	100%	0%	79%

Remarks: The figures in the first row indicate the number of participants from the group being interviewed. The percentages indicate the percentage of participants from the group who mentioned that subtheme. Sustainability refers to maintaining air services in a non-commercialised route. That is, air services are economically sustainable without extra subsidy.

With the factors that prompted aviation subsidy programmes in the SPR, the subthemes receiving the most support and attention from participants are flight accessibility, airfare affordability, sustainability and limited funding. SPR countries are geographically isolated, scattered across a vast ocean. The developing economies and small population size make it challenging for commercial carriers to provide frequent flight services. Hence, most participants believed that government intervention is required to ensure flight accessibility and connectivity (100%),[11] airfare affordability (97%) and the sustainability of air services (88%)

[11] Percentage of participants who discussed corresponding themes or subthemes. For example, 100% reflects that all 36 participants discussed the ‘flight accessibility’ and ‘connectivity’ subthemes.

to and from the SPR region, especially as air transport is the only viable and seamless transport mode to and from the SPR. A government official supports this view:

> "*For a country scattered by water and due its geographically spread, no CSO means no service to the people. It also has the objective of connectivity, whereby trade and commerce can flourish.*" – G8

In supporting the tourism industry, participants also expressed the belief that subsidising airfares provides a competitive edge for SPR countries as popular tourism destinations. The SPR competes with Australia, New Zealand and other tourism destinations such as Bali (Indonesia) to attract tourists and holidaymakers. Aviation subsidies support flight operations and thus facilitate the hospitality sector in the SPR. This view was expressed by an academic:

> "*Maybe $3,000 return is a much more accurate account for airfare to Niue, but New Zealanders and Australia will not be willing to pay that amount to visit Niue.*" – A5

Additionally, political influence was discussed by the majority (77%) of participants as a significant factor prompting aviation subsidy programmes in the SPR. The political influence factor is evident in SPR countries, as aviation subsidy programmes are mostly dependent on the political priorities of their respective governments. This point was raised by an airport manager:

> "*Political change because these policies [aviation subsidy] that change it depends on the government of the day.*" – A06

Most participants were also concerned that some politicians in SPR countries may rely on subsidies to maintain airport operations or build new airport terminals, and use them as tangible achievements to attract voters. Majority of participants (77%) were aware of the benefits of aviation subsidies to airport infrastructure developments (i.e., terminal buildings, runway upgrades, air traffic control towers) in the SPR. Because of limited funding, the participants believed that the SPR governments should often partner with foreign aid institutions to fund and develop aviation infrastructure and technical training. The majority (72%) of participants across different groups (governments, airlines, airports, academics, passengers and travellers,

and environmental agencies) agreed with the need to engage with foreign aid institutions to support and fund airport infrastructure developments in the SPR.

> "*…would say without any hesitation rate it as significant, I mean if you count the airport, did we build one? 'Eua – New Zealand; Ha'apai – Australia; Vava'u – EU; Tongatapu – Japan. Mean if you take all of that away and just leave government, so is government seriously responsible for Aviation in Tonga? No.*" – F1

Public obligation was also raised by many participants (61%) as a vital factor behind aviation subsidy programmes in the SPR. This factor indicated that air transport may be the most viable and efficient transport link to and from SPR countries such as Niue or between domestic destinations in Papua New Guinea. This factor was highlighted by all stakeholder groups, except for participants from foreign aid institutions, tourism organisations and environmental agencies. A government official commented:

> "*…rebuild airline as it's like the only saving grace for the island – seems no one will service that route, you know, no shipping line and those services and will service that routes or any airline. So, the national carrier was essential.*" – G6

The mandatory international safety compliance factor was also alluded to by more than half of the participants (58%), as this may have a devastating impact on aviation safety and operations as well as air travel to the SPR. For instance, an airline manager expressed this view:

> "*We don't forget the international organisations, especially ICAO I think. We don't want them to issue any warning of significant, any danger, that might sabotage people coming in, we have to make sure.*" – AO4

The airline equipment factor in terms of upgrading the aircraft fleet of national airlines was raised by many participants (47%) from governments, airlines, academics, passengers and travellers, and tourism organisations. Interestingly, national pride is one of the key factors for implementing aviation subsidies in the SPR. This was supported by a passenger/traveller:

> "*Because it's the pride of the nation.*" – P1

Some participants (36%) from governments, academics, passengers and travellers and tourism organisations believed that national carriers were instrumental for SPR countries to demonstrate their independence from being colonised. They somehow viewed their national carriers flying around with their respective national flags as a way of showing their sovereignty and identity around the world. The academics raised concerns regarding misplaced national pride:

> "*You know how we all started national pride, and national pride is why we had national airline itself…National pride and government subsidy, it cost you millions of dollars; national pride for leaders. Leaders are trying to have an airline to see the flag carrier flying so national pride, it does play a role in convincing government to continue to do subsidy because we don't want to see a flag carrier falls down.*" – A2

2.5.4 Impacts of aviation subsidies on the SPR (Theme 3)

Table 16 shows participants' perspectives on the impacts of aviation subsidies on social wellbeing, tourism development, economic wellbeing and environmental wellbeing, respectively. Participants generally agreed that aviation subsidies promote aviation development and significantly impact tourism development, social wellbeing and economic wellbeing in the SPR. However, participants were concerned about the associated adverse environmental impacts of the aviation industry.

Table 16

Impacts and Benefits of Aviation Subsidies within the SPR

Subthemes	Governments (n = 11)	Airlines (n = 4)	Airports (n = 2)	Academics (n = 6)	Passengers/ travellers (n = 7)	Foreign aid institutions (n = 3)	Tourism organisations (n = 1)	Environmental agencies (n = 2)
1. Economic wellbeing	Ripple effect, GDP, employment, telecommunication	Employment, trade	GDP	Ripple effect, exchange rate, employment, agriculture, telecommunication	Employment, ripple effect	Ripple effect, safety infrastructure, employment	GDP, trade	GDP, trade
2. Environmental wellbeing	Limited number of flights, carbon emissions, airport infrastructure developments	Limited number of flights, carbon emissions	Carbon emissions, airport infrastructure developments	Limited number of flights, carbon emissions, airport infrastructure developments, trade-offs, opportunity forgone	Carbon emissions, airport infrastructure developments	Limited number of flights, carbon emissions, airport infrastructure developments	No comment	Limited number of flights, carbon emissions, airport infrastructure developments
3. Social wellbeing	Flight connectivity, education, technical training, health sector, humanitarian support, improved quality of life	Flight connectivity, education, technical training, health sector	Flight connectivity, happiness	Flight connectivity, health, education, cultural aspects, training	Flight connectivity, training, health sector, education, humanitarian support	Flight connectivity, opportunity costs, facilitating social activities, health, education, level of happiness	Flight connectivity	Flight connectivity
4. Tourism development	Boost tourism, flight, tourism employment, destination connectivity	Boost tourism, destination connectivity	Boost tourism, route development	Boost tourism, sole air link, government taxes	Boost tourism, exchange rate, ripple effects	Boost tourism and hotels	Boost tourism, sole air link	Boost tourism

Remark: The figures in the first row indicate the number of participants from the group being interviewed.

In terms of tourism development, all participants strongly supported the notion that aviation growth significantly boosts the growth of the tourism industry in the SPR. The majority of SPR countries are tourism-driven economies, and most inbound tourists visiting SPR countries choose and prefer to travel by air. For instance, airport infrastructure developments and route development subsidies have positivity impacted the number of tourists to and from the SPR. A tourism official expressed this view:

> "*If we don't have the airline connections, we won't have tourism in the Pacific.*" – T1

In terms of social wellbeing, most participants agreed that aviation development substantially improves social wellbeing in the SPR. It provides flight connectivity (for most SPR countries) not only for tourists but also for linking friends and families. Additionally, most participants concurred that aviation development facilitates access to better healthcare (e.g., cancer chemotherapy, advanced heart and brain surgeries) and further education opportunities (e.g., tertiary education and specialised technical training) that are not provided in the SPR. The participants also highlighted that because of the geographical isolation of the SPR, aviation provides the sole access to humanitarian support during natural disasters (e.g., tropical cyclones). Interestingly, airport infrastructure developments are believed to facilitate local social activities and the happiness of local residents. The runway upgrade at Funafuti Airport (Tuvalu) was referred to as one such example. This view was supported by a government official and a foreign aid institution official:

> "*...access for the Samoan people travel to/from Samoa…Pacific travel is very Pacific driven, the Pacific travel for funerals, weddings, birthdays.*" – G3

> "*…people do sleep on the runway during night-time and playing on the runway after flights have departed.*" – F2

Regarding economic wellbeing, the participants commonly agreed that aviation development facilitates agriculture, employment, GDP growth, telecommunication, trade; more importantly, it has ripple effects on all other sectors in the SPR. Overall, the participants acknowledged that aviation subsidies are the backbone for tourism development and social wellbeing and,

ultimately, the economic wellbeing of the SPR. This view was expressed by a passenger/traveller:

"*It does have a huge impact...support the wellbeing…of the country as a whole.*" – P3

On the other hand, most participants raised concerns about the adverse impacts of aviation development on environment wellbeing in the SPR. In particular, the participants were aware of the harmful impacts of carbon emissions from aircraft operations and cutting down trees for airport infrastructure developments. However, the SPR is considered to make the least contribution (because of the limited number of flights to and from the SPR) to global climate change in terms of carbon emissions from flight operations. This view was raised by an environmental agency official:

"*We [Pacific] only contribute only 0.001% in the world…the lowest contribution to the emission, but we are most vulnerable to the impact of any aviation activities.*" – E1

2.5.5 Problems of implementing aviation subsidies within the SPR (Theme 4)

Table 17 shows the problems of implementing aviation subsidy programmes in the SPR. Political influence, misuse of subsidies and the lack of priority of the aviation sector were the problems most discussed by participants. Importantly, all participants agreed that the main problem of implementing aviation subsidies within the SPR is political influence.

Table 17

Problems of Implementing Aviation Subsidies within the SPR

Subthemes	Governments (n = 11)	Airlines (n = 4)	Airports (n = 2)	Academics (n = 6)	Passengers/ travellers (n = 7)	Foreign aid institutions (n = 3)	Tourism organisations (n = 1)	Environmental agencies (n = 2)	Average
1. Lack of priority	36%	50%	100%	16%	42%	100%	100%	0%	56%
2. Misuse of subsidies	36%	50%	50%	66%	28%	33%	0%	0%	33%
3. Political influence	63%	50%	50%	66%	71%	100%	100%	50%	69%
4. Reliance on subsidies	11%	25%	0%	16%	0%	0%	100%	0%	19%
5. Others	11%	25%	50%	16%	0%	100%	0%	0%	25%

Remarks: The figures in the first row indicate the number of participants from the group being interviewed. The percentages indicate the percentage of participants from the group who mentioned that subtheme.

Political influence received the most attention among participants (66%) as the most concerning problem for the implementation of aviation subsidies in the SPR. The participants' perspectives varied across different groups. Airline and airport managers were more concerned about changes in aviation subsidy policies resulting from changes in governments. For instance, a pre-approved subsidy payment for the Tonga Airports Limited was cancelled as the new government came into leadership in 2019. Passengers and travellers were mostly concerned with the unfair distribution of the CSO programme caused by political drive. For example, passengers pointed out that in Papua New Guinea (PNG), the CSO programme was awarded to provinces with more substantial political influence in parliament. The government officials, however, were more concerned about interference from their political leaders through the appointment of airline executives or commercial decisions that may not be in the best interest of the airlines.

> "*Of course, politics everywhere, whether we like it or not...especially in the smaller islands… It's a certain element of political interference, of favouritism.*" – G1

Participants (44%) mentioned that the lack of priority for aviation development in the SPR was evident when the aviation industry competed for funds with the health, education and other sectors. The lack of priority for the aviation sector by the SPR governments often leads to limited funds being provided, which has impacted aviation development within the SPR (e.g., recently, airport infrastructure developments in Tonga, Samoa, and the Solomon Islands were put on hold). This view was expressed by a government official:

> "*It's really unfortunate in Samoa itself, aviation is very much taken for granted...That is unfortunate that is happening in the Pacific." – G3*

Misuse of aviation subsidies is another problem voiced by several participants (38%). Most participants believed that the lack of rigorous monitoring allowed or led to the misuse of aviation subsidies in the SPR. This needs to be addressed accordingly. This is an alarming issue because it was found in both groups of aviation stakeholders: the beneficiaries (airlines or airports) and the suppliers (the SPR governments). The misuse of subsidies includes mismanagement of funds offered from the SPR governments that received by beneficiaries

(i.e., airlines and airports) and government agencies mismanaging the tax collected for aviation subsidies. It should be noted that the participants' perspectives varied for this subtheme. Academics were concerned that tax earmarked for the aviation sector to mitigate environmental issues could be utilised for other sectors instead. Airport managers were disappointed with the fact that the SPR governments failed to provide subsidies to support their operations. For example, Tonga Airports Limited has not received the Tongan government's Policy Obligation subsidy since its corporatisation in 2007. Airline managers were concerned that the CSO subsidy programme was not being utilised by airlines as intended:

> "*It [subsidy] wasn't used by the airline. It was down; it went somewhere else, just disappeared.*" – AO3

Lastly, the reliance on subsidies by airlines and airports in SPR countries was another major problem voiced by participants (19%). They believed that some aviation operators (e.g., airlines and airports) might not actively try to search for commercial opportunities but rely on continued government support to operate. An airline manager offers this view:

> "*It's more negative impact because you will mostly rely on mostly rather than doing your job and going out there to try and promote your routes and get people to pay actually to put bums on the seat.*" – AO3

There were other notable problems raised by participants, such as the negative impacts of cultural influence on high-level governmental decisions regarding the national carriers, a lack of professional aviation knowledge and skills to support the SPR's aviation development and operations, and the lack of collective regional directions and approaches for facilitating the growth of the SPR's aviation sector. The problems mentioned above are commonly seen across SPR countries.

2.5.6 Impacts of COVID-19 on the SPR (Theme 5)

Table 18 presents the participants' perspectives about the impacts of the COVID-19 pandemic on the aviation and tourism sectors, as well as the economic development of the SPR. Most SPR countries are tourism-driven economies. The adverse impacts of the COVID-19 pandemic on their respective aviation-related sectors are evident and have catastrophically impacted the

economic development of the SPR. Notably, the uncertainty related to the duration of the global pandemic, and the impacts on air travel, travellers and tourist numbers are the major concerns of participants. Moreover, the impacts of the COVID-19 pandemic on airline operations were highlighted, and future implementation and policy designs for aviation subsidies in SPR countries were voiced by participants.

Table 18

Impacts of COVID-19 within the SPR

Subthemes	Governments (n = 11)	Airlines (n = 4)	Airports (n = 2)	Academics (n = 6)	Passengers/ travellers (n = 7)	Foreign aid institutions (n = 3)	Tourism organisations (n = 1)	Environmental agencies (n = 2)	Average
1. Impacts on aviation industry	54%	75%	100%	100%	14%	0%	100%	0%	55%
2. Impacts on tourism & hospitality	45%	50%	50%	28%	14%	0%	100%	0%	36%
3. Impacts on economic development	36%	50%	0%	16%	14%	0%	100%	0%	27%

Remark: The figures in the first row indicate the number of participants from the group being interviewed. The percentages indicate the percentage of participants from the group who mentioned that subtheme.

Participants' views (58%) reinforced and pinpointed the adverse impacts of the COVID-19 pandemic on the SPR's aviation industry. All airline operations and air travel to and from SPR countries have been severely impacted, as most scheduled flight services were cancelled. The lack of stimulus support for aviation operators (airlines and airports) adds to this challenge. This view was supported by an airline manager.

> "*By the end of next week, the airlines will be running dry, if they're not already dry of cash.*" – AO2

> "*But in the Pacific, we haven't seen that [stimulus package]…because governments don't have the money.*" – AO2

Several participants (20%) further highlighted the risks associated with excessive government investment in the aviation industry, which were realised through the COVID-19 pandemic. Academics were more concerned about the lack of return on substantial investments expected from the aviation industry because SPR countries are now facing a downturn in air travel and tourism demand. The collective concerns of participants stem from the uncertain timeframe of

the COVID-19 pandemic and its negative impacts on the confidence and willingness to travel by air and its affordability to air travellers. Participants commented that the tourism and hospitality industries in the SPR also took a direct hit from the COVID-19 pandemic. As SPR countries rely almost exclusively on air transport to bring in tourists and holidaymakers, the strong correlation between aviation and tourism activities was evident during this pandemic. In particular, airline executives and academics expressed their support for the Australia–New Zealand bubble to revive the confidence of travellers during the crisis. An airline manager offered the following view:

> "*A hit over tourism, accommodation like a hotel, because tourism is no longer there or staying on those facilities. It a very, very hard and direct impact.*" – AO4

In addition, academics highlighted the importance of government intervention and ownership in terms of enabling mercy and repatriation flights for SPR citizens during the COVID-19 pandemic. Employment, trading, education, healthcare within the SPR were also negatively affected by the COVID-19 pandemic. This view was supported by an academic:

> "*In terms of economic lifeline of Fiji, very scary situation, it's not well.*" – A4

One government official (2%) pointed out that the SPR's aviation industry needs to be prioritised during and after the COVID-19 pandemic through government support (e.g., aviation subsidy programmes), as aviation will be instrumental to the movement of goods and people, as well as benefiting the health and education sectors.

> "*I think for this pandemic, after this pandemic, there might be some readjustment of those priorities…People getting access to those places through air transport.*" – G1

2.6 Discussions and policy implications

This section focuses on discussing the key results of this study that are critical to aviation subsidies in the SPR. Importantly, this study offers managerial and policy implications for government policymakers and stakeholders to guide them in establishing and updating the aviation subsidy programmes or related strategic policies for the aviation and tourism sectors in the region.

2.6.1 Political influence on the aviation sector within the SPR

Political influence over the aviation sector in the SPR is inevitable (Taumoepeau, 2007). Indeed, the participants revealed that political influence is one of the critical challenges for the effective and efficient implementation of aviation subsidy programmes as mentioned on Theme 4 Subtheme 3 (see Table 17). Previous SPR-based studies (Taumoepeau, 2014, 2016) reported similar results, which suggested that although aviation subsidies are significant for the development of the aviation industry, the political influence of leaders on SPR-based national carriers should be limited. The participants also believed that aviation subsidies often encouraged political control over the managerial decisions of airlines. For example, in various SPR countries, political leaders appointed the CEOs and senior executives of their respective national carriers, who may not necessarily have the appropriate relevant experience and professional aviation knowledge. In other cases, political leaders have directed the purchase of national airlines' aircraft fleet, although such a decision was not financially viable. Such influence from political leaders often negatively impacted the financial sustainability of national carriers.

Additionally, this study finds that political leaders primarily influence the forms of aviation subsidies in the SPR. For example, the government of Nauru provides a direct subsidy in the form of a cash injection to Nauru Airline, which offers a bonus salary to the airlines' executives. More importantly, the strong political influence on the SPR's aviation sector highlights the lack of an institutional framework or structure for aviation subsidies, and this may lead to the misuse of aviation subsidies in the SPR, as voiced by the participants.

The participants believed that this issue and the associated negative effects must be fully acknowledged and recognised. Policymakers in SPR countries should establish aviation subsidy frameworks that are shielded from excessive political influence. Realistically, political influence cannot be eliminated. It can, nevertheless, be managed properly for the benefit of the region's aviation sector. Mills and Kalaf-Hughes (2017) found that the Small Community Air Service Development Programme aviation subsidy in the US was more successful with the support of their local congress representative. This suggests that political influence can be both ways.

2.6.2 Lack of an institutional framework for aviation subsidies within the SPR

Our study revealed that the aviation subsidy programmes in the SPR lack a formal institutional framework or structure, notably for implementation, auditing and monitoring. This potentially leads to misuse of subsidies as identified on Theme 4 Subtheme 2 (see Table 17). Despite the different long-standing types of government subsidy for the SPR's aviation sector, the SPR-based national carriers continually struggle to provide and sustain their services (Kissling, 2014; Stanley, 2000; Taumoepeau & Kissling, 2008). These studies implied that the current aviation subsidy programmes (i.e., ad-hoc basis) for the aviation sector in the SPR are not as effective as the comprehensive and formal aviation subsidy programmes in other well-developed aviation markets (e.g., RASS, PSO, and EAS). The unique aviation market structure (i.e., domestic monopolistic market structure) of SPR countries (Cheer et al., 2018; Taumoepeau, 2016), in contrast to Australia, EU or the US, may contribute to the lack of aviation subsidy programmes in the SPR. This is because those developed countries have various airlines to bid for the aviation subsidy programmes. In contrast, the majority of SPR countries have a domestic monopolistic aviation market served by one government-owned airline, thus leading to the lack of an intuitional framework to monitor aviation subsidy programmes.

The lack of intuitional frameworks for aviation subsidy programmes may affect the growth of the aviation sector and, ultimately, economic growth. To address this important issue, SPR governments should prioritise the establishment of a formal institutional framework or structure that provides guidelines for the implementation and monitoring of aviation subsidies (Cheer et al., 2018; Taumoepeau et al., 2017). The RASS in Australia, the PSO in EU and the EAS in the US are excellent cases to copy (Abreu et al., 2018; Metrass-Mendes et al., 2013; Park & O'Kelly, 2017). An appropriate framework for aviation subsidy programmes should clearly state the selection criteria, the tendering processes and the minimum level of required services, etc. These aspects allow quantifiable targets and goals to be measured and achieved in a transparent and fair process (Calzada & Fageda, 2012; Duesterberg, 2018; Wittman et al., 2016). Of course, the forms and the institutional frameworks of the aviation subsidy programmes established should be tailor-made to suit aviation in each country's operating environment (Hazledine & Collins, 2011). For example, the civil aviation authorities of the EU countries may administer the PSOs, but the Ministry of Finance of each SPR country

administers its aviation subsidy programmes. These existing institutional characteristics should be considered in designing SPR countries' own subsidy frameworks.

2.6.3 Impacts of aviation subsidies within the SPR

The aviation industry is one of the key pillars supporting tourism and economic development, and the overall social wellbeing of the SPR (Cheer et al., 2018; Kissling, 2003). The participants commonly believed that aviation subsidies are vital for the livelihood of the SPR, as they provide access to air transport services within/to/from the SPR as shown in the Theme 1 Subtheme 5 (see Table 15). Similar findings have been obtained for aviation subsidy programmes in Australia and Canada (Department of Infrastructure, Transport, Regional Development and Communications (DITRDC), 2020; Government of Canada, 2020). The adverse impacts of aviation subsidies and aviation development on the environment were also voiced by the participants. Similar results were reported by van Beers and van den Bergh (2001) in terms of the unintended and unforeseeable effects of environmental damage resulting from aviation subsidies. Taumoepeau et al. (2017) argued that climate change is a rising challenge to SPR countries that should be prioritised, especially as SPR countries are likely to suffer most from climate change.

A balanced approach to establishing aviation subsidy programmes is recommended that contributes to aviation, tourism and economic development while mitigating the associated environmental impacts. Lutte and Bartle (2017) recommended taking a multidimensional approach so that economic, environmental and social sustainability improve the sustainability of the international air transport sector. The ICAO (2019) also provided guidelines for sustainable air travel and neutral aviation sector growth through the establishment of various mitigation strategies under the Carbon Offsetting and Reduction Programme Scheme for International Aviation (CORSIA). This programme encourages sustainable infrastructure, radical new technology and aircraft, and sustainable fuels to promote aviation growth without affecting the environment. Therefore, the SPR's policymakers should incorporate these global standards and goals (e.g., CORSIA) into their design of aviation subsidy programmes, thus ensuring that aviation subsidies support the sustainable growth of the SPR's aviation sector. Such policies may include establishing national environmental policies for their aviation sectors (Chaouk et al., 2020), deploying a greener aircraft fleet, using alternative fuel (Yilmaz & Atmanli, 2017), etc. Notably, the environmental wellbeing aspects need to be incorporated

into the design of aviation subsidy programmes in the SPR (e.g., all aviation subsidies funding airports and airlines should meet the CORSIA standards).

2.6.4 COVID-19's impact on the future of the aviation and tourism sectors within the SPR

The COVID-19 pandemic disrupted the global aviation industry in 2020 to an unprecedented degree, and it is predicted to impact the aviation industry in the years to come (Linden, 2020). ICAO (2020) predicted a potential USD$261–264 billion overall loss in airline operating revenues. The participants believed that both the aviation and tourism industries in the SPR took a severe direct hit from the COVID-19 pandemic, despite some of SPR countries being COVID-19 free, such as Niue, Samoa and Tonga. Recent studies (Asia Development Bank, 2020; Scheyvens & Monovo, 2020; SPTO, 2020) also reported that tourism and commercial airlines came into a halt within the SPR. In response to this global crisis, many governments around the world launched stimulus subsidies to their airline industries such as credit, loans and other measures to keep international airlines afloat (Linden, 2020). However, the participants revealed that most of the SPR governments did not provide a stimulus subsidy to support their aviation sectors because of limited funding and capital resources. Most importantly, the participants were very concerned about the uncertainty and impacts of this global pandemic on the future of the SPR's aviation and tourism industries, as well as the health and trade sectors as displayed by Theme 5 (see Table 18).

It is suggested that the SPR governments should offer a stimulus subsidy and support for their aviation sectors in light of the COVID-19 pandemic (i.e., external uncertainties). Previous studies (Lipsitch et al., 2009; Winston, 2020) suggested that the uncertainty and urgency aspects of any global infectious disease are significant challenges for the aviation industry. However, the stimulus subsidy should only be used as a short-term strategy (Linden, 2020). The SPR policymakers, therefore, may consider incorporating the external factors (i.e., COVID-19) in their long-term aviation development strategies, which would minimise the negative impacts on the aviation industry (Linden, 2020) and thus avoid the aviation industry's reliance on government subsidies (Hall, 2010).

Additionally, given the strong correlation between the aviation and tourism sectors of the SPR (Cheer et al., 2018; Milne, 1992; Taumoepeau et al., 2017), the participants believed that a

collective regional and coordinated approach between the aviation and tourism sectors might provide a robust recovery strategy during the post-COVID-19 period. An efficient and holistic regional and coordinated approach between the airline and tourism sectors in the SPR may provide a critical opportunity for the speedy recovery of all SPR countries as a destination to travel to for holidays and vacations. For example, SPR countries should share skills and capacity (pilots and maintenance engineers) (SPTO, 2020). Therefore, an effective coordinated recovery plan for aviation and tourism is recommended to be implemented by a regional-based organisation such as the South Pacific Community. Previous studies supported the concept of 'regionalism' (Guthrie, 2013; Nolan et al., 2005; Tukuitonga, 2017) within the SPR context. Tukuitonga (2017, p. 342) defined regionalism as the "creation and operation of intuitions and processes at the regional level to achieve better outcomes". In the context of the SPR, the regionalism concept recognises the shared common challenges for all SPR countries, such as having small economies, facing geographical isolation and dealing with high vulnerability to external factors such as natural disasters. Furthermore, for SPR countries with no confirmed infection cases of COVID-19, their tourism and aviation industries still suffered as air travellers and tourists lost confidence to travel and visit overseas for holidays and vacations during the global pandemic (SPTO, 2020).

2.6.5 Relationship with foreign aid development partners in the SPR

Most aviation subsidy forms in the SPR aim at developing and improving airport infrastructure, airline operations and aircraft purchases. The participants revealed that substantial aviation infrastructure developments in the SPR are currently funded by the SPR's foreign aid institutions or development partners such as the Asia Development Bank, the Australian government, the European Union, the New Zealand government, the Peoples' Republic of China, and the World Bank Group under the Overseas Development Assistance Programme as per Theme 1 (see Table 14). In contrast to countries such as Australia (DITRDC, 2020), Canada (Government of Canada, 2020) and the US (Wittman, 2014), their aviation operators received subsidies from their local governments. This study finds that the SPR governments are highly reliant upon the support of their foreign development partners for developing their aviation sector. Given the impacts of the unprecedented COVID-19 pandemic and the limited resources and funding within the SPR, the working relationship between SPR countries and their development partners needs to be further strengthened and reinforced. SPR countries will need

to seek more ongoing Overseas Development Assistance programmes supporting the recovery after the COVID-19 crisis.

Importantly, the participants perceived that the SPR governments' national priorities and the foreign aid institutions' priorities might differ. Often, foreign aid development partners may have their own priorities regarding their support for the SRP's aviation and social and economic development. The SPR governments need to ensure that aviation subsidy programmes and/or support funded by foreign aid institutions will align with their national needs and priorities. For example, in 2012, the People's Republic of China gifted the Kingdom of Tonga with a brand-new aircraft, a Modern Ark (MA-60). However, Tonga's aviation industry subsequently faced the high operating costs of the aircraft and was negatively influenced because of the political controversy with the New Zealand government (Murray, 2015; Taumoepeau, 2016). To resolve this salient issue, the approaches adopted by the PSO in the EU and the EAS in the US could be reviewed and followed. Such approaches restrict the influence of foreign aid institutions or external parties on the implementation of aviation subsidies (Calzada & Fageda, 2012; Williams, 2005; Wittman et al., 2016). Therefore, SPR countries should follow the PSO and EAS frameworks to prioritise their nations' interests rather than the interests of their development partners when designing and implementing aviation subsidy programmes.

2.7 Conclusion

This study examined the impacts of aviation subsidies in the SPR and proposes approaches to better support the growth of its aviation and tourism industries. Interviews were conducted to collect the views of key stakeholders. The interview data were analysed by thematic analysis. Several key findings are observed in this study. First, SPR countries are heavily reliant on aviation subsidies for the development and sustainability of their aviation industries. Direct financial support through state-owned enterprises (i.e., national carriers or airports) is the most common form of aviation subsidy. Aviation subsidies in the SPR are motivated by several considerations, such as offering affordable airfares, improved flight accessibility and meeting international aviation safety standards. Despite some long-standing problems (i.e., political influence, lack of priority, misuse of subsidies, and reliance on aviation subsidies), the importance and benefits of aviation subsidy programmes in the SPR are well recognised by all stakeholder groups being interviewed. In contrast to developed economies, airport infrastructure developments within the SPR has been mostly funded or supported by foreign

aid institutions. Besides, aviation subsidies in the SPR are distributed on an ad-hoc basis and without a formal institutional framework. Additional problems arising from government subsidies that were highlighted by the participants, which included its impacts on airline competition due to the monopolistic policies restrict entrants into the SPR markets, and its potential harmful impacts on the SPR environments resulting from aviation operations and infrastructure developments (i.e., airports). Lastly, the COVID-19 pandemic directly hit the aviation and tourism sectors and the economic wellbeing of the SPR. Therefore, this study suggested that the SPR countries' governments and stakeholders should follow a well-established institutional framework of aviation subsidy, such as the PSO in the EU, and thus form and design effective and vigorous guidelines for implementing, updating and monitoring the aviation subsidy programmes. Importantly, the environmental component and stimulus packages for external uncertainties such as the COVID-19 pandemics were also voiced and recommended by participants to be included in the institutional framework.

To the best knowledge of the authors this study is among the first to analyse aviation subsidies and their impacts on the aviation and tourism sectors as well as the overall economic, social and environmental wellbeing in the SPR. This study contributes to the air transport literature via a cross-national analysis of aviation subsidies in an under-studied region (i.e., the SPR). Importantly, the results of this study highlight the significance of establishing a formal aviation subsidy framework (i.e., similar to EAS or PSO) to mitigate the current problems of ad-hoc aviation subsidy programmes within SPR countries. Additionally, the aviation subsidy framework should be customised to suit each country's situation, comply with environmental standards (i.e., CORISA) and support recovery from the COVID-19 pandemic.

This study has two potential limitations. (i) The findings of this study are direct observations from the interview data collected from the SPR participants only and thus cannot be directly generalised to a larger population or other regions; and (ii) The recruitment of interview participants was interrupted by the COVID-19 pandemic and Tropical Cyclone Harold (Cat 5), which devastated Fiji, Solomon, Tonga and Vanuatu in April 2020. Some interviews were cancelled because the contacted interviewees were in the midst of managing these crises. This reduced the number of participants that were successfully interviewed.

In light of the potential limitations above, future research could be conducted as an extension of this study. Four worthwhile areas for future research are: (i) a closer examination to quantify the impacts of the COVID-19 pandemic on aviation, tourism and economic development in the SPR; (ii) a systematic review of the approaches and strategies adopted by governments, aviation operators (e.g., airlines and airports), and tourism authorities and operators worldwide to deal with exogenous shocks (e.g., the COVID-19 pandemic); (iii) as an extension of this study, it is meaningful for future study to examine the effects of COVID-19 on the SPR's aviation and tourism sectors and overall economic development, probably by comparing the market outcomes during the pre- and post-COVID-19 era when reliable and updated data are available; and (iv) to empirically evaluate the economic effects of aviation subsidies on the air transport sector in the SPR countries during the pre- and post-COVID-19 era. Such research would be beneficial for the SPR governments and policymakers to devise strategies to transition from and speed up the recovery from external uncertainties, probably through better-designed aviation subsidy programmes.

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Chapter Three – Strategies for pandemics within the South Pacific Region

Preamble

The first two chapters of this thesis investigated two key challenges to the SPR's aviation growth: international tourism demand and aviation subsidies during and amid the COVID-19 era. Chapter 3 addresses the third research objective (what can be learnt from past and present pandemics so that the SPR can better cope with future pandemics) (see the Introduction). This chapter undertakes a systematic review of the literature and publications to identify travel-related policies and measures to mitigate and control the spread of the virus and pandemics during the post-COVID-19 era. This chapter suggests that the SPR's governments and industry partners (e.g., airlines and airports) should implement short-term travel-related policies and measures (i.e., border closures and travel restrictions, quarantine and isolation, hygiene measures, virus testing, contact tracing, airport screening and other measures) in parallel with a long-term strategy (i.e., vaccination) to address future pandemics in the SPR during the post-COVID-19 era. This chapter also suggests a risk-based approach which calls for robust coordination and collaboration by governments across the SPR to handle any pandemics and outbreaks. Importantly, the SPR's governments should provide aviation subsidies to facilitate and speed up the recovery of their aviation and tourism sectors, as both of which are the pillar industries of the SPR countries. This chapter contributes to the limited contemporary research on the relationships of pandemics with aviation and tourism within the SPR. Additionally, it provides timely and feasible policy implications to help the SPR's governments, and aviation and tourism sectors recover from the formidable impacts of the COVID-19 pandemic and manage future pandemics.

Study 3: Strategies for South Pacific Region to address future pandemics – Implications for the aviation and tourism sectors based on systematic literature review (2010–2021)

Publication status and candidate contribution

This study was submitted in a highly ranked transport policy journal, *Transport Policy* in November 2021 and accepted for publication in May 2022. The doctoral candidate is the first author of the publication, with the doctoral supervisors being co-authors. The doctoral candidate is the first and corresponding author of the publication who contributed the most to the work, with all the doctoral supervisors being co-authors.

3.0 Abstract

This study systematically reviewed the literature on travel-related policies and measures for controlling and mitigating the adverse impacts of pandemics, with a focus on the air transport and tourism sectors. The key findings are applied to the SPR so that appropriate business strategies and industrial policies can be developed to safeguard the sustained development of aviation and tourism. In total, 159 publications were selected and examined using descriptive analysis, content and thematic analyses and a meta-analysis. The findings of this study suggest that short-term policies and measures (e.g., border closures/travel restrictions, quarantine and isolation, hygiene measures, virus testing, contact tracing, airport screening and other measures) and a long-term strategy (vaccination) should both be implemented to address future pandemics in the SPR. A risk-based approach is recommended, which calls for effective coordination and collaboration across different governments in the region. In addition, the SPR governments should provide financial support for the recovery of the aviation and tourism sectors, both of which are the pillar industries of the SPR.

3.1 Introduction

The COVID-19 pandemic has had a devastating impact on the global aviation industry since its outbreak in December 2019, causing a total estimated loss of US$234 billion in 2020 (ICAO, 2021) and put many airlines into financial difficulties to the extent that they had to be

bailed out with government support (Zhang & Zhang, 2021). The loss to international tourism income is even larger, estimated to be US$300–450 billion during the same period (UNWTO, 2021). The pandemic, together with the subsequent travel restrictions, drastically reduced global aviation operations and economic activities in the related sectors, notably tourism, trade and supply chains. The aviation industry lost approximately 90% of its projected output in 2020 globally (IATA, 2021), which is in sharp contrast to the 4% decline in international travel experienced during the SARS pandemic of 2003 (Steiner et al., 2013).

Ironically, the aviation industry is often instrumental in spreading pandemics, such as COVID-19, in terms of both distance and time (e.g., Abeyratne, 2006; Grais et al., 2003, Wilson, 1995; Zhang et al., 2020). Moreover, the impact of pandemics on the aviation industry has arguably worsened as the aviation industry has grown in size (Aripov, 2009; Balkhair, 2020). It is crucial for the aviation industry to develop an effective strategy to recover from the COVID-19 pandemic and, as far as possible, safeguard against future pandemics (Tisdall et al., 2021; Tisdall & Zhang, 2020). However, few studies have investigated the travel-related policies and measures that aimed to mitigate the spread of pandemics in the aviation industry (Bielecki et al., 2021). This research gap is particularly damaging for countries that rely heavily on tourism income but have limited medical resources, such as the SPR and many other developing countries. Geographically, the SPR comprises 15 small island countries with emerging economies, limited natural resources and relatively small populations scattered across the Pacific Ocean (Salesi et al., 2021). Unlike countries that can rely on large domestic markets (Czerny et al. 2021), international aviation and tourism are vital for the SPR's economic growth (Cheer et al., 2018; Taumoepeau, 2016). This study aimed to contribute to the emerging literature by studying government policy and market performance in the SPR amid the COVID-19 pandemic, so that the aviation industry and the related sectors, notably tourism, can better manage the current and future pandemics.

The COVID-19 virus has caused by far the most destructive and catastrophic pandemic that the worldwide aviation industry has ever faced (e.g., Le et al., 2021; Scheyvens & Movono 2020; Zenker & Kock, 2020). COVID-19 exposed the inefficiencies of existing strategies and policies (e.g., airport screening, crisis and risk management policies, and travel restrictions) in addressing an unexpected pandemic of huge scale and damage (e.g., Baber, 2020; McLaughlin et al, 2020; Wenzel et al., 2020; Williams & Balaz, 2015). Hence, one of the priorities for

governments and aviation stakeholders is to develop effective control responses and recovery strategies to safeguard against similar crises in the future (e.g., Baber, 2020; Chung, 2015; Guan et al., 2020; Le et al., 2021). With the increase in the global population and urbanisation, the threat of pandemic outbreaks may be intensified in the future (Carlson, 2020).

IATA (2021) projected that the COVID-19 pandemic would primarily impact developing countries, such as the SPR, which have developing economies and limited infrastructure. Indeed, the SPR's economies have been devastated by the COVID-19 pandemic as a result of the restrictions on international travel and flight services (Wenzel et al., 2020). Cliff et al. (2000) noted that although the SPR was an isolated region, its mortality rates could be among the highest if a pandemic reached its shores. The region has limited health infrastructure and medication, and the population is less immune to outside disease (Horwood et al., 2019). Inadequate capacity to respond to public emergencies caused by an uneven distribution of medical resources is a crucial factor contributing to the dire outcomes of COVID-19 in less-developed regions, although there was a significant lag in the onset time of the initial infected cases in these islands, probably because of the remote location and inconvenient transportation (Mei & Hu, 2020).

A relatively large number of studies have investigated the past and current pandemics, including studies conducted in Africa (Avraham & Ketter, 2017; Bogoch et al., 2015; Weiss & McLean, 2004), Australia (DITRDC, 2020; Macilree & Duval, 2020), China (e.g., Abdullah et al., 2020; Chinazzi et al., 2020; Czerny et al., 2021; Fu et al., 2021; Fuller et al., 2013), Hong Kong (Chong & Zee, 2012; Bowen & Laroe, 2006; Lam et al., 2011), the Middle East (Bogoch et al., 2015; Dickens et al., 2020), the United Kingdom (UK) (Graham et al., 2020; Transport Commission, 2020) and the United States (US) (Brown & Kline, 2020; Jhung et al., 2001; Zenker, 2021). However, few studies have examined the SPR, which has unique features in terms of geography, economy and transportation. Additionally, limited contemporary research has focused on the relationships between pandemics and tourism (Hall & Seyfi, 2020; Ryu et al., 2020) and the policy implications for the air transport and tourism sectors amid pandemics (e.g., Baker et al., 2012; Budd et al., 2020; Sharma et al., 2020a; Wenzel et al., 2020).

Partly because of the SPR's small market and population size, there is a dearth of research focusing on COVID-19's impact on the region's aviation and tourism sectors (Carlson, 2020; Craig et al., 2020).

This study aimed to contribute to a better understanding of pandemic risks to the global aviation industry, so that the SPR governments and stakeholders can better design effective travel-related policies and measures to address the current and future pandemics. Specifically, this study will attempt to answer the following research questions:

- *What are the key findings of previous studies on the effects of recent pandemics (post-2000) on the aviation and tourism sectors?*
- *What are the key policy changes triggered by past pandemics and COVID-19, and how have they influenced the aviation and tourism sectors?*
- *What can be learnt from past pandemics and the COVID-19 crisis so that the SPR can cope better with pandemics?*

This study will systematically review the relevant reports prepared by governments and international institutions, and published studies available from academic databases (academic journals and textbooks) for the period January 2010–February 2021. The pandemics included in this study occurred after 2010, except for SARS, which occurred in 2003. Many studies in the literature have discussed the impacts of SARS, allowing us to cover all major pandemics occurring in the current millennium. Priority will be given to governments' and aviation stakeholders' responses, with the aim of synthesising and recommending travel-related policies and strategies for the SPR countries.

The remainder of this paper is structured as follows: Section 3.2 provides the methodology and data used for this study. Section 3.3 reports and discusses the results. Section 3.4 discusses the lessons learned and the policy implications for the SPR regarding controlling and managing future pandemics. Section 3.5 summarises the key findings and identifies areas for future study.

3.2 Methodology and data sources

This study uses a systematic review methodology to analyse publications that focused on the travel-related policies and measures in the air transport and tourism sectors used to mitigate the impacts of pandemics. Section 3.2.1 explains why a systematic review methodology has been used, Section 3.2.2 describes the systematic literature review process and Section 3.2.3 presents the data analysis procedure.

3.2.1 Systematic literature review

Systematic literature reviews have been widely adopted in the air transport and tourism literature (e.g., Ginieis et al., 2012; Grepin et al., 2021; Pahlevan-Sharif et al., 2019; Papatheodorou, 2021; Weihofen et al., 2019), and other literature, including healthcare (e.g., Aromataris et al., 2014; Lai, 2012; Leitmeyer & Adlhoch, 2012; Moher et al., 2010). The systematic review approach has also been instrumental in establishing practice guidelines and identifying gaps in knowledge in healthcare studies (Shamseer et al., 2015), and it has provided an important way for scholars and practitioners to apply existing knowledge for further actions (e.g., policy implications). A systematic literature review fulfils the following: (i) it collects all possible studies related to a chosen topic, (ii) reviews and analyses the results and conclusions, and (iii) reviews both positive and negative results in a specific field (Torgerson et al., 2003). A systematic review is replicable because of its methodical procedure (Liberati et al., 2009; Mulrow, 1994), which is a notable advantage. Figure 3 depicts the procedure that this study followed for extracting and selecting the publications.

3.2.2 Data selection

- **Search strategy**

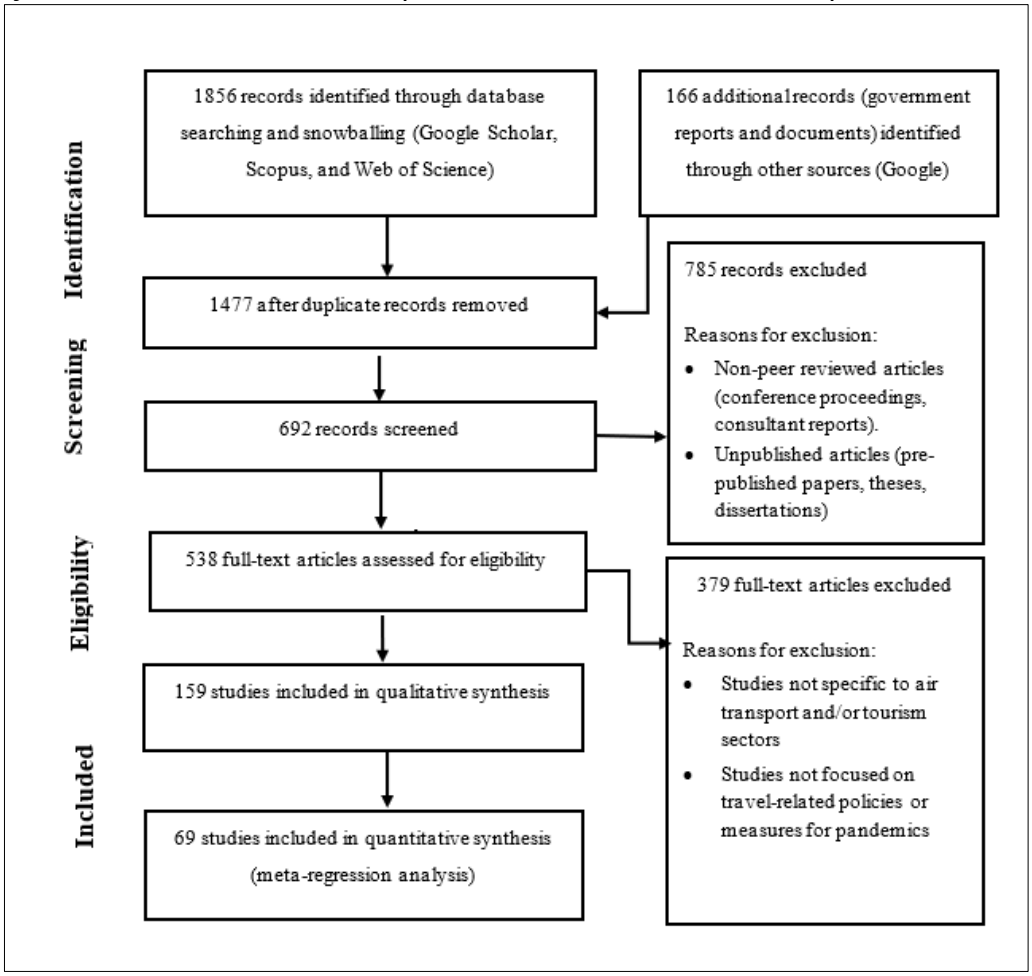
In light of the research questions identified in the introduction, the initial searches were conducted using a broad-scale search of three main academic databases (Google Scholar, Scopus and Web of Science), focusing on studies published from January 2010 to February 2021.[12] These databases were used as a starting point to identify the overall trends and evolution of research on pandemics in relation to air transport and tourism. The following Boolean search strings were used in each search engines: 'COVID-19 pandemic' or 'pandemic' or 'crisis' or 'air transport pandemic' or 'airline recovery strategy' or 'airport recovery strategy' or 'airline response strategy' or 'airport response strategy' or 'COVID-19 and aviation' or 'COVID-19 and airline' or 'COVID-19 and air policies' or 'SARS and aviation' or 'SARS and recovery' or 'SARS and pandemic' or 'H1N1 and aviation' or 'H1N1 and recovery' or 'H1N1 and pandemic' or 'Ebola and aviation' or 'Ebola and pandemic' or 'Ebola and recovery'. Because this study focused on analysing pandemic response policies and documents, a manual search on Google was also performed to identify relevant government reports or documents. An

[12] With the limited time available for the PhD research, therefore the author decided to limit the publications included for review from January 2010 to February 2021. More importantly, the impacts of the SARS outbreak on aviation and tourism are still examined in the post-2010 publications.

additional bibliographic snowball technique was used to check the reference lists for related articles and was limited to English-language publications only. This research conducted the search for the articles between November 2020 and February 2021.

Figure 3

Systematic Review Flowchart of the Literature Review Process of Articles



- **Literature screening, eligibility and inclusion criteria**

Once the relevant studies and documents had been identified, both from academic databases (1856) and through manual collection (166), the titles, abstracts and keywords were exported to Endnote for screening purposes; all duplicated publications (545) were discarded before the initial screening. The initial screening was carried out on the remaining 1477 publications (title, abstract and keywords) using three main criteria: (i) non-peer-reviewed articles (conference proceedings, consultant reports); and (ii) any unpublished articles (pre-published papers, theses, dissertations) were excluded. Only published handbooks, official reports and peer-

reviewed journal articles were included in the study. (iii) The title and abstract were used for screening, so that only studies and documents relevant to infectious disease control or pandemic measures with discussions of the air transport and tourism sectors were included.

After the initial screening processes, 538 publications were assessed for eligibility by conducting a full-text review of the publications in terms of their relevance to the research questions of this study. Two eligibility criteria were used: (i) the study needed to be relevant to travel-related policies of pandemics; (ii) the study concerned and focused on the commercial air transport and tourism sectors. This left 159 publications to be included in the qualitative analysis (i.e., content analysis).[13] Further screening was conducted to identify the studies and documents to be included in the second stage of the quantitative analysis via meta-regression analysis (MRA). The two eligibility criteria used to screen the publications to be included in the MRA analysis were: (i) the study focused on the effectiveness of any of the travel-related policies or measures in mitigating the pandemic; (ii) the methodology used for the analysis was either case studies, empirical modelling or experiments. All review studies were excluded from the MRA analysis. This left 69 publications to be included in the MRA analysis.

3.2.3 Data extraction and analyses

The following data were extracted from the 159 publications included in the qualitative analysis (see Appendix E for details of the 159 publications). A standard extraction form was used to input the following data into an Excel spreadsheet:

- Study characteristics: author, year of publication, title of the study or journal (if applicable), publication type and geographical scope
- Study methodology: research approaches
- Travel-related policies and measures: border closures and travel restrictions, quarantine and isolation, airport screening, hygiene measures, social distancing, contact tracing, virus testing, vaccination and others.
- Pandemics: SARS, H1N1, Ebola, COVID-19

[13] The author acknowledged more recent articles related to the COVID-19 pandemic (e.g, Oum et al., 2020; Zhang et al., 2020; Zhang et al., 2021) were published after completing this research and did not meet the selection criteria mentioned in Figure 3.

Data extracted were analysed via three different methods: descriptive analysis, content analysis and MRA.

- **Descriptive analysis**

The descriptive analysis sought to investigate the overall trend in terms of how pandemics (i.e., SARS, H1N1, Ebola and COVID-19) have been studied from an air transport and tourism perspective. The study characteristics, publication types, geographical scopes, and research methods applied were analysed, revealing how the extant research on the impact of pandemics on the air transport and tourism sectors has evolved throughout the study period. The aggregated data indicated the trends of epidemics and their possible associations with the interventions, mechanisms or measures implemented.

- **Content analysis**

One important objective of the literature review was to identify the research themes and focus within the selected publications (Vaismoradi et al., 2013; Zhong et al., 2015). Likewise, content analysis in this study was used to identify the impact of the pandemics on various government-level interventions and aviation measures (i.e., airport and airline measures), concentrating on each study's title, abstract and keywords. All of the 159 articles were imported into VOS viewer software (a tool used to visualise the bibliometric network) to construct co-occurrence networks (i.e., VOS maps) of terms extracted from the bibliographic data (the keywords provided by the authors) and text data (titles and abstracts of publications) (Modak et al., 2019; Wu et al., 2020a). Two co-occurrence maps were created for this study regarding how pandemics have affected the air transport and tourism sectors.

In addition, content analysis was used to investigate the effectiveness of travel-related policies or measures introduced by governments and relevant stakeholders (i.e., airports, airlines and health agencies) to mitigate the impacts of the pandemics. All 159 studies were imported into QRS-Nvivo software (Version 12) for thematic analysis. This study followed both inductive and deductive approaches (e.g., Creswell et al, 2011; Spasojevic et al., 2018; Thyme et al., 2013; Wu et al., 2020a). The inductive approach considers the main themes developed or identified through the initial literature review. Additional themes could be identified during the thematic analysis (deductive approach), depending on the most significant and most frequent policies implemented during the pandemics. The codes in the thematic analysis represent short

phrases, the essence of an issue, or a suggestion regarding the policies or mechanisms for controlling and managing the pandemics. All the themes identified during the eligibility assessment were categorised into themes and subthemes. For example, the statement "Wearing face masks: encouraged to everybody within the airport premises. Mandatory when imposed by the airport home country in public places or means of transport" was categorised under the 'Policies or Mechanisms' theme and categorised under the 'Hygienic measures' subtheme.

- **Meta-regression analysis**

MRA is a statistical approach used to synthesise an extensive collection of results on a specific subject (e.g., Cho & Honorati, 2014, Elburz et al., 2017; Elvik, 2005; Weichselbaumer & Winter-Ebmer, 2005). Note that meta-analyses are commonly used in the health and transport economics literature. It is an efficient method (for minimising costs and time) of understanding a specific topic and has commonly been used to aggregate the findings of clinical and medical trials (Egert & Halpern, 2006) and the air transport industry as well (Wu et al., 2020a). Furthermore, it allows a quantitative assessment of the literature from an econometric perspective (Weichselbaumer & Winter-Ebmer, 2005). In the current study, MRA was used to analyse the 69 selected studies (i.e., case studies, modelling or experiments). Previous studies on the impact of the policies and mechanisms used to control and mitigate the spread of the pandemics reported whether the outcomes were positive (effective) or negative (ineffective)[14]. Hence, a probit model was used to examine the differences in various types of policies and mechanisms. Similar analyses using a probit model may be found in previous studies (e.g., Cho & Honorati., 2014; Minviel & Latruffe, 2014; Stavropoulos & Burger, 2020; Wu et al., 2020a).

The probit model was used to examine whether the policies and mechanisms were effective. This model is specified as:

$$y^* = x_i \beta_s + \varepsilon_i,$$

[14] The policies or mechanisms implemented are considered as effective or ineffective as per the empirical results of the selected publications included in this study.

where $y^*$is the outcome variable observed, x_i is a vector of explanatory variables such as different pandemics (i.e., SARS, H1N1, Ebola and COVID-19) and geographical coverage, β represents the vector of coefficients to be estimated and ε_i represents the error term.

For estimation purposes, the explanatory variables extracted from the descriptive analysis and the content analysis of the selected publications were divided into five groups: policies and mechanisms, past pandemics, publication type, geographic areas and research methodology. All of the exploratory variables in the MRA are binary variables (values of either 1 or 0), except for the study period, which is a continuous variable. The definitions of all the variables of interest in the probit model are summarized in Table 19:

Table 19

Definition of Variables Used in the Meta-Regression Analysis

Variables	Description
Effective travel-related policies or measures	= 1 for a positive effect on pandemic containment; 0 otherwise
Border closure or travel restriction	= 1 if the type of mechanism is border closures or travel restrictions; 0 otherwise
Quarantine or isolation	= 1 if the type of mechanism is quarantine or isolation; 0 otherwise
Hygiene measures	= 1 if the type of mechanism is hygiene measures; 0 otherwise
*Airport screening	= 1 if the type of mechanism is airport screening; 0 otherwise
Social distancing	= 1 if the type of mechanism is social distancing; 0 otherwise
Contact tracing	= 1 if the type of mechanism is contact tracing; 0 otherwise
Virus testing	= 1 if the type of mechanism is virus testing; 0 otherwise
Vaccination	= 1 if the type of mechanism is vaccination; 0 otherwise
Other (e.g., information technology innovation, travel advisory)	= 1 if the mechanism is another type; 0 otherwise
Pandemics	
COVID-19	= 1 if the pandemic is COVID-19; 0 otherwise
*Ebola	= 1 if the pandemic is Ebola; 0 otherwise
H1N1	= 1 if the pandemic is H1N1; 0 otherwise
SARS	= 1 if the pandemic is SARS; 0 otherwise
Publication types	
Journal article	= 1 for a journal article; 0 otherwise
*Other types of publication	= 1 for a other types of publication; 0 otherwise
Study period	= Continuous variable, the timespan of the studies
Geographical areas	
Africa	= 1 for African countries; 0 otherwise
Asia	= 1 for Asian countries; 0 otherwise
America	= 1 for American countries; 0 otherwise
Europe	= 1 for European countries; 0 otherwise
Oceania	= 1 for Oceanian countries; 0 otherwise
*Other regions	= 1 for other regions; 0 otherwise
Research methods	
Empirical study	= 1 if an empirical approach was the primary method applied in the study; 0 otherwise
*Case study	= 1 if a survey approach was the primary method applied in the study; 0 otherwise
Simulation/scenario approach	= 1 if a simulation or scenario was the primary method applied in the study; 0 otherwise

Remarks: * refers to the baseline reference for each category.

3.3 Results

This section includes three parts: Section 3.3.1 provides a descriptive analysis of the policies and mechanisms for controlling and mitigating pandemics (2010–2021) in the aviation and tourism sectors. Section 3.3.2 presents the content and thematic analyses, which identify the effectiveness of the policies and mechanisms. Section 3.3.3 provides the results of the MRA.

3.3.1 Descriptive analysis

- **Characterisation of selected publications**

The first research question in the Introduction focuses on how the policies and mechanisms used to control the pandemic have been studied. Figure 4 shows the number of publications and research methodologies in aviation and tourism publications during the period of January 2010–February 2021. The number of studies was fairly steady until a surge in 2020 (see Appendix F for details). Prior to this, the number of studies ranged from one to three publications in most years, with three exceptions: eight publications in 2011 and four publications in 2016 and 2018. Apparently, studies related to the COVID-19 pandemic attracted unprecedented attention from the international research community (e.g., Fang et al., 2021; Gossling et al., 2020; Graham et al., 2020; Hall & Studdert, 2021). It is noted that previous research highlighted that passenger travel is one of the key aspects of epidemiology and disease surveillance (Hon, 2013; Khan et al., 2009) but it had not been a priority in the tourism and aviation literature until the COVID-19 pandemic (Bajardi et al., 2011; Chen et al., 2020c).

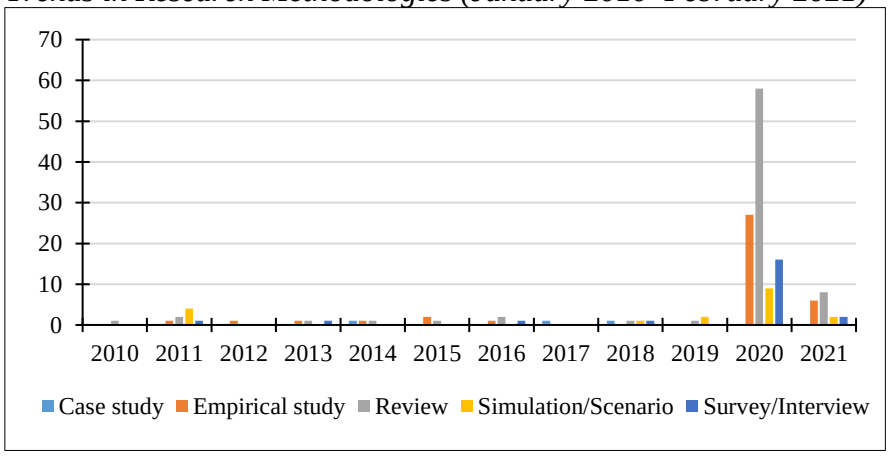
Regarding the research methodology, different research designs and approaches, including (e.g., case study, empirical studies, reviews (desktop analyses, literature reviews and descriptive analyses), surveys, interviews, and simulations and scenarios, have been used. Among the reviews, desktop analyses, literature reviews and descriptive analyses are the most common methods, accounting for 47.9% (76) of the selected publications, followed by empirical analyses (25.1% or 40 publications), surveys or interviews (13.8% or 22 publications), simulations or scenarios (11.3% or 18 publications) and case studies (3 or 1.9% or three publications). It should be noted that 48 (30.2%) publications used two or more research methodologies (e.g., surveys and empirical studies)[15]. The result of having a large number of review studies reflected the need for effective policies and control measures, which called for a systematic review of existing findings so that research gaps and needs could be more clearly identified (e.g., Bajardi et al., 2011; Budd et al., 2011; Chetty, 2020b; Tanriverdi et al., 2020). Within the empirical studies, econometric and statistical approaches have been used for different types of industry data. The surveys have examined the perspectives of passengers (Cahyanto et al., 2016; Chou & Lu, 2011; Neatherlin et al., 2013), airlines and

[15] These 48 publications are grouped and categorised in accordance with the primary research design used for analysis, which avoids double counting. Studies that collected data by interviewing experts and used the empirical analysis (i.e., Chou & Lu, 2011; Cahyanto et al., 2016) to analyse the data were classified as having the survey methodology.

airport industries (Neatherlin et al., 2013; Pongpirul et al., 2020, Suau-Sanchez et al., 2020) and the tourism sector (e.g., Das & Tiwari, 2020; Graham et al., 2020; Kement et al., 2020; Qiu et al., 2020), mostly on various travel-related policies and measures. Simulations have been used to examine the effectiveness of travel-related policies and measures under different scenarios and restrictions (e.g., travel restrictions, thermal body screening, close contacts, tests and quarantine or isolation).

Figure 4

Trends in Research Methodologies (January 2010–February 2021)



Regarding the distribution by publication type, journal articles take the largest share, accounting for 86.2% or 137 publications. Government and regional reports comprised 11.9% or 19 publications, whereas books and other sources accounted for 1.9% or three publications. The selected journal articles were sourced from various disciplines (i.e., aviation, business, development, medical, tourism and transport). The top three journal sources include the *Journal of Air Transport Management* (16 articles), followed by *Travel Medicine and Infectious Disease* (seven articles) and *Annals of Tourism Research* (six articles). This highlighted that the research interests on pandemics and related measures are not limited to any particular discipline (e.g., aviation, business, health, management or tourism).

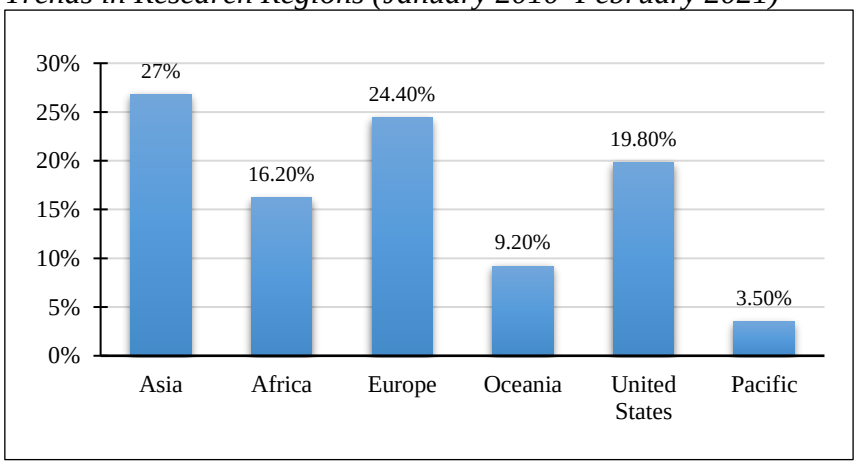
Additionally, the vast range of journal types reinforced the multi-faceted efforts required from cross-sectional organisations and countries to manage pandemics. The reports and handbooks selected for this study include reports and handbooks from specialised international agencies (e.g., IATA, ICAO, UNWTO and the World Health Organization (WHO)), regional organisations (e.g., European Union Aviation Safety Administration (EASA)) and various

government agencies (e.g., the Civil Aviation Administration of China (CAAC); the DITRDC; the Federal Aviation Administration (FAA); the United Kingdom Civil Aviation Authority (UKCAA)). Note that the reports and handbooks of these organisations provide guidelines and recommendations on various control and measures to mitigate pandemics. Additionally, the reports and handbooks highlighted the need for cross-sectoral (airports, airlines, border agencies, healthcare and tourism) and cross-country collaboration in order for the measures to be effective (EASA, 2020a; IATA, 2020; ICAO, 2020).

Figure 5 shows the geographic regions that are examined in the selected publications and the number of publications for each region. It is not surprising to note that most of the selected studies focused on Asia (27% or 43 publications); this could be because many of the Asian economies were more badly hit by previous pandemics (e.g., SARS), although it is probably too early to tell in the case of COVID-19, which has imposed devastating damage globally. Economies or countries in Asia examined in the selected publications include Hong Kong, mainland China, Indonesia, Malaysia, Singapore, South Korea and Vietnam. The European region includes Germany, Italy and the United Kingdom, with 24.4% or 38 publications dedicated to the region. This is somewhat surprising, because the tourism markets in Spain and France were very large. This might be because our selection criteria only selected publications in English only. Many publications focused on the United States, accounting for 19.80% of our selected publication (31 publications), followed by Africa (16.20% or 26 publications), Oceanian countries (i.e., Australia, New Zealand and Pacific countries, with 9.20 % or 15 publications). Only six (3.50%) publications included Pacific Island countries in the analysis, although 93 cross-country analyses have been included in our study. The global geographical coverage of the selected publications emphasizes that pandemics or health-related emergencies are not limited to any particular countries or regions, even though they may start in specific locations. There is a lack of research on the travel-related mitigation measures related to the SPR's aviation and tourism sectors. In addition, the two studies focused primarily on the Pacific were descriptive discussions without rigorous empirical analysis. Since the SPR shares features with other developing countries that rely extensively on aviation and tourism, our study not only contributes to these sectors in the SPR region but is expected to also offer some general insights to this understudied field.

Figure 5

Trends in Research Regions (January 2010–February 2021)



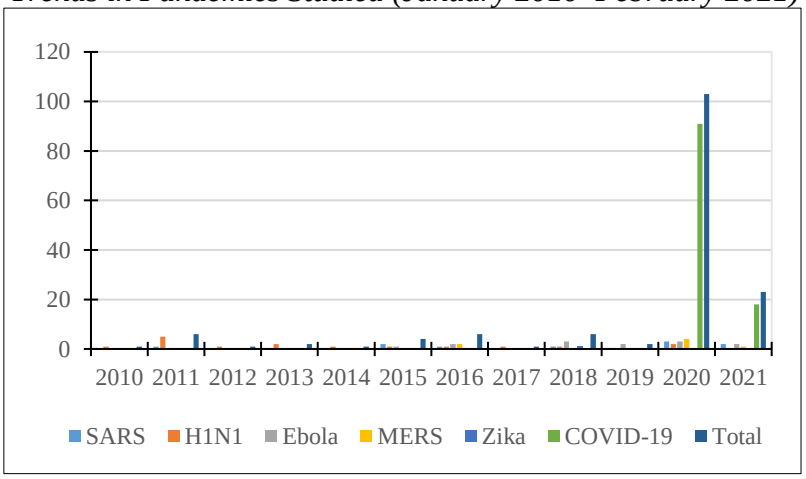
- ## Research focus

- **Past and present pandemics occurring during the study period**

Within the research into pandemics relating to the air transport and tourism sectors, the majority (69.9% or 109 publications) of the selected publications focused on the COVID-19 pandemic and were published in 2020 and 2021, as shown in Figure 6. However, 10.3% (16 publications) of the selected publications focused on the H1NI virus, 8.3% (13 publications) on Ebola, 6.4% (10 publications) on SARS, 4.5% (seven publications) on MERS and 0.6% (one publication) on Zika, respectively. It should be noted that the Zika outbreak happened in four Pacific Islands (i.e., Cook Islands, Easter Island, French Polynesia, New Caledonia) between 2013 and 2014 (Cao-Lormeau et al., 2013). The WHO later declared Zika as an international health emergency in February 2016 and November 2016, respectively (Richardson, 2016). Zika was transmitted by mosquitoes and travel-restrictions were later imposed on pregnant women who were considered as the higher risk group (Jamorisk & Selgelid, 2020). Many of the studies were carried out shortly after a significant breakout of the disease, with only a few revisiting pandemics that took place years ago. This may not be very helpful in developing long-term strategies. Indeed, viruses such as H1N1 virus and Ebola have been detected multiple times over the years. Even though each virus or epidemic may have some unique features, systematically reviewing the measures adopted and lessons learnt in dealing with these pandemics can be useful, so that effective control measures can be identified that inflict minimum damage to the economy, especially the aviation and tourism sectors.

Figure 6

Trends in Pandemics Studied (January 2010–February 2021)

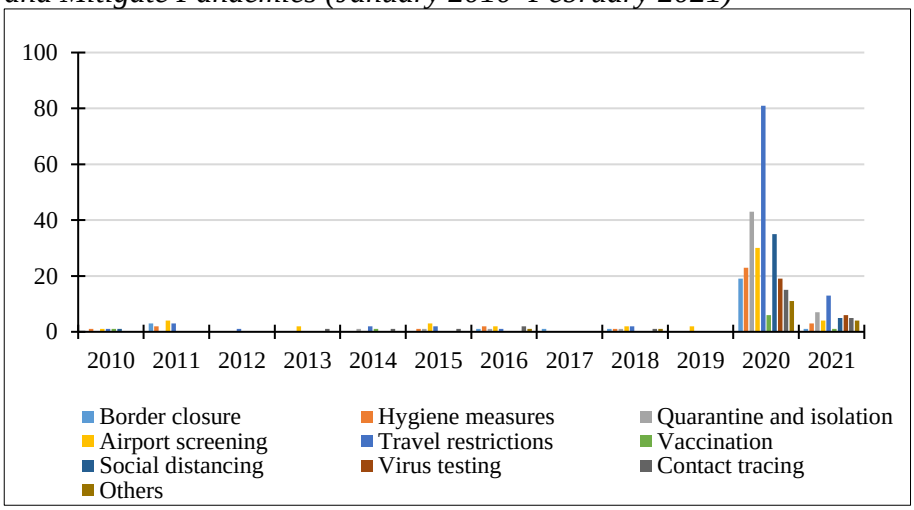


- **Policies and mechanisms for controlling and mitigating past pandemics**

The policies and mechanisms considered in the selected publications are categorised into 10 main groups: border closures, travel restrictions, airport screening, hygiene measures, quarantine and isolation, contact tracing, social distancing, virus testing, vaccination, and other measures (e.g., information technology (IT) innovations and travel advisories for passengers), with the number of related studies shown in Figure 7. Among all the selected publications, travel restrictions received a considerable amount of attention, accounting for 27.4% (106 publications), followed by quarantine or isolation (14% or 54 publications) and airport screening (e.g., thermal body temperature) (12.9% or 50 publications). Social distancing has 10.6% (41 publications), hygienic measures has 8.5% (33 publications), border control has 6.7% (26 publications), contact tracing has 6.7% (26 publications), virus testing has 19% (six publications) and vaccination has 2.3% (nine publications). The majority of the selected publications (64.8% or 103 publications) focused on two or more measures. During the current COVID-19 pandemic, although traditional travel related-measures (e.g., border closures and travel restrictions, quarantine, thermal body screening at airports, hygiene measures, social distancing and contact tracing) have been extensively used, there are concerns that they are insufficient for containing the crisis (Wenzel et al., 2020). Instead, vaccination has been regarded as the main tool in most countries, which has not been a focus in previous studies. This highlights the significant heterogeneity and complexity in pandemic control strategies and policies.

Figure 7

Policies and Mechanisms Listed in Selected Publications to Control and Mitigate Pandemics (January 2010–February 2021)



3.3.2 Content and thematic analysis

- **Content analysis: Network analysis with VOS viewer**

Figure 8 shows the co-occurrence of words listed in the selected publications' keywords. The keywords represent the key ideas or focus of each publication as defined by the authors. VOS viewer software was used to find the minimum number of occurrences to maximise the pool of keywords used. The keywords most frequently used were "COVID-19", "coronavirus", "air travel", "crisis", "lockdown", "outbreak", "pandemics", "SARS-COV-2", "travel restrictions" and "tourism". As indicated by the colour spectrum (or the key) in Figure 8, blue represents the keywords in abstracts that are found in earlier publications (2010) and the yellow keywords are found in publications after 2020 (Wu et al., 2020a). The common measures mentioned throughout the decade include "isolation", "quarantine", "screening", "border closure" and "contact tracing", which revealed the travel-related policies and measures used over time. "Air travel" and "tourism" also share the common keyword "risk". This reflects their dual role in pandemic control: on the one hand, these sectors suffer significantly from a pandemic and thus sufficient support should be provided. On the other hand, air travel and tourism can facilitate the spread of a pandemic, and thus tight control is needed. A good understanding of the associated risk is of critical importance for balancing the conflicting objectives of industry support vs. pandemic control.

Figure 8

Co-occurrence of Words Listed in Keywords

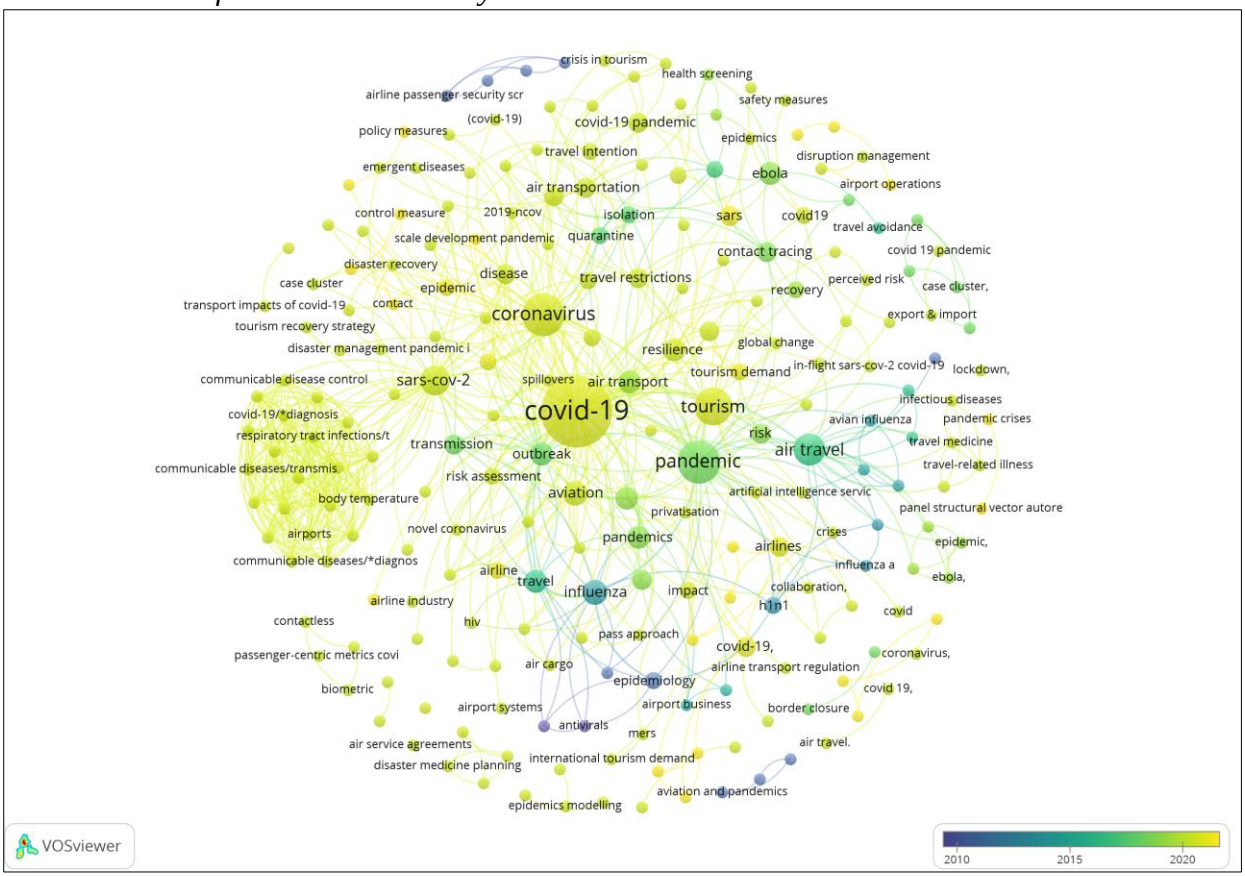
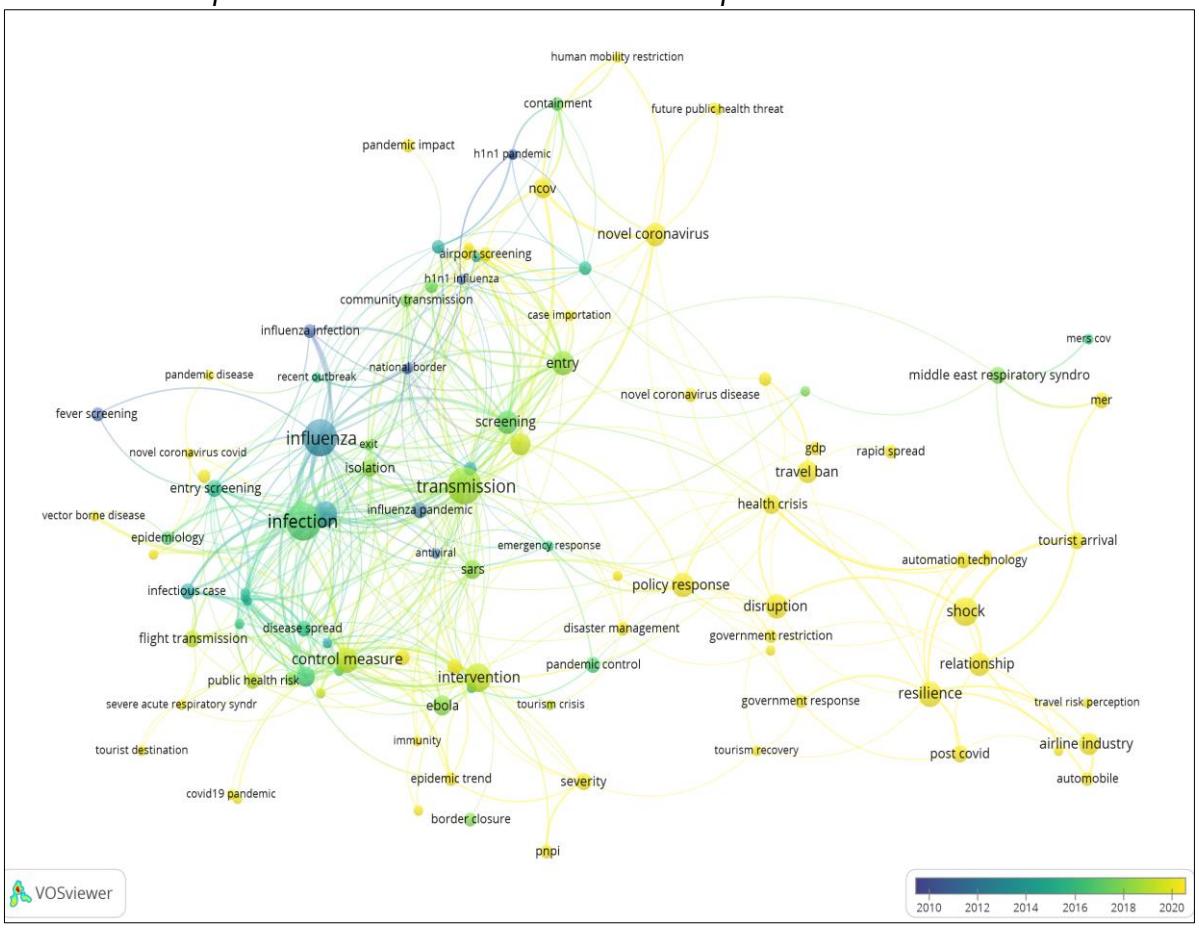


Figure 9 illustrates the co-occurrence of words in the selected publications' titles and abstracts. The minimum number (two occurrences) and the 113 most frequently used words were included in order to get the most results. The keywords that are the most frequently used were: "novel coronavirus", "isolation", "infection", "shock", "influenza", "transmission", "screening", "control measure", "travel ban" and "intervention". Again, blue represents keywords that are found in the earlier selected publications (2010), and yellow represents keywords are found in the selected publications after 2020 (Wu et al., 2020a). Overall, it seems that after 2020, the issues related to "policy response" and industry performance (e.g., resilience, disruptions) received increased attention.

Figure 9

Co-occurrence of Words Listed in Titles and Abstracts of the Selected Publications



Overall, Figures 8 and 9 show that most studies and publications were seen after 2020 because of the unprecedented and prolonged COVID-19 pandemic across the globe. Importantly, these two figures also highlight policies and mechanisms implemented to control and mitigate past pandemics, as reflected by the words "travel restrictions", "border control", "policy response", "control measures", "restriction", "quarantine", "vaccine", "fever screening", "government restrictions", "travel ban", "PNPI" [16], and "isolation". This is in line with the observations in Section 3.3.1, namely that since 2020, there has been a substantial increase in air transport and tourism publications related to policies and mechanisms for controlling and mitigating pandemics. It should be noted that this study did not combine synonyms into one word for the analysis; for example, "COVID-19", "coronavirus" and "SARS-2" were listed as separate terms, although they all refer to the same virus. These words show how the COVID-19 virus

[16] Personal non-pharmaceutical interventions (social distancing, thermal body screening; hygiene measures – masks, sanitization, etc.).

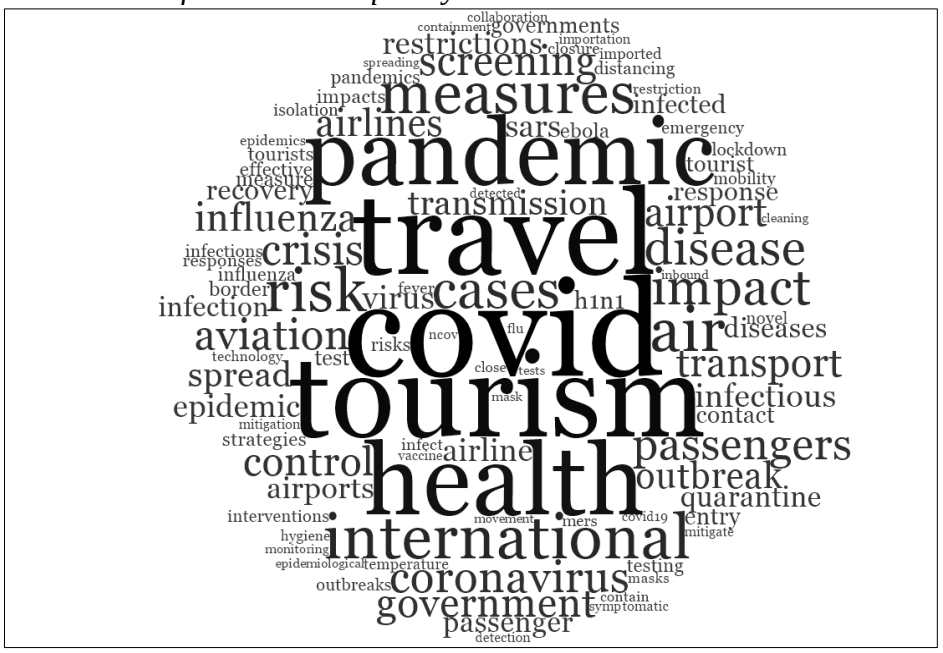
was referred to in the early stages of the pandemic before its name was changed and confirmed by the World Health Organization (e.g., Chen et al., 2020a; Fang et al., 2020; Haider et al., 2020; Hoque et al., 2020). (see Appendix G for the top 20 co-occurrences in keywords, titles and abstracts).

- **Content analysis: Word frequency**

Figure 10 identifies the words that were the most frequently used within the selected publications. The word cloud displays the words in the list generated after formatting with a frequency of 100 or more. The size of the words that appear in Figure 8 corresponds to the frequency of the words used in the selected publications. The most frequently used words in the text, after excluding some stop words[17] and irrelevant words[18], are "travel", "tourism", "COVID", "pandemic", "government", "health", "coronavirus", "impact", "measures", "screening" and "restrictions" (see Appendix H for the results of the 45 most frequent words). The most frequently used words in the text are similar to those presented in Section 3.3.2.

Figure 10

Word Cloud of the Most Frequently Used Words in the Selected Publications



[17]Stop words (e.g., according", "after" and "because") are irrelevant for search purposes in this study because they are commonly used in English articles (Banks et al., 2018). Other words such as "able" "about" were also filtered and removed when running the word frequency queries.

[18] Irrelevant words refer to words that are not relevant for search purposes. This study aimed to identify travel-related mitigating measures. Hence words such as "across", "action", "arrival", "cabin" and "centre" were deemed to be irrelevant words and were filtered out when running the frequency queries.

- ## Content and Thematic analysis

The second research question stated in the Introduction focused on the impacts of pandemics on the air transport and tourism sectors, including those associated with travel-related policies and measures. Keywords such as "border closure", "quarantine or isolation", "travel restrictions or ban", "screening" and "contact tracing" are repeatedly reported in Figures 6, 7 and 8. As mentioned, the analysis started with the deductive approach, namely a content analysis of the 159 selected publications. The content and thematic analysis in this study aimed to identify the key policies and measures implemented by governments and stakeholders to control and mitigate pandemics. This section presents the studies and findings related to the identified themes (i.e., policies or measures for controlling and mitigating pandemics).

- **Border closures and travel restrictions**

A vast amount of research supported the significant role of the aviation sector as a vector for spreading infectious diseases (e.g., Abeyratne, 2006; Ali & Keil, 2006; Brownie et al., 2016; Grais et al., 2003). This notion supports the border closure and travel restriction policies implemented by governments, especially for controlling passengers and travellers originating from high-risk (infected) countries. This has commonly been an immediate response to prior and pandemics (e.g., SARS, H1N1, Ebola and COVID-19) to limit and prevent the entry of infected passengers who may transmit viruses across countries. For example, Mei and Hu (2020) highlighted that "countries such as Fiji have already started to monitor high-risk persons and strengthen the management of international borders" (p. 2).

Still, there is some debate on the effectiveness of border closures and travel restrictions for controlling the spread of viruses across borders (e.g., Bielecki et al., 2020; Bogoch et al., 2015; Boyd et al., 2017; Burns et al., 2020). Several researchers concurred that border closure and travel restriction policies had been effective (Bogoch et al., 2015; Burns et al., 2020; Tuncer & Le, 2014), especially in small and isolated countries (e.g., Bielecki et al., 2020; Boyd et al., 2017; Mateus et al., 2014, Steffen, 2010). However, two studies (Chen et al., 2020b, Czerny et al., 2021) argued that such policies are only effective if applied promptly from the outset of the outbreak. Chong and Zee (2012) and Wilder-Smith (2021) suggested that these policies could not stop the virus from spreading to other countries but would be effective as a short-term measure or delaying mechanism. In another extreme, some studies suggested that border closures and travel restrictions were completely ineffective, especially considering the high

implementation costs imposed on different sectors (tourism and trade) (Bajardi et al., 2011; Huizer et al., 2015; Lam et al., 2011). Overall, major concerns have been raised about the negative impacts on the aviation and tourism industries, noting the lack of empirical evidence to support the claimed effectiveness of these policies for controlling inbound virus transmission (Bogoch et al., 2015).

- **Airport screening**

The airport screening policy requires passengers and travellers to undergo temperature checking on arrival, complete health declaration forms and watch for flu symptoms (e.g., Fisher et al., 2011; Gold et al., 2019; Khan et al., 2009; Priest et al., 2011). Airport screening and related procedures have been implemented worldwide as one of the default government responses to pandemics (Cowling et al., 2010). Bogoch et al. (2015) and Gold et al. (2019) pointed out the effectiveness of airport screening. Tabares (2021) also asserted that "With the detection technologies available in the 21st century, it is expected that health screening can satisfactorily replace quarantine measures" (p. 3).

However, many aviation and tourism researchers (e.g., Bielecki et al., 2021; Chung, 2015; Khan et al., 2013; Nishiura & Kamiya, 2011) argued that airport screening policies has been ineffective in the past. In particular, Steffen (2010) highlighted that "WHO explicitly states that it 'does not believe entry and exit screenings would work to reduce the spread of this disease'" (p. 182). Prior studies pointed out that airport screening allowed asymptomatic passengers to slip through (Nishiura & Kamiya, 2011; Priest et al., 2020; Tuite et al., 2019). Asymptomatic passengers might not be successfully detected, as they do not show any symptoms during the incubation period of being infected. One of the major concerns voiced by previous studies is related to the extensive resources (equipment and human resources) required, leading to inefficient and ineffective outcomes (e.g., Burns et al., 2020; Gold et al., 2019; Le et al., 2021; Zenker & Kock, 2020).

- **Quarantine and isolation**

In conjunction with border closure and travel restrictions, quarantine and isolation have also been commonly used as initial responses to pandemics (Bielecki et al., 2020). Inbound passengers and travellers are required to be quarantined or isolated from the destination community for a specified period (which usually varies from 7 to 14 days). In the case of

onboard quarantine, seats on aircraft are allocated to asymptomatic passengers. Additionally, passengers and travellers who may have been exposed to any infected persons during the flight will also be required to quarantine or isolate themselves after landing. Quarantining and isolation are either mandatory (as in New Zealand) or voluntary (as in Malaysia) (WHO, 2015). For example, in New Zealand, all passengers must spend 14 days in mandatory isolation quarantine (Swadi et al., 2020).

Academics and governments have generally accepted that quarantine and isolation policies are effective in controlling the spread of the virus (e.g., EASA, 2020b; Khan et al. 2020; Tay et al., 2020; WHO, 2015). Indeed, during the 2009 H1N1 pandemic, four Pacific Island nations were able to delay or prevent the inflow of the influenza virus through imposing a strict maritime quarantine upon sailors (Kool et al., 2013). On the other hand, several studies argued that quarantine and isolation measures are only effective when combined with other policies such as travel restrictions, efficient testing and contact tracing (Bielecki et al., 2020; EASA, 2020c; WHO, 2015). Extensive resources are required (e.g., human resources related to medical, service and enforcement activities, and quarantine facilities and infrastructure) for the implementation of these travel-related policies and measures. There are significant costs to passengers, aviation and tourism, and other sectors in the economy, such as trade and supply chains. Therefore, arguments have also been made that quarantine and isolation policies are ineffective for controlling and mitigating past pandemics, especially when the high associated costs are considered (e.g., Cahyanto et al., 2016; Huizer et al., 2015; Tuncer & Le, 2014; Vickerman, 2020). Some researchers have even argued that such policies devastated the aviation and tourism industries (Huizer et al., 2015; Tay et al., 2020). For example, this policy prompted airlines in the UK to take legal actions against the UK government to remove the mandatory quarantine requirements on tourists (Chen et al., 2020c).

- **Hygiene measures in airports and airline operations**

One significant risk of pandemics is that a virus can be transmitted via the air or through direct contact with infected persons or on any infected surface for a prolonged period (FAA, 2020). Therefore, the global aviation industry has been required to enhance hygiene measures for passengers and travellers, such as wearing masks at airports and during flights, more frequent sanitisation, more frequent cleaning and disinfection of aircraft and airport facilities, and making personal protective equipment available to employees (e.g., EASA, 2020a;

Organisation for Economic Co-operation Development (OECD), 2020a; Pongpirul et al., 2020; Wilder-Smith, 2021).

Most of the selected publications in our study indicated that the hygiene measures implemented by aviation operators have been effective for controlling and mitigating pandemics and virus spread (e.g., Cahyanto et al., 2016; Chen et al., 2020b, 2020c; Serrano & Kazda, 2020; Uva & Ratajczyk, 2020). One specific hygiene measurement is that "Hand hygiene…entering an airport until leaving an airport as well as continuous face coverings are key elements of preventing SARS-CoV-2 transmission" (Bielecki et al., 2020, p. 7). Again, during the H1N1 pandemic, Chou and Lu (2011) found that passengers and airline staff were satisfied with the hygiene measures implemented to control the spread of the virus. For the COVID-19 pandemic, Zenker et al. (2021) and Tuchen et al. (2020) highlighted that passengers and travellers felt more anxious about their health in response to the hygiene measures implemented by aviation operators rather than feeling safer. Masks can be controversial in certain cases, probably because they are constantly visible. For example, the EASA (2020a) stated that "the use of face masks in airports should be considered only as a complementary measure and not as a replacement for established preventive measures" (p. 23). Concerns about the high costs to the aviation industry of implementing such measures have also been voiced (Ribeiro et al., 2020; Serrano & Kazda, 2020).

- **Contact tracing at airports and inflight**

The air transport industry can positively contribute to safeguarding borders by identifying and detecting any infected persons through efficient and robust contact tracing systems that identify and trace infected passengers flying across international borders. Contact tracing, as implemented by airports and airlines, includes collecting passengers' details for tracing purposes, targeting infected persons or those exposed (close contact) to any infected persons and who are thus at risk of contracting the virus during the flight. This assists the later quarantine and isolation for those passengers accordingly. For example, the passengers' manifests were a crucial component for contact tracing in Australia (Draper et al., 2020). In addition, airlines and airports may collect passengers' contact and health information and pass this to the destination countries' governments, thus minimising the risk of the virus spreading across borders (EASA, 2020c).

Similar to other policies discussed above, there have been debates on the effectiveness of contact tracing (e.g., Cheng et al., 2020; Chetty et al., 2020a; FAA, 2020; Pavli et al., 2020). Aviation regulators (EASA, 2020b; Federal Aviation Administration, 2020) have indicated that contact tracing is an effective policy for controlling the COVID-19 virus if implemented promptly at the outset of the pandemic. The EASA (2020b) suggested that "Test-Trace-and-Isolate (TTI) strategies are a useful tool to limit the spread of SARS-CoV-2" (p. 13). However, the FAA (2020) mentioned that contact tracing needs to complement other measures (e.g., quarantine, travel restrictions and testing) and needs good coordination with the relevant stakeholders. This report also mentioned that "Early case finding and rapid isolation, contact tracing…and quarantine of exposed contacts/isolation of infected persons are critical components of aggressive containment of the virus" (FAA, 2020, p. 15). On the other hand, Huizer et al. (2015) insisted that contact tracing can be ineffective because it is resource-intensive for the aviation sector and was ineffective in controlling the H1N1 virus. More importantly, Pavli et al. (2020) claimed that only limited studies have tried to examine the effectiveness of contact tracing policies for controlling and mitigating pandemics such as the COVID-19 pandemic.

- **Social distancing**

Governments worldwide have relied on social distancing to manage the risk of spreading (Fu et al., 2021). "Social distancing is at the core of crisis management" (OEDC, 2020b, p. 5). The European Commission (EC) (2020) highlighted that developing countries rely heavily on large-scale physical distancing to slow down human-to-human spread of viruses. The EC (2020) also emphasised that social distancing becomes effective when combined with other policies and hygiene measures. Wearing masks and physical distancing have proven to be effective countermeasures.

Social distancing at airports and during flights effectively controls the spread of a virus (e.g., Abdullah et al., 2020; Chen et al., 2020a; EC, 2020; Fu et al., 2021). High-risk virus transmission is often due to close contact with infected passengers or travellers, which highlights the importance of social distancing (i.e., 1–2 m apart) at airports and in-flight. Social distancing measures at the airport environment often involve using floor markers for queue management (check-in and waiting points) and seat arrangement at airport terminals (Abdullah et al., 2020, Khan et al., 2013; Lee, 2020). Regarding in-flight social distancing (i.e., block of

middle seats), the IATA (2020) and Salari et al. (2020) strongly opposed this policy because there is lack of empirical evidence to support such policy and the financial constraints it entailed. On the other hand, a number of studies (Barnett, 2020; Glusac, 2020) supported that this in-flight social distancing strategy (i.e., block of seats) would half the risk of virus transmission inside the aircraft. However, Bailey (2020) highlighted that this strategy fails to meet the advocated six feet of social distancing. The WHO (2019) identified any passengers seated in the same row or in the adjacent two rows (front and behind) as close in-flight contacts. There are concerns about the difficulty and high costs of implementing a 1- to 2-m social distance at crowded airports and during flights (ACI and IATA, 2020; Khan et al., 2013).

Social distancing (seat arrangement) is practised in flights by several airlines (Leitmeyer & Adlhoch., 2012). The IATA (2020) strongly opposed this policy because there is a lack of empirical evidence to support it, and the financial constraints it entails can be significant. Similarly, there is insufficient evidence to support the relationship between in-flight transmission and in-flight social distancing (e.g., Khan et al., 2013; Leitmeyer & Adlhoch., 2012; Neatherlin et al., 2013), and a simple cost-efficient strategy such as a hygiene policy (wearing masks and offering sanitisation) may suffice (Chen, 2020; Leitmeyer & Adlhoch, 2012). A more recent study provided solid evidence that in-flight virus transmission is highly possible, as shown by the transmission detected during a flight from Singapore to China (Chen et al., 2020a).

- **Virus testing**

The early detection of any infection could provide information on whether a virus or other diseases are being transmitted across countries. A virus testing policy relies heavily on a reliable testing strategy for all outbound passengers and travellers before they show any symptoms (Tabares, 2021). Infected passengers and travellers detected by the mandated virus testing are immediately isolated (WHO, 2015). Usually, virus testing for passengers and travellers is conducted before departure and upon arrival at the destination. Testing is often conducted by taking a nasal or throat swap from passengers and travellers at medical clinics or airports (EASA, 2020b). The time required for the test results varies in different countries. For example, COVID-19 test results are received within 1 hour in Moscow (Tabares, 2021), but may take weeks in the Pacific, where COVID-19 test samples are transferred to Fiji or New Zealand because local facilities are limited (Kool et al., 2013). A swab testing policy at

international airports is mandatory in most countries (WHO, 2019), but is voluntary in Malaysia (Elias, 2020; Vickerman, 2020).

Virus testing policies have been effective and successful at controlling the spread of COVID-19 (OECD, 2020b; WHO, 2019). The OECD (2020b) specified that "Testing is an essential component of exit strategies from containment" (p. 34). More importantly, virus testing is an essential component of other mitigation measures such as border closures and travel restrictions, quarantine and isolation hygiene measures. Additionally, if testing is conducted effectively, "Testing to mitigate or replace quarantines" would be possible (Tabares, 2021, p. 2), which would benefit the tourism and airline industries. However, limited research effort has focused on the effectiveness of virus testing policies (Tabares, 2021).

- **Vaccination**

Pandemics are caused by an infectious bacterium or virus that becomes capable of spreading widely and rapidly (Wilson, 2004). A vaccination policy involves the development of antiviral drugs or vaccines to reduce the risks of being susceptible to infection and transmitting the disease in the community (Lai et al., 2021; Lim, 2006; Wilder-Smith et al., 2012). In the airline industry, many airlines started to require passengers to provide evidence of being vaccinated before they were allowed to travel. For example, Australia, Denmark and Sweden have committed to implementing a 'vaccine passport' (Hall & Studdert, 2021).

It is accepted that vaccination is the most effective approach to overcome pandemics (e.g., CAAC, 2020; Chong & Zee, 2012; EASA, 2020c; Lee, 2021; WHO, 2015). Vaccination alone can effectively control and mitigate most epidemics by reducing the risk of a susceptible individual being infected, thus minimising the possibility of seeding the disease in the community (Chong & Zee, 2012). However, the vaccination policy implemented by governments is considered to be a long-term strategy because the development of antiviral drugs requires high costs and an extensive time for preparation, trials and distribution. As such, there is a need for other short-term measures, such as border closures and travel restrictions, hygiene measures, quarantine and isolation, social distancing and virus testing (EASA, 2020b; World Health Organization, 2015). One main concern regarding the vaccination strategy is the lack of public acceptance, which was observed during the H1N1period (Chong & Zee, 2012). Importantly, this study found that vaccination policies were among the least examined

measures by air transport and tourism researchers, possibly because of the expertise required to analyse this particular policy (Padron-Regalado, 2020).

- **Other measures (IT Innovation, travel information and advisory)**

Governments and aviation stakeholders (e.g., airport operators) have expended tremendous effort to control and mitigate the spread of COVID-19 through information technology (IT) innovations. Various IT innovations have been adopted at airports, such as additional contactless or touch-free kiosks, automated self-serving facilities for various processes, electronic check-ins, modified security checks to avoid contact, and modified customs and immigration controls to avoid changing documents (Choi, 2021; Serrano & Kazda, 2020; Tabares, 2021). The US government encourages the use of IT innovations to minimise human interactions at all US airports (FAA, 2020). Travel information and advisories for passengers and travellers involve providing timely and appropriate information on new travel requirements for different cities and countries during a pandemic, such as the risk of disease, testing requirements and vaccination. In the US, the relevant aviation stakeholders are required to provide travel information in multiple languages to travellers (FAA, 2020). This ensures that all passengers and travellers are fully aware of and comply with the updated travelling requirements or choose not to travel after knowing the relevant information.

It is generally acknowledged that such measures (IT innovations, travel information and advisories) have been effective in controlling and mitigating the COVID-19 pandemic (e.g., EASA, 2020a; Serrano & Kazda, 2020; Tabares, 2021; WHO, 2019). Serrano and Kazda (2020) commented that technology is, as of now, the main driver for ensuring that the safety objectives can be achieved, and that touchless travel can be offered to passengers at airports. With regards to travel information and advisories for passengers and travellers, the World Health Organization also encourages health professionals to provide relevant information on the pandemic to the public, as practiced in Africa (Gilbert et al., 2020) and India (Kumar, 2020). In the US, pandemic information is also shared between aviation employees and passengers (FAA, 2020). During the pre-COVID-19 era, Huizer et al. (2015) found that travel advisories were ineffective in controlling and mitigating the spread of a virus. This argument has not been widely accepted. Surprisingly, despite their increasing use, IT innovations and travel information and advisories have not been thoroughly examined in the literature compared with the other policies and measures discussed above.

3.3.3 Meta-analysis

All the selected 159 publications were used in the descriptive analysis and content analysis, and the content and thematic analyses to maximize the literature coverage. In the subsequent MRA analysis, 69 publications produced 613 observations regarding the effectiveness of travel-related policies and measures for controlling and mitigating the impacts of the pandemics (see the selection process in Section 3.2.2). For estimation purposes, some travel-related policies or measures implemented were grouped according to similarities in their characteristics, as reported in Table 20.

Table 20

Definitions and Grouping of Policies and Measures Used in Past Pandemics

Policies and measures	Definition	Examples
Border control	Governments close borders against entry into domestic or international cities	The New Zealand government completely closed its borders in March 2020
Travel restrictions	Governments restrict any international travellers from entering their countries	The Malaysian government has restricted any international travellers entering the country since 2020
Hygiene measures	Governments require passengers and travellers to wear masks, along with the sanitation and extra cleaning regimes for airports and airlines	Inbound travellers to Australia were required to wear masks, along with restriction of in-flight passenger movements and pre-packaged sanitation packages for travellers
Airport screening	Screening of inbound passengers' temperature on arrival or departure at airports	The South Korean government implemented the health declaration forms and thermal camera scanning for inbound passengers arriving at international airports in 2012
Quarantine or isolation	Passengers are required to quarantine or be isolated at a specified location for a specified period (e.g., 14 days) upon arrival	Taiwan's government has imposed mandatory home isolation or hotel quarantine for 14 days since April 2020
Vaccination	Passengers are required to be vaccinated before travel (confirmation of vaccination)	The governments of Australia, Denmark and Sweden require all travellers to provide vaccination immunity passports for entry to start in 2021
Virus testing	Passengers required to provide confirmation of negative test results before travelling	Virus testing was conducted at Taiwanese international airport in 2020
Contact tracing	Governments require airlines and airports to trace the movements of arriving passengers or record inbound passengers' contact details	Vietnam's government considered inbound passengers flying on the same flights as primary contacts in 2020. All passengers were required to self-isolate and quarantine, as one of the passengers tested positive for COVID-19
Social distancing	International travellers must keep 1–2 m apart from other passengers (at airports and inside aircraft).	European airlines were encouraged to adhere to social distancing measures during the flight (to the extent possible) in 2020
Other	IT innovations and travel information and advisory	Spanish airports modernised their airport operations (e.g., digital identification, video analytics, remote control towers) to limit human-to-human interactions in 2020

Grouping		
Border control and travel restrictions	Border control and travel restrictions	Refer to the examples mentioned above
Vaccination and virus testing	Vaccination and virus testing	Refer to the examples mentioned above

Table 21 shows the estimated results of the probit model for determining (probability) of the effectiveness of the travel-related policies and measures studied in prior publications for controlling and mitigating different pandemics.

Table 21

Estimation Results of the Probit Model

Dependent variable = *Effectiveness of policies and measures*			
Explanatory variables	**Coefficients**	**Robust standard error**	**Marginal effect**
Policies and mechanisms			
Border closures and travel restrictions	0.322**	0.184	0.047**
Hygiene measures	1.696 ***	0.585	0.250***
Quarantine or isolation	0.824**	0.317	0.121*
Social distancing	0.647	0.347	0.095
Contact tracing	0.858**	0.334	0.126**
Vaccination and virus testing	0.712**	0.315	0.105**
Others	0.555	0.337	0.082
Pandemics			
COVID-19	1.065**	0.221	0.157***
H1N1	-0.632***	0.281	-0.093**
SARS	0.676**	0.330	0.099**
Geographic regions			
Africa	1.358***	0.402	0.199***
America	1.121***	0.347	0.165***
Asia	0.784**	0.367	0.115**
Europe	0.976 ***	0.360	0.144**
Oceania	1.342***	0.394	0.197***
Research methodology			
Empirical study	-0.335	0.239	-0.049
Simulations and scenario	0.631**	0.315	0.093**
Study characteristics			
Journal publications	-1.189	0.315	-0.175
Study year			
Study period	-0.043***	0.009	-0.006***
Constant	0.530	0.889	
Observations	613		
Pseudo-R^2	0.402		

Remarks: *, ** and *** indicate that the explanatory variable is significant at 10%, 5% and 1% significance levels, respectively. Twelve observations were omitted because of collinearity.

As mentioned earlier, the dependent variable was a binary variable, taking a value of 1 if a study reported that the travel-related policies and measures could effectively control and

mitigate the impacts of the pandemics, and 0 otherwise. All policies and measures discussed above were included as explanatory variables, except for airport screening, which was used as the reference. A statistically significant and positive coefficient estimate for the policies and measures variables indicated that there is a higher likelihood (i.e., a higher chance or frequency) that a prior study found that an explanatory variable (a particular policy or measure) effectively controlled and mitigated past pandemics compared with the baseline reference (i.e., airport screening). Conversely, a statistically significant and negative coefficient estimate for the policies and measures variables indicated that compared with airport screening, the explanatory variable (a particular policy or measure) was less likely to be identified as effective by a prior study. Therefore, the regression analysis revealed the effectiveness of travel-related policies and measures found in prior publications. For example, if the coefficient estimates are statistically significant and positive at either the 1% or 5% level, this suggests that prior publications provide more support for the effectiveness of the policies and measures for tackling past pandemics, compared with airport screening (the reference measure in the model).[19] As reported in Table 21, hygiene measures were most frequently identified as being effective by previous studies, followed by, in decreasing frequency, contact tracing, quarantine or isolation, vaccination and virus testing, and border closures and travel restrictions in comparison with airport screening (baseline reference). Social distancing and other measures (e.g., IT innovations) were positive but not statistically significant in comparison with airport screening (baseline reference). In other words, although previous studies tended to regard them as more effective than airport screening, there were quite some mixed views. For example, the positive but insignificant estimate of "social distancing" suggests that although some studies recommended social distancing, there are still significant reservations about its actual effectiveness.

Another result of the probit model relates to the effectiveness in controlling and mitigating past pandemics and/or viruses, including SARS, Ebola, H1N1 and COVID-19. This study found that the COVID-19 and SARS pandemics had statistically significant and positive coefficient estimates at the 5% statistical level, and H1N1 had a significant negative coefficient estimate

[19] The choice of airport screening as the base model for the travel-related policies group was found to be ineffective (Bielecki et al., 2021; Chung, 2015). Asymptomatic passengers might not be successfully detected, as they do not show any symptoms during the incubation period of being infected (Nishiura & Kamiya, 2011). This implies that airport screening is less important for controlling and mitigating past pandemics in comparison with other travel-related policies and measures identified.

at the 1% statistical level, compared with Ebola (the omitted variable in the models, which served as the reference base). These findings indicate that previous publications more frequently provided positive views on the policies and measures against COVID-19 and SARS in comparison with Ebola (baseline reference), but tended to be less satisfactory about the policies and measures for stopping the spread of the H1N1 virus in comparison Ebola (baseline reference).

Geographic regions were also controlled for in the model, with "other regions" used as the reference base (i.e., the omitted variable). Interestingly, previous studies were more likely to provide positive comments on the policies and measures in Africa and Oceania in comparison with other regions (baseline reference), followed by America, Europe and Asia in comparison with other regions (baseline reference). This ranking is not entirely consistent with each region's performance during the COVID-19 pandemic, because the estimation includes all previous pandemics in the past two decades. This highlights the significant heterogeneity of pandemics, and should warn governments that past experiences do not ensure future success in pandemic control.

Research methodology variables were also included, with "case study" serving as the reference base (the omitted variable). The significantly positive coefficient of simulations and scenarios suggests that previous studies using this research method were more likely to find policies and measures to be effective compared with case studies and empirical studies. Since the latter are more directly based on reality, this suggests to researchers that careful validation and model calibration are needed in pandemic control studies.

Study characteristics included journal publications and other types of publications (the omitted variable or reference). The negative but insignificant coefficient estimate of journal publications suggests that academic researchers tended to be more conservative than government agencies and industrial organisations, although this difference was not statistically significant in comparison with other types of publications (baseline reference). The study period variable was significantly negative, which indicates that prior studies that included a longer period had a lower chance of finding the policies and measures to be successful at dealing with past pandemics.

Overall, the likelihood of the effectiveness of the travel-related policies and measures for controlling and mitigating past and current pandemics that were investigated in prior publications was quite sensitive to the types of policies and measures implemented, the pandemic types involved, the geographic regions being studied, the publication types, the research methodology used and the study periods. In particular, the likelihood of obtaining results that are relevant to the outcome of effective of control and mitigation of past and current pandemics can be affected by (1) the implementation of border closures and travel restrictions, hygiene measures, quarantine or isolation, contact tracing and biomedical measures; (2) the COVID-19, H1N1 and SARS pandemics; (3) pandemic control in Asia, Africa, Europe, Oceania and America; (4) and applied simulation and scenario analyses.

The corresponding marginal effects of the probit model measures the effectiveness of travel-related polices and measures that results from changing an explanatory variable (Wooldridge, 2015) (see Table 21), providing more accurate estimates than the estimated coefficients of the probit model themselves. For example, when a prior publication investigated the effectiveness of border closures and travel restrictions in mitigating and controlling past pandemics, they are more likely to be reported as effective in comparison with airport screening (i.e., baseline reference). Similarly, if a prior publication studied H1N1, it is less likely to report travel-related polices and measures are effective in mitigating and controlling this pandemic in comparison with Ebola (see Table 21). Note that both the significance and signs of the coefficient estimates of the probit model are similar to those of the marginal effects.

3.4 Discussions and policy implications for the SPR's aviation and tourism industries

One key objective of this study was to identify the lessons learnt from past studies, and thus to enable SPR countries to cope with current and future pandemics. The unique characteristics of the SPR (geographic isolation, lower economies, small population sizes and extensive spread across the Pacific Ocean) will be considered for providing policy and operational recommendations.

3.4.1 Short-term strategies: Travel-related policies and measures

Prior studies suggested that travel-related policies and measures were effective short-term strategies, including border closures and travel restrictions, quarantine or isolation, hygiene measures, social distancing, virus testing and contact tracing (e.g., Chong & Zee, 2012; FAA, 2020; Gwee et al., 2021; Wilder-Smith & Freedman, 2020). Although the SPR is geographically isolated, it is still vulnerable to pandemic risks, as witnessed during the 1918–1919 influenza, H1N1 and COVID-19 pandemics (e.g., Craig et al., 2020; Dean, 2020; Eichner et al., 2020; Grydehoj et al., 2020; McLeod et al., 2008; Shanks, 2016; Xu et al., 2018). Although the 15 SPR countries implemented almost all of the above discussed policies and measures during the COVID-19 pandemic, as of September 2021, most SPR countries still have COVID-19 cases, except for the Cook Islands, Kiribati, Nauru, Niue, Tokelau, Tonga and Tuvalu. Therefore, SPR policymakers and stakeholders, such as the civil aviation authorities and aviation operators (airports and airlines), should recognise that travel-related policies and measures only delay the inevitable or provide a "time buffer". Because SPR countries have inadequate medical infrastructures (e.g., limited hospital beds and capacity and inadequate virus testing facilities) (Horwood et al., 2019; Mei & Hu, 2020), limited airport infrastructure capacity (e.g., limited space for airport screening and social distancing at airports) (Miles & Marchi, 2020) and outdated IT infrastructure at airports (e.g., no self-check-in kiosks at SPR airports) (Miles & Marchi, 2020), SPR countries have to utilize the time buffer for preparation purposes (e.g., securing the stock of medical supplies, and providing updated training or briefing to medical and operation teams).

Moreover, travel-related policies and measures disrupt the operation of the aviation and tourism sectors and, ultimately, economic development across countries, because the aviation sector is of critical importance to many sectors, including tourism, trade and logistics (Gong et al. 2018; Tsui et al. 2021a, 2021b; Fu et al. 2021). It is apparent that border closures and travel restrictions, and quarantine or isolation policies have had a catastrophic economic impact on SPR countries (Horwood et al., 2019; Pacific Region Infrastructure Facility (PRIF), 2021; SPTO, 2020) because the SPR's economies are heavily dependent on tourism revenues, including the Cook Islands (87% of GDP), Vanuatu and Samoa (47% of GDP), and Fiji (38% of GDP). Therefore, the SPR's governments could seriously consider and follow the travel-related policies and measures adopted by New Zealand (which is also a tourism-oriented and geographically isolated nation), where COVID-19-related strategies were effective. The practices adopted in New Zealand included a timely border closure, compulsory quarantine and

isolation of inbound passengers, strict hygiene measures, virus testing, social distancing, contact tracing and airport screening since February 2020 (Huang et al., 2020; Summers et al., 2020a). As a result, New Zealand (partly) resumed international tourism by establishing 'travel bubbles' between New Zealand and Australian cities in late 2020, followed by agreements with the Cook Islands and Niue in mid-2021. Additionally, the SPR's policymakers should also consider the largely successful strategies adopted by Taiwan (also an island economy), notably early border control and travel restrictions, airport screening and quarantine (14 days), contact tracing, social distancing, hygiene measures, technology and transparency (e.g., Chen, 2020; Hsieh et al., 2021; Huang, 2020; Gwee et al., 2021; Wang et al., 2020a). Importantly, Taiwan's approach seemed to be less intrusive than that of other countries, as mass lockdowns and closure of schools and organisations were not widely used.

3.4.2 Long-term strategy: appropriate vaccination legislation framework

Many studies argued that vaccination is the most effective long-term pandemic control measure (e.g., CAAC, 2020; Daou, 2021; Lee, 2021; Lee & Sibley, 2021). In response to the COVID-19 outbreak, the Emergency Use Listing (WHO, 2021) approved 13 different vaccinations against the COVID-19 virus, including the Pfizer/BioNTech Comirnaty vaccine (listed December 2020), the SII/Covishield and AstraZeneca/AZD1222 vaccines (listed February 2021), Janssen/Ad26.COV 2.S (listed March 2021), the Moderna COVID-19 vaccine (listed April 2021), the Sinopharm COVID-19 vaccine (listed May 2021) and Sinovac-CoronaVac (listed June 2021). In light of the recent COVID-19 variants (Delta, Delta plus, Omicron variants). Preliminary assessments of vaccine effectiveness have supported the notion that most vaccines stimulate sufficient immunity against most variants, although further studies are still required (WHO, 2021). Vaccine approval procedures (i.e., vaccine development, testing and approval) are often time-consuming and costly. Vaccine development may take up to 10 years (EC, 2020). Given the formidable and unprecedented impact of the COVID-19 pandemic, experts aimed to provide widespread access to vaccines within 12 to 24 months (e.g., Elias, 2021; IATA, 2020; Movsisyan et al., 2021; WHO, 2021). For instance, the Pfizer/BioNTech vaccine was developed within 12 months (March–December 2020) (Centre for Disease Control and Prevention, 2021; Re et al., 2021). However, such speed may not always be possible in future pandemics.

Studies also supported the notion that access to the vaccine was the critical milestone for the resumption of air transport and tourism activities (e.g., CAAC, 2020; Hall & Studdert, 2021; IATA; Movsisyan et al., 2021). The IATA (2021) launched the 'IATA travel pass' initiative (vaccine travel passport) to facilitate the resumption of international air travel and tourism (without a quarantine). Such an initiative will ensure that the governments are confident that the risk of importing COVID-19 is mitigated by allowing only vaccinated passengers to visit. Several airlines (e.g., Air New Zealand, British Airways, Etihad, Emirates, Korean Air, Qantas, Jetstar, Singapore Airlines and Sri Lankan Airlines) have implemented or agreed to trial the 'travel pass' initiatives (IATA, 2021; Lee & Sibley, 2021; Movsisyan et al., 2021). In addition, Singapore Airlines also established a vaccinated travel lane for France, Italy, South Korea, the UK and the USA.

In light of the dependence of the SPR countries on air transport and tourism, policymakers in the region, together with the executives of aviation and tourism operators, should consider and prioritise the 'travel pass' initiative as a recovery pathway. In addition, the high level of vaccine hesitancy (Chakraborty et al., 2021; Huh & Dubey, 2021) and a lack of access to vaccines are evident and problematic within the SPR (Pacific Region Infrastructure Facility, 2021). Furthermore, the strong opposition to COVID-19 vaccination by many church leaders (influential figures within the SPR) (Lee & Sibley, 2020; Seal, 2021), the rapid misinformed news cycle (e.g., Abbas et al., 2021; Chand, 2021; Huh & Dubey, 2021; Kant et al., 2021; Lazarus et al., 2021) and limited access to vaccines (PRIF, 2021; Wilson et al., 2020) may all negatively influence vaccination schemes within the SRP. Therefore, SPR policymakers may consider some of the other regions' successful strategies for gaining public trust in the vaccination roll-out through robust, continual and coordinated vaccination campaign awareness (e.g., discussions on in the case of Taiwan as reported by Huh and Dubey (2021), Kuo (2021) and Summers et al. (2020a). It may also be helpful to establish an appropriate legislative framework and policies for health to enable effective vaccination roll-out (Movsisyan et al., 2021; Summers et al., 2020b).

3.4.3 A risk-based approach to tackling the pandemics

The literature supports the risk-based approach to tackling the pandemics (e.g., EASA, 2020a; FAA 2020; ICAO, 2020; Patel & Sridhar, 2020). The risk-based approach supports adjustment of the mitigation measures based on geographical differences and pandemic stages and the

associated risks of spreading the virus. For example, Taiwan is geographically closer to the COVID-19 outbreak's epicentre in Hubei, in mainland China. A stringent border closure was immediately imposed on passengers originating from mainland China, and airport screening was introduced in December 2019. Asymptomatic passengers were required to finish quarantine or home isolation in January 2020; this was extended to all passengers in February 2020 (Lee & Sibley, 2021, Summers et al., 2020a). New Zealand, which is geographically far away from the COVID-19 outbreak, responded by banning travellers from mainland China in February 2020 in the early stage of the COVID-19 pandemic and conducted airport screening of passengers from high-risk regions (e.g., mainland China, Hong Kong, Japan, Singapore and Thailand) in February 2020, and ordering passengers from overseas to self-isolate for 14 days in March 2020. Importantly, Taiwan established a three-level approach[20], and New Zealand established a four-level alert system[21] to mitigate the risks of COVID-19 spreading across their borders. These risk-based approaches recognised that resorting to stringent measures in early stages may be necessary if the risk of spreading the virus is high. Such a risk-based approach will provide a more cost-effective approach to control and mitigate the adverse negative impacts of pandemics (e.g., Christidis & Christodoulou, 2020; Jamal & Budke, 2020; Macilree & Duval, 2020; Rahman et al., 2020). For example, Taiwan's risk-based approach has contained a large COVID-19 outbreak (550 cases and seven deaths) while sustaining its net GDP compared with the losses made by other countries such as New Zealand, Italy and the United States (International Monetary Fund, 2020; Lee & Sibley, 2021; Patel & Sridhar, 2020).

In contrast to a risk-based strategy, a few regions, such as mainland China, Vietnam and Hong Kong, have effectively implemented a "zero COVID" strategy. Australia and New Zealand imposed very strict control in the early days, but after some outbreaks and especially after the

[20] Taiwan adopted a three-level approach: (1) Watch (remember to follow usual precautions), (2) Alert (strengthen early warning) and (3) Warning (avoid nonessential travel) (Taiwan Central Epidemic Command Centre, 2021; Summers et al., 2020a).

[21] New Zealand adopted a four-level alert system: Level 1 – Border restrictions for non-NZ citizens and permanent residents. All passengers (regardless of origin or symptomology) are required to go into managed isolation and quarantine for 14 days (except for travel bubbles); no lockdown. Level 2 – Border restrictions for non-NZ citizens and permanent residents. All passengers (regardless of origin or symptomology) are required to go into managed isolation and quarantine for 14 days (except for travel bubbles). Lockdown lifted with hygiene measures. Level 3 – Border restrictions for non-NZ citizens and permanent residents. All passengers (regardless of origin or symptomology) are required to go into managed isolation and quarantine for 14 days. Partial lockdown (travel is restricted during Level 3). Level 4 – Border restrictions for non-NZ citizens and permanent residents. All passengers (regardless of origin or symptomology) are required to go into managed isolation and quarantine for 14 days. Full lockdown (Unite Against COVID-19, 2021; Summers et al., 2020a).

availability of vaccines, they joined most countries in adopting the "live with COVID" strategy. As of the year end in 2021, mainland China remains the only large economy still pursuing the "zero COVID" target. In terms of COVID-19 infection and death numbers, mainland China probably performed the best in terms of pandemic control outcomes (i.e., infection cases and the number of deaths) among the world's large economies after the major outbreak in Hubei. However, this came at very high social costs and medical inputs, and passenger flows to and from China has been restricted to minimum levels (Czerny et al. 2021). Many have also argued that it is extremely difficult, if not impossible, for other countries to adopt some of the restrictive measures (e.g., compulsory contact tracing, virus testing and vaccination requirements)[22]. Mainland China government agencies insist that the "zero COVID" strategy has been the best choice which has allowed the country to largely maintain normal life and economic activity; otherwise, as it is the world's largest population but limited medical resources per capita, the "live with COVID" strategy would have brought disaster to the country. We have not seen a systematic comparison between the "zero COVID" strategy vs. "live with COVID" strategy, which would be of great academic and practical value. It also remains to be seen how long China can continue with such a strategy, especially since the long-awaited vaccines have become available.

The unprecedented impact of COVID-19 arguably revealed gaps within the SPR's health sector and their ineffective pandemic control policies. Because the region has high dependence on international business and passenger flows, but has quite limited resources (e.g., funds, human resources and medical infrastructure), a risk-based approach is likely to be the best choice. However, there is no report of any risk-based approach or strategies for addressing health crises and pandemics within the SPR. Most SPR countries merely imposed stringent border closures, travel restrictions and lockdowns while awaiting vaccines to be delivered. Although the SPR is geographically isolated, the possible severe impacts of future pandemics on the SPR are likely to be higher than those on developed countries such as Australia, New Zealand and the United States. First, the SPR population has a higher level of underlying health conditions (e.g., cancer, diabetes, high blood pressure, obesity) which suggests that future pandemics will have a devastating impact (e.g., Baker et al., 2012; Horwood et al., 2019: Kool et al., 2013; Mei &

[22] Although compulsory vaccination policies were also imposed in some other countries, they are often restricted to special groups (e.g., airport employees, civil servants, etc.). In mainland China, vaccination requirements have been imposed on many more sectors, if not universally.

Hu, 2020). The WHO (2021) reported that Fiji recorded 44,745 confirmed COVID-19 cases and 631 deaths (78% with underlying health conditions) in the 5-month period of March–September 2021, compared with New Zealand, which, over 19 months (February 2020–September 2021), only recorded 2,871 COVID-19 cases and 26 deaths. It is thus appropriate for the SPR to implement stringent measures (e.g., border closures and travel restrictions coupled with quarantine and isolation, social distancing, vaccination, effective virus testing and contact tracing) until a comprehensive risk-based approach is established.

3.4.4 Coordination and collaboration among sectors and regions

Effective implementation of travel-related policies and measures for controlling and mitigating past pandemics is heavily reliant on holistic coordination and collaboration across government agencies and industrial sectors in multiple countries (e.g., Belhadi et al., 2021; Gilbert et al., 2020; Paraschi et al., 2020; Sheller, 2021). Therefore, public health crises, including pandemics, require a holistic or whole nation approach. This involves government departments (e.g., health departments, civil aviation authorities, and border agencies such as customs, immigration and quarantine) and industries (airlines, airports, quarantine hotels, bus or taxi operators, and inbound passengers), so that streamlined implementation of travel-related policies and measures can successfully tackle the spread of the virus (IATA, 2020; ICAO, 2020; Rahman et al., 2020). For instance, Hsieh et al. (2021) praised the implementation of travel-related policies and measures for the COVID-19 pandemic in Taiwan, which was executed by Taiwan's National Epidemic Prevention Team (NEPT), including central and local governments, private enterprises, and citizens, which was led by the Central Epidemic Command Centre (CECC) with clear communication among all parties. There was also cooperation between Taiwan's NEPT and CECC, which formulated and amended travel-related policies and measures, with input from local residents (who suggested quarantine taxi services for inbound passengers to their designated quarantine facilities)[23]. The SPR is yet to develop good collaboration and coordination, and there is no evidence of any comprehensive crisis management plans to address pandemics within the SPR (Douglas et al., 2020). For instance, Fiji's National Disaster Management Plan does not include any specific response to

[23] Taiwan experienced some significant challenges amid the COVID-19 outbreaks in mid-2021 (see, for example, https://www.reuters.com/world/asia-pacific/taiwan-scrambles-vaccines-domestic-covid-19-cases-rise-2021-05-17/) but managed to contain the outbreaks through increased vaccination rates. Some concerns remain over its locally produced vaccine (e.g., https://www.taiwannews.com.tw/en/news/4325662)

pandemics (Fiji National Disaster Management Council, 1995). The SPR's governments may consider the effective strategies used by the NEPT and CECC in Taiwan, such as coordination and open communication among stakeholders for managing the COVID-19 pandemic.

Furthermore, research has supported the idea that intergovernmental coordination and collaboration need to extend to regional and international regimes as a pandemic becomes a global crisis (e.g., EASA, 2020a; Gossling et al., 2020; Macilree & Duval, 2020; Paraschi, 2020). As mentioned, travel-related policies and measures aim to mitigate the risk of the virus spreading across countries (Gossling et al., 2020; Gwee et al., 2021). Hence, good coordination and collaboration is important, which often call for the sharing of information between national departments across countries (e.g., EASA, 2020b; Gilbert et al., 2020; Rahman et al., 2020; Sheller, 2021). For example, all member countries of the OECD are urged to coordinate, collaborate and share information regarding their respective travel-related strategies for stopping the spread of COVID-19, such as border closures and reopening, containment measures and existing strategies (OECD, 2020c).

Additionally, the SPRs' governments may consider devising a more integrated approach to disaster management in case of future pandemics. The recent increased frequency, scale and complexities of disasters (e.g., tropical cyclones) and pandemics within the SPR highlight the need for close coordination and collaboration among the SPR countries. For instance, Fiji, the Solomon Islands, Tonga and Vanuatu were hit by Tropical Cyclone Harold (Category 4) in April 2020 as the COVID-19 pandemic emerged within the SPR (Mei & Hu, 2021; Paraschi, 2020). The current Pacific Islands Emergency Management Alliance project for the SPR aims to strengthen the Pacific Islands' preparedness and responses, and recovery from emergencies and disasters. However, there is still a clear lack of regional platforms for sharing, coordinating and collaborating on relevant disaster information within the SPR (South Pacific Commission, 2021). Cooperation among stakeholders and sometimes even competitors has been increasingly studied in the disaster prevention and mitigation literature in recent years, notably regarding climate change-related disasters (Zheng et al. 2019, 2021). These studies suggest that it is often in all stakeholders' interests to cooperate in efforts such as disaster prevention and pollution control, even if some stakeholders have conflicting interests (Homsombat et al. 2013). Pandemic control is important to all countries. An integrated approach would provide the SPR with a more effective and efficient approach to controlling the spread of any pandemics and

other disasters, and it could be led by regional organisations such as the Pacific Island Forums or the South Pacific Commission.

3.4.5 Recovery for the post-pandemic era: Tourists' behavioural change

Travel-related policies and measures could have adverse impacts on the air transport and tourism sectors, as well as affecting tourist behaviour (e.g., Chen et al., 2020c; Ilgaz et al., 2021; Tsui et al. 2021a; Skare et al., 2021; Yan et al., 2021; Zhang et al., 2021). The reduction in tourist flows during the COVID-19 pandemic was mainly caused by border closures and travel restrictions imposed by governments (Lai et al., 2021; Ilgaz et al., 2021; Liu et al., 2021), and the hygiene measures and social distancing measures imposed by airports and airlines, which induced passenger's travel anxiety (Chen et al., 2020a; Donaire et al., 2021). However, travel anxiety can be overcome by ongoing campaigns and updated information on the effectiveness of travel-related policies and measures (Donaire et al., 2021). Apparently, tourist demand reduction is primarily caused by pandemics or disease avoidance by travellers and their confidence about air travel, regardless of the travel-related policies and measures implemented (IATA, 2020; Kock et al., 2020).

Additionally, lockdowns forced people to work from home and they are now accustomed to online business meetings (e.g., Zoom meetings and online conferences) (Hensher et al., 2021; Kock et al., 2020). In particular, business travel demand decreased during the pandemic (Kock et al., 2020; Wachyuni & Kusumaningrum, 2020). Therefore, international aviation and tourism operators (including those in the SPR) should embrace the 'new normal' during and after the pandemic and identify opportunities for aviation and tourism operators to adapt and transform their business models (Czerny et al., 2021; Beck & Hensher, 2020). Finally, it is worth noting that most tourists are likely to or be willing to travel after the pandemic, including millennial tourists (Donaire et al. 2021; Kusumaningrum & Wachyuni, 2020) and aged passengers (Graham et al., 2020). It may be very helpful for governments and airports to provide incentive programmes to the airline industry to lower their operation costs. Such measures will be particularly attractive to the low-cost carriers serving many price-sensitive leisure travellers, because they are very sensitive to input costs (e.g., Dresner et al. 1996; Fu et al. 2006, 2015; Chung & Whang 2011; Wang et al. 2017, 2020c). Even under normal market conditions, regional markets and small economies such as those of the SPR need to work hard

to promote air connectivity and aviation services (Zhang et al. 2017; Wang et al. 2020b). Extra effort is needed for recovery from pandemics.

Travellers' reactions and travel intentions regarding the SPR during the COVID-19 era and post-COVID-19 era have not been empirically examined by prior studies. However, the SPR's governments and aviation and tourism decision-makers may learn from international travel and tourism changes in other countries. Therefore, the SPR's governments should effectively collaborate with aviation and tourism stakeholders to adapt or transform strategies for the recovery of the aviation and tourism industries in the SPR. The good examples of Macau and Taiwan may serve as useful references by the SPR governments (Lin et al, 2020; Yeh, 2021). Both Asian economies quickly recovered their international tourism demands by focusing on the short-haul Asian markets (Japan, South Korea and Malaysia), with well-planned safety campaigns and flexible 'travel bubbles' policies being implemented (Yeh, 2021). In addition, the SPR's airlines may consider strengthening and improving their domestic and intra-regional air routes and connectivity through government support and financial aid once the COVID-19 pandemic is finally eradicated.

3.4.6 Importance of government subsidies for air transport, aviation and tourism

The worldwide air transport and tourism sectors are among the sectors that suffered the most devastating impact in past and current pandemics (e.g., Ali & Keil, 2006; Bogoch et al., 2015; Le et al., 2021; Zenker & Kock, 2020). Air transport operators, such as airlines, airports, tourism operators and the hospitality industry, have been experiencing significant financial distress because of border closures and travel restrictions, and mandatory quarantine and isolation during the COVID-19 era (Chinazzi et al., 2020; Ying et al., 2021). Hence, governments in many countries tried to support and subsidise their aviation and tourism-related operators to assist their recovery, which is a vital component for stabilizing supply chains and stimulating economic development (e.g., Abate et al., 2020; Elias, 2020; Li, 2021; 2020; Suau-Sanchez et al., 2020; Yeh, 2021). For example, for tackling the impacts of COVID-19, US airlines received more than US$80 billion in financial aid from the US government in 2020. In addition, the Taiwanese government provided NT$105 trillion to airlines, hotels and travel agencies (Wu et al., 2021) (refer to Appendix I for more examples of government supports provided to the aviation industry in light of the COVID-19 pandemic). In addition, the

substantial costs of travel-related policies and measures (e.g., hygiene measures such as masks, sanitization, extra cleaning regimes and social distancing) are financially supported by the government in many countries (Li, 2021; Wu et al., 2021).

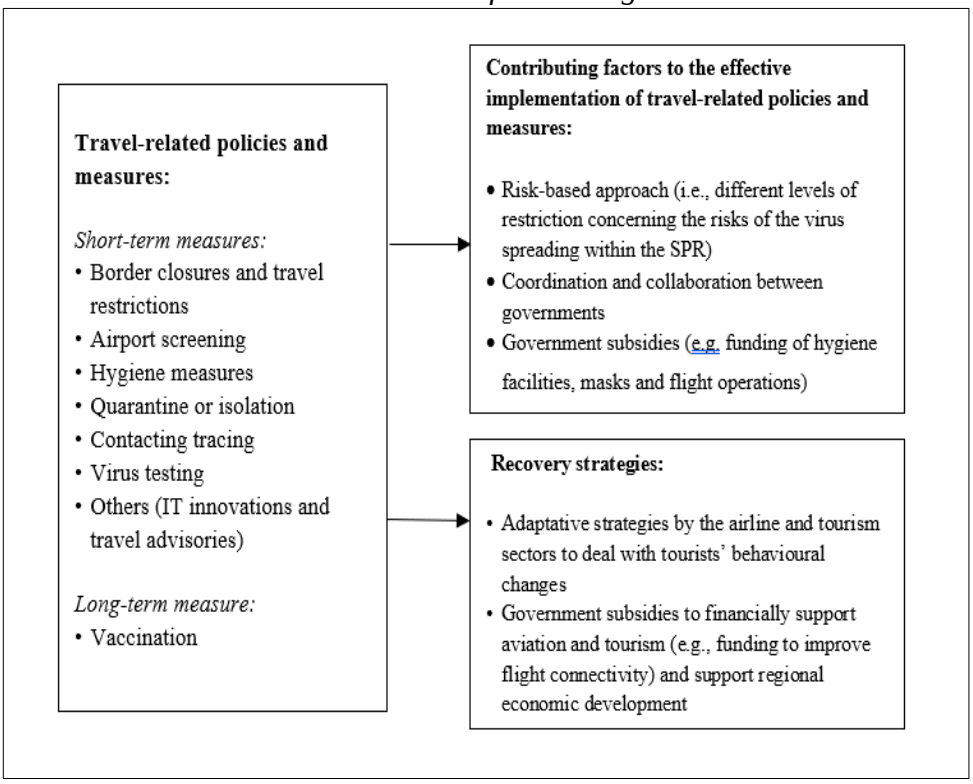
Aviation and tourism are critical for the economic development of the SPR (Ali et al., 2020; Salesi et al., 2021). Hence, government support or subsidies for these two pillar sectors in the SPR should be prioritised in their pandemic control and recovery plans (Miles & Marchi, 2020; Singh et al., 2021). The SPR's governments often encounter the problem of insufficient funds but, have in some cases, relied on foreign aid donors or international institutions for providing support to these industries. For example, financial support for tourism-related businesses in some SPR countries (e.g., Fiji, Samoa, Niue, Tonga and Vanuatu) has provided by international institutions and governments, such as the Asian Development Bank, the World Bank and the governments of Australia, China and New Zealand (PRIF, 2021; SPTO, 2020). Similarly, the New Zealand government has also funded upgrades of the immigration and ticketing counters and kiosks at Niue Airport (Miles & Marchi, 2020). Importantly, governments in the SPR should encourage their national and regional carriers to operate more intra-SPR routes (especially among COVID-19 free countries) and attract more international airlines to increase flight connectivity to the SPR regions through effective subsidisation policies and schemes. For example, the government of New Zealand provided NZ$9.1 million to the PASO, the regional safety oversight organisation for the Pacific, to improve the Pacific's aviation safety and security, leading to better connectivity and enabling regional economic development and prosperity (PASO, 2021).

In summary, the risks and adverse impacts of any pandemic are inevitable in the SPR, similar to other countries. In order to safeguard and mitigate the impacts of pandemics, policymakers and aviation and tourism executives in the SPR should carefully consider the travel-related policies and measures that have been successfully implemented in different regions, such as New Zealand and Taiwan. Additionally, effective travel policies and measures to deal with future pandemics should carefully consider the risk-based approach, which identifies the most appropriate travel-related policies and measures by balancing the risks and benefits of candidate measures. There is also a compelling need for effective communication, inter-regional coordination between relevant stakeholders, and ongoing government subsidies.

Figure 11 presents the strategies that the SPR should consider for dealing with future pandemics.

Figure 11

Travel-related Policies and Measures for Dealing with Future Pandemics



3.5 Conclusion

The COVID-19 pandemic highlighted the ineffective travel-related policies and measures implemented by governments and aviation industries, and the need for enhanced readiness for controlling and mitigating the spread of the COVID-19 virus. This study aimed to learn lessons from past studies so that they can be applied in the SPR to cope with future pandemics, with a focus on the aviation and tourism sectors. Importantly, this study proposes several pragmatic policy implications for SPR policymakers to help them overcome the challenges of future pandemics.

A systematic literature review (159 publications) and a meta-analysis were applied to prior studies (69 selected publications) between January 2010 and February 2021. It was found that the unprecedented impacts of the COVID-19 pandemic led to a significant increase in studies on travel-related policies and measures. Asia was the most researched region and the SPR was

the least researched region. The MRA results obtained from the probit model suggested that the likelihood of obtaining effective measures in the literature are sensitive to: (i) the implementation of border closures and travel restrictions, hygiene measures, quarantine or isolation, contact tracing and biomedical measures; (ii) studies analysing the COVID-19, H1N1 and SARS pandemics; (iii) studies conducted in Asia, Africa, Europe, Oceania and America; and (iv) studies that applied simulations and scenarios.

The geographical isolation of the SPR cannot fully eliminate its vulnerability to future pandemics. The most effective response to future pandemics in the SPR is vaccination (a long-term strategy). In the short term, the SPR should use timely strategies such as border closures and travel restrictions, quarantine and isolation, hygiene measures, contact tracing, virus testing and airport screening. In order to ensure the effective implementation of travel-related policies and measures within the SPR in light of the costs and resources, the SPR's governments are urged to implement the risk-based approach (i.e., different levels of restriction concerning the risk of spreading the virus within the SPR) and work hard toward inter-governmental and regional coordination.

Furthermore, aviation and tourism operators in the SPR are encouraged to identify recovery strategies and understand how past pandemics have impacted tourists' behaviour and travel intentions. Hence, they can identify ways to regain customer trust and confidence about visiting the SPR. Strategies may include boosting domestic and intra-regional flight services (especially within the countries that are COVID-19 free) and attracting international airlines once the COVID-19 pandemic has been contained. In light of the importance of the aviation and tourism sectors to the SPR's economic development and supply chains, government financial support is vital for the recovery and sustainability of the aviation sector in the SPR. Governments may seek foreign donors and international institutions to provide the much-needed support, given the limited resources and funding available to the SPR countries for tackling future pandemics.

There are three potential limitations to the current study. First, although the author systematically reviewed the literature and publications published on Google Scholar, Scopus, Web of Science and websites from January 2010 to February 2021, the COVID-19 pandemic is ongoing and the implications of variants such as Delta are not yet known. As such, more recent publications may present new perspectives and insights. Second, this study was limited

to English-language studies, and it is therefore possible that additional insights may be found in articles published in other languages. Third, it should be noted that meta-regression analysis may be prone to limitations such as false positive (Thompson & Higgins, 2002), capitalisation on chance which may result in multipliers (Raudenbush, 2009), and the presence of low statistical power during estimation (Hedges & Pigott, 2004).

In light of these practical limitations, several interesting areas for future research can be suggested: (i) a closer examination to quantify the impacts of the COVID-19 pandemic on aviation, tourism and economic development within the SPR; and (ii) an updated investigation of publications post-COVID-19 in the air transport and tourism sectors would provide a more systematic and accurate view of the impacts of the COVID-19 within the SPR.

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General Discussion

Linking back to the research objectives

This PhD thesis examined three critical and related challenges facing the aviation industry within the SPR during different stages of the COVID-19 era. Overall, this PhD thesis answers the three research objectives (see the Introduction) in three distinct chapters. Chapter 1 focused on analysing how aviation and its key determinants affected tourism growth within the SPR during the pre-COVID-19 era, suggesting that scheduled airline capacity positively influenced tourist numbers travelling to the SPR. Chapter 2 focused on examining the goals and effects of aviation subsidies on the SPR's aviation development prior to and amid COVID-19 era, highlighting that the aviation and tourism industries are heavily reliant on aviation subsidies to operate and support the SPR's economic development, especially amid the COVID-19 era. Chapter 3 focused on identifying the lessons that could be learnt from past and present pandemics so the SPR can cope better with future pandemics during the post-COVID-19 era, suggesting that different short-term travel-related policies and measures (e.g., border closures and travel restrictions, quarantine and isolation, hygiene measures, airport screening, virus testing and other measures) and a long-term strategy (vaccination) should be implemented to address future pandemics.

Policy implications

Table 22 lists 25 key policy implications of the findings of the three chapters that have been discussed in this PhD thesis, and highlights how these policies, measures and strategies may help to facilitate and achieve sustainable aviation growth in the SPR from the perspectives of governments and key stakeholders.

Table 22

Summary of Policy Implications of the PhD Thesis

Chapter 1	Chapter 2	Chapter 3
• Effects of the aviation industry on tourism growth within the SPR: ✓ Increase air access to the SPR countries via more liberalised air service agreements ✓ Develop route development strategies for reaching new destinations ✓ Better connectivity and access for tourists to the SPR through multiple stopovers and/or code-sharing	• Political influence on the aviation sector within the SPR: ✓ Establish aviation subsidy frameworks that avoid political influence	• Short-term strategies: Travel-related policies and measures: ✓ Follow the travel-related policies and measures implemented by New Zealand and Taiwan
• Close collaboration between aviation and tourism within SPR: ✓ Establish a regional strategic plan to attract and bring opportunities to the SPR ✓ Cooperate in disaster prevention programmes and infrastructure investments ✓ Closer and stronger partnerships between airlines and tourism sectors	• Lack of an institutional framework for aviation subsidies within the SPR: ✓ Prioritise the establishment of formal institution frameworks for aviation subsidies	• Long-term strategy: an appropriate vaccination legislation framework: ✓ Establish the legislative framework and policies to enable effective vaccination roll-out ✓ Implement a 'travel pass' initiative as a recovery pathway ✓ Implement a robust, continual and coordinated vaccination awareness campaign to gain the public's trust in vaccination roll-out
• Aviation and tourism growth to create economic growth opportunities within the SPR: ✓ Prioritise development projects for the aviation and tourism sectors ✓ Provision of quality services to attract tourists	• Impacts of aviation subsidies within the SPR: ✓ Establish a balanced approach for aviation, tourism and economic development while mitigating the environmental impacts ✓ Establish environmental policies for addressing aviation operations	• A risk-based approach to tackling pandemics: ✓ Implement stringent travel-related policies and measures for pandemics until a comprehensive risk-based approach can be established
	• COVID-19's impact on the future of the aviation and tourism sectors within the SPR: ✓ Offer stimulus subsidies for the aviation sector in light of the COVID-19 pandemic ✓ Take a collective, regional and cooperated approach to provide a robust post-COVID-19 recovery strategy	• Coordination and collaboration among sectors and regions: ✓ Establish comprehensive crisis management plans to address pandemics ✓ Integrate regional approaches to disaster management in the case of natural disasters
	• Relationships with foreign aid development partners in the SPR: ✓ Strengthen the relationship between the SPR countries and foreign development partners ✓ Ensure that aviation subsidies funded by foreign aid institutions align with national needs and priorities	• Recovery for the post-pandemic era: tourists' behavioural change: ✓ Collaboration between aviation and tourism stakeholders to transform strategies for the recovery of the aviation and tourism sectors
		• Importance of government subsidies for aviation and tourism: ✓ Prioritise aviation subsidies to support the recovery of aviation and tourism amid and post-COVID-19 pandemic

Among all the policy implications listed above, the following three key policy implications are recommended to the SPR governments and industry partners as they are obvious and they appear repeatedly across the three chapters of this PhD thesis.

- **Coordination and collaboration among sectors and regions within the SPR**

All three chapters in this PhD thesis support the notion that robust regional coordination is the key to overcoming the challenges to the SPR's aviation development during different stages of the COVID-19 era. Chapter 1 highlights the importance of regional cooperation in marketing the SPR as a tourist destination and for dealing with common crises such as natural disasters (Lawson, 2017). Chapter 2 calls for a collective regional and cross-sectional approach to help the SPR recover from the COVID-19 pandemic (SPTO, 2020). This notion is also reinforced in Chapter 3 (Mei & Hu, 2021). It highlights the importance for the SPR's countries to pool their limited resources to collectively tackle common challenges such as limited resources (e.g., funding and aviation infrastructure), natural disasters and the COVID-19 pandemic. Hence, this PhD thesis calls for closer coordination among the SPR's governments, the aviation and tourism sectors, and other relevant stakeholders (e.g., health departments and disaster management) to share resources and effectively control challenges such as natural disasters and pandemics facing the SPR's aviation sector (Gossling et al., 2020; Sheller, 2021; South Pacific Commission, 2021). This subject matter addresses all three research objectives.

- **Aviation subsidies are key enablers of aviation and tourism development within the SPR**

Collectively, aviation subsidies within the SPR are among the common challenges or issues discussed and raised in all three chapters of this PhD thesis. Chapter 1 indicates that the SPR's governments should prioritise their development projects in the aviation and tourism sectors to support the region's welfare in the form of aviation subsidies (e.g., upgrading airport infrastructure and facilities) (SPTO, 2018). Chapter 2 underlines that aviation subsidies (either locally funded or funded by foreign aid) are the main enabler of aviation development within the SPR (Scheyvens & Monovo, 2020; SPTO, 2020). Moreover, aviation subsidies contribute to airfare affordability, flight accessibility and service sustainability, which positively impact economic and social wellbeing and tourism growth within the SPR. Chapters 2 and 3 also support the importance of ongoing subsidies being provided for the SPR's aviation and tourism

sectors to facilitate and speed up recovery from the COVID-19 pandemic (Miles & Marchi, 2020; Singh et al., 2021). Collectively, this PhD thesis calls for the SPR's governments to establish formal aviation subsidy frameworks to ensure that tailor-made aviation subsidy programmes are designed and implemented, thus positively contributing to development of the SPR's aviation industry, which addresses the second research objective.

- **Recovery strategies for the post-COVID-19 era within the SPR**

The formidable and unprecedented COVID-19 pandemic devastated the aviation and tourism sectors within the SPR (see Chapters 2 and 3), which amplified the challenges for the aviation and tourism sectors (see Chapters 1, 2 and 3). Chapter 1 illustrates the growth of aviation and tourism within the SPR during the pre-COVID-19 era. Chapters 2 and 3 show the SPR's aviation and tourism development during and after the COVID-19 era. Specifically, Chapter 2 shows the adverse impacts of having no aviation subsidies available for the SPR's aviation and tourism amid in the COVID-19 era (Miles & Marchi, 2020; PRIF, 2021; SPTO, 2020). Chapter 3 further highlights the importance of aviation subsidies and regional and cross-sectional collaboration for speedy recovery by the SPR countries as tourist destinations during the post-COVID-19 era. Evidently, aviation and tourism will be vital for the SPR's recovery when the COVID-19 pandemic can be effectively controlled, and international travel restrictions have been eased and lifted. Thus, the COVID-19 pandemic recovery strategies for the SPR should be carefully designed. Collectively, the three chapters in this PhD thesis address the three research objectives in which the challenges of the COVID-19 pandemic across different stages are discussed.

Conclusion

The SPR is a unique region which contains many of the world's smallest, least populated and least developed countries, which are widely dispersed across the Pacific Ocean. The SPR countries' geographical isolation suggests that the aviation industry plays a critical role in the development of the region's tourism industry. However, this particular situation presents a paradox, as the SPR relies heavily on the tourism sector for economic growth, but the SPR's aviation industry continues to struggle to grow, which was amplified by the COVID-19 pandemic. This PhD thesis examines three key but related challenges (i.e., tourism growth, aviation subsidies and pandemics) to the sustainable growth of the aviation and tourism sectors and, ultimately, economic development within the SPR during the pre-, amid and post-COVID-19 era. It aims to contribute to the aviation and tourism literature on an under-examined region – the SPR – and also offers timely, constructive and overarching policy implications for the sustainable growth of the SPR's aviation and tourism industries.

This PhD thesis aimed to contribute to ICAO's initiative known as the 'No Country Left Behind' by providing a multi-faceted analysis of an under-researched region, the SPR, focusing on aviation and tourism growth during the COVID-19 era. The three research objectives for this PhD thesis pivot on: (i) how aviation and key determinants affect tourism growth within the SPR during the pre-COVID-19 era; (ii) the goals and effects of aviation subsidies on the SPR's aviation development prior to and amid the COVID-19 era; and (iii) what lessons can be learnt from past and present pandemics so the SPR can cope better with future pandemics during the post-COVID-19 era. Therefore, this PhD thesis was structured to comprise three chapters which address these three research objectives.

Chapter 1 addresses the first research objective, in which it uses the 2SLS model to empirically analyse the key determinants of tourists from Australia and New Zealand (the two largest tourism markets for the SPR) to the Cook Islands, Fiji, Samoa and Tonga (these countries have different economic levels). One of the key findings of this chapter is that scheduled airline capacity contributes to tourism growth in the SPR, and it also affirms regional collaborations among relevant stakeholders to overcome the common challenges facing aviation and tourism growth, such as the expansion of source markets and natural disaster responses. Chapter 2 addresses the second research objective, which use a qualitative approach (i.e., interviews and thematic analysis) to explore the perspectives of key aviation stakeholders (government and

regional officials from aviation authorities, environmental and financial departments, international institutions, aviation and tourism operators, travellers and academics) on the impact of aviation subsidy programmes on the SPR's aviation development and wellbeing (economic, social and environmental). This chapter identified that aviation subsidies are the main enabler of aviation development within the SPR. Aviation subsidies contribute positively to economic and social (education, health) wellbeing and tourism development, but it negatively impacts environmental wellbeing within the SPR. Finally, Chapter 3 addressed Research objective three, by applying a systematic review (descriptive analysis, content analysis and meta-regression analysis) of the literature and publications between January 2010 and February 2021 to identify travel-related policies and measures to mitigate and control past and present pandemics. Two key findings of this chapter are that the SPR should implement short-term travel-related policies and measures (e.g., border closure and travel restrictions, quarantine and isolation, hygiene measures, airport screening, virus testing and other measures) and a long-term strategy (vaccination) to mitigate and control future pandemics within the SPR.

Theoretically, the critical contribution made across this PhD thesis to the air transport and tourism literature is that it provides an empirical study on the SPR, an understudied region. Specifically, this PhD thesis contributes to the literature by reaffirming the aviation–tourism nexus and identifying the key determinants impacting the SPR's international inbound tourism demand. Additionally, this PhD thesis adds to the knowledge of the emerging issue of aviation subsidies within the SPR, examining the perspectives of aviation stakeholders on the impacts of aviation subsidy programmes on aviation, tourism and wellbeing. Finally, this PhD thesis contributes to the emerging literature on the 'hot topic' of the COVID-19 pandemic, as it systematically reviews the literature and publications with respect to travel-related policies and measures to mitigate and control past, present and future pandemics.

Although each chapter provides its own individual contributions, the collective findings make a significant contribution to the air transport and tourism literature on the SPR. In addition, this PhD thesis provides empirical findings and evidence to support timely and feasible policies and recommendations for different stakeholders within the SPR, such as the SPR's governments and aviation and tourism operators, thus developing the aviation and tourism sectors and speeding up their recovery from the unprecedented and formidable COVID-19 pandemic. In particular, regional cooperation and collaboration across the SPR are suggested

by this PhD thesis to address these challenges faced by the aviation and tourism sectors as a whole.

Limitations and future research

There were number of potential limitations to the research comprising this thesis. Chapters 1, 2 and 3 each have their individual limitations. Chapter 1 could not include all the 15 SPR countries because of the limited data availability on smaller island countries. The findings of Chapter 2 are direct observations from interview data collected from the SPR participants only and thus cannot be generalised to a larger population or other regions, and the recruitment of interview participants was interrupted by the COVID-19 pandemic and Tropical Cyclone Harold (Category 5). Although Chapter 3 systematically reviews the literature and publications published on Google Scholar, Scopus, Web of Science and websites from January 2010 to February 2021, the COVID-19 pandemic is ongoing and the implications of new variants such as Delta and Omicron are yet unknown. As such, more recent publications may present new perspectives and insights about the impact of COVID-19 on the SPR.

In light of the limitations above, future research could be conducted to extend this PhD thesis. Two worthwhile areas for future research are: (i) as an extension of this thesis, it would be meaningful for future studies to quantify and examine the effects of the COVID-19 pandemic on the SPR's aviation and tourism sectors and economic development during the pre-, amid and post-COVID-19 era when reliable and updated data are available; and (ii) an updated investigation of the impact of aviation subsidies if the formal aviation subsidy frameworks are designed and implemented by the SPR's governments. This will offer a more in-depth analysis of the impacts of aviation subsidy programmes on the SPR's aviation, tourism and wellbeing during the post-COVID-19 era. These two potential future research avenues may help the SPR's governments and policymakers to understand the impact of uncertainties on the SPR's aviation and tourism demand and growth, and assess the benefits of tailor-made aviation subsidy programmes to transition the aviation and tourism sectors and thus speed up the recovery from the COVID-19 pandemic.

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Appendices

Appendix A – Interview questions

Two set of interview questions were prepared:

- Set 1 is for participants who were aware of the government subsidy programmes provided by their respective countries.
- Set 2 is for participants who were not really aware of the government subsidy programmes provided by their respective countries**.**

Interview Questions (Set 1)

Start:

1. Can you tell me about your current job and your organization?
2. Can you tell me about your understanding of government subsidy schemes in your country (if any)?

If yes, then proceed with these questions.

For government officials and politicians:

Objectives:

- Identify the government subsidy schemes implemented in the SPR.
- How are they designed/planned/implemented?
- What are the measurement tools?
- Are they successful?
- The future outlook for government aviation subsidy schemes.

1. What are the subsidy schemes provided for the aviation industry in your country? Please name and explain.
2. How are these programmes funded? Local government funding or foreign aid? What is your role in the subsidy scheme?
3. What is the ratio or percentage of government subsidy to the aviation industry?
4. What agencies are involved with the subsidy design/plan/implementation of the schemes? What are their respective roles? Are there any relationships among these agencies?
5. Could you name other subsidy schemes implemented within the SPR region or internationally? If yes, did they impact how to design/plan/implement your subsidy schemes in your country?
6. How do the subsidy schemes provided for the aviation industry compare to other sectors within your country?
7. What are the critical objectives of planning and implementing the subsidy schemes in your country (if any)? What are your expectations for the subsidy schemes?
8. Can you think of any impacts of aviation subsidies on the aviation sector, the tourism industry, economic wellbeing, social wellbeing and environmental wellbeing?
9. Can you explain the key indicators that are used to measure the success of the aviation subsidies in your country?
10. Do you think that the aviation subsidy schemes deliver the expected results to the public? Please explain.
11. What are the future plans for the subsidy schemes for the aviation industry in your country?

For local aviation operators:

Objectives:

- Impact of the government subsidy on their organisations.
- Roles in design/planning/implementation of the government subsidy.
- Whether the government subsidy is suitable for their organisations.
- Successful or not?
- What challenges are they facing as a receiver?
- Plans for the government subsidy.

1. What types of subsidy schemes have your organisation received as an aviation operator in your country? Please explain.
2. What is your role in designing, planning or implementing the aviation subsidy schemes, if any?
3. How do you spend the government subsidy? What are the specific areas where you are utilizing the government subsidy for the growth of the aviation industry?
4. How much share (in percentage or ratio) do you put in for the project/activity?
5. Can you explain any challenges you face as a subsidy receiver? How can you overcome these challenges?
6. In your opinion, how does the subsidy impact your organisation and your sector? Can you think of any impacts of the aviation subsidy on the aviation industry, tourism, economic wellbeing, social wellbeing and environmental wellbeing?
7. How do you measure (key indicators) the success of the subsidy provided for your organisation and your sector?
8. Based on your experience, can you think of any improvements that could be made to the subsidy provided for your organisation and your sector?

For foreign aid donors:

Objectives:

- Roles in government subsidy scheme design/plan/implementation.
- Challenges as a provider.
- Future plans for government subsidies in the SPR.

1. Can you discuss the support that is provided by your organisation towards the aviation industry in the SPR?
2. In your opinion, what are the types of challenges to providing such support for the aviation industry in the SPR?
3. What are your roles in the subsidy being provided for the aviation industry in the SPR (if any)?
4. Can you briefly explain how the aviation subsidy is formulated/designed/implemented? Are local aviation operators involved?
5. Can you think of any impacts of government subsidies on the aviation industry, tourism, economic wellbeing, social wellbeing and environmental wellbeing?
6. How does your organisation measure the impacts of an aviation subsidy?
7. Does your organisation have any plans to support the aviation industry in the SPR further?

For academics:

Objectives:

- Academics' perspectives on the government subsidies provided within the SPR.

1. What types of subsidy schemes provide for the aviation industry in the SPR?
2. In your opinion, what are the objectives of the subsidy scheme for aviation?
3. Do you think that the subsidy schemes within the SPR effectively contribute to the growth of the aviation industry? If not, why?
4. Can you think of any impacts of aviation subsidies on the aviation industry, tourism, economic wellbeing, social wellbeing and environmental wellbeing?

5. What would be the most suitable subsidy (scheme) to support aviation growth within the SPR? Why?
6. Do you think the subsidy schemes in the SPR deliver value to the public? Please explain.
7. Would you like to see any changes to the current subsidy schemes provided to the aviation industry within the SPR? Please explain

For relevant stakeholders (tourist operators, environmentalist groups, etc.)

Objectives:

- Perspectives from relevant stakeholders.

1. Are you aware of any subsidy schemes being provided for the aviation industry in your country?
2. What do you think about the expected benefits of the subsidy schemes in your country?
3. Do you think that the current subsidy schemes are the best approach or schemes to support the aviation industry?
4. What are your opinions regarding the impacts of the aviation subsidies on the aviation industry, tourism, economic wellbeing, social wellbeing and environmental wellbeing?
5. Do you think that the aviation subsidy schemes in your country have any impacts on your organisation? Please explain.
6. Would you like to see any changes to the current subsidy schemes to support the aviation industry in your country further?

For the travelling public:

Objectives:

- Are they aware of the government subsidy for the aviation industry?
- Does it impact them directly?
- Is it successful?
- Future improvement for the government subsidy.

1. What do you want your government to support for the development of the aviation transport sector in your country?
2. Do you know of any subsidy schemes for the aviation industry in your country (e.g., airlines and airports)? If yes, how did you learn about them?
3. In your opinion, what are the impacts of the aviation subsidy schemes on the aviation sector, tourism sector, economic wellbeing, social wellbeing and environmental wellbeing?
4. In your opinion, do the aviation subsidy schemes have any impact on you in any way?
5. In your opinion, what are the goals of the subsidy scheme in your country?
6. Do you think that the aviation subsidy schemes are successful? Please explain.
7. Are you satisfied with the aviation subsidy scheme? Why? If not, then how would you like the government to improve on the current subsidy schemes provided?

End:

Do you have any additional points/comments you would like to mention about the aviation subsidy scheme in your country or in the SPR?

Interview Questions (Set 2)

Start:

1. Can you tell me about your work and your organization?
2. Can you tell me about your understanding of government subsidy schemes in your country (if any)?

If no, then proceed with these questions.

For government officials and politicians:

Objectives

- Perspectives on the establishment of a subsidy for the aviation sector.
- What are the challenges to the establishment of an aviation subsidy?
- Any future outlook for government subsidy schemes for the aviation industry.

1. What are your views regarding the establishment of subsidy schemes for the aviation industry in your country?
2. How will you design/plan/implement such an aviation subsidy scheme?
3. What are the main challenges to providing subsidies for the aviation industry?
4. Can you think of any impacts of subsidies on the aviation sector, tourism, economic wellbeing, social wellbeing and environmental wellbeing?
5. How will the performance of the subsidy scheme be measured if implemented?
6. In your opinion, what are the future plans for subsidies for the aviation industry in your country?

For local aviation operators:

Objectives:

- Impact of the lack of a subsidy on their organisations and sectors.
- Role in the design/plan/implementation of the government aviation subsidy schemes.
- Preferred aviation subsidy schemes.
- Successful?
- Challenges as a receiver.
- Plans for the government aviation subsidy.

1. What type of subsidy scheme or programme do you think would be appropriate for your organisation and sector? Please explain.
2. In your opinion, do you think that it should be mandatory for the government to provide a subsidy to support your organisation? Explain.
3. Can you think of any impact of aviation subsidy schemes on the aviation sector, tourism, economic wellbeing, social wellbeing and environmental wellbeing?
4. How would the subsidy scheme impact your organisation and your sector?
5. In your opinion, what are the challenges for establishing a subsidy for your sector?
6. In your opinion, what would be the most suitable subsidy for your organisation and your sector?

For relevant stakeholders (tourism, environment)

Objectives:

Perspectives of other stakeholders on the government subsidy for the aviation industry:

1. Are you aware of any subsidy schemes that are being provided for the aviation industry in your country?

2. Would you like to see the aviation industry being subsidised by the government in your country? Why or why not?
3. What would be the likely benefits or drawbacks of having a subsidy for the aviation industry in your organisation and your sector?
4. Can you think of any impacts of subsidies on the aviation industry, tourism, economic wellbeing, social wellbeing and environmental wellbeing?
5. How will you measure the impacts of any subsidy for the aviation industry and its impact on your organisation and your sector if implemented?
6. What is your preferred future outlook on subsidies for the aviation industry in your country?

For the public:

Objectives:

- Are they aware of the government subsidy for the aviation industry?
- Perspective on the impacts of the aviation subsidy.
- Will they be successful?
- Future improvements for the government subsidy.

1. What do you want your government to do for aviation development in your country?
2. Do you know of any subsidy schemes for the aviation industry (e.g., airlines and airports)? If yes, how did you learn about it? If no, why don't you think that is the case?
3. In your opinion, if your government provides a subsidy programme for the aviation industry, what will be the impacts on the aviation and tourism sector, economic wellbeing, social wellbeing and environmental wellbeing.
4. Will you be directly impacted if the subsidy programme for the aviation sector is implemented? How?
5. How will you define a successful aviation subsidy scheme in your country? Please explain.
6. What will be a suitable subsidy scheme that you would like your government to consider in the future? Why?

End:

Do you have any additional points or comments you would like to mention about the aviation subsidy scheme in your country or in the SPR?

Appendix B – Invitation letter to potential participants

Dear participants,

I am a PhD student at the School of Aviation at Massey University, New Zealand. This interview is conducted as part of my research towards my PhD in Aviation Management.

I am researching the impacts of government subsidies (e.g., of state-owned aviation operators, lower airfares, route developments, airport developments, relief support etc.) on the regional market development in the South Pacific Region (SPR). There is a lack of evidence-based approach research on the aviation government subsidy within the SPR. It is anticipated that this research will provide pragmatic and practical policy implications that would support the growth of the aviation sector within the SPR. A summary of the research is available to you once the project is completed, if you agree to participate in this research.

In viewing your knowledge of the government subsidy programs for the aviation industry within the SPR, I invite you to participate in this research. Your participation is invaluable for this research. The interview will take approximately 20–30 minutes to complete.

Please be assured that the confidentiality of your responses will be upheld at all times. This data will be stored at Massey University for 5 years and will be disposed of after that. Your answers and identity will be completely anonymous.

This project has been evaluated by peer-reviewed and judged to be low risk. Consequently, it has not been reviewed by of the University's Human Ethics Committees. The researcher named in this document is responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Prof Craig Johnson, Director, Research Ethics, telephone 06 356 9099 x 85271, email humanethics@massey.ac.nz".

If you agree to participate in this interview, please provide the best way to contact you (e.g., phone, skype, viber, etc) and the most appropriate time for your interview.

If you have any other questions or enquiries, please do not hesitate to contact me. I have also enclosed further information if required.

Thank you for your attention and truly appreciate your time.
Sincerely

Ms. Vinolia Salesi (PhD candidate)
Email: vsalesi@massey.ac.nz
Telephone: +64 (06) 356 9099 ext. 85647

Appendix C – Follow up letter to participants

Dear participants,

Thank you for taking your valuable time to assist me in my educational endeavours and this research. This data will be used to analyse the government subsidy schemes (e.g., of state-owned aviation operators, lower airfares, route developments, airport developments, relief support etc.) within the SPR.

This project has been evaluated by peer-reviewed and judged to be low risk. Consequently, it has not been reviewed by of the University's Human Ethics Committees. The researcher named in this document is responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Prof Craig Johnson, Director, Research Ethics, telephone 06 356 9099 x 85271, email humanethics@massey.ac.nz".

Please confirm your availability for phone (or skype or viber) interview on xx as previously advised.

Appreciate if you can provide the following demographic information for record purposes.

Full Name:

Nationality:

Gender:

Age:

Highest qualification:

Occupation:

Years of experience in your field:

Looking forward to hearing from you.

Thank you for your time.

Kind Regards

Vinolia

Appendix D – Information sheet for participants

Researcher: Vinolia Salesi
Type of Project: PhD Research
Purpose of the Project: To examine the perspectives of relevant stakeholders (government officials from the departments of aviation.
Research project for the Doctor of Philosophy (Aviation Management), Massey University, New Zealand.
Project Description: - A Summary

Governments' contribution and support significantly influence the robust development of aviation growth. This research aims to examine the impacts of government subsidies (e.g., of state-owned aviation operators, lower airfares, route developments, airport developments etc.) on the regional aviation market development in the South Pacific Region (SPR). It investigates the various perspectives of relevant stakeholders (e.g., aviation, finance, tourism, environment and the travelling public) to provide policy implications that would improve the aviation industry and economic development within the SPR.

Invitation

Thank you for agreeing to read this information. In viewing your knowledge of the government subsidy programs for the aviation industry within the SPR, I sincerely invite you to participate in this interview. A summary of the research is available to you once it's completed if you agree to participate in this research.

Project Procedures

There is a limited publication on the government subsidy within the SPR, hence the need for the evidence-based approach to understanding this critical issue.

The interview will take approximately 20–30 minutes to complete. It will be conducted remotely (via telephone or skype) or any mode that is preferred by the participant. The interview will be tape-recorded.

Data Management

Be assured that all your answers to the interview questions will be kept strictly confidential, and your identity will be completely anonymous. All the data will be stored at Massey University for 5 years and will be disposed of after that.

'Participant's Rights

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- *decline to answer any particular question;*
- *withdraw from the study at any time;*
- *ask any questions about the study at any time during participation;*
- *provide information on the understanding that your name will not be used unless you give permission to the researcher;*

- *be given access to a summary of the project findings when it is concluded.*
- *Ask for the recorder to be turned off at any time during the interview.*
- *You have the right to decline to answer any particular question.*

Project Contacts

Any queries you have regarding this research should be addressed to Vinolia (researcher) on Mobile: 04 0272916729 and Email:vsalesi@massey.ac.nz.

Ethical Approval Statement

This research has been evaluated by peer-reviewed and judged to be low risk. Consequently, it has not been reviewed by of the 'University's Human Ethics Committees. The researcher named in this document is responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher, please contact Prof Craig Johnson, Director, Research Ethics, telephone +64 06 356 9099 x 85271, email humanethics@massey.ac.nz".

Appendix E – The selected publications included in Study 3

Authors and year	Publication type	Geographic scope	Primary research method	Strategies and mechanisms
Abate et al. (2020)	Journal	Global	Empirical analysis	Social distancing, need for government support, risk-based approach
Ali et al. (2020)	Journal	Global	Descriptive analysis	Hygiene measures, vaccination
Amankwah-Amoah et al. (2021)	Journal	Asian region (South Asian: Pakistan and Sri Lanka)	Descriptive analysis	Airport screening (exit/entry), quarantine or isolation and contact tracing
Airports Council International & IATA (2020b)	Report	Global	Descriptive analysis (reviews)	Airport screening (entry), hygiene measures, social distancing, contact tracing, virus testing, vaccination, risk-based approach
Baber (2020)	Journal	Global	Empirical analysis	Social distancing and travel restrictions
Bajardi et al. (2011)	Journal	American, Europe, Oceania	Empirical analysis (scenario)	Travel restrictions
Barbate & Aher (2020)	Journal	African, American, Asia, Europe	Review (literature)	Travel restrictions
Belhadi et al. (2021)	Journal	Not specified	Empirical analysis (mixed methodology)	Border closures, quarantine, airport screening, hygiene measures, social distancing, lockdown
Bielecki et al. (2020)	Journal	Global	Descriptive analysis (literature reviews)	Border closure, hygiene measures, airport screening, social distancing, quarantine, other (travel advisory)
Bogale et al. (2020)	Journal	African region	Empirical analysis (survey)	Hygiene measures
Bogoch et al. (2015)	Journal	African region	Empirical analysis	Travel restrictions, airport screening
Boldog et al. (2020)	Journal	American, Asia and Europe	Empirical analysis (scenario)	Travel restrictions, airport screening
Boyd et al. (2017)	Journal	Oceanian	Case study	Border closure
Boyd et al. (2018)	Journal	Oceanian	Case study	Border closure
Budd et al. (2011)	Journal	Africa, American, and other regions	Descriptive analysis	Border closure, hygiene measures, airport screening
Budd et al. (2020)	Journal	Europe	Descriptive analysis	Border closure, quarantine, airport screening, social distancing, virus testing, vaccination
Burns et al. (2020)	Journal	Global	Descriptive analysis (literature reviews)	Border closure, travel restrictions, airport screening, quarantine
Civil Aviation Administration of China (2020)	Report	Asia (China)	Descriptive analysis	Quarantine, airport screening, hygiene measures
Cahyanto et al. (2016)	Journal	American	Empirical analysis (survey)	Hygiene measures

Chen et al. (2020a)	Journal	American	Empirical study	Travel restrictions, social distancing
Chen et al. (2020b)	Journal	Asian Region	Empirical analysis (survey)	Quarantine, airport screening, hygiene measure, contact tracing
Chen et al. (2020c)	Journal	Africa and Asia	Descriptive analysis (reviews)	Airport screening, virus testing, vaccination, other (travel advisory)
Chetty et al. (2020b)	Journal	Africa and Asia	Descriptive analysis (reviews)	Travel restrictions, airport screening
Chevtaeva & Guillet (2020)	Journal	Africa and Asia	Empirical analysis (survey)	Hygiene measures, social distancing
Chinazzi et al. (2020)	Journal	Asian region	Empirical analysis (scenario)	Travel restriction, quarantine and isolation
Choe et al. (2021)	Journal	Asian region	Empirical analysis	Border closure, travel restrictions, quarantine and isolation
Chong & Zee (2012)	Journal	Asian region	Empirical analysis	Travel restriction, antiviral hospitalisation
Chou & Lu (2011)	Journal	Asian region	Empirical analysis (survey)	Hygiene measures
Chowdhury & Chhikara (2020)	Journal	Asian region	Descriptive analysis	Hygiene measure
Christidis & Christodoulou (2020)	Journal	Asia, Europe, Oceania, other regions	Empirical analysis (survey)	Travel restrictions, quarantine and isolation
Chung (2015)	Journal	Asia, American, Europe, and Oceania	Empirical analysis	Airport screening
Coelho et al. (2020)	Journal	Africa, Asia and Europe	Empirical analysis (scenario)	Border closure, quarantine and isolation, airport screening, social distancing, contact tracing
Czerny et al. (2021)	Journal	Asian region	Descriptive analysis (reviews)	Travel restrictions, government subsidies
Das & Tiwari (2020)	Journal	Asian region	Empirical analysis (survey)	Border closure, travel restrictions, quarantine and isolation, hygiene measures, social distancing
Deb & Nafi (2020)	Journal	Global (Africa, American, Asia, Europe, Oceania, other regions	Empirical analysis	Border closure (partial/full)
Debnath & Bardhan (2020)	Journal	Asian region	Empirical (reviews)	Quarantine, hygiene measures, airport screening, virus testing, other (travel advisory)
Delgado et al. (2020)	Journal	American	Empirical analysis	Hygiene measures
Department of Infrastructure, Transport, Regional Development and Communication (2020)	Report	Australia	Descriptive analysis	Border closure (early), quarantine, government support
Dickens et al. (2020)	Journal	Africa and American	Empirical analysis (scenario)	Travel restrictions, quarantine and isolation, airport screening, virus testing
European Union Air Safety Agency (EASA) (2020a)	Report	European region	Descriptive analysis	Hygiene measures (risk-based approach)
EASA (2020b)	Report	European region	Descriptive analysis	Travel restriction
EASA (2020c)	Report	European region	Description analysis	Travel restriction

Edwards (2020)	Journal	Oceania (Pacific region)	Descriptive analysis	Travel restrictions (early)
Elias (2020)	Journal	American	Descriptive analysis	Travel restrictions, quarantine and isolation, hygiene measures, airport screening, social distancing, virus testing
European Commission (2020)	Report	European region	Descriptive analysis	Travel restrictions, quarantine, hygiene measures, airport screening, social distancing, virus testing, vaccination, contact tracing, communication, collaboration
Federal Aviation Administration (2020)	Report	American	Descriptive analysis	Travel restrictions, hygiene measures, airport screening, social distancing contact tracing, virus testing, other (IT), risk-based approach
Fang et al. (2020)	Journal	Asian region	Empirical analysis	Travel restrictions, social distancing
Fisher et al. (2020)	Journal	Asia and American.	Descriptive analysis	Border closure, airport screening
Fu et al. (2021)	Journal	Asian region	Descriptive analysis	Travel restrictions, quarantine, virus testing, contact tracing
Gallego & Font (2020)	Journal	Africa, American, Asia and Europe	Empirical analysis	Travel restrictions
Gardner et al. (2016)	Journal	Africa, Asia and Europe	Empirical analysis	Airport screening
Gilbert et al. (2020)	Journal	African region	Empirical analysis	Travel restrictions, quarantine and isolation, airport screening, virus testing
Gold et al. (2019)	Journal	Africa and American,	Empirical analysis (scenario)	Airport screening (exit)
Gossling (2020)	Journal	African and Asian regions	Descriptive analysis	Travel restrictions
Gossling et al. (2020)	Journal	African and Asian regions	Descriptive analysis	Border closures, travel restrictions quarantine, social distancing
Graham et al. (2020)	Journal	European region	Empirical analysis (survey)	Travel restrictions, hygiene measures, airport screening, social distancing, contact tracing, virus testing, other (IT)
Grydehøj et al. (2020)	Journal	European region	Descriptive analysis	Travel restrictions, quarantine and isolation, contact tracing, virus testing
Gudmundsson et al. (2020)	Journal	Asia, American, Europe, Oceania (Pacific).	Empirical analysis	Travel restrictions
Haider et al. (2020)	Journal	Asia, American, Europe, Oceania (Pacific).	Empirical analysis	Border closure, travel restriction, quarantine, airport screening, contact tracing, other (travel advisory)
Hall et al. (2020)	Journal	African and Asian regions	Descriptive analysis (reviews)	Travel restriction, quarantine
Hall & Seyfi (2020)	Journal	European region	Descriptive analysis (reviews)	Travel restriction, quarantine
Haryanto (2020)	Journal	African and Asian regions	Descriptive analysis (reviews)	Travel restrictions, quarantine and isolation, social distancing

He & Harris (2020)	Journal	African and Asian regions	Descriptive analysis (reviews)	Travel restrictions
Hoarau (2020)	Journal	Global (205 small island states, including the SPR)	Empirical analysis	Travel restrictions, social distancing
Hoque et al. (2020)	Journal	Asian region	Descriptive analysis (reviews)	Travel restrictions
Huizer et al. (2015)	Journal	Asia, Europe and Oceania	Descriptive analysis (reviews)	Travel restriction, quarantine and isolation, airport screening (entry), hygiene measures, contact tracing
Iacus et al. (2020)	Journal	Asia, Europe and Oceania (Pacific)	Empirical analysis (scenario)	Travel restrictions
International Air Transport Association (2020)	Report	Global	Descriptive analysis (reviews)	Border restrictions, quarantine, virus testing
International Civil Aviation Organisation (2020)	Handbook	Global	Descriptive analysis (reviews)	Travel restrictions, contact tracing
Ivanov et al. (2020)	Journal	Asian and European regions	Descriptive analysis (conceptual)	Travel restrictions, other (IT innovations)
Jamal & Budke (2020)	Journal	African and Asian regions	Descriptive analysis (reviews)	Travel restrictions
Jones & Comfort (2020)	Journal	Not specified	Descriptive analysis (reviews)	Travel restrictions
Karabulut et al. (2020)	Journal	Global	Empirical analysis	Travel restrictions, border closures
Karim et al. (2020a)	Journal	Asian region	Empirical analysis	Travel restrictions, quarantine and isolation, hygiene measures, airport screening, virus testing
Karim et al. (2020b)	Journal	Asian region	Descriptive analysis (conceptual)	Travel restrictions
Kaushal & Srivastava (2021)	Journal	Asian region	Empirical analysis (survey)	Hygiene measures
Kement et al. (2020)	Journal	European region	Empirical analysis (survey)	Border restrictions, travel restrictions, quarantine and isolation, hygiene measures, social distancing
Khan et al. (2013)	Report	American	Empirical analysis	Airport screening
Khan et al. (2020)	Journal	Asian and European regions	Empirical analysis	Travel restrictions, quarantine, hygiene measures, airport screening, virus testing, contact tracing
Kool et al. (2013)	Journal	Oceania (Pacific region)	Descriptive analysis	Airport screening
Kumar (2020)	Journal	Asian region	Descriptive analysis (conceptual)	Travel restrictions
Kutela et al. (2021)	Journal	Global	Descriptive analysis (conceptual)	Travel restrictions, social distancing
Lam et al. (2011)	Journal	Asian region	Empirical analysis (scenario)	Border closures, travel restrictions (children)
Lamb et al. (2020)	Journal	United States	Empirical analysis (survey)	Hygiene measures, social distancing, contact tracing, vaccine
lbn-mohammed et al. (2021)	Journal	Global	Descriptive analysis (reviews)	Travel restrictions
Le et al. (2021)	Journal	Asian region	Descriptive analysis	Travel restrictions, quarantine and isolation, virus testing, contact tracing, other (travel advisory)

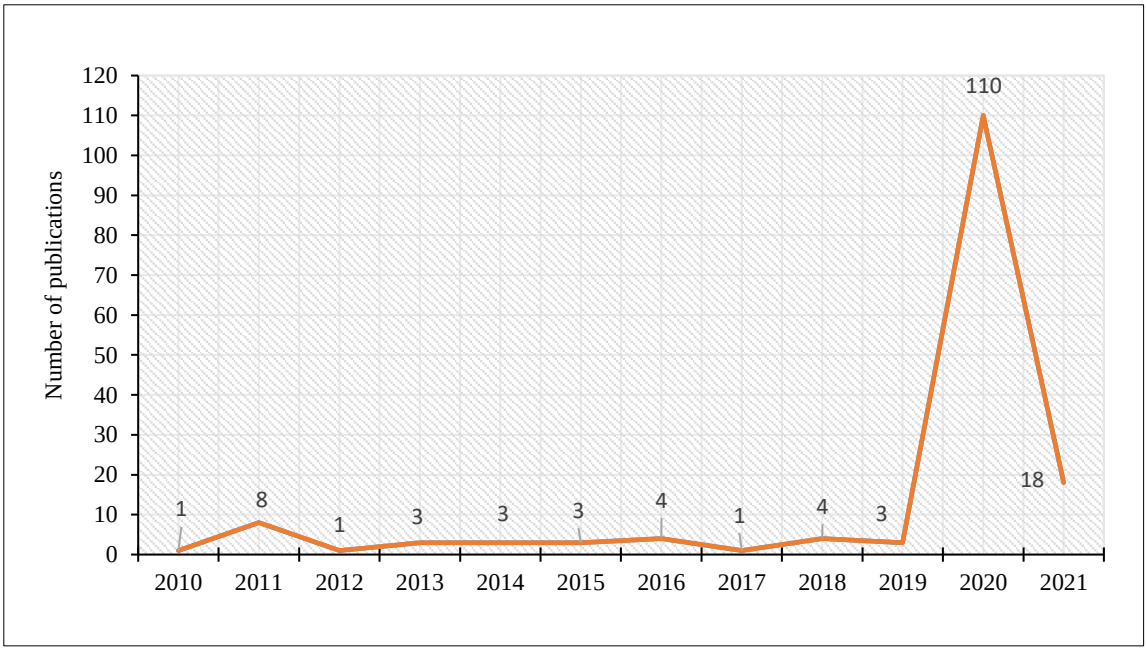
Leitmeyer & Adlhoch (2016)	Journal	Global	Empirical analysis (survey)	Contact tracing
Li et al. (2020)	Journal	Asian region	Empirical analysis	Travel restrictions
Liden (2021)	Journal	Asian region	Empirical analysis	Travel restrictions
Liu et al. (2020)	Journal	Asian region	Empirical analysis	Travel restrictions
Macilree & Duval (2020)	Journal	Asia, American, Europe and Oceania	Descriptive analysis	Travel restrictions, quarantine, hygiene measures, social distancing, government subsidy
Malmberg & Britton (2020)	Journal	Not specified	Empirical analysis (scenario)	Travel restrictions, quarantine, contact tracing
Mansour & Salem (2020)	Journal	African region	Descriptive analysis (narrative)	Travel restrictions, government subsidy
Mateus et al. (2014)	Report	Global	Descriptive analysis (review)	Travel restrictions
Matiza (2020)	Journal	Global	Descriptive analysis (review)	Travel restrictions, government subsidy
Mei & Hu (2020)	Journal	Oceania (Pacific)	Empirical analysis	Travel restrictions
Mertzanis & Papastathopouls (2021)	Journal	Global	Empirical analysis (statistical)	Travel restrictions
Monmousseau et al. (2020)	Journal	American	Empirical analysis (statistical)	Travel restrictions
Nakamura & Managi (2020)	Journal	Global	Empirical analysis (scenario)	Travel restrictions, quarantine, risk-based approach
Neatherlin et al. (2013)	Journal	American	Empirical analysis (survey)	Contact tracing
Neuburger & Egger (2021)	Journal	European region	Empirical analysis (cluster)	Travel restrictions
Nicola et al. (2020)	Journal	Global	Descriptive analysis (reviews)	Travel restrictions (partial), quarantine and isolation, social distancing
Nikolaou & Dimitriou (2020)	Journal	European region	Empirical analysis (statistical)	Travel restrictions
Nishiura & Kamiya (2011)	Journal	Asian region	Empirical analysis (statistical)	Travel restrictions, quarantine
Novelli et al. (2018)	Journal	African and European regions	Empirical analysis (survey)	Travel restrictions (partial), quarantine and isolation, social distancing
Organisation for Economic Co-operation Development (2020a)	Report	Global	Descriptive analysis	Travel restrictions, hygiene measures, social distancing, contact tracing, risk management
OECD (2020b)	Report	Global	Descriptive analysis	Travel restrictions, social distancing, government subsidies
OECD (2020c)	Report	Global	Descriptive analysis	Travel restrictions, quarantine and isolation, airport screening, virus testing, government subsidies
Ozbay et al. (2021)	Journal	Global	Descriptive analysis (reviews)	Travel restrictions, social distancing
Papatheodorou (2021)	Journal	Global	Descriptive analysis (reviews)	Social distancing
Paraschi (2020)	Journal	European region	Empirical analysis (survey)	Quarantine

Pavli et al. (2020)	Journal	European region	Empirical analysis	Travel restrictions, quarantine and isolation, hygiene measures, airport screening, contact tracing
Pongpirul et al. (2020)	Journal	Asian region	Survey	Travel restrictions, airport screening, social distancing
Priest et al. (2011)	Journal	Oceania region	Empirical analysis (scenario)	Airport screening
Qiu et al. (2011)	Journal	Asian region	Survey	Hygiene measures
Rahman et al. (2020)	Journal	Global	Descriptive analysis	Travel analysis
Ribeiro et al. (2020)	Journal	Global Region	Empirical analysis (statistical)	Travel restrictions, quarantine and isolation
Robertson (2020)	Journal	American	Descriptive analysis	Travel restrictions, quarantine and isolation, airport screening, social distancing, vaccination
Rutynskyi & Kushniruk (2020)	Journal	European region	Empirical analysis (statistical)	Quarantine and isolation
Salman et al. (2020)	Journal	Global	Empirical analysis (statistical)	Travel restrictions, quarantine and isolation, vaccination, other (IT)
Serrano & Kazda (2020)	Journal	Global	Empirical analysis (survey)	Travel restrictions, other (travel advisory)
Sevilla (2018)	Journal	Africa, American, Asia, Europe and Oceania	Empirical analysis (scenario)	Hygiene measures, airport screening, contact tracing, other (travel advisory), communication
Shaban et al. (2020)	Journal	Global	Empirical analysis	Other (travel advisory)
Sharma et al. (2020a)	Journal	Asia (India)	Empirical analysis (survey)	Travel restrictions
Sharma et al. (2020b)	Journal	Global	Descriptive analysis (reviews)	Travel restrictions, social distancing
Sharun et al. (2020)	Journal	Asia, Europe and Oceania	Descriptive analysis (reviews)	Travel restrictions (partial), quarantine and isolation, contact tracing, virus testing, vaccination, other (travel advisory)
Sheller (2021)	Journal	African	Descriptive analysis	Travel restrictions
Sigala (2020)	Journal	Global	Descriptive analysis	Travel restrictions, hygiene measures, social distancing, other (IT)
Singh (2020)	Journal	Global	Descriptive analysis (reviews)	Travel restrictions
Skare et al. (2021)	Journal	Global	Empirical analysis	Travel restrictions
Sokołowski (2020)	Journal	Asia, American, Europe and Oceania	Descriptive analysis (reviews)	Border restrictions, hygiene measures
Suau-Sanchez et al. (2020)	Journal	Global	Empirical analysis (survey)	Border closure, travel restrictions (partial), quarantine, airport screening, social distancing
Tabares (2021)	Journal	Global	Empirical analysis (scenario)	Quarantine, hygiene measures, airport screening, social distancing, contact tracing, virus testing, other (IT, travel advisory)
Tateno & Bolesta (2020)	Report	Asian and Oceania (Pacific)	Descriptive analysis (reviews)	Border closure, travel restrictions

Tay et al. (2020)	Journal	Global	Descriptive analysis (reviews)	Border closure, travel restrictions, quarantine, hygiene measures, airport screening, social distancing, virus testing
Transport Commission (2020)	Report	European region	Descriptive analysis	Travel restriction, quarantine, airport screening
Tuchen et al. (2020)	Journal	Global	Descriptive analysis (reviews)	Airport screening, social distancing
Tuite et al. (2019)	Journal	African regions	Empirical analysis (scenario)	Airport screening
Tuncer & Le (2014)	Journal	Asia, American and Oceania	Empirical analysis	Travel restrictions, quarantine and isolation, vaccination
Uva & Ratajczyk (2020)	Journal	European region	Descriptive analysis	Travel restrictions, quarantine, hygiene measures, social distancing, contact tracing, government subsidies
Uzuner & Ghosh (2020)	Journal	Europe (Italy)	Empirical analysis (statistical)	Travel restrictions, quarantine, hygiene measures, social distancing, government subsidies
Vickerman (2020)	Journal	Europe (England, Scotland, Wales)	Descriptive analysis (reviews)	Border closure, travel restrictions, quarantine
Wachyuni & Kusumaningrum (2020)	Journal	Asia (Indonesia)	Empirical analysis (survey)	Travel restrictions
Wang et al. (2018)	Journal	Asia and Oceania (Pacific)	Descriptive analysis	Quarantine
Wilder-Smith (2021)	Journal	Global	Descriptive analysis (reviews)	Travel restrictions, vaccination
Wilson et al. (2020)	Report	Oceania (NZ and Pacific)	Descriptive analysis (reviews)	Travel restrictions, quarantine
World Health Organization (WHO) (2015)	Report	Global	Descriptive analysis (reviews)	Border closure, travel restrictions, quarantine and isolation, hygiene measures, airport screening, contact tracing
WHO (2019)	Report	Global	Descriptive analysis (reviews)	Border closure, travel restrictions, quarantine and isolation, hygiene measures, airport screening, contact tracing
United Nation World Tourism Organisation (2020)	Report	Global	Descriptive analysis	Travel restrictions
Wu et al. (2020b)	Journal	Asia (China)	Descriptive analysis	Hygiene measures, airport screening, social distancing, vaccination
Yeh (2021)	Journal	Asia (Taiwan)	Empirical analysis (scenario)	Quarantine, social distancing, government subsidies
Young et al. (2014)	Journal	European region	Empirical analysis (case studies)	Contact tracing
Zanin & Papo (2020)	Journal	Europe (Spain)	Empirical analysis (statistical)	Travel restrictions, quarantine, virus testing
Zenker et al. (2021)	Journal	American and Europe	Empirical analysis (survey)	Airport screening, virus testing
Zhang (2020)	Journal	Not specified	Descriptive analysis	Social distancing
Zhang et al. (2020)	Journal	Asian region	Empirical analysis (statistical)	Travel restrictions, quarantine, airport screening, contact tracing

Zhang et al. (2021)	Journal	Global	Empirical analysis (scenario)	Travel restrictions

Appendix F – Number of aviation and tourism publications related to pandemics (January 2010–February 2021)



Appendix G – Top 20 terms used in keywords, titles and abstracts

Number	Keywords	Occurrences	Text	Occurrences
1	COVID-19	7	COVID	120
2	Travel	2	Pandemics	58
3	China	2	Impact	39
4	Coronavirus	2	Risk	29
5	Airports	1	Tourism	27
6	Body temperature	1	Airport	25
7	Communicable disease control	1	Traveller	21
8	Communicable disease control/diagnoses	1	Spread	21
9	Communicable disease control/transmission	1	Crisis	20
10	COVID-19/*diagnosis	1	China	20
11	COVID-19/prevention and control	1	Airline	20
12	COVID-19/transmission	1	Case	20
13	Influenza, human/diagnosis	1	Measure	20
14	Influenza, human/prevention and control	1	Outbreak	20
15	Influenza, human/transmission	1	Air travel	18
16	Mass screening/methods	1	Infectious disease	18
17	Quarantine	1	Response	17
18	Respiratory tract infection/diagnosis	1	Strategy	17
19	Respiratory tract infection/prevention and control	1	Travel	15
20	Respiratory tract infections/transmission	1	Disease	14

Appendix H – Results of word frequency queries (top 45 words)

Number	Words	Length of words	Word count
1	COVID	5	7475
2	Tourism	7	6540
3	Travel	6	6524
4	Health	6	5407
5	Pandemic	8	4999
6	International	13	3193
7	Air	3	3167
8	Risk	4	3070
9	Measures	8	3047
10	Cases	5	2730
11	Impact	6	2538
12	Disease	7	2424
13	Coronavirus	11	2156
14	Passengers	10	2119
15	Crisis	6	2074
16	Aviation	8	2027
17	Screening	9	1925
18	Control	7	1889
19	Government	10	1884
20	Transport	9	1819
21	Airport	7	1814
22	Influenza	9	1804
23	Airlines	8	1739
24	Outbreak	8	1655
25	Spread	6	1522
26	Transmission	12	1510
27	Virus	5	1403
28	Infectious	10	1380
29	Restrictions	12	1340
30	Airline	7	1328
31	SARS	4	1322
32	Epidemic	8	1318
33	Airports	8	1272
34	Passenger	9	1200
35	Quarantine	10	1170
36	Diseases	8	1141
37	Recovery	8	1133
38	Infection	9	1130
39	Response	8	1037
40	Infected	8	1008
41	H1N1	4	940
42	Contact	7	898
43	Entry	5	887
44	Tourists	7	829
45	Governments	11	778

Appendix I – Measures taken to support airlines in some countries and regions

Country/region	Measures	Effective date or duration
China	Waiver of the Civil Aviation Development Fund payable by airlines	1 Jan 2020
China	A subsidy of CNY 0.0176 per available seat-kilometre for cooperating international routes, and a subsidy of CNY 0.0528 per available seat-kilometre for international routes covered by a single airline	From 23 Jan to 30 Jun 2020
China	Exemption of parking fees and a 10% reduction of the base price of landing and takeoff fees at Class 1 and 2 airports; 10% reduction of route fares; 8% reduction of the base price of jet fuel sales difference for domestic flights operated by domestic airlines	23 Jan 2020
China	Support for airlines' reorganization and optimization of capacity as required	11 Feb 2020
Hong Kong	Full waiver for 5 months on parking and airbridge fees for idle passenger aircraft	From Feb to Jun 2020
Hong Kong	40% reduction of passenger aircraft landing charges for 4 months	
Hong Kong	Reduction of ramp handling, maintenance and airside vehicle-related fees	
Hong Kong	Purchase of around 500,000 air tickets in advance from the four home-based airlines worth up to HK$2 billion	8 Apr 2020
The US	$25 billion in loans and loan guarantees available to passenger airlines	30 Mar 2020
The US	$17 billion in loans and loan guarantees to Boeing and its suppliers	
Singapore	10% landing charge rebate for all scheduled passenger flights landing in Singapore	From Apr 2020 to Mar 2021
Singapore	50% rebate on rental paid for airlines lounges and offices within the terminal buildings of Changi Airport and Seletar Airport	
Singapore	100% rebate on aircraft parking charges at Changi Airport and Seletar Airport	
Singapore	Waivers of the 1% increase in landing, parking, and aerobridge (LPA) charges for all airlines and freighter flights	
Singapore	Deferred payment of certain fees such as certificates of airworthiness	
Singapore	Temasek Holdings voted in favour of new issuance of shares and bonds and buying all remaining shares and bonds	26 Mar 2020
Australia	$715 m relief package to refund and waive aviation fuel excises, air service charges, and domestic and regional aviation security charges	17 Mar 2020
Australia	$198 million to maintain critical air services throughout regional Australia by securing operations to certain routes	28 Mar 2020
New Zealand	NZ$163 million financial support to pay passenger-based government charges for the next 6 months	17 Mar 2020
New Zealand	NZ$37 million to cover airway-related fees for the next 6 months	
New Zealand	Any fee rises or pricing reviews from agencies that charge fees at the border put on hold for 12 months	
New Zealand	NZ$900 million government loan to Air New Zealand over the next 2 years	20 Mar 2020
Germany	€9 billion bailout to take 20% stake of Lufthansa	25 May 2020
France and Netherlands	€10 billion bailout to Air France-KLM	24 Apr 2020
Italy	€600 million bailout to Alitalia	17 Mar 2020
Sweden and Denmark	$300 million credit guarantees to SAS	17 Mar 2020

Source: Li (2021).

Appendix J – Statements of contribution

DRC 16

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STATEMENT OF CONTRIBUTION
DOCTORATE WITH PUBLICATIONS/MANUSCRIPTS

We, the candidate and the candidate's Primary Supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the candidate's contribution as indicated below in the *Statement of Originality*.

Name of candidate:	Vinolia Kilinaivoni Salesi
Name/title of Primary Supervisor:	Wai Hong Kan Tsui / Associate Professor
Name of Research Output and full reference:	
Salesi, V.K., Tsui, W.H.K., Fu, X., & Gilbey, A. (2021). The nexus of aviation and tourism growth in the South Pacific Region. Asia Pacific Journal of Tourism Research, 26(5), 557-578.	
In which Chapter is the Manuscript /Published work:	Chapter 1
Please indicate:	
• The percentage of the manuscript/Published Work that was contributed by the candidate:	80%
and	
• Describe the contribution that the candidate has made to the Manuscript/Published Work:	
This work is primarily that of the candidate, with minor contributions being provided by the supervisors to help guide the methods, analysis and review of the study.	
For manuscripts intended for publication please indicate target journal:	
Candidate's Signature:	Vinolia K. Salesi Digitally signed by Vinolia K. Salesi Date: 2022.01.31 10:32:54 +13'00'
Date:	31 January 2022
Primary Supervisor's Signature:	Dr. Kan Tsui Digitally signed by Dr. Kan Tsui Date: 2022.01.31 11:21:29 +13'00'
Date:	31 Jan 2022

(This form should appear at the end of each thesis chapter/section/appendix submitted as a manuscript/ publication or collected as an appendix at the end of the thesis)

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STATEMENT OF CONTRIBUTION
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We, the candidate and the candidate's Primary Supervisor, certify that all co-authors have consented to their work being included in the thesis and they have accepted the candidate's contribution as indicated below in the *Statement of Originality*.

Name of candidate:	Vinolia Kilinaivoni Salesi
Name/title of Primary Supervisor:	Wai Hong Kan Tsui / Associate Professor
Name of Research Output and full reference:	
Salesi, V.K., Tsui, W.H.K., Fu, X., & Gilbey, A. (Under Review). Stakeholder perceptions of the impacts of aviation subsidies in the South Pacific Region. Under Revision for Journal of Air Transport Management.	
In which Chapter is the Manuscript /Published work:	Chapter 2
Please indicate:	
• The percentage of the manuscript/Published Work that was contributed by the candidate:	80%
and	
• Describe the contribution that the candidate has made to the Manuscript/Published Work:	
This work is primarily that of the candidate, with minor contributions being provided by the supervisors to help guide the methods, analysis and review of the study.	
For manuscripts intended for publication please indicate target journal:	
Journal of Air Transport Management	
Candidate's Signature:	Vinolia K. Salesi Digitally signed by Vinolia K. Salesi Date: 2022.01.31 10:32:54 +13'00'
Date:	31 January 2022
Primary Supervisor's Signature:	Dr. Kan Tsui Digitally signed by Dr. Kan Tsui Date: 2022.01.31 11:22:34 +13'00'
Date:	31 Jan 2022

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Name of candidate:	Vinolia Kilinaivoni Salesi
Name/title of Primary Supervisor:	Wai Hong Kan Tsui / Associate Professor
Name of Research Output and full reference:	
[redacted]	
In which Chapter is the Manuscript /Published work:	Chapter 3
Please indicate:	
• The percentage of the manuscript/Published Work that was contributed by the candidate:	80%
and	
• Describe the contribution that the candidate has made to the Manuscript/Published Work:	
This work is primarily that of the candidate, with minor contributions being provided by the supervisors to help guide the methods, analysis and review of the study.	
For manuscripts intended for publication please indicate target journal:	
Transport Policy	
Candidate's Signature:	Vinolia K. Salesi Digitally signed by Vinolia K. Salesi Date: 2022.01.31 10:32:54 +13'00'
Date:	31 January 2022
Primary Supervisor's Signature:	Dr. Kan Tsui Digitally signed by Dr. Kan Tsui Date: 2022.01.31 11:23:22 +13'00'
Date:	31 Jan 2022

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