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Innovation and productivity in tourism small and medium enterprises: A longitudinal study

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ABSTRACT

This paper examines the factors influencing innovation and the relationship between innovation and productivity among Australian tourism small and medium enterprises (SMEs). Unlike most past studies relying on cross-sectional data, this study employs longitudinal innovation data of 400 tourism SMEs over five years. A two-stage random-effects probit model is used to account for unobserved firm heterogeneity. The results show that innovation inputs, firm characteristics, and external environment significantly affect innovation in general with competition and demand uncertainty being the distinct drivers of marketing innovation. The study reveals a significant and positive effect of technological and marketing innovation on tourism SMEs' productivity. Findings inform policy discussions to improve the current low levels of productivity in the tourism industry.

1. Introduction

The Australian tourism industry, long touted for its vital role in the Australian economy, presents an interesting dichotomy. Historically, the sector has been lauded due to its contribution to the economy ($60.8 billion or 3.1% of the GDP in 2018–2019), high GDP growth rates (Tourism Research Australia, 2019) and destination competitiveness (ranked seventh globally) (World Economic Forum, 2019). However, the productivity growth of the Australian tourism sector, both in the short run and long run, ranks among the worst globally (Assaf & Tsionas, 2018). For example, accommodation and food services, a critical subset of Australian tourism, experienced a decline of 5.2% in multifactor productivity growth over the period 2006 to 2019 (Australian Bureau of Statistics, 2019a). Due to the productivity challenges facing the tourism sector, the Australian government launched the Tourism, 2020 Strategy, which includes a focus on increasing both productivity and innovation.

Innovation has been recognised as a prerequisite for tourism firms to remain competitive in global tourism markets (Martin-Rios & Ciobanu, 2019; Pikkemaat, Peters, & Bichler, 2019) and as key to building a more productive, adaptable and resilient tourism sector (Organisation for Economic Co-operation and Development, 2020; Zenker & Kock, 2020). Innovation in tourism provides tourists with new tourism products and new experiences, enhances the quality and efficiency of tourism services and processes and drives customer demand (Hall & Williams, 2019; Hjalager, 2010). Although the study of tourism innovation has increased in recent years, this strand of academic research is still under-explored, compared to the broader business literature (Hall & Williams, 2019; Kim, Tang, & Bosselman, 2018; Williams, Rodríguez-Sánchez, & Škokić, 2019). Moreover, empirical research on innovation and firm performance in tourism remains limited (Gomezelj, 2016; Lee, Hallak, & Sardeshmukh, 2016; Martin-Rios & Ciobanu, 2019). Most available studies use profitability, customer satisfaction or hotel occupancy rate to measure firm performance (Lee et al., 2016; Martínez-Román, Tamayo, Gamero, & Romero, 2015; Nicolau & Santa-María, 2013; Orfila-Sintes & Mattsson, 2009). However, as Porter and Ketels (2003, p. 7) have underlined, 'true competitiveness is measured by productivity'. Further, 'in the long run', productivity is 'almost everything' (Krugman, 1994, p. 9). Hall and Williams (2019) have highlighted the fact that tourism productivity is persistently low in most developed and emerging economies. Nevertheless, there has been 'surprisingly little research' on productivity in the tourism industry, and it remains unclear whether innovation drives productivity in tourism (Hall & Williams, 2019, p. 61). This issue is further compounded by the fact that productivity studies on tourism SMEs, which comprise the overwhelming percentage of tourism firms, are even rarer (Díaz-Chao, Miralbell-Izard, & Torrent-Sellens, 2016; Pikkemaat et al., 2019). Therefore, the link between innovation and productivity in the tourism SME context deserves increased academic research attention.

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Given the relative lack of empirical research on innovation and productivity in tourism SMEs, this paper contributes to the literature by empirically analysing the relationship between innovation and firm productivity in the context of Australian tourism SMEs. A two-stage random-effects probit model was developed that links (i) innovation output and its determinants and (ii) innovation output and firm productivity. Simultaneous estimation of random-effect probit models is conducted using longitudinal firm-level data from the Business Characteristics Survey (BCS) over a five-year period from 2011 to 2016 (ABS, 2019b). In the tourism literature, most existing studies on innovation are based on cross-sectional data (Verreynne, Williams, Ritchie, Gronum, & Betts, 2019). Analysis using cross-sectional data might result in biases because it is unable to account for the time lag of innovation activities and unobserved firm heterogeneity (Morris, 2018; Rodriguez-Sanchez, Williams, & Brotons, 2019). By using longitudinal data, our paper moves beyond the cross-sectional analysis of innovation and provides new insights regarding the effect of innovation on productivity in tourism SMEs.

This remainder of this paper is organised as follows: Section 2 reviews the literature on innovation and productivity in the tourism context. Section 3 presents the data sources and the empirical model. The econometric results and discussion are presented in Section 4. The final section summarises the findings, highlights contributions and concludes the paper with recommendations for policy.

2. Literature review

2.1. Innovation in tourism SMEs and typologies of innovation

SMEs comprise most businesses in the tourism sector[1] (TRA, 2019; Williams et al., 2019). However, they mostly lag behind large firms in the technological evolution and innovation race (Hall & Williams, 2019; OECD, 2020). Tourism SMEs tend to adopt or imitate innovations developed by other firms rather than introduce innovation with a high degree of novelty (Gomezelj, 2016; Hjalager, 2002). The relatively low levels of innovation capacity among tourism SMEs are primarily due to the lack of necessary knowledge and resources (both finance and human capital) to invest in innovation (Martínez-Román et al., 2015; Verreynne et al., 2019). Moreover, SMEs also face several disadvantages in undertaking innovation, such as (i) economies of scale, which make it challenging to recoup significant sunk costs associated with innovation; (ii) limited access to capital markets; and (iii) inadequate management expertise and organisational capabilities (Pikkemaat, 2008; Tejada & Moreno, 2013; Thomas, Shaw, & Page, 2011). Tourism activities are characterised by seasonal factors and vulnerability to natural disasters and economic climate; this uncertainty increases the pressure for tourism SMEs to innovate across a diverse range of innovation types (Serrasqueiro & Nunes, 2014; Verreynne et al., 2019).

Although much evidence posits SMEs as possessing less innovative potential, there are also counterarguments that SMEs, due to their small size, have greater flexibility than larger firms (Bunnell & Coe, 2001). As Christensen and Overdorf (2000) have postulated, SMEs are unconstrained by internal routines; therefore, they are able to respond more swiftly to new innovation opportunities, changes in tourism markets or emerging customer needs. SMEs also can use their knowledge and marshal their available resources effectively and innovatively (Zahra, Neubaum, & Naldi, 2007) and are more advantageous in introducing innovation in small-scale or niche tourism markets (Shaw & Williams, 2004). They can also expand rapidly via internationalisation (Williams & Shaw, 2011). SMEs are increasingly vital, as both contributors to innovation in tourism (Thomas et al., 2011) and, sometimes, sources of disruptive innovation (Hall & Williams, 2019).

[1] SMEs account for 99.7% of total businesses in the Australian tourism sector (TRA, 2019).

The Oslo Manual proposes four types of innovation: (i) product; (ii) process; (iii) marketing; and (iv) organisational, where the first two are often grouped under the broader term of technological innovation and the latter two under non-technological innovation (OECD & Eurostat, 2005, 2018). In the tourism context, due to the intangible and perishable nature of tourism activities, their products/services and processes are typically produced and consumed at the same time (OECD, 2012). Thus, the common distinction between product and process innovation is tenuous in tourism (Mina, Bascavusoglu-Moreau, & Hughes, 2014; Toivonen & Tuominen, 2009). Therefore, the use of the term technological innovation is well-accepted within the tourism literature. However, the readaptation of the term non-technological innovation in tourism has been an issue of concern (Montresor, 2018). There exists empirical evidence that organisational innovation and marketing innovation have no relationship with each other in the small service context (González-Blanco, Coca-Pérez, & Guisado-González, 2019) as well as in the generic business literature (Brouillette, 2014; Egbetokun, Mendi, & Mudida, 2016). While marketing and technological innovation are often cited as the two most common types of innovation in tourism SMEs (Divisekera & Nguyen, 2018; Tejada & Moreno, 2013), with the former being particularly important for small tourism firms (Hall & Williams, 2019), organisational innovation is the least popular type (ABS, 2019b; Tejada & Moreno, 2013). The current paper focuses on technological innovation and marketing innovation, which is also in keeping with prior studies in SMEs (e.g. Aksoy, 2017) and in tourism (e.g. Cosma, Paun, Bota, & Fleseriu, 2014; Divisekera & Nguyen, 2018; Romero & Tejada, 2020).

In tourism, technological innovation is defined as the introduction of new products or services that provide tourists with new experiences or the implementation of new processes that increase the quality and efficiency of tourism services and reduce costs of delivery (Martin-Rios & Ciobanu, 2019). Successful technological innovations increase revenue and operational efficiency, leading to improved firm performance (Hall & Williams, 2019). Marketing innovation is the implementation of new marketing methods or strategies, such as new ways of advertising, pricing or positioning tourism products and opening new sales channels or market segments (Martin-Rios & Ciobanu, 2019). Due to operating in a highly competitive environment, marketing innovation is crucial for tourism firms to drive customer demand and strengthen their competitive position (Divisekera & Nguyen, 2018; Line & Runyan, 2012). Marketing innovation facilitates better communication, both locally and globally and reinforces the relationships between tourism providers and their customers (Hall & Williams, 2019). Thus, innovation in marketing is critical for tourism and hospitality firms (Divisekera & Nguyen, 2018; Nieves & Diaz-Meneses, 2016). In Australia, marketing innovation is the most popular innovation type in tourism SMEs, evidenced by the highest number of innovations implemented (442 marketing innovations) over the period 2011–2016 (ABS, 2019b). However, marketing innovation has received little attention in the tourism and hospitality literature to date (Nieves & Diaz-Meneses, 2016).

2.2. Determinants of innovation in tourism

The success of an innovation process is determined by various internal and external factors that act as enablers or inhibitors to a firm's innovation performance (OECD & Eurostat, 2018). These factors can be classified under three broad subheadings: (i) innovation inputs, which are investments or activities that SMEs undertake in pursuit of innovation; (ii) firm characteristics, which represent their capabilities to undertake innovation; and (iii) environment, which refers to external factors that are beyond the control of the firm (Martínez-Ros & Orfila-Sintes, 2012; OECD & Eurostat, 2018).

As a labour-intensive industry, the quality of human capital is critical to tourism firms (Hall & Williams, 2019). As Blake, Sinclair, and Campos-Soria (2006) have asserted, human capital includes education, skills and training acquired by workers both on and off the job. A study

by Gökovali and Avci (2012) showed human capital to be a decisive factor in innovation performance in tourism. However, human capital presents a major challenge to tourism firms due to the low qualification levels of the workforce and high staff turnover rates (Nieves & Quintana, 2018). Training and education have been suggested as ways to enhance the stock of human capital (McGuirk, Lenihan, & Hart, 2015). Available evidence shows that staff training has a positive influence on innovation in hotels in Taiwan (Tseng, Kuo, & Chou, 2008), Germany (Ottenbacher, Shaw, & Lockwood, 2006), the Balearic Islands (Martínez-Ros & Orfila-Sintes, 2012) and Spain (Nieves & Quintana, 2018; Romero & Tejada, 2020). Conversely, Tugores and García (2015) found no significant relationship between general training and environmental innovations in Balearic hotels.

The innovation process requires various and considerable resources that challenge resource-constrained SMEs. Hence, collaboration is advocated as a critical contributor to innovation in small tourism firms (Zach, 2016) because it allows them to access their collaborator's resources (Denicolai, Cioccarelli, & Zucchella, 2010), increases their supply of skilled personnel (Gokovali & Avci, 2012) and assists in sharing the costs of product development and marketing (Hall & Williams, 2019). Collaboration also facilitates knowledge sharing and the accumulation of experience and practices in co-producing integrated tourism services in a given destination (Wang & Fesenmaier, 2007). However, the literature also suggests that SMEs might be disadvantaged in collaborative innovation projects due to the dominance of larger collaboration partners (Rosenbusch, Brinckmann, & Bausch, 2011).

The rapid development of information and communication technology (ICT) has revolutionised the tourism industry (Buhalis et al., 2019; Law, Buhalis, & Cobanoglu, 2014). ICT facilitates the mobility of passengers, luggage and information. It also increases efficiency in the distribution of tourism services and lessens the travel burden for tourists (Berné, García-González, García-Uceda, & Múgica, 2015). New forms of ICT have had a significant effect on the way tourism firms market their products worldwide and efficiently communicate with the global audience (Hall & Williams, 2019; Hjalager, 2010). Social media platforms have been used extensively as marketing and communication channels that stimulate holiday decision-making (Hays, Page, & Buhalis, 2013; Law et al., 2014). However, for some SMEs, insufficient understanding of ICT-related opportunities acts as a barrier to adopting new forms of ICT (Giotopoulos, Kontolaimou, Korra, & Tsakanikas, 2017). Many tourism SMEs also lack ICT management skills and the capacities to maximise benefits from ICT-related innovations. This lack of ability can exhaust their resources and hamper future innovation (Hall & Williams, 2019).

Innovation investments are costly (Hall & Williams, 2019), particularly for tourism SMEs with limited financial resources (Motta & Sharma, 2020). Therefore, financial support is proposed as a facilitator that both encourages and supports innovation in tourism (Mei, Arcodia, & Ruhanen, 2015). Firms may obtain additional financing through government financial support such as grants, subsidies or tax incentives (Guisado-González, Guisado-Tato, & Vila-Alonso, 2012) or via private financing such as debts or bank loans (Serrasqueiro & Nunes, 2014). In terms of existing evidence, Divisekera and Nguyen (2018) demonstrated a positive effect of funding on innovation in Australian tourism SMEs, whereas Guisado-González et al. (2012) found little effect of public funding on the innovation performance of Spanish hotels. In the case of Spanish hospitality SMEs, Martínez-Román et al. (2015) demonstrated that the effects varied dependent upon the types of finance accessed.

In favour of the potential benefits that training, collaboration, ICT and financial support could offer tourism SMEs, this paper proposes the following hypothesis:

Hypothesis 1. Innovation inputs—training, collaboration, ICT investment, government financial support and private finance— positively affect innovation outputs, both technological and marketing innovation.

Of the firm characteristics, firm size is the most widely cited influencer of innovation because it reflects a firm's resources. Due to resource constraints, smaller firms are less likely to invest in innovation (OECD, 2019b; Rosenbusch et al., 2011). Firm age also influences innovation, although evidence on its effect is inconclusive (OECD & Eurostat, 2018). Some studies have shown that age is associated with experience, which enhances a firm's innovation capability (Arrow, 1962; Romer, 1986), whereas other studies have asserted that age can cause inertia, which prevents firms from making changes (Hannan & Freeman, 1984). A firm strategy that focuses on innovation is also crucial since it will encourage and support innovative ideas and devote resources for innovation (Wikhamn, Armbrecht, & Remneland-Wikhamn, 2018). An innovation focus provides SMEs with an effective response to overcome the liabilities associated with their small size (Rosenbusch et al., 2011). Home-based businesses comprise a large portion of the Australian business community, particularly among SMEs. In tourism, this type of business is popular in accommodation services such as bed and breakfasts, farm stays and, more recently, Airbnb. The latter is perceived as a disruptive innovation in tourism, which significantly affects the hotel market (Guttentag, 2015; Guttentag & Smith, 2017). Finally, SME exporters are known to have better access to foreign knowledge spillovers, worldwide information and international experience, leading to higher innovation capability (De Fuentes, Dutrenit, Santiago, & Gras, 2015; Love & Roper, 2015). Therefore, the following hypothesis is proposed:

Hypothesis 2. Firm characteristics—firm size, firm age, innovation focus, home-based business and exports—are likely to influence innovation outputs, both technological and marketing innovation.

The innovation process is also influenced by the external environment. As Martin-Rios and Ciobanu (2019) have posited, strong competition exists in tourism markets, as evidenced by the rapid emergence of new firms and market segments. This competition pressure is likely to stimulate tourism firms to innovate to maintain a competitive market edge (Blake et al., 2006; Pirnar, Bulut, & Eris, 2012). However, other evidence has suggested that the effects of competition could also be negative (Hashmi, 2013; Schumpeter, 1934) or non-linear (Im, Park, & Shon, 2015; Scherer, 1965). In addition to competition, tourism firms operate under uncertainty of demand and unpredictable macro-environmental conditions (Hall & Williams, 2019; Verreynne et al., 2019). While uncertainty presents a challenge to firm growth, it is also perceived to be a driving force behind innovation (Freel, 2005; Morrow, Sirmon, Hitt, & Holcomb, 2007). To react to uncertainty, tourism SMEs innovate to reduce barriers to growth and support firm performance (Verreynne et al., 2019). Due to differences in knowledge base and technology levels across tourism industries, the industry in which a firm operates might also affect its innovation performance (Martin-Rios & Ciobanu, 2019). The available evidence forms the basis for the following hypothesis:

Hypothesis 3. External environment—market competition, demand uncertainty and industry—is likely to influence innovation outputs, both technological and marketing innovation.

2.3. Innovation and firm productivity in tourism

Schumpeter (1934) asserted that innovation is not simply a new idea or invention; rather, productivity increases when innovation is applied. For tourism SMEs, innovation is crucial to enhance their competitiveness, survival and productivity (Hall & Williams, 2019; Sundbo, Orfila-Sintes, & Sørensen, 2007; Torrent-Sellens, Ficapal-Cusí, Boada-Grau, & Vigil-Colet, 2016). Empirical studies on innovation and productivity have extensively focused on manufacturing, while academic research on services has been gathering momentum over the last decade (Hall & Williams, 2019). Much evidence suggests a positive effect of innovation on firm productivity (De Fuentes et al., 2015; García-Pozo, Marchante-Mera, & Campos-Soria, 2018; Hall, Lotti, & Mairesse, 2009). In

relation to tourism, not only is research on innovation and firm productivity scarce (Hall & Williams, 2019; Romão & Nijkamp, 2019), but the limited available evidence presents inconclusive or mixed results (Hall & Williams, 2019).

In their study of the UK accommodation and attractions sectors, Blake et al. (2006) showed that innovation is one of the key drivers of firm productivity. A study by Smeral (2007) on Austrian tourism revealed physical capital and firm size as the major determinants of productivity growth, rather than innovation. Little research is available regarding the relationship between innovation and firm productivity in tourism SMEs. Of the limited evidence, two studies on tourism SMEs in Catalonia (Spain) produced conflicting results. Torrent-Sellens et al. (2016) indicated that innovation, internet use and new forms of work organisation are co-innovative sources of productivity; together, these factors explained 45.4% of the cumulative variance in perceived productivity. Díaz-Chao et al. (2016) demonstrated a negative effect of co-innovation (as represented by internet use and work teams) on labour productivity.

The limited availability of empirical research, in addition to the mixed findings, on the relationship between innovation and firm productivity in tourism SMEs suggests that further research is required in this area. Another significant issue is that the aforementioned tourism studies were based on cross-sectional data, which are unable to account for the time lag of innovation (Peters, Roberts, & Vuong, 2017). Moreover, since there is potential variation among firms (Morris, 2018), the estimation of the effect of innovation on productivity might not be accurate if unobserved firm heterogeneity is not accounted for (Morris, 2018; Rodriguez-Sanchez et al., 2019). Thus, longitudinal studies that go beyond the cross-sectional analysis of innovation and productivity in tourism are needed to provide more accurate insights into whether innovation can improve firm productivity for tourism SMEs. Since most studies in the broader innovation literature suggest a positive effect of innovation on productivity; the following hypothesis is proposed:

Hypothesis 4. Technological and marketing innovations positively affect tourism SME productivity.

3. Research method

3.1. Data source

The econometric analysis utilises data drawn from the Business Longitudinal Database Confidentialised Unit Record File. The key input to this database is based on the BCS, collected by the Australian Bureau of Statistics (ABS). The BCS gathers data related to the innovation activities of Australian SMEs (defined as employing fewer than 200 persons). This paper uses the latest compilation of this database, released in 2019, which provides firm-level data for the five years from 2011–2012 to 2015–2016.

In terms of industry classification, industries in the BCS are divided into 19 industry divisions based on the Australian and New Zealand Standard Industrial Classification (ANZSIC) (ABS, 2006). The Tourism Satellite Account (TRA, 2019) identifies four key tourism-related industries: (i) accommodation and food services, (ii) transport, (iii) retail trade and (iv) arts and recreation. However, under the ANZSIC, transport (both passenger and freight) is aggregated with two non–tourism related industries under one broad division: transport, postal and warehousing. We opted to exclude this division from the sample because analysis based on the aggregate division is likely to produce biased results, given that our study focuses only on innovation in tourism industries. Consequently, the three industry groups used for our empirical analysis are (i) Accommodation and Food Services, (ii) Arts and Recreation Services and (iii) Retail Trade, for a sample size of 400 SMEs.

3.2. Measures

3.2.1. First stage: Determinants of innovation

The measures for the dependent variables—innovation outputs—are similar to the widely adopted innovation measures developed by the Oslo Manual (2018; OECD & Eurostat, 2005). These are also in line with most empirical research on tourism innovation. Accordingly, technological innovation is measured by a binary variable that takes the value 1 if the firm introduced or implemented new or significantly improved products or processes in the last 12 months and 0 if they did not. Marketing innovation is measured by a binary variable that takes the value 1 if the firm implemented new or significantly improved marketing methods in the last 12 months and 0 if they did not. The independent variables are innovation inputs, including investments in training for staff, collaboration for innovation, investments in ICT, government financial support and private finance. These inputs are all measured by categorical variables. We control for the possible effect of firm characteristics (i.e., size, age, home-based business, exports and innovation focus) and external environment (i.e., market competition, demand uncertainty and industry) on innovation outcomes.

3.2.2. Second stage: Innovation and firm productivity

The BCS measures firm performance based on the firm's subjective assessment of their performance. In our study, the dependent variable is self-reported productivity, which is a binary variable that takes the value 1 if the firm reported that their productivity increased (compared to the previous year) and 0 if otherwise. Subjective measures of firm performance, using self-assessment by the firm's entrepreneur or owner, are commonly used in business research (Hallak, Assaker, & O'Connor, 2014; Runyan, Droge, & Swinney, 2008). Using such a measure allows researchers to obtain the necessary data related to a firm's performance without directly disclosing sensitive financial information. This measure has been proved to be reliable and effective in measuring firm performance (Droge, Jayaram, & Vickery, 2004; Wall et al., 2004) and has been employed in several empirical studies in the tourism and hospitality industry (see e.g., Hallak et al., 2014; Kim & Shim, 2018; Torrent-Sellens et al., 2016; Verreynne et al., 2019).

As highlighted in the literature, innovation is proposed to be one of the key drivers of productivity. The dependent variables—innovation outputs (i.e., technological innovation and marketing innovation)—in the first stage enter the second stage as independent variables for productivity performance. As Blake et al. (2006) and Smeral (2007) have postulated, physical capital plays a vital role in boosting productivity in tourism. Therefore, we include capital and non-capital investments as control variables to account for their potential effects on the firm productivity of tourism SMEs. Finally, we include two other variables—firm size and industry—to control for the differences in size categories and tourism industries.

An extract of the questionnaire, variable definitions and descriptive statistics of the sample used for this study are provided in the Appendix.

3.3. Data analysis

The CDM model, developed by Crépon, Duguet and Mairesse (Crépon, Duguet, & Mairessec, 1998), is acknowledged widely as 'the workhorse in the empirical literature on innovation and productivity' (Lööf, Mairesse, & Mohnen, 2017, p. 1–2). Given the aims of our study, we employed a modified version of the CDM model that focuses on the two main stages of the innovation process: (i) innovation outputs and its determinants and (ii) innovation outputs and productivity. Due to the binary nature of the outcome variables and the panel structure of the data, random-effect probit regressions were employed to estimate (i) the probability that a tourism SME reported a form of innovation output and (ii) the probability that a tourism SME reported increased productivity. The general form of the model is presented below.

3.3.1. First stage

For panel, $i = 1, \ldots, N$ indicating the individual firms and $t = 1, \ldots, 5$ indicating the time periods (the financial year from 2011–2012 to 2015–2016), the random-effects probit regression of the innovation output on its determinants is written as below:

$$y^{*}_{1i(t-1)} = \gamma_1 x_{1i(t-1)} + \gamma_2 z_{1i(t-1)} + \epsilon_{1i(t-1)} + u_{1i} \quad (1a)$$

$$y_{1i(t-1)} = \begin{cases} 1 \; if \; y^{*}_{1i(t-1)} > 0 \\ 0 \; else \end{cases} \quad (1b)$$

where $y_{1i(t-1)}^{*}$ is an unobserved latent variable, $y_{1i(t-1)}$ is the observed binary dependent variable (i.e., a form of innovation output: technological innovation or marketing innovation), $x_{1i(t-1)}$ is a vector of explanatory variables (i.e., innovation inputs: training, collaboration, ICT investment, government financial support and private finance), $z_{1i(t-1)}$ is a vector of control variables (e.g., firm size, firm age, home-based business, exports, innovation focus, competition, demand uncertainty and industry group), γ_1 and γ_2 are corresponding unknown parameters, $\epsilon_{1i(t-1)}$ is the observation-level error term and u_{1i} is the random effect.

3.3.2. Second stage

The random-effects probit regression of firm productivity on innovation outputs is specified as follows:

$$y^{*}_{2it} = \beta_1 y_{1i(t-1)} + \beta_2 z_{2it} + \epsilon_{2it} + u_{2i} \quad (2a)$$

$$y_{2it} = \begin{cases} 1 \; if \; y^{*}_{2it} > 0 \\ 0 \; else \end{cases} \quad (2b)$$

where y_{2it}^{*} is an unobserved latent variable, y_{2it} is an observed dependent variable (firm productivity), $y_{1i(t-1)}$is a vector of innovation outputs (i.e., technological innovation and marketing innovation, from the first stage), z_{2it} is a vector of control variables (i.e., capital investment, non-capital investment, firm size and industry group), β_1 and β_2 are corresponding unknown parameters, ϵ_{2it} is the observation-level error term and u_{2i} is the random effect.

Simultaneous estimation was employed to estimate the model. Accordingly, the two innovation output equations (i.e., technological innovation and marketing innovation) and the productivity equation were estimated simultaneously as one system using the maximum likelihood estimation method, as employed by Wooldridge (2010) and White (1996). The simultaneous equation estimation is able to handle the potential source of endogeneity in the innovation-productivity relationship and derive consistent estimators (Hashi & Stojčić, 2013).

4. Results and discussion

The estimation results of the random-effect probit regression model are presented in the following tables. Table 1 shows the determinants of technological and marketing innovation, and Table 2 shows the impact of innovations on firm productivity.

As shown in Table 1, the significance and impact of factors vary across the two types of innovation. Of the innovation inputs, collaboration for innovation is the most significant determinant for both types of innovation outputs, as evidenced by the largest marginal effects. The results provide evidence that tourism SMEs who engaged in

Table 2
The impact of innovation outputs on firm productivity.

Explanatory variables	Dependent variable: Firm productivity		
	Coefficient	SE	Marginal effects
Technological innovation	1.061***	0.374	0.273
Marketing innovation	1.053***	0.371	0.283
Capital investment	–0.004	0.045	–0.001
Non-capital investment	0.013***	0.005	0.003
Firm size (ref: 1 to 4 employees)			
5 to 19 employees	–0.122	0.152	–0.025
20 to 199 employees	0.235	0.149	0.053
Industry (ref: Retail Trade)			
Accommodation & Food Services	0.122	0.149	0.020
Art & Recreation Services	0.083	0.159	0.016
Observations	1240		
Prob > chi-squared	0.000***		

Note: ***, ** and *: statistically significant at 1%, 5%, and 10%, respectively.

Table 1
Determinants of innovation outputs.

Explanatory variables	Dependent variables					
	Technological innovation			Marketing innovation		
	Coefficient	SE	Marginal effect	Coefficient	SE	Marginal effect
Training	0.371**	0.150	0.069	0.375**	0.147	0.057
Collaboration	0.784***	0.153	0.236	0.645***	0.146	0.183
ICT investment	0.542***	0.119	0.154	0.561***	0.118	0.145
Government finance	0.277*	0.148	0.093	0.178	0.146	0.059
Private finance	0.319**	0.129	0.091	0.240*	0.130	0.079
Firm size (ref: 1 to 4 employees)						
5 to 19 employees	–0.039	0.153	–0.006	0.076	0.153	0.012
20 to 199 employees	–0.180	0.158	–0.043	0.081	0.156	0.011
Firm age	–0.017**	0.008	–0.005	–0.024***	0.009	–0.006
Home-based business	–0.296*	0.172	–0.083	–0.418**	0.180	–0.123
Exports	0.065	0.207	0.044	0.108	0.199	0.035
Innovation focus	0.568***	0.096	0.151	0.492***	0.100	0.129
Competition (ref: No competition)						
1 or 2 competitors	0.146	0.240	0.051	0.210	0.265	0.046
3 or 4 competitors	0.223	0.238	0.060	0.532**	0.256	0.126
5 or more competitors	0.225	0.218	0.068	0.524**	0.238	0.114
Demand uncertainty	–0.091	0.126	–0.023	0.372***	0.121	0.087
Industry (ref: Retail Trade)						
Accommodation & Food Services	–0.199	0.143	–0.059	0.038	0.143	0.015
Art & Recreation Services	–0.326**	0.148	–0.080	0.268*	0.145	0.071
Observations	1240			1240		
rho	0.336***			0.310***		
Prob > chi-squared	0.000***			0.000***		

Note: ***, **, and *: statistically significant at 1%, 5%, and 10%, respectively

collaboration are more likely to report technological and marketing innovation by 23.6% and 18.3%, respectively. This result is in line with the literature, which supports the importance of networks for the development and implementation of innovation for tourism SMEs (Carlsen, Liburd, & Edwards, 2010; Divisekera & Nguyen, 2018). Collaboration allows resource-constrained tourism firms to access knowledge and resources of collaborative partners (Gokovali & Avci, 2012) and facilitates co-creation of new tourism products and marketing initiatives (Hall & Williams, 2019). Further, this seems to reflect the multifaceted nature of the tourism industry, where interactions and collaboration with stakeholders such as suppliers, intermediaries, or competitors (e.g., destination-wide marketing campaigns) and customers (Hall & Williams, 2019; Romero & Tejada, 2020) are vital for innovation to be successfully developed and implemented. Despite its crucial role, there remains a low level of collaboration among tourism firms and between firms and other stakeholders in the tourism value chain (Divisekera & Nguyen, 2018; Novelli, Schmitz, & Spencer, 2006). Generally, Australian SMEs performed poorly in almost all aspects of collaboration, compared to SMEs in other OECD countries (Australian Government, 2017). In tourism, just over 10% of Australian SMEs collaborated for innovation purposes (ABS, 2019b).

The second most significant determinant is ICT investment—tourism SMEs that invested in ICT are 15.4% and 14.5% more likely to implement technological and marketing innovation, respectively. Our findings are supported by the recent literature in tourism. As Buhalis et al. (2019) highlighted, ICT is revolutionising the development of technological innovation in tourism. It not only enables the creation of new tourism products, but also enhances the efficiency of service processes and customer-to-customer processes that determine the tourists' experience. In addition, ICTs provide new ways to access information, reduce operation and communication costs, and encourage marketing initiatives (Hall & Williams, 2019). Numerous ICT applications, using social media platforms, have enabled tourism firms to communicate effectively with their customers worldwide and provided a variety of marketing channels for promoting tourism products and services (Hays et al., 2013; Law et al., 2014). Our finding, therefore, validates the crucial role of ICT in facilitating and driving innovation in various areas in tourism SMEs. However, as the OECD (2019a) have asserted, SMEs are lagging behind in digital evolution and ICT usage. This may be due to the small size of tourism firms, the cost barriers of ICT adoption that face SMEs and a lack of understanding of ICT-related opportunities by SME owners (Giotopoulos et al., 2017). Low levels of digital intensity have also been observed by Grundke, Marcolin, and Squicciarini (2018) in the accommodations and food services industry. This is particularly problematic in Australia because many tourism firms operate in regional and remote regions where ICT infrastructure is insufficient (OECD & Eurostat, 2018).

Regarding financing, private finance is significant for technological innovation and moderately significant for marketing innovation. Tourism SMEs that obtained private finance were 9.1% and 7.9% more likely to report technological and marketing innovation, respectively. Government finance was moderately significant for technological innovation, with a marginal effect of 9.3%. As prior studies indicate, tourism SMEs typically face substantial financial difficulties such as insufficient internal funds, lack of access to financing and disadvantage in terms of credit history (Motta & Sharma, 2020; Serrasqueiro & Nunes, 2014). Our findings highlight the significance of financial support for tourism SMEs in developing and implementing innovation. The varying effects of finance types on innovation support Martínez-Román et al. (2015), while the demonstrated slight effect of government finance on SME tourism innovation is in line with Guisado-González et al. (2012).

Investment in staff training is significant for both technological and marketing innovation—tourism SMEs that increased investment in staff training were 6.9% and 5.7% more likely to implement technological and marketing innovation, respectively. Skill shortage is a major challenge faced by many tourism SMEs. The model results indicate that upskilling staff is highly relevant to innovation in tourism SMEs. Training is an effective way to enhance a firm's human capital. Investments in training upgrade employees with new technological capabilities and improve or adjust their knowledge, skills and abilities to meet organisational needs (Martínez-Ros & Orfila-Sintes, 2012; Nieves & Quintana, 2018). A high level of human capital contributes to the success of innovation in tourism (Dwyer, Edwards, Mistilis, Roman, & Scott, 2009; Ottenbacher et al., 2006). However, most tourism firms tend to focus on recruitment to cope with the skills shortage rather than on improving internal capacity through training and retention (Asia-Pacific Economic Cooperation [APEC], 2017). The quality of tourism and hospitality training programs is also of concern to many tourism businesses in Australia (Committee for Economic Development of Australia [CEDA], 2017).

Regarding the control variables, the effects of firm age and home-based business are statistically and negatively significant for innovation outputs of tourism SMEs. The results indicate that the longer a tourism SME has been operating, the less likely it is to introduce or implement innovation. These results support the view that younger tourism firms are more innovative than their older counterparts (Hall & Williams, 2019). Home-based tourism SMEs are less likely to implement both technological and marketing innovation. A firm strategy that focuses primarily on innovation is significantly and positively associated with innovation outputs. Firms with such strategies in place will support innovative ideas, prioritise new development and devote resources strategically for innovation. Our results, in the case of Australian tourism SMEs, are supportive of Wikhamn et al. (2018)'s study in Swedish hotels. No significant differences in terms of innovation performance among tourism SMEs were identified across size categories or between Australian tourism exporters and non-exporters.

For factors related to the external environment, the results show that the effect of competition and demand uncertainty are statistically and positively significant for marketing innovation. This implies that strong competition in the market and high demand uncertainty stimulate tourism SMEs to implement more innovative marketing initiatives. Given that there have been competing perspectives on the role of competition to innovation in tourism (Hall & Williams, 2019), our study contributes to the literature by providing empirical evidence that competition drives marketing innovation in tourism SMEs. This finding is particularly consistent with Weidenfeld, Williams, and Butler (2014) who also found that competition among tourist attractions was a driver of marketing innovation in UK tourism. The significant impact of uncertainty is supported by Verreynne et al. (2019). Accordingly, tourism SMEs introduce innovation to boost customer demand for their tourism products and services, overcome barriers related to uncertainties and remain ahead of their competitors. Significant differences in terms of innovation performance are found across tourism industries. Tourism SMEs in the arts and recreation industry, in particular, are less likely to introduce technological innovation but more likely to implement marketing innovation than those in the retail trade industry.

Estimates of the effect of innovation outputs on firm productivity are presented in Table 2. The results reveal a significant and positive impact of technological and marketing innovation on the productivity of Australian tourism SMEs. As the marginal effects indicate, the implementation of technological innovation is associated with 27.3 percentage points that the tourism SME will be more likely to report productivity increases as compared with the previous year. Tourism SMEs that implemented marketing innovation also show a significantly higher probability of reporting increased productivity (by 28.3%). Based on these statistically significant results, we are able to confirm hypothesis 4 that innovation outputs, both technological and marketing, have a positive effect on the productivity of tourism SMEs.

The contribution of the two innovation types on productivity improvement can be explained through its impact on the firms' output and input. The introduction of technological innovations is likely to boost firm performance, while reducing input costs due to

improvements in operation efficiency, waste reduction, and energy savings (Hjalager, 2010). On the other hand, marketing innovation drives customer and product demand, which contributes to improved market performance for tourism firms (Nieves & Diaz-Meneses, 2016). Thus, marketing innovation can also increase productivity by means of output growth. Given the scarcity of empirical research on innovation and productivity in the tourism industry (Hall & Williams, 2019) and that previous innovation studies were mainly based on cross-sectional data (Verreynne et al., 2019), the findings from this study using five-year panel dataset therefore make an important contribution to the tourism literature. Finally, in relation to the control variables, investments in non-capital assets are positively associated with increased productivity for tourism SMEs. We found no evidence of differences across size categories and tourism sub-industries in terms of their reported productivity performance.

5. Conclusions

Tourism productivity has been persistently low in most developed and emerging market economies (Hall & Williams, 2019). Of the potential solutions, innovation has often been proposed as a means to boost productivity levels. In the context of the Australian tourism sector, the current study provides empirical evidence regarding innovation and productivity in tourism SMEs. Our findings constitute a vital contribution to the tourism literature in three ways. First, the role of productivity as a key indicator of firm performance has been generally neglected in previous tourism research. Empirical studies on the relationship between innovation and productivity are scarce and their results are somewhat mixed (Hall & Williams, 2019). In addition, little empirical research has examined the effect of innovation on firm productivity, particularly in the tourism SME context. Second, to the best of the authors' knowledge, no study has analysed the two stages of the innovation process—innovation and its determinants and innovation and firm productivity—in tourism simultaneously. Third, most studies on innovation are based on cross-sectional data. Not only are longitudinal studies on tourism innovation rare (Hall & Williams, 2019; Verreynne et al., 2019), but very few studies cover a period longer than two years. In this study, we used a longitudinal database that covers the innovation activities of Australian tourism SMEs over five years. The use of longitudinal data represents an advance in analysing the innovation–productivity relationship in tourism.

We found that both technological innovation and marketing innovation have a significant and positive effect on the firm productivity of tourism SMEs. Further, marketing innovation showed a slightly more substantial impact on productivity in comparison with technological innovation. Thus, our results highlight the significance of marketing innovation as a contributor to productivity improvement in the tourism sector. This is an important contribution to the literature given that most available studies on tourism productivity focus mainly on technological innovation, overlooking the role of marketing innovation.

This research also makes practical contributions by shedding light on various factors that drive innovation in tourism SMEs. The findings reveal that collaboration, training, investment in ICT, and private finance positively influence both types of innovation outputs; further, government financial support had a moderately positive effect on technological innovation. The results of this study have important policy implications. Our results suggest that future policy directives should consider a package of policies to jointly promote collaboration, ICT, training and access to finance.

The results showed that collaboration strongly contributed to both technological and marketing innovation. It is asserted that many human-made and cultural attractions are not the domain of any single organisation but instead rely on a range of stakeholders. Collaboration is therefore crucial to achieve the overall success of innovation in tourism. However, despite its vital nature, Australian business collaboration in general ranks among the lowest in the OECD. The rate of collaboration for innovation among tourism SMEs is relatively low. Therefore, policy should extend innovation collaboration programs among tourism SMEs. Specifically, government, destination and tourism industry bodies must be proactive in facilitating networking and collaboration and enhancing the degree of mutual trust and knowledge-sharing among tourism firms, stakeholders in the tourism value chain and research institutions to achieve improved innovation outcomes.

Staff training was found to contribute significantly to both technological and marketing innovation. Thus, as Australian tourism SMEs face continued severe skill shortages, public policy should offer opportunities for employees in tourism to upskill and obtain further education. In part, the joint policy promotion should focus on closer alignment between the tourism industry and training and education providers to develop targeted training and education programs that provide skills-based and on-the-job experience for the tourism workforce. Such programs must be tailored to meet industry needs and to be accessible for tourism SMEs, who often encounter human resource disadvantages.

The role of ICT as a major driver of innovation has been increasingly recognised in the recent tourism literature. Findings from the current study reinforce the significance of ICT investment for both technological and marketing innovation. Given this evidence, policies are required to overcome many of the issues faced by tourism SMEs, such as cost barriers, lack of ICT skills and insufficient ICT infrastructure, particularly in regional and remote areas where most of tourism firms operate. There is an important need to improve ICT infrastructure, encourage more ICT investments, increase SMEs' awareness of ICT opportunities and leverage the cost barriers in adjusting to and adopting new technologies for tourism SMEs. Further, ICT skills training is necessary to upgrade the ICT management capacities of SMEs so that they can effectively foster value creation derived from the application of ICTs.

Finally, given the significance of private finance for innovation and that tourism SMEs are often characterised as those with limited financial resources, there may exist a need for favourable interest rates and credits for innovative tourism SMEs or start-ups with high growth potential, when applying for private finance for investment in innovation. In Australia, a relatively low percentage of tourism firms received government financial assistance for innovation activities (ABS, 2018). Just over 10% of Australian tourism SMEs received government financial assistance for innovation over the surveyed period. The tepid results for government funding for tourism SME innovation suggest that existing policies should be reviewed and evaluated regarding the efficacy of the funding programs.

Overall, this study makes a significant contribution to knowledge; however, it is not without limitations. First, the chosen modelling strategy is governed by data availability. For example, data on one key input to innovation, namely R&D expenditure, is not available in the BCS survey. Nonetheless, this limitation may not unduly impact our findings as most SMEs and tourism firms do not invest in R&D activities (Hervas-Oliver, Albors Garrigos, & Gil-Pechuan, 2011; Toivonen & Tuominen, 2009). Second, most of the variables used for the analysis are categorical or binary; therefore, interpretations of and inferences from the results should be treated with caution. Where data are available, future research could analyse and compare innovation processes across tourism sub-industries. This would provide further insights into the behaviour, drivers and economic effects of SME innovation in each tourism sub-industry. In this way, innovation policies targeting SMEs could be tailored to fit specific industry needs. Further, future studies of the innovation–productivity relationship could adopt other measures of productivity, such as labour productivity and multifactor productivity, to provide further insights into the effects of various types of innovation on different measures of tourism productivity.

Credit author statement

Van K. Nguyen: Conceptualisation, Literature Review, Methodology, Analysis, Writing – Original draft preparation.

Riccardo Natoli: Writing – Reviewing and Editing, Supervision.
Sarath Divisekera: Writing – Editing, Supervision.

Declaration of Competing Interest

None.

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Appendix A

Table A1
Variable definitions.

Variables	Definitions
Technological innovation	Binary variable, 1 = reported product or process innovation, 0 = otherwise
Marketing innovation	Binary variable, 1 = reported marketing innovation, 0 = otherwise
Productivity	Binary variable, 1 = productivity increased, 0 = otherwise
Training for employees	Binary variable, 1= increased structured or formal training for employees, 0 = otherwise
Collaboration	Binary variable, 1 = engaged in collaboration for innovation purposes, 0 = no collaboration
ICT investment	Binary variable, 1= increased ICT expenditure, 0 = otherwise
Government financial support	Binary variable, 1 = received financial assistance from Australian government, 0 = otherwise
Private finance	Binary variable, 1 = obtained debt or equity finance for innovation, 0 = otherwise
Firm size	Number of employees: 1 = 1–4 employees, 2 = 5–19 employees, 3 = 20–199 employees
Firm age	Years of operation under current ownership
Home-based	Binary variable, 1 = home-based business, 0 = non-home based business
Export status	Binary variable, 1 = exporter, 0 = non-exporter
Innovation focus	Binary variable, 1 = major focus on innovation, 0 = otherwise
Competition	Degree of competition: 0 = no competition, 1 = 1–2 competitors, 2 = 3–4 competitors, 3 = 5 or more competitors
Uncertainty	Binary variable, 1 = Uncertain demand, 0 = otherwise
Industry	Industry group, 1 = Retail trade, 2 = Accommodation and Food services, 3 = Arts and Recreation services
Capital investment	Amount (in million AUD) of capital expenditure
Non-capital investment	Amount (in million AUD) of non-capital expenditure

Table A2
Descriptive statistics of tourism SMEs in Australia.

Variables	
Innovation inputs	
Increased staff training (%)	11.36
Joined collaboration for innovation (%)	10.55
Increased ICT investment	19.52
Received government financial support (%)	10.68
Obtained debt/equity finance (%)	13.78
Firm characteristics	
Firm size (%)	
1 to 4 employees	38.25
5 to 19 employees	32.00
20 to 199 employees	29.75
Firm age (mean)	10.49
Home-based business (%)	14.05
Exporters (%)	7.58
Major focus on innovation (%)	49.83
External environment	
Degree of competition	
No competition	6.67
1 or 2 competitors	14.36
3 or 4 competitors	16.88
5 or more competitors	62.08
Experienced demand uncertainty (%)	15.51
Tourism-related industries (%)	
Retail Trade	32.50
Accommodation & Food Services	35.25
Art & Recreation Services	32.25
Innovation outputs	
Introduced technological innovation (product and/or process innovation) in the last 12 months (%)	36.18
Implemented marketing innovation in the last 12 months (%)	29.95
Firm productivity	
Experienced productivity increases as compared to the previous year (%)	19.94

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tmp.2021.100804.

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