Will air transport or tourism affect urban property prices? The case of regional cities in New Zealand

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Abstract

Tourism is one of the most important economic activities in New Zealand and tourists commonly travel by air, given that New Zealand is an isolated country. This paper explicitly models the inter-relationships among air transport, tourism and property prices in the regional cities of New Zealand. We investigated this inter-relationships by constructing a three-stage least squares (3SLS) structural model using a balanced monthly panel dataset of New Zealand's six smaller regions/cities from January 2008 to December 2014. Our empirical results showed that tourism activity raised airline seat capacity scheduled at an airport. This indicated that airlines did plan their seat capacity according to tourism activities within a region. However, adjusting the airline seat capacity of an airport alone had no significant effect on the tourism demand of the regions. This implied that tourism does not react to exogenous changes in the supply of air travel in the sample. Interestingly, both airline seat capacity and tourism activity have no significant effect on the property prices of the regions. This may be a unique characteristic of regional cities in New Zealand.

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1. Introduction

The aim of this paper is to identify the significance of air transport (airline seat capacity) and tourism activity and their effects upon the property prices of New Zealand's regional cities/centres. A substantial body of recent literature has investigated the close relationship between international air transport activities or aviation policy and tourism of a country or city (e.g. Bieger & Wittmer, 2006; Page & Connell, 2014; Warnock-Smith & O'Connell, 2011; Zhang, 2015). In the context of New Zealand, the air transport–tourism linkage has also been well investigated and many researchers have found the existence of strong causality between the two variables, as it is a geographically isolated country, and the majority of inbound and outbound tourists travel via air transport to and from New Zealand for different purposes (Balli & Tsui, 2015; Duval, 2013; Duval & Schiff, 2011). Given the flow of international and domestic tourists, it is not surprising to see that New Zealand's tourism sector is one of the key sources for local economic development. The situation is supported by figures from Statistics New Zealand, indicating that the total international and domestic tourism expenditure was approximately NZ$10,040 and NZ$17,002 million in 2014, and increased to NZ$11,758 and NZ$18,080 million in 2015 (Statistics New Zealand, 2015a). The tourism sector also generated 4.9% of New Zealand's gross domestic product (GDP) by March 2015 (Tourism New Zealand, 2015). In addition, approximately 11.9% and 12.1% of New Zealand's population was directly and indirectly employed by the tourism industry during 2014 and 2015, respectively (Statistics New Zealand, 2015b). In light of this tourism development, New Zealand's international and domestic tourism expenditure confirms the tourism–led growth hypothesis suggested by the empirical studies that the positive contribution of tourism towards local, regional and national economies due to its significant role as a source of foreign exchange earnings, creation of employment opportunities, income generation and other tourism-related activities (e.g. Balli & Tsui, 2015; Brida, Cortes-Jimenez & Pulina, 2013; Ertugrul & Mangir, 2015; Paci & Marrocu, 2014).

It is well recognized that tourism-related activities positively affect housing or property prices directly or indirectly (Biagi et al., 2012, 2015; Cooper & Morpeth, 1998). The external demand of tourists competing with regional/local communities for land use has a direct effect on property values. The positive contribution of tourism-related activities to regional/local economies also generates an indirect effect on property prices. Aviation activities may also have impacts on property prices. The presence of airports and their related infrastructure make a positive contribution to their regional/local economies (Bilotkach, 2015; Cidell, 2014; Green, 2007). However, those living close to an airport may be negatively affected by its noise pollution and externalities, which lower the area's housing values (Chalermpong, 2010; Cohen & Coughlin, 2008; 2009; Matos et al., 2013). Nevertheless, studies that have attempted to quantify the overall effects of air transport (airline seat capacity) and tourism activity on the property prices on a regional basis are limited. The main contribution of our paper is to empirically investigate the impacts of airline seat capacity and tourism activity on the property prices of New Zealand's regional cities/centres.

A substantial body of prior literature has focused on analyses of the relationships between air transport and tourism (Balli & Tsui, 2015; Duval, 2013; Duval & Schiff, 2011), as well as between tourism and the property prices of major cities (Biagi et al., 2012, 2015; Cooper & Morpeth, 1998). Few researches have studied their inter-relationships at the regional level and therefore, this paper makes use of a balanced panel dataset with a total of 504 observations of the six regional airports/centres in New Zealand (i.e. Dunedin/Otago, Invercargill/Southland, Napier/Hawke's Bay, New Plymouth/Taranaki, Queenstown/Central Otago Lakes and Whangarei/Northland), and uses the three-stage least squares (3SLS) estimation procedure to simultaneously examine the significance of air transport activities and tourism activity on the property prices of New Zealand's six regions/centres. Most importantly, the main contribution of our study to the literature is that it is one of the first empirical studies to shed light on this unique linkage focusing on the regional cities, but not the major cities, which have well-developed and well-connected international airports to facilitate air transport movement (air passengers and air cargo traffic), tourist flows (domestic and international) and trade volumes. This study allows for a more robust understanding and measurement of the impact of air accessibility and tourism activity on New Zealand regional centres' property markets. The findings suggest that airline seat capacity and tourism activity are not the effective indicators of property prices and do not have a significant influence on the property prices of New Zealand's regional cities/centres.

The structure of this paper is as follows. Section 2 describes the empirical model used to investigate the inter-relationships among airline seat capacity, tourism activity and property prices. Section 3 provides an overview of airline seat capacity and the number of guest nights for New Zealand's six regions/cities and their respective property prices, and presents the dataset for analysis. Section 4 presents the empirical findings of the study. Section 5 offers a discussion of the findings and policy implications, and Section 6 concludes the study.

2. Empirical models

When modelling the dynamics and inter-relationships of air travel, tourism and property prices, inferring causality can be a difficult exercise due to the inherent problem of endogeneity. It is well documented that the relationship between tourism and air travel is endogenously determined (Bieger & Wittmer, 2006; Eugenio-Martin, 2003; Prideaux, 2000), as access to air travel facilitates tourism, whereas strong tourism demand and growth encourage airlines to lobby for greater flight frequency. Moreover, both air travel and tourism are likely to stimulate the development of the local economy – a characteristic of which is property prices (Brueckner, 2003; Shiller 2007). However, a well-developed city (often associated with rising property prices) is more likely to attract more tourists and increase air travel demand (Law, 1992; Prideaux, 2000). As such, the presence of endogeneity is prevalent across these key variables.

This paper is the first study to simultaneously model these complex inter-relationships. It is often difficult to find valid external instruments to overcome the endogeneity problem during the modelling process, as noted by Hausman and Taylor (1981). An external instrument must be correlated with the endogenously determined regressor of interest and uncorrelated with the error terms in the model. Simultaneously modelling air travel, tourism and property prices is thus a formidable task. Recent studies have employed internal instruments that are inherent in the dataset in order to facilitate econometric modelling (Arrelano & Bond, 1991; Arrelano & Bover, 1995). These studies have been successfully applied in the contexts of economic growth (Khadraoui & Smida, 2012), corporate performance (Schultz, Tan & Walsh, 2010) and tourism economics (Garín-Muñoz, 2009). One methodology that incorporates internal instruments is the 3SLS model, which uses existing variables in the dataset as instruments (Zellner & Theil, 1962). The 3SLS model has been applied to economic growth (Li & Liu, 2005), air travel (Lu & Peeta, 2009) and tourism (Chen & Soo, 2007) while overcoming the inherent problem of endogenously determined regressors of interest.

The 3SLS model combines the characteristics of the two-stage least squares (2SLS) model and the seemingly unrelated regression (SUR) specifications. It is a system of equations that instrument the dependent variables by using the regressors as instrumental variables and estimates the regressions of interest simultaneously. First, the use of instrumental variables overcomes the biases caused by any potential endogeneity issues present in the dataset. Second, the simultaneous estimation of the system of regressions correctly accounts for any cross-correlation in errors that may be presented across the individual regression equations (Zellner & Theil, 1962). This is likely to be the case in this study, as air transport, tourism and property prices are inextricably linked and are likely to be influenced by similar macroeconomic factors. In such a scenario, estimating the regressions jointly in a 3SLS framework will result in greater efficiency than estimating the three regressions separately using the ordinary least square (OLS) or 2SLS specifications.

The 3SLS specification is shown as follows:

$$Y_1 = \beta_{10} + \beta_{11}\hat{Y}_2 + \beta_{12}X_1 + \ldots + \beta_{1k}X_{k-1} + \varepsilon_1 \tag{1}$$

$$Y_2 = \beta_{20} + \beta_{21}\hat{Y}_1 + \beta_{22}Z_1 + \ldots + \beta_{2q}Z_{q-1} + \varepsilon_2 \tag{2}$$

$$Y_3 = \beta_{30} + \beta_{31}\hat{Y}_1 + \beta_{32}\hat{Y}_2 + \beta_{33}C_1 + \ldots + \beta_{3w}C_{w-2} + \varepsilon_3 \tag{3}$$

where Y_i is the dependent variable in regression (*i*),

$\hat{Y}_i$ is the predicted value of Y_i based on the first-stage regressions,

X_k is the k^{th} control variable in regression (1),

Z_q is the q^{th} control variable in regression (2),

C_w is the w^{th} control variable in regression (3) and

ε_i is the error term in regression (*i*).

The first-stage regressions used to estimate $\hat{Y}_i$ are as follows:

$$Y_1 = \alpha_{10} + \alpha_{11}X_1 + ... + \alpha_{1k-1}X_{k-1} + \nu_1 \quad (4)$$

$$Y_2 = \alpha_{20} + \alpha_{21}Z_1 + ... + \alpha_{2q-1}Z_{q-1} + \nu_2 \quad (5)$$

The instruments for Y_1 and Y_2 are the control variables in Equations (1) and (2), respectively. Note that Y_i has been exogenised by Equations (4) and (5), and thus its regression coefficients in the system of equations can be interpreted as causal. On the other hand, the control variables in Equations (1) to (3) have not been exogenised, and thus their coefficients estimates must be interpreted with caution.

3. Data sources and descriptive analysis

- *Data sources*

The panel dataset of six airport and regions in New Zealand from January 2008 to December 2014 was obtained from various sources (see Table 1). Data for the total available seat kilometres (ASK), the total guest nights, and the average property prices of the sampled regions were collected from the Official Airline Guide (OAG), Statistics New Zealand and Real Estate Institute of New Zealand (REINZ). In order to investigate the inter-relationships among airline seat capacity, tourism activity and property prices in New Zealand's six secondary (smaller) regions, we collected and included other relevant explanatory (control) variables for the estimation process.

The selection of the unique explanatory variables for each equation is important. For the case of the total ASK (the proxy for airline seat capacity), we must consider the primary variables that drive airline demand (e.g. the tourism demand of a destination, the income level of the country, the regional population, the characteristics of a region, exogenous shocks, regional effects and seasonal fluctuations). For the case of the total guest nights (the proxy for tourism activity), we need to consider the factors that may affect and stimulate tourism demand and activity (e.g. airline seat capacity scheduled for an airport in a region,[6] the cost of living and eating at a destination, the cost of travel, supply of hotel room capacity, the characteristics of a region, the exchange rate between the local and overseas currency, exogenous shocks, regional effects and seasonal fluctuations). For the case of property prices, we must consider the factors that may affect its variation (e.g. airline seat capacity, tourism activity and demand, the income level of the country, the characteristics of a region, other socio-economic

[6] There is only one commercial airport per city across New Zealand.

factors (the regional population, number of migration, supply of new houses within a region and mortgage rates), exogenous shocks, regional effects and seasonal fluctuations).

Data on the GDP per capita of New Zealand and the regional population size of each region were collected from Statistics New Zealand. These metrics will capture the income levels of New Zealand's population and the population size of each region for air travel demand, vacations and property prices. To grasp the effect of the costs of living, eating and travel experienced by domestic and international tourists who stay in and visit the sampled regions, two sets of regional tourism indicators (RTIs) (accommodation, food and beverages, and transport) were sourced from the Ministry of Business Innovation & Development. [7]

In addition, we measured the impact of the supply of hotel room capacity on the total guest nights of each region in this study; as expected, an adequate supply of hotel rooms (capacity for accommodation) may be one of the key attributes explaining the tourism demand of a destination. The data for this variable were sourced from Statistics New Zealand. Moreover, we also used the exchange rate between the New Zealand currency (New Zealand dollars) and US dollars to account for the substitution effect between overseas vacations and domestic holidays among the New Zealand's population, and the exchange rate was taken from the Reserve Bank of New Zealand. To capture other factors (socio-economic factors) that may affect the property prices of the sampled regions, we sourced the data on net migration and the number of new houses that have been built in each region, as well as the effective mortgage rates for housing lending from Statistics New Zealand and the Reserve Bank of New Zealand, respectively.

As shown in Table 1, we have created three dummy variables (tourist centre, the global financial crisis and the Christchurch earthquakes) to capture their impacts on the demand for airline seat capacity, tourism activity and the property prices of the sample regions in this study. These three dummy variables take the value of 1 when their characteristics are present and 0 otherwise. We also created seasonal and regional dummy variables to capture the fluctuations in seasonal patterns of airline seat capacity, tourism activity and demand, and property prices in New Zealand's six regions/cities.

- *Descriptive statistics*

The descriptive statistics for all variables of interest are shown in Table 2. Three dependent variables ln(*Total ASK*)$_{it}$, ln(*Total guest nights*)$_{it}$ and ln(*Property prices*)$_{it}$ denote the total ASK scheduled by airlines, the total guest nights and the average property prices of region i at time t. The variables ln(*National GDP per capita*)$_{t}$ (Athanasopoulos & Hyndman, 2008; Fraser & McAlevey, 2015; Garín-Muñoz, 2009), ln(*Regional population*)$_{it}$ (Jeanty, Partridge & Irwin, 2010; Levine, 1999; Reichert, 1990; Stillman & Maré, 2008), ln(*RTI-Accommodation*, *Food & Beverage*, *Transport-Dom*)$_{it}$ and ln(*RTI-Accommodation*, *Food &*

[7] The RTI measures the change in the level of expenditure by both international and domestic travellers in New Zealand regions (the website of Ministry of Business, Innovation & Employment).

Beverage, *Transport-Intl*$)_{it}$ for domestic and international tourists (Cracolici & Nijkamp, 2009; Divisekera, 2003; Eugenio-Martin, 2003; Lim, 1999; Narayan, 2004; Prideaux, 2000), ln(*Total hotel capacity*$)_{it}$ (Borooah, 1999; Knutson, 1988; Lockyer, 2005; Tsai et al., 2006), *Exchange rate*$_t$ (Lim, Min & McAleer, 2008; Schiff & Becken, 2011; Song & Li, 2008), *Effective mortgage rate*$_t$ (Fraser & McAlevey, 2015; Janet Ge, 2009; Leung, Shi & Tang, 2013), *Net migration*$_{it}$ (Coleman & Landon-Lane, 2007; Fry, 2014; Leung, Shi & Tang, 2013; Stillman & Maré, 2008), *Number of new houses built*$_{it}$ (Janet Ge, 2009) are used as the explanatory variables in the 3SLS regression model, together with three dummy variables of *Tourist centre*$_t$, *Global financial crisis*$_t$, and *Christchurch earthquakes*$_t$ as well as *regional dummies* and *seasonal dummies* to capture the inter-relationships among airline seat capacity, tourism activity and property prices in New Zealand's six regions/cities (Fraser & McAlevey, 2015; Leung, Shi & Tang, 2013; Lim & McAleer, 2008; Tsui, Gilbey & Balli, 2014; Yeoman et al., 2012). It should be noted that different sets of explanatory variables are employed for each regression model in the 3SLS framework (see Section 2 - Equations 1, 2 and 3). Detailed explanations of all the variables of interest are shown in Table 1.

The descriptive statistics are presented in Table 2. The average monthly total ASK is over 18.5 million with high variability (standard deviation of 22 million ASK). This is probably due to the heterogeneity of air travel demand across the sampled regions and the significant seasonality in air travel. Similarly, the total guest nights have an average of 97,183 nights per month and a substantial degree of variation (standard deviation of over 73,000 nights per month). The average property prices of the sampled regions exhibits relatively less variability and are valued at NZ$287,924. All three variables of interest are positively skewed as they are truncated at zero. Many of the remaining variables display high levels of variation, such as hotel capacity, due to the cross-sectional heterogeneity of the dataset and the high seasonal component in the time series.

For the estimation of the panel data 3SLS regression model, all the variables of interest need to be stationary in order to avoid the problem with spurious correlation (e.g. Alba & Papell, 2007; Aizenman & Jinjarak, 2009; Balli, Balli & Louis, 2016; Leung, Shi & Tang, 2013). Therefore, the panel unit root tests are performed to test the stationarity of all the variables being investigated in this study. Table 3 indicates that only four variables ln(*Property prices*$)_{it}$, ln(*RTI-Transport-Dom*$)_{it}$, ln(*RTI-Transport-Intl*$)_{it}$ and *Number of new houses built*$_{it}$ are stationary. Therefore, first-order differencing was applied to the remainder of the variables to render them stationary.

4. Empirical findings

Table 4 contains the estimation results of the panel data 3SLS model used to investigate the (simultaneous) inter-relationships among air transport, tourism activity and the property prices of New Zealand's six regions. The R^2 values show that all the models have strong explanatory power for identifying the major determinants affecting air transport demand, tourist activity and the property prices of the sampled regions. Observations of the key estimation results are discussed below.

In Model (1), the 12-period lagged value of the total scheduled airline seat capacity $\ln(totalASK)_{it-12}$ for a region is positively, statistically significant and marginally correlated to the current period of the total airline seat capacity for the sampled regions. This implies that flight schedules in the current period or season are related to the planning and market conditions in the corresponding prior scheduling season, as airlines typically plan and revise their flight schedules twice a year (i.e. the summer and the winter schedules) (Chin, Hooper & Oum, 1999). The significant positive coefficient estimate suggests that a 1% increase in total guest nights for a region will lead to a 0.05% increase in the total scheduled airline seat capacity for that particular region. Note that causality can be inferred for this regressor, as it has been instrumented in the system of equations. In addition, the statistically significant and positive national economic variable $\ln(GDP\ per\ capita)_t$ indicates that it is positively related to the air transport demand of the sampled regions. This finding supports the prior literature (e.g. Athanasopoulos & Hyndman, 2008; Garín-Muñoz, 2009; Seddighi & Shearing, 1997; Tsui et al., 2014), claiming that growth in the income level of a country or city will increase air travel demand.

In Model (2), the coefficient estimate of one-period lagged value of the total guest nights $\ln(totalguestnight)_{it-1}$ of the sampled regions is reported to be statistically significant and negative. This finding is contrast to our expectation and the prior literature regarding the dynamic relationship between tourism demand and repeat visits to a tourism destination (Balli, Balli & Louis, 2016; Garín-Muñoz & Montero-Martín, 2007; Santana-Jiménez & Hernández, 2011). $\ln(totalguestnight)_{it-1}$ has not been instrumented, so the effect we observed is a marginal correlation, not causation. This unexpected result could be the result of a spurious correlation rather than causation. The coefficients of regional tourism prices and the expenditure indicators (or indices) $\ln(dpriceacom)_{it}$ and $\ln(dpricefood)_{it}$ for domestic tourists, together with the two indicators $\ln(intlpricefood)_{it}$ and $\ln(intltranscost)_{it}$ for international tourists visiting and staying at the sampled regions, are reported to have statistically significant and positive signs. Again, as these regressors have not been instrumented, we must interpret their signs as marginal correlations rather than causation. For example, there may be unobservable festival events that happened in the regions (for which the variation is not captured by the seasonal dummies). These unobservable events may simultaneously increase tourism demand and the costs of accommodation and food. As expected, all the seasonal dummies in this model show their significance of monthly seasonality's effect on the tourism demand of the sample regions, which also indicates that New Zealand's tourism sector displays strong seasonal patterns and that the seasonality phenomenon is pronounced (Lim & McAleer, 2008). All other variables are found to have no significant impact on the tourism demand of the sampled regions in this study.

In Model (3), the dependent variable $\ln(propertyprice)_{it+1}$ is the one-month forward value of the property prices of the sampled regions in this study. The significant positive coefficient estimate of the current period of property prices $\ln(propertyprice)_{it}$ suggests that the current period of property prices (or the relative lagged strength) of the sampled regions are positively marginally correlated to the changes in their future property prices. This effect is often termed as the "momentum effect" in the property literature (Beracha & Skiba, 2011; Leung, Shi & Tang, 2013; Oikarinen & Engblom, 2015). The significant positive coefficient of regional population size $\ln(\textit{regionalpop})_{it}$ reported in this study is consistent with standard economic theory and underscores the importance of population change and property prices, as the population growth of a region or city (a demographic factor) puts direct pressure on housing demand and services (Jeanty, Partridge & Irwin, 2010; Levine, 1999; Reichert, 1990). It also provides clear evidence that changes in the population of the sampled regions are positively associated with an increase in their respective property prices, as a larger population may result in more demand for dwellings and houses in the regions. It should be noted that the population size for all the sampled regions experienced different rates of growth during the study period, ranging between 2.12% and 13.33% growth (Statistics New Zealand, 2015c).[8] Interestingly, the coefficient estimate of the number of new houses built $\textit{Housebuilt}_{it}$ is positively correlated with the property prices of the sampled regions. This may be because the supply of new dwellings and houses in the sampled regions cannot satisfy their respective market demand in the short run.

In addition, the statistically significant and positive national economic variable of effective mortgage rates $\textit{Emr}_t$ implies that the effective mortgage rates for housing lending was positively correlated to property prices in this study, and this finding is consistent with the study of Leung, Shi and Tang (2013) regarding the positive impact of the interest rate on changes in housing prices in Australia and New Zealand. One of the possible reasons for this positive correlation is that the housing supply is quite inelastic in the short run, despite an increase in the effective mortgage rates for home loans (the cost of home ownership relative to other consumption items), and property prices would thus also increase. In terms of the impact of being a tourist centre $\textit{Touristcentre}_t$ (or the destination characteristics associated with a region), a significant positive correlation with property prices was found in this study, which reflects that if a particular region is characterised as a popular destination for tourists and holidaymakers, it will also likely be associated with an increase in property prices. This is perhaps caused by a higher percentage of holidaymakers and leisure travellers who are more willing to visit and stay in the region, which, in turn, also improves and creates employment relating to the tourism-related sector (e.g. hotels and motels, restaurants, touring and scenic services, outdoor sports and entertainment). Note that this study considers Queenstown to be the only tourist centre among the sampled regions. In terms of seasonality, the coefficients of seasonal dummies (April, May, June, August, and September) are reported to be statistically significant and negative, which indicate that the property prices of the sampled regions are generally lower during these months in comparison with the base month of January. This could be due to the normal seasonal drop in demand during the colder seasons (autumn and winter); often, home buying is often postponed to the spring and summer periods.

[8] The growth rate of the population size for the sampled regions for the period of 2008–2014: Dunedin/Otago, 2.12%; Invercargill/Southland, 3.14%; Napier/Hawke's Bay, 4.04%; New Plymouth/Taranaki, 6.05%; Queenstown/Central Otago Lakes, 13.33%; Whangarei/Northland, 6.27%.

5. Discussion and policy implications

Despite the fact that the role of air transport on tourism growth and *vice versa* has been widely investigated in the current tourism literature, their effects on regional property prices have been understudied. In this study, regional tourism was found to have a positive linkage with regional air transport development in New Zealand, but the growth in air transport activities for a region did not positively stimulate its tourism growth. This empirical finding may be unique to the smaller (secondary) regions/cities of New Zealand considered in this study. This situation shows that tourism growth led to air transport growth in New Zealand's smaller regions/cities or supported the statement that "tourism is a driving factor for and, in some cases, a stimulator a change in air transport" (Bieger & Wittmer, 2006, p.40). In addition, from an airline strategic planning and operational perspective, if airlines recognise an increase in tourism activity and demand for a particular destination, in the commercial sense, additional airline seats and/or frequent flights will be planned and scheduled to capture and satisfy the increasing air travel demand of that destination. Contrariwise, it is common to see that having more airline seats for a region may not translate to an increasing number of tourists to visit that region, as tourist numbers will also depend on the competitiveness and attraction of a destination and other factors.

Surprisingly, the future property prices of New Zealand's smaller regions/cities were not influenced by air transport and tourism activity, but were affected by other socio-economic factors (e.g. its current property prices, the regional population size, the status of a region, mortgage rates and the supply of new houses). Our empirical findings may be unique to the smaller regional cities of New Zealand, as they are unlikely to be facing supply constraints. As such, any economic growth fostered by tourism and air travel (Prideaux, 2000; Brueckner, 2003) is unlikely to face binding capacity in the property market and push up the prices in our sample. These phenomena suggest that even local/regional government policies to encourage and develop inbound tourism and air travel (air accessibility) will not destabilise and disrupt their local property markets. Three key reasons that have contributed to Queenstown's property market growth are tourism growth, residential construction and increased investor confidence (Colliers International, 2015).

6. Concluding remarks

The aim of this study was to empirically investigate the inter-relationships among air transport (airline seat capacity), tourism activity (total guest nights) and property prices for New Zealand's six smaller airports/regions (i.e. Dunedin/Otago, Invercargill/Southland, Napier/Hawke's Bay, New Plymouth/Taranaki, Queenstown/Central Otago Lakes and Whangarei/Northland) using the 3SLS regression model for the period of January 2008–December 2014. First, the empirical results revealed that tourism activity increased airline seat capacity scheduled for an airport, and the current period of airline seat capacity was significantly related to the corresponding prior season's planning and schedules, *ceteris paribus*. Second, airline seat capacity for an airport did not stimulate tourism demand for the sampled regions. Third, both airline seat capacity and tourism activity have no significant impact on the property prices of New Zealand's smaller regions/cities but future property prices are marginally correlated to the current period of property prices for the regions, the status of a region as a tourist centre, the effective mortgage rates, the number of new houses built in the region and the regional population size. Note that the result of the casualty from tourism activity to airline seat capacity (or airline travel demand) is consistent with the prior literature.

The key findings of this study have significant implications for strategic planning and decision-making by policy makers (e.g. tourism authorities and operators, as well as airline management) regarding how to devise the best strategies and/or approaches to attract more domestic and international tourists and holidaymakers to visit and stay at the smaller regions or cities in New Zealand. One of the viable options is the formation of strong partnership between tourism operators and airlines to advertise and promote a destination cost-effectively. However, Air New Zealand's dominance in New Zealand's domestic aviation market and the sampled regions is believed to lead to higher airfares, which affects domestic tourist numbers travelled by air. It should be noted that the recent rapid growth of the low-cost carrier (LCC), Jetstar, in New Zealand may increase tourism demand, particularly those visiting friends and families, and leisure travellers, both of whom may be price-sensitive (Dresner, 2006; Lawton & Solomko, 2005; Pulina & Cortés-Jiménez, 2010; Whyte & Prideaux, 2007). During the study period, Jetstar only offered low-cost budget air travel to Dunedin and Queenstown airports during the study period.[9]

In addition, the findings of air transport and tourism activity have had little or no impact on property prices in New Zealand's smaller regions/cities, suggesting that investment and development in airline capacity and tourism marketing is unlikely to result in excessive growth in their property prices. This may be the result of having sufficient capacity for development without straining the local markets. In contrast, larger cities and the well-developed and connected airports (e.g. Auckland, Canterbury/Christchurch and Wellington) that are densely populated and act as the central nodes facilitate air transport movements, and their respective property prices are indeed sensitive to increasing tourism flows and air transport activities, as being a more popular destination with high demand for domestic and international tourism and trade volumes is likely to increase property prices.

Finally, considering the likely impact of the LCC's service on New Zealand's tourism, this study implies that there is a need to further investigate and estimate the role of LCCs on New Zealand's regional tourism demand and growth. Therefore, market share analysis and price competition analysis between the incumbent airline (Air New Zealand) and LCC (Jetstar) will provide interesting insights into this important issue for New Zealand's tourism and aviation sectors if airfare data are available. In addition, one potential limitation of our study was observed: the data of ASK in this study is a variable that measures the scheduled airline seat capacity for an airport or a region/city, but not the actual passenger numbers or tourist numbers (leisure and business tourists) transported by airlines to and from a region.

[9] Jetstar commenced low-cost scheduled domestic services to Dunedin in July 2011.

Therefore, the variable of ASK may have limited the robustness of the finding of the impact of airline seat capacity upon the tourism demand of a region, as it does not capture the exact number of tourist arrivals by air to a region, a variable that is believed to closely linked to the variable of total guest nights in this study. As an extension of this study, it may be worthwhile to use the information of revenue passenger kilometres (RPK) (when available), which may show a positive linkage between air transport development (the actual number of tourist arrivals by air to a region) and tourism demand in New Zealand's smaller regions/cities.

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Table 1.Variable definition and source (January 2008–December 2014)

Time series and variables	Definition	Source
ln(*Total available seat kilometres*)$_{it}$	The logarithm of total available seat kilometres (ASK) scheduled by airlines of region *i* at time *t*.	Official Airline Guide (OAG)
ln(*Total guest nights*)$_{it}$	The logarithm of the number of guest nights (domestic and international) of region *i* at time *t*.	Statistic New Zealand
ln(*Property prices*)$_{it}$	The logarithm of average property prices of region *i* at time *t*	Real Estate Institute of New Zealand (REINZ)
ln(*National GDP per capita*)$_{t}$	The logarithm of gross domestic product (GDP) per capita of New Zealand at time *t*	Statistic New Zealand, author's own calculation
ln(*Regional population*)$_{it}$	The logarithm of the population size of region *i* at time *t*	Statistic New Zealand, author's own calculation
ln(*RTI-Accommodation-Dom*)$_{it}$	The logarithm of the regional tourism indicator of accommodation costs for domestic tourists of region *i* at time *t*	Ministry of Business, Innovation & Development
ln(*RTI-Food & Beverage-Dom*)$_{it}$	The logarithm of the regional tourism indicator of food and beverage costs for domestic tourists of region *i* at time *t*	Ministry of Business, Innovation & Development
ln(*RTI-Transport-Dom*)$_{it}$	The logarithm of the regional tourism indicator of transport costs for domestic tourists of region *i* at time *t*	Ministry of Business, Innovation & Development
ln(*RTI-Accommodation-Intl*)$_{it}$	The logarithm of the regional tourism indicator of accommodation costs for international tourists of region *i* at time *t*	Ministry of Business, Innovation & Development
ln(*RTI-Food & Beverage-Intl*)$_{it}$	The logarithm of the regional tourism indicator of food and beverage costs for international tourists of region *i* at time *t*	Ministry of Business, Innovation & Development
ln(*RTI-Transport-Intl*)$_{it}$	The logarithm of the regional tourism indicator of transport costs for international tourists of region *i* at time *t*	Ministry of Business, Innovation & Development
ln(*Total hotel capacity*)$_{it}$	The logarithm of the total hotel capacity (stay unit nights available) of region *i* at time *t*	Statistic New Zealand
Exchange rate$_{t}$	The exchange rate between the New Zealand and US dollars at time *t*	Reserve Bank of New Zealand
Effective mortgage rate$_{t}$	The effective mortgage rate of house lending at time *t*	Reserve Bank of New Zealand
Net migration$_{it}$	The net migration of region *i* at time *t*	Statistic New Zealand
Number of new houses built$_{it}$	The number of new houses (dwelling units and houses) to be built in region *i* at time *t*	Statistic New Zealand
Tourist centre$_{t}$	A binary variable that takes 1 for the region as the tourist centre and 0 otherwise	Author's own calculation
Global financial crisis$_{t}$	A binary variable that takes 1 for the period of the global financial crisis in 2008/09 and 0 otherwise	Author's own calculation
Christchurch earthquakes$_{t}$	A binary variable that takes 1 for the period of the Christchurch earthquakes between February 2011 and January 2012, and 0 otherwise	Author's own calculation
Regional dummies	The dummy variable for each region in the study	Author's own calculation
Seasonal dummies	The dummy variable for each month of the year	Author's own calculation

Table 2. Descriptive statistics for variables (January 2008–December 2014)

Time series and variables	Variables	Observations	Mean	Standard deviation	Maximum	Minimum	Skewness	Kurtosis
***Total available seat kilometres**$_{it}$*	$\ln(totalASK)_{it}$	504	18,543,183	21,973,103	1.29E+08	539,106	1.801	6.606
***Total guest nights**$_{it}$*	$\ln(totalguestnight)_{it}$	504	97,183	73,171.44	34,939	19,567	1.379	4.086
***Property prices**$_{it}$*	$\ln(propertyprice)_{it}$	504	287,924	81,228.70	565,000	165,000	1.010	3.485
***National GDP per capita**$_{t}$*	$\ln(GDP\ per\ capita)_{t}$	504	3916.50	1232.72	7005	2518	1.203	3.194
***Regional population**$_{it}$*	$\ln(regionalpop)_{it}$	504	117,240	38,780.37	166,959	43,431	-0.672	2.265
***RTI-Accommodation-Dom**$_{it}$*	$\ln(dpriceacom)_{it}$	504	96.47	24.44	200	41	0.680	4.333
***RTI-Food & Beverage-Dom**$_{it}$*	$\ln(dpricefood)_{it}$	504	110.02	24.72	211	66	1.111	4.871
***RTI-Transport-Dom**$_{it}$*	$\ln(dtranscost)_{it}$	504	83.15	25.80	171	26	0.585	3.064
***RTI-Accommodation-Intl**$_{it}$*	$\ln(intlpriceacom)_{it}$	504	107.72	55.30	259	20	0.372	2.253
***RTI-Food & Beverage-Intl**$_{it}$*	$\ln(intlpricefood)_{it}$	504	109.22	53.90	261	25	0.353	2.164
***RTI-Transport-Intl**$_{it}$*	$\ln(intltranscost)_{it}$	504	79.94	43.80	214	8	0.587	2.681
***Total hotel capacity**$_{it}$*	$\ln(totalhotelcap)_{it}$	504	192,372	120,152.90	433,132	79,800	0.852	2.074
***Exchange rate**$_{t}$*	$Exrate_{t}$	504	0.76	0.08	0.870	0.515	-1.232	3.941
***Effective mortgage rate**$_{t}$*	Emr_{t}	504	6.62	1.06	8.820	5.510	0.934	2.558
***Net migration**$_{it}$*	$Netmigr_{it}$	504	-12.89	58.87	215	-200	-0.286	3.714
***Number of new houses built**$_{it}$*	$Housebuilt_{it}$	504	71.71	36.10	274.000	8.000	1.004	5.122
***Tourist centre**$_{t}$*	$Touristcentre_{t}$	504	0.17	0.37	1.000	0.000	1.789	4.200
***Global financial crisis**$_{t}$*	GFC_{t}	504	0.29	0.45	1.000	0.000	0.949	1.900
***Christchurch earthquakes**$_{t}$*	$Earthquake_{t}$	504	0.14	0.35	1.000	0.000	2.041	5.167

Table 3. Panel unit root tests (January 2008–December 2014)

Time series and variables		Level (constant only)				First-order differencing			
		Levin, Lin & Chu	Im, Pesaran & Shin	ADF	PP	Levin, Lin & Chu	Im, Pesaran & Shin	ADF	PP
ln(*Total available seat kilometres*)$_{it}$	AIC	0.991	0.468	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	0.992	0.467	0.002**	0.000**	1.000	0.000**	0.000**	0.000**
ln(*Total guest nights*)$_{it}$	AIC	1.000	0.995	0.991	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	1.000	0.995	0.991	0.000**	1.000	0.000**	0.000**	0.000**
ln(*Property prices*)$_{it}$	AIC	0.000**	0.000**	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
ln(*National GDP per capita*)$_{t}$	AIC	1.000	1.000	1.000	0.915	0.154	0.004**	0.008**	0.000**
	SIC	1.000	1.000	1.000	0.915	0.000**	0.000**	0.000**	0.000**
ln(*Regional population*)$_{it}$	AIC	0.042**	0.998	0.982	0.837	0.015**	0.003**	0.011**	0.000**
	SIC	0.051	0.999	0.970	0.837	0.000**	0.000**	0.000**	0.000**
ln(*RTI-Accommodation-Dom*)$_{it}$	AIC	1.000	0.905	0.967	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	1.000	0.905	0.967	0.000**	1.000	0.000**	0.000**	0.000**
ln(*RTI-Food & Beverage-Dom*)$_{it}$	AIC	1.000	1.000	1.000	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	1.000	1.000	1.000	0.000**	1.000	0.000**	0.000**	0.000**
ln(*RTI-Transport-Dom*)$_{it}$	AIC	0.000**	0.000**	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**
ln(*RTI-Accommodation-Intl*)$_{it}$	AIC	1.000	1.000	0.999	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	1.000	0.153	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
ln(*RTI-Food & Beverage-Intl*)$_{it}$	AIC	1.000	1.000	1.000	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	1.000	0.000**	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
ln(*RTI-Transport-Intl*)$_{it}$	AIC	1.000	0.089	0.002**	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	1.000	0.000**	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
ln(*Total hotel capacity*)$_{it}$	AIC	1.000	0.955	0.919	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	1.000	0.053	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
Exchange rate$_{t}$	AIC	0.886	0.433	0.826	0.578	1.000	0.000**	0.000**	0.000**
	SIC	0.289	0.150	0.359	0.578	0.000**	0.000**	0.000**	0.000**
Effective mortgage rate$_{t}$	AIC	0.000**	0.057	0.166	0.600	0.297	0.001**	0.004**	0.002**
	SIC	0.000**	0.057	0.166	0.600	0.297	0.001**	0.004**	0.002**
Net migration$_{it}$	AIC	1.000	0.940	0.695	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	0.043**	0.000**	0.000**	0.000**	0.000	0.000**	0.000**	0.000**
Number of new houses built$_{it}$	AIC	0.000**	0.000**	0.000**	0.000**	1.000	0.000**	0.000**	0.000**
	SIC	0.000**	0.000**	0.000**	0.000**	0.124	0.000**	0.000**	0.000**

Remarks: The values indicate the *p*-values. The test is shown for the constant only. ** indicates the rejection of the null hypothesis (H_0) that the time series has a panel unit root. AIC denotes Akaike Information Criterion; SIC denotes Schwarz Information Criteria; ADF dentes Augmented Dicky–Fuller; PP denotes Phillips–Perron.

Table 4. Three-stage least squares (3SLS) estimation of the structural model

Dependent variables	**Model 1** ln(*totalASK*)$_{it}$		**Model 2** ln(*totalguestnight*)$_{it}$		**Model 3** ln(*propertyprice*)$_{it+1}$	
Explanatory variables	**Estimates**	**Standard deviation**	**Estimates**	**Standard deviation**	**Estimates**	**Standard deviation**
Constant	-0.171**	0.072	0.199*	0.110	11.055***	0.596
ln(*totalASK*)$_{it}$	-	-	-0.005	0.058	-0.036	0.027
ln(*totalASK*)$_{it-12}$	0.808***	0.032	-	-	-	-
ln(*totalguestnight*)$_{it}$	0.052*	0.029	-	-	-0.003	0.021
ln(*totalguestnight*)$_{it-1}$	-	-	-0.114***	0.030	-	-
ln(*propertyprice*)$_{it}$	-	-	-	-	0.123***	0.047
ln(*GDP per capita*)$_{t}$	1.511**	0.735	-0.297	0.967	0.617	0.543
ln(*regionalpop*)$_{it}$	-3.607	6.843	-	-	10.686**	4.994
GFC$_{t}$	0.001	0.01	-0.002	0.014	0.007	0.012
Earthquake$_{t}$	-0.001	0.01	-0.005	0.012	-0.01	0.007
Touristcentre$_{t}$	-0.003	0.014	0.002	0.016	0.313***	0.020
ln(*dpriceacom*)$_{it}$	-	-	0.359***	0.043	-	-
ln(*dpricefood*)$_{it}$	-	-	0.235***	0.044	-	-
ln(*dtranscost*)$_{it}$	0.030**	0.015	-0.033	0.021	-	-
ln(*intlpriceacom*)$_{it}$	-	-	0.031	0.032	-	-
ln(*intlpricefood*)$_{it}$	-	-	0.242***	0.033	-	-
ln(*intltranscost*)$_{it}$	-	-	0.027*	0.015	-	-
ln(*totalhotelcap*)$_{it}$	-	-	-0.126	0.220	-	-
Exrate$_{t}$	-	-	-0.074	0.259	-	-
Emr$_{t}$	-	-	-	-	0.167**	0.067
Netmigr$_{it}$	-	-	-	-	0.0001	0.0001
Housebuilt$_{it}$	-	-	-	-	0.0003***	0.0001
February	0.063**	0.027	-0.309***	0.037	-0.012	0.020
March	0.065***	0.023	-0.211***	0.044	-0.015	0.017
April	0.021	0.023	-0.166***	0.034	-0.028*	0.016
May	0.041	0.027	-0.288***	0.040	-0.036*	0.019
June	0.058**	0.023	-0.201***	0.040	-0.032*	0.017
July	0.074***	0.021	-0.105***	0.039	-0.018	0.016
August	0.044**	0.022	-0.194***	0.032	-0.046***	0.016
September	0.030	0.020	-0.120***	0.030	-0.028**	0.014
October	0.029	0.019	-0.127***	0.031	-0.009	0.014
November	0.038*	0.020	-0.143***	0.027	-0.022	0.014
December	0.045**	0.020	-0.110***	0.033	-0.023	0.014
Regional dummy(2)	0.005	0.013	-0.012	0.017	-0.074***	0.010
Regional dummy(3)	0.006	0.012	-0.004	0.017	-0.049***	0.010
Regional dummy(4)	-	-	-	-	-	-
Regional dummy(5)	-0.004	0.013	-0.003	0.016	-0.19	0.015
Regional dummy(6)	0.002	0.013	0.011	0.02	-0.384	0.025
R^2 values	0.775	-	0.867	-	0.964	-
Observations	420	-	420	-	420	-

Remarks: (1) *, ** and *** indicate that the explanatory variable is significant at the 0.10, 0.05 and 0.01 significance level, respectively. (2) Instrumental variables used: *totalASK*$_{-12}$, *totalguestnight*$_{-1}$, *propertyprice*, *GDP per capita*, *regionalpop*, *GFC*, *earthquake*, *touristcentre*, *dpriceacom*, *dpricefood*, *dtranscost*, *intlpriceacom*, *intlpricefood*, *intltranscost*, *totalhotelcap*, exrate, *emr*, *netmigr*, *housebuilt*, *February*, *March*, *April*, *May*, *June*, *July*, *August*, *September*, *October*, *November*, *December*, *regional dummy(2)*, *regional dummy(3)*, *regional dummy(4)*, *regional dummy(5)* and *regional dummy(6)*.