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The determinants of Chinese visitors to Australia: A dynamic demand analysis

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HIGHLIGHTS

- Chinese visitors are very price sensitive and have a high income elasticity.
- Chinese economic growth has been a main driver of inbound tourism demand.
- Overseas travelling has become a trend in China.

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ABSTRACT

Although China has progressively become an important inbound tourism market for Australia, its demand elasticities have been little studied to date. This study examines the determinants of Chinese visitors to Australia using a dynamic time-series estimator. Interesting findings include a high income elasticity as a source of the continuous doubledigit growth rates in Chinese arrivals that Australia has experienced over the past two decades, together with relatively high total trip price elasticities for both short run and long run. A trend of Chinese outbound to Australia is also identified. From a policy perspective, the results confirm that keeping a low cost of visiting Australia, both ground and travel costs, is a good strategy to secure greater numbers of Chinese tourists.

1. Introduction

The strong economic growth in China has raised the middle-income class of the country significantly and stimulated substantial growth in outbound tourism to many countries around the world, including Australia. The income effects on tourism demand from the middle-income class of China were well observed and documented in literature. Earlier, when Hong Kong was first granted Approved Destination Status, Chinese tourists were described as locusts who ravaged Hong Kong's economic landscape, leaving nothing behind (Liu & McKercher, 2014). To some extent, adverse impacts of price increases in the destinations on tourism demand from China did not seem to materialise.

As its economy has grown, tourism demand from China has impacted on most countries. China has become one of the key inbound markets for Australia and has played an increasingly important role in boosting the Australian tourism sector. The growth of this market still has much more to offer in the coming years, stemming from the pulse of the middle-income class amongst a large size of the Chinese population.

Despite its increasing importance for many destinations worldwide, very little is known about the sensitivity of Chinese demand for tourism to changes in key economic variables, except for destination Hong Kong (Li, Song, Cao, & Wu, 2013). The determinants of the Chinese market in other destinations have not been examined clearly and specifically.

It is imperative for Australia's policy makers and the Australian tourism industry to understand the determinants of Chinese

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tourists accurately in planning and policy development. In particular, the extent to which Chinese visitors are sensitive to price changes is a crucial factor informing tourism policies in Australia. If Chinese visitors are indeed price *inelastic*, policy makers could take advantage of this and set the price in favour of the Australian tourism industry. In contrast, if they are price sensitive, an increase in prices could result in a substantial loss of tourism revenue from Chinese tourists.

This paper fills an important gap in the literature to help formulate tourism policies to nurture the growing momentum of the Australian tourism industry. It provides timely information, and raises awareness, to better manage an important market. A dynamic demand analysis is undertaken to determine the important factors underpinning inbound tourism to Australia from China. The paper begins with a brief overview of important features of the Australian tourism industry together with a review of previous Australian studies on tourism demand. It then outlines the adopted approach, provides a description of the study methodology and data, and interpretation of the results. The paper concludes with a discussion of the importance of the findings for tourism stakeholders in Australia and elsewhere. Although set in the China-Australia context, the findings in this paper should be of interest and value to those directly involved with the marketing and management of Chinese tourists in many other countries.

2. A snapshot of the Australian tourism sector

For several decades, tourism has been a key industry contributing to the Australian economy through its export capacity. More recently, macro-economic conditions have been conducive for tourism growth, particularly the inbound sector, given the depreciation of the Australian dollar, the release of employment from the downturn of the mining boom, and the reduced demands for aeroplane seats by the fly-in fly-out (FIFO) workers associated with mining (Pham, Jago, Spurr, & Marshall, 2015). Tourism shares of gross domestic product (GDP) for both domestic and inbound tourism sectors peaked in 2000–01 (Fig. 1), and have settled at slightly lower levels at approximately 2.1 per cent and 0.8 per cent, respectively, over the last three years. However, it appears that the tourism sector has not been able to accelerate to its full extent to take advantage of the macro-conditions. In 2014–15, tourism contributed $47.5 billion to GDP, with $34.2 billion from the domestic tourism sector and $13.3 billion from the inbound sector (The Australian Bureau of Statistics, or ABS, 2016).

Of the inbound sector, latest data from Tourism Research Australia (TRA) for the past decade show China and India to be the two fastest growing markets (Table 1). Arrivals from both markets have sustained double-digit growth over an extended period. Chinese arrivals growth reached 22 per cent in 2014–15, slightly more than two percentage points above that of India (19.6 per cent). However, from a low base, in 2014–15 the Indian market share reached approximately three per cent of total inbound tourism expenditure, about the same level as that of Singapore, Malaysia, South Korea and Hong Kong (Table 2). The Indian market still has much potential in the years ahead, given the rapid development and large population of the Indian economy. For China, the expenditure share had expanded from 7 per cent in 2005–06 to 21 per cent in 2014–15, putting China at the top among all inbound markets in Australia, driving the Australian tourism industry on its trajectory toward the Tourism 2020 target (Tourism Australia, 2016).

Given the rapid increase of Chinese arrivals in Australia, one might have thought Australia would be one of the favourite destinations that Chinese tourists would go. Latest data from the United Nations World Tourism Organisation (UNWTO, 2016) in Table 3 show the mix of destinations that Chinese visitors have travelled. Australia was not among the top ten destinations of Chinese tourists in 2014. While it is not surprising to see countries in proximity to China such as Hong Kong, Macao, Korea, Thailand, Taiwan and Japan on top of the list, it is interesting to see countries including the United States of America, France and Russia ranking above Australia. This observation highlights a need for Australia to formulate tourism policies carefully in such a way to penetrate the Chinese market more effectively. Thus, it is crucial to understand the determinants of the Chinese tourist arrivals to Australia.

3. Determinants of tourism demand: an Australian focus

As summarised in Lim (1997), Crouch (1992), Song and Li (2008), and Peng, Song, Crouch, and Witt (2014), previous studies on modelling tourism demand and forecasting have typically been based upon fundamental economic theory capturing the effects of income, own-price, cross-price and occasionally some other specific factors included as dummy variables. The determinants reflect

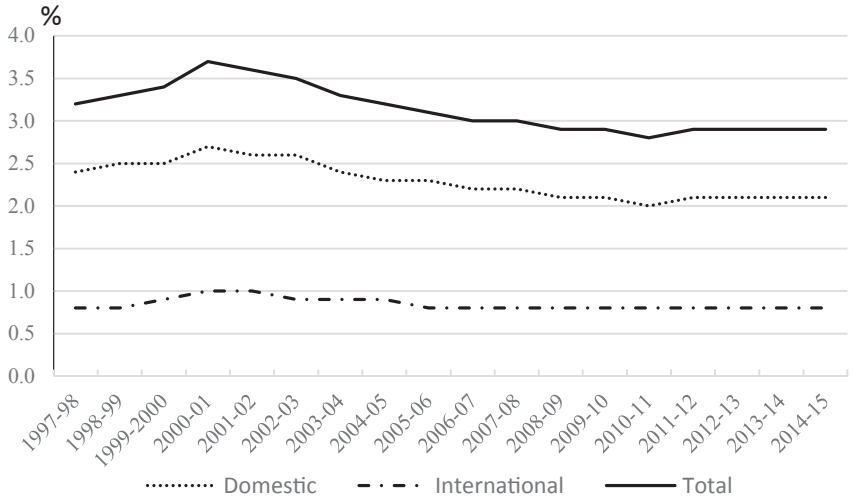

Fig. 1. Tourism shares in gross domestic product (per cent).
Source: The Australian Bureau of Statistics, Cat no. 5249.0, 2016

Table 1
Historical annual growth rates of arrivals of Australia's top ten international markets (per cent).

	New Zealand	China	UK	US	Singapore	Japan	Malaysia	South Korea	Hong Kong	India	Total
2005–06	0.4	6.2	2.2	1.1	−10.8	−4.2	−10.8	3.6	3.1	31.2	1.1
2006–07	2.1	15.4	4.0	0.6	2.0	−9.6	1.7	12.0	−4.2	10.0	2.7
2007–08	0.4	10.4	−6.2	−0.5	−0.5	−15.0	4.8	−12.7	−7.0	19.9	−0.6
2008–09	−1.5	−5.3	−3.8	−0.8	2.7	−22.8	18.3	−17.9	1.2	10.3	−1.9
2009–10	1.2	9.7	−1.0	7.8	5.1	−10.1	7.7	1.1	2.8	11.7	2.5
2010–11	5.7	28.1	−3.0	−4.9	8.5	0.1	12.6	5.3	11.0	12.8	3.8
2011–12	0.5	17.0	−5.5	−0.2	0.0	−5.4	0.2	−2.3	−1.6	6.0	1.1
2012–13	−0.1	18.0	1.8	6.4	15.2	−1.3	9.6	−3.9	9.6	8.4	4.9
2013–14	4.3	12.2	7.0	9.0	15.4	−2.5	25.1	0.2	16.7	15.0	8.1
2014–15	4.0	22.2	0.6	9.2	2.4	0.8	5.4	8.0	3.5	19.6	7.1

Source: Tourism Research Australia, July 2015

Table 2
Tourism expenditure shares of Australia's top ten international markets - (per cent).

	New Zealand	China	UK	US	Singapore	Japan	Malaysia	South Korea	Hong Kong	India
2005–06	9.0	6.9	16.0	10.7	3.1	11.7	2.6	5.5	2.6	1.4
2006–07	8.9	7.3	17.5	9.6	3.2	8.6	2.7	6.5	2.6	1.5
2007–08	8.8	8.4	15.2	9.6	3.5	7.0	3.1	5.3	2.4	2.2
2008–09	7.6	9.5	14.2	9.1	3.2	6.5	3.2	5.1	2.4	2.5
2009–10	8.0	11.2	13.2	8.5	3.5	5.6	3.6	4.9	2.6	2.8
2010–11	8.2	13.1	11.9	8.0	3.9	5.3	3.6	5.1	2.9	3.3
2011–12	8.4	14.1	11.0	8.5	3.8	5.4	3.6	5.2	2.7	2.6
2012–13	8.2	16.1	11.2	8.8	3.6	5.2	3.3	4.3	2.9	2.8
2013–14	7.8	17.5	11.8	8.7	3.6	4.5	3.4	3.6	3.1	2.5
2014–15	7.5	20.9	10.5	9.1	3.6	4.0	3.3	3.5	3.2	3.1

Source: Tourism Research Australia, July 2016

Table 3
Shares of destinations in total outbound trips of Chinese visitors.

	2010	2011	2012	2013	2014	2014 Ranking
	Per cent					
Australia	1.4	1.4	1.3	1.2	1.3	15
France	2.6	2.7	2.7	2.8	2.5	10
Germany	1.6	1.6	1.6	1.5	1.6	13
Hong Kong, China	35.9	34.8	32.0	30.1	29.2	1
Indonesia	1.4	1.5	1.5	1.4	1.3	14
Japan	4.3	2.7	3.0	2.3	3.7	6
Korea, Republic of	5.8	5.7	6.0	7.6	9.4	3
Macao, China	12.3	12.0	11.4	11.1	10.6	2
Malaysia	3.5	3.2	3.3	3.1	2.5	11
Myanmar	0.3	0.3	0.3	0.3	1.2	17
Russian Federation	2.3	2.2	2.1	1.9	1.7	12
Singapore	3.6	4.0	4.3	4.0	2.6	9
Spain	0.7	0.8	0.8	0.8	0.9	18
Switzerland	0.9	1.2	1.2	1.2	1.3	16
Taiwan Province of China	4.8	4.3	5.2	4.8	5.8	5
Thailand	3.5	4.4	5.9	8.1	7.1	4
United States of America	2.5	2.8	3.1	3.2	3.3	7
Viet Nam	2.8	3.6	3.0	3.4	3.0	8

Source: UNWTO, 2016

the interaction of drivers between the country of origin and the destination country. Thus, both sides of 'a trip' can have an influence on the number of arrivals at a destination.

From the country of origin – tourism generating region – income is predominantly applied in most of previous tourism demand studies; it is a fundamental concept of the economic demand theory. Income is often proxied by gross domestic product (GDP), personal (disposable) income or national income. Studies over the past three decades undertaken for many countries reveal that the purchasing power of individuals is an important influence on their decision to travel. An increase in real income provides consumers with greater spending power, resulting in the increased discretionary consumption of many types of products including tourism (Crouch, 1992; Peng et al., 2014).

At the destination country, depending on the study purposes, prices applied in previous studies range from a highly disaggregated commodity level (Divisekera, 2006; Wu, Li, & Song, 2010) to the national aggregate level (Lim & McAleer, 2001). Thus, the actual form of prices varies between studies. However, the lack of a tourism price index *per se* was, and still is, a real challenge in modelling tourism arrivals. Individual researchers have adopted various proxies as a result. The most common ones are price-adjusted exchange rates (i.e., real exchange rates), consumer price indexes of destinations and transportation costs. In some cases, CPI and exchange rates have been used in a comprehensive combination to derive own-price and competing prices (Song & Wong, 2003; Song, Wong, & Chon, 2003).

The use of CPI as a proxy for tourism prices is rather controversial. O'Hagan and Minnock (1983) argue against the practice, in contrast to the supporting findings in Morley (1994) that, since non-fare tourism prices and CPI are highly correlated, the CPI could be used as a proxy for a tourism price index. In such situations, interpretation of the estimated coefficient is problematic, as implicitly visitors were assumed to be in the country already regardless whether or not they could afford to pay for the airfares. For comparing with CPI, Morley (1994) derived tourism price indexes directly by combining the individual price indexes of goods that are associated with tourism consumption and the corresponding expenditure shares. This approach coincided with the Tourism Satellite Account (TSA) framework that was introduced by the UNWTO (2008, 2010). This approach has inspired and orientated our thinking in this paper.

An important observation here is that most studies have applied prices to reflect the cost of living for tourists at the destination (such as CPI or real exchange rate) to measure the *own-price* effects, with some also adding transportation costs (airfare) to measure the response from tourists when transportation costs change. While

this separate treatment of transportation cost may be appropriate in some situations (e.g., where countries of origin and destination are close together and particularly where transport substitution is possible (Martin & Witt, 1987)), it may not be practical for the case of Australia where airfare can determine whether or not a trip takes place. A *bundle* approach (i.e., total costs including airfare) to measuring price effects for travelling to Australia is probably more realistic (Divisekera, 1995), since high airfares that require a larger budget to come to Australia could deter some visitors, even though they are willing to pay for costs of living while in Australia. In that case, the non-airfare spending will never eventuate. Alternatively, cheaper airfares during promotion periods, or an introduction of new low-cost carriers, may not suffice to attract additional visitation expenditure in Australia if an expensive destination reduces "length of stay". In that case, the airfare spending will also not eventuate. What matters here is the required total budget for travelling, including the cost of travelling (airfares) and the cost of living (accommodation, food and drinks) that simultaneously make a trip affordable and worthwhile for visitors to travel.

Regarding inbound tourism demand to Australia, Kulendran (1996), Kulendran and King (1997), Lim and McAleer (2001), Divisekera (1995, 2003), Lim, McAleer, and Min (2009), examined the international short-term tourist flows to Australia from Japan, New Zealand, Singapore, the UK, and the US. Visitors from those countries of origin were found to be very responsive to changes in tourism prices in Australia and changes in their income, indicating that international tourism is a luxury product.

Seetaram (2010, 2012), and Seetaram and Dwyer (2009) used the dynamic panel data technique to model international arrivals to Australia from ten markets,[1] including China, over the period 1991 to 2007. Seetaram (2012) and Seetaram and Dwyer (2009) also estimated the relationship between immigration and induced inbound tourism demand. With the panel data, elasticities obtained from Seetaram (2010, 2012) take the form of the aggregate response of the inbound tourism sector across all ten markets. Given the fact Australia was granted Approved Destination Status in 1999, and China's economic growth has been much faster than any of those selected countries, using the aggregate income and price elasticities from a group of ten markets as a proxy for the Chinese market is very likely to under-estimate the response from Chinese visitors notwithstanding the fact that the aggregate elasticity estimates are valuable for the policy making process at the aggregate level.

To the best of our knowledge, to date there is no published study on tourism demand elasticities for Chinese visitors to Australia as a destination. This study will fill the gap by estimating those demand elasticities and determinants of Chinese tourists to Australia.

4. Methodology

Given the available time-series data and our interest in estimating the elasticities of Chinese visitors to Australia, we specify a dynamic demand relationship in Equation (1). The number of Chinese *arrivals* is chosen as the dependent variable. The independent variables include three main groups of variables: *income factor* (proxied by GDP per capita), *price factor* (proxied by the weighted price), and *other factors* representing changes in the operating environment of tourism as well as migration flows from China to Australia. These choices are broadly consistent with most other tourism demand studies over the past five decades as pointed out in Crouch (1992), Lim (1997), Seetaram and Dwyer (2009), Seetaram (2012), Dwyer, Seetaram, Forsyth, and King (2014), and Peng et al. (2014). All variables in Equation (1), except the dummy variables, are implemented in the annual growth form[2] to mitigate effects of possible heteroscedasticity. The advantage of using growth rates is that the marginal effects (i.e., coefficient parameters) can interpreted as elasticities, which is similar to the double-log form that has been commonly used in previous studies. As the same for the double log form, the elasticities derived from Equation (1) are not changing over time, they are the average elasticities over the whole study period.

$$Arrivals(t) = \beta_0 + \beta_1\, Arrivals(t-1) + \beta_2\, Income\ Factor(t) + \beta_3\, Price\ Factor(t) + \beta_4\, Other\ Factors(t) \quad (1)$$

With the lagged dependent variable incorporated in the model, we argue that Chinese visitors could either return to visit Australia after the first visit, the kind of *habit persistence* or stable behaviour patterns as applied in Martin and Witt (1987) and Song et al. (2003), or they could promote and convince their neighbours, friends and relatives to visit Australia after they return home from their trips. We explicitly emphasise the role of this factor as a determinant of tourism demand. If it is in the form of *word of mouth*, then this "advertising" should be taken seriously, as in a way it is free publicity. Furthermore, it is essential to know how Australia is perceived by Chinese visitors by the inclusion of this variable, which could be either positive or negative, depending on their experience while they are in Australia. From a technical point of view, the lagged dependent variable allows us to examine the effect in the short-run and the long-run explicitly.

This study adopted the real GDP per capita as an income measure to explain the movements of Chinese visitors. The bundle approach combines the costs of domestic and international travels in a weighted average sum to estimate the price index variable. In particular, we make a slight variation to Morley's approach to deriving tourism price index for Chinese visitors using the two tourism price indexes published by the Australian Bureau of Statistics (ABS), one for domestic and one for international travelling. Both contain price movements of airfares and accommodation. The domestic price index is dominated by a large accommodation share. It is what both domestic and foreign visitors face when travelling within Australia – the cost of living for tourists at the destination from the perspective of the Chinese visitors. The international price index is predominantly represented by the long-haul airfares for the Australian outbound. As the international competition will force airfares of all international carriers to move broadly in line with each other, the ABS' international price index would be the same with the price index that inbound foreign

[1] New Zealand, China, Germany, Hong Kong, the US, the UK, Korea, Singapore Malaysia and Japan.

[2] This is the percentage change from the previous year.

visitors to Australia would also have to face – the cost of travel to the destination (Martin & Witt, 1987; Witt & Witt, 1995). To combine both airfares and cost of living, the Australian tourism satellite account data for inbound tourism expenditure ABS (2016) indicate that the long distance transportation cost dominates, accounting for nearly 70 per cent the total. Using this ratio (7:3), a tourism price index for Chinese visitors was derived using 70 per cent of international price index (airfare) and 30 per cent of the domestic price index (cost of living). This approach is similar to that in Kulendran (1995), in which the ratio of 6:4 for transport to accommodation costs was applied for the Japanese visitors.

The reason for a low accommodation share in tourism expenditure for Chinese visitors is probably because the Chinese community in Australia now is much larger than the Japanese community of the 1990s; the free accommodation offered by families and friends could reduce the accommodation expenses for the Chinese visitors.

The chosen specification presented as Equation (1) does not include the bilateral exchange rate between China and Australia, as the exchange rate was found to be statistically insignificant during the model testing. The rationale for not using the exchange rate is that the Yuan has been heavily influenced by trade policies to promote exports from China, and is tightly controlled by the Chinese government. Analysis from FXCM Market Insights pointed out that the "*Yuan has not been made fully convertible*" (FXCM 2016). Furthermore, the practice of two rates, offshore (CNH) through the Bank of China in Hong Kong, and onshore (CNY) in the mainland (Desloires, 2015), helps to de-associate the link between exchange rate changes and outbound tourism by the Chinese.

In term of cross-price effects, we share the view of Crouch, Schultz, and Valerio (1992) that since Australia is rather distant from all other major destinations, price substitution or price complementary are not influential. In addition, the *consistency* of price indexes in the bundle approach across all possible countries is a real challenge. Thus, the inference of the estimates would not be very accurate if other destinations were to be incorporated as substitutes. Hence, Equation (1) does not include cross-price elasticity.

The group *Other Factors* includes migration flow from China and four dummy variables capturing events that happened during the study period 1991–2014 (24 observations), namely the breakout of the Severe Acute Respiratory Syndrome (SARS) in late 2002, shocks in the domestic travel supply caused by the Australian mining boom; the global financial crisis (GFC) 2008; and a trend in tourism demand for travel by the Chinese.

Chinese migration is expected to have positive effects on tourism via visiting friends and relatives (Dwyer, Pham, Jago, Bailey, & Marshall, 2016). Other mechanisms through which migration can affect tourism include: making the destination country more tourism attractive with diverse culture; business networks that connect the destination and an origin country, stimulating business travel (Seetaram & Dwyer, 2009).

When SARS broke out in Guangdong province of China in November 2002, it effectively reduced the number of travellers significantly across many countries, particularly for visitors from China. The event was modelled as an intercept change for 2003. It is expected that SARS has a negative effect on tourism (Dwyer, Forsyth and Spurr, 2006).

In 2005, the mining boom in Australia began to absorb a substantial amount of hotel rooms and air transport capacity to facilitate the needs of the FIFO mining workers (Dwyer et al., 2016; Pham et al., 2015). The FIFO activity imposed a severe constraint on the supply side of the Australian tourism sector, at least over the period from 2005 to 2007, during which aviation and accommodation services could not be expanded quickly to satisfy the demands from both mining and tourism industries. In this context, the supply constraint is incorporated as a dummy variable for the period 2005–2007. We expect that this variable has a negative sign due to the supply constraint for both transport and accommodation.

The Global Financial Crisis (GFC), starting in 2007, reduced household consumption and created a loss in *consumer confidence* across many countries. While the GFC effects still linger for many countries, its exact time span for China is not clear-cut, since the economy grew at 9 per cent in 2008, well above the economic growth rates of many other developed and developing countries. However, comparing the performance of the Chinese economy before and after the GFC, it is clear that the Chinese economy was building growth momentum, rising upward from 10 per cent in 2003 to 14 per in 2007, but from 2008, it has actually been trending downward from 9 per cent to just slightly above 6 per cent growth in recent years (The World Bank, 2016; IMF 2016). For this reason, the GFC dummy variable is adopted for the period from 2008 onwards. It is expected that the GFC has a negative effect on tourism via its affects to the budget constraint of travellers (Li, Blake, & Cooper, 2010).

Although the Chinese economy has slowed down, the strong long-run growth path of the economy throughout the period since 1991 has certainly changed consumer behaviour over the course of time. It is well documented in economic theory that, when growth is continuously strong over a long period, income increases become more permanent and consumer behaviour will move toward the purchase of more luxury goods. Tourism is generally perceived as a luxury consumption item (Crouch, 1992) and people might use it to state their social-economic status among friends and relatives. As such, in developing countries like China, demand for travel might be added to the household consumption bundle of the wealthier residents. That this trend is likely to apply to the Chinese population is justification for our assumption to include the *trend* variable. Because the trend reflects aspects of economic growth (i.e., increase travel budget) and technological progress (i.e., lower travel costs), we expect that the trend variable has a positive sign.

In summary, expected signs for the coefficients are as follows.

β_0: not specified
β_1: lagged effect (could be positive or negative, but more likely positive in this case)
β_2: positive (income elasticity)
β_3: negative (own-price elasticity)
β_4: negative for SARS, GFC and the mining boom; positive for *migration* and *trend*.

5. Data sources

(a) Chinese arrivals

Australian Bureau of Statistics, Overseas Arrivals and Departures (2016), Cat no. 3401.0, Table 5: Short-term Movement – Visitor Arrivals Selected Countries of Residence.

(b) Price Index

Australian Bureau of Statistics, Consumer Price Index – Tourism Research Australia (2016), Cat no. 6401.0.

(c) Migration flows from China

Australian Bureau of Statistics, Overseas Arrival and Departures (2016), Cat no. 3401.0; Table 12: Permanent Movement, Settlers – Country of Birth, Major Groups and Selected Source Countries.

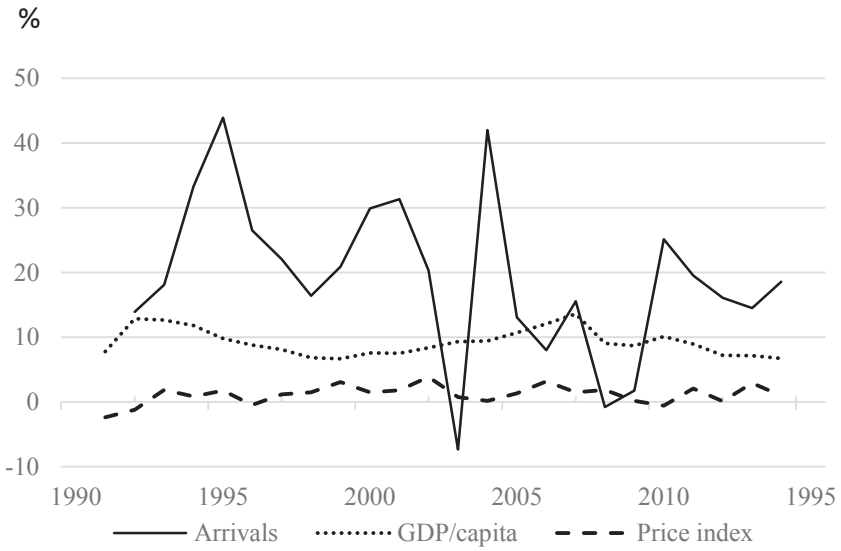

Fig. 2. Time series plot of main variables (1992–2014) – annual growth (per cent).
Source: derived from the ABS (2016) and The World Bank (2016)

(d) Macro-economic variables

The World Bank, World Development Indicators (2016).

All data in this study are presented in yearly percentage change format and cover the period of 1991–2014. Due to the yearly data format, we do not need to examine the nature of seasonality in the time series. However, this issue will be examined in the future if monthly or quarterly data sets become available.

6. Results and discussion

The time series plot of the main variables in the form of annual growth used in Equation (1) shows no abnormality in the trend and pattern (see Fig. 2). There is a sharp decline (by 7.3 per cent) of tourism arrivals at the outbreak of the SARS pandemic in 2003 while the global financial crisis only produced a minor fall of 0.8 per cent. However, the reductions in these two periods were followed by strong bounce-back corrections, resulting in an average annual growth rate of 19.3 per cent in the whole period, which is much faster than the average annual growth rate of GDP per capita (9.3 per cent) and price index (0.5 per cent).

To check for stationarity of main variables, we use the augmented Dickey-Fuller test with the null hypothesis that the series have a unit root. The test results rejected the null hypothesis for tourist arrivals (p-value = 0.001), lag of tourist arrival (p-value: 0.002), cost index (p-value = 0.000), and migration flows (p-value = 0.004) but failed to reject the null hypothesis for GDP per capita (p-value = 0.272). Despite one of the regressors having a unit root, we can still proceed with the analysis if all regressors are not cointegrated. The Johansen trace test for cointegration failed to reject the null hypothesis that the rank of the cointegration matrix is zero (test statistics: 63.55; critical value at 5%: 47.21). Thus, we are confident that these variables can be used to estimate the determinants of Chinese arrivals in Australia as specified in Equation (1). Because the lagged dependent variable is included, the error term in Equation (1) may have serial correlation.[3] To mitigate this issue, we firstly applied the Prais-Winsten regression to take into account possible heteroscedasticity and serial correlation in the error terms. The diagnosis tests show that the regression residuals meet the required criteria. In particular, the Durbin h test failed to reject the null hypothesis that the regression residuals do not have autocorrelation (p-value: 0.393) while the Portmanteau test failed to reject the null hypothesis that the residuals are white noise (p-value: 0.622). To check for the robustness of results, we then conducted the Cochrane-Orcutt regression, which is an alternative approach to control for serial autocorrelation in Equation (1). Although results from both techniques are similar, the Cochrane-Orcutt estimator is better for model selection criteria (i.e., Akaike Information Criterion – AIC, and Bayesian Information Criterion – BIC) are lower (see Table 4). Thus, it is a preferred model in this paper. We now focus on discussing results of the Cochrane-Orcutt estimator.

6.1. Lagged dependent variable

Overall, all coefficients in Table 4 have the expected signs. The results confirm a lag effect of the arrivals from the previous year – every one percentage point increase in the number of arrivals in a year is associated with about 0.30 percentage points increase in arrivals in the following year. The positive sign for the lagged dependent variable indicates that Chinese visitors have a positive perception of Australia as a tourist destination. The result is strongly consistent with TRA's unpublished data for the period from 2010/11 to 2014/15 which show approximately 50 per cent of Chinese arrivals are repeat visitors (data provided to authors). While the lagged variable indicates an immediate effect between two consecutive years, the historical data simply recorded the *return visitors* in general, not specifically referring to those coming back immediately after their visits in the previous year.

6.2. Trend variable

Results show a trend of 2.8 per cent growth per year in arrivals to Australia from China. By itself, it appears to be rather a strong trend. However, putting this value in the context of the arrival

[3] For simplicity, we rewrite Equation (1) without any covariates as: $y_t = \rho y_{t-1} + \varepsilon_t$ or $\varepsilon_t = y_t - \rho y_{t-1}$. Thus, the error term in the next period is specify as: $\varepsilon_{t-1} = y_{t-1} - \rho y_{t-2}$ or $y_{t-1} = \varepsilon_{t-1} + \rho y_{t-2}$. Replace y_{t-1} into the error term of the first period reveal a serial relationship: $\varepsilon_t = y_t - \rho(\varepsilon_{t-1} + \rho y_{t-2}) = y_t - \rho\varepsilon_{t-1} - \rho^2 y_{t-2}$.

Table 4
Regression results (sample size 1991–2014).

	Prais-Winsten estimator		Cochrane-Orcutt estimator	
	Coefficient	Std. err	Coefficient	Std. err
Tourism arrivals in the previous period	**0.310	0.124	**0.306	0.129
GDP per capita	***3.705	1.066	***3.812	1.155
Price index	**-4.522	1.543	**-4.425	1.621
SARS epidemic	***-55.730	8.459	***-55.819	8.771
Mining boom	***-47.970	8.763	***-48.344	9.179
GFC	***-45.581	8.247	***-45.392	8.553
Trend	***2.830	0.645	***2.805	0.671
Migration from China	***0.102	0.033	**0.098	0.035
Constant	**-33.605	14.89	**-34.118	15.556
R^2 adjusted	0.831		0.821	
DW h-test (p-value)	−0.165 (0.393)		−0.044 (0.398)	
Portmanteau (Q) test (p-value)	8.063 (0.622)		7.795 (0.649)	
ρ	−0.399		−0.394	
AIC/BIC	146.5/156.3		141.4/150.8	

Significant levels: *** = 1%; ** = 5%.

growth rates with an average of 19.3 per cent per annum over two decades (and at times the rates went up to 30 per cent and 44 per cent), the value of the trend coefficient is realistic. Understanding the causes of this *trend* is beyond the scope of this paper. This remains a critical area for further research to explain how the Australian marketing agencies can influence such a *perception* among Chinese travellers. Also, an important question for future research would be how large are the outbound trends from China to other countries, as compared to the results for Australia.

6.3. Dummy variables

Results for SARS, mining-boom-induced supply constraints and GFC are highly statistically significant. Adverse impacts of these events on the number of the Chinese arrivals to Australia appear to be larger than the changes in the observed historical data. The reason is that, while the observed changes are the net simultaneous results of various factors, the regression parameters isolate and represent the effects of each factor individually without the interactions of the others (i.e. parameters are measured with the "*ceteris paribus*" or "all else remain constant" assumption). However, when considering all factors together, the net effects of parameters are close to the observed data. For example, the predicted mean effects of all factors in 2003 apart from SARS is 55.8 per cent; hence, the effective impact of SARS is only 8 per cent (55.8–47.8), which is close to the observed change of the 7 per cent reduction in 2003.

6.4. Income elasticity

The growth rate of Chinese arrivals to Australia has generally increased faster than the GDP per capita growth rate in China. This results in a short-run income elasticity of 3.8 per cent, implying a long-run income elasticity of 5.5[4] per cent. The value of the long-run income elasticity is slightly higher than that of Japanese tourists (4.45%) that Kulendran (1995) estimated earlier when Japanese tourists were prominent in Australia. As demand for necessities will not grow faster than, or even proportional to, income increases, a value greater than unity of the income elasticity in this case reflects the luxury consumption nature of a tourism experience in Australia among the Chinese. This high income elasticity explains clearly the source of the continuous double-digit growth rates in Chinese arrivals that Australia has experienced over the past two decades. Indeed, in any years without major events, SARS for example, the income effect has predominantly driven the total Chinese arrivals. With low population growth rates in China (approximately 0.5 per cent per annum), the GDP per capita growth rates of the country are nearly the same as the GDP growth rates; this implies the economic impact of China's GDP growth on tourism demand will not be discounted on the per capita basis (GDP divided by the size of the population). Even at the projected GDP growth at the low end of 6 per cent for China in the next few years (IMF, 2016), this high income elasticity will continue to sustain a significant tourism demand for Australia. The value of the income elasticity is strongly reinforced, independently, by the projection of the Chinese arrivals growth rate of 23.3 per cent for 2015–16 by TRA (2016) given a forecast of 6.3 per cent growth for China's GDP.

6.5. Price elasticity

It is important to note that the price elasticity in this paper is on the basis of the total trip costs, including the costs of living and costs of airfares (also referred to as *travel* or *transportation* in previous studies). Thus, a one per cent increase in the price index for Chinese visitors used in this paper is equivalent to a combined uniform increase of one per cent for both the *costs of living* and the *airfares* simultaneously in other studies which have two separate price components.

The estimated short-run price elasticity for Chinese visitors is −4.4% (Table 4), with a long-term price elasticity of −6.4%. This long-run price elasticity is larger than those individual long-run price elasticities for the cost of living (−3.5%) and the cost of transportation (−3.6%) that Divisekera (1995) estimated earlier for Japanese tourists. However, on an equivalent basis, the impacts of 1 per cent increase in the tourism price index in this paper should be compared to the sum of both individual price elasticities, −3.5 plus −3.6, per cent for Japanese tourists. Thus, in comparison, Japanese tourists back then were even more price responsive than Chinese visitors currently, −7.1 per cent as opposed to −6.4 per cent.

However, compared to the aggregated long-run elasticities in Seetaram (2010) for all inbound markets in Australia, the elasticities in this paper for the Chinese visitors are higher, at the upper end of the range. Again, the long-run price elasticity of −6.4 per cent in this paper should be compared with the sum of both price and airfare elasticities in Seetaram (2010), −2.54 and −2.08 per cent respectively. This difference is expected, as compared to all other

[4] Applying the Taylor-series expansion rule: 5.5 = 3.812/(1−0.306).

regions in Seetaram's study, China is the fastest growing economy; thus, the response to price changes are much stronger. It may well be the case that Chinese tourists to Australia are more price sensitive than other key markets given the large proportion of first time travellers. A study of tourism to Malaysia (Habibi & Rahim, 2009) estimated a price elasticity of demand for visitors from China of −8.09, the highest price sensitivity of the ten inbound markets studied. Overall, estimated elasticities in this paper are within the range of elasticities estimated in previous studies.

Together with the income price elasticity, the absolute value greater than one for the price elasticity reinforces the fact that tourism *is* indeed a luxury consumption for the Chinese. The high value of the price elasticity is simply because Australia is far from China, airfares are relatively expensive, and in addition to the costs of living in Australia, the cost for a trip to Australia can take up a large proportion of an average Chinese household income. Any price changes can lead to changes in the travel decision of Chinese visitors. Thus, the *bundle* price elasticity is an important determinant for policy makers in Australia to keep in mind when considering policies directly related to the cost of trips as a whole.

The effect of migration is significant but with a modest magnitude of 0.1 in the short run and 0.14 in the long run. Our estimated parameter is higher than that of Seetaram (2012) with an estimated immigration elasticity of 0.028 for the short run and 0.009 for the long-run for 15 main tourist markets in the 1980–2008 period. The higher magnitude of migration elasticity in the long run of this study is in line with the finding of Dwyer et al. (2014) who found that the elasticity of migration for tourism in 2006 was 0.59 compared to 0.33 in 1991.

7. Limitations of this study

Ideally, the *bundle* price index could have been estimated using all individual price series associated with Chinese tourists' consumption and the expenditure shares that Chinese tourists spend in the consumption bundle. Unfortunately, the expenditure series of the International Visitor Survey (IVS) data are only available for the period from 2004 to 05 to 2014–15 (Tourism Research Australia, 2016), which severely constrains the number of observations available for this study. Technically, data for IVS prior to 2004–05 could be "backcasted" but results are not guaranteed to produce consistent time series data as the survey methodology has been revised several times. As a result, the direct approach, as outlined in Morley (1994), was not able to be undertaken. The movements of airfares for Chinese visitors are then based on the domestic and international *holiday travel and accommodation* price series (ABS, 2016). In particular, the airfare price index for Chinese visitors is proxied by the Australian outbound series as the exact airfare price index for Chinese visitors would require the shares of airlines that Chinese visitors used and the corresponding average airfares. Such information was not available. Thus the ratio 7:3 was used. This ratio can change over time, as consumption patterns can change over time, resulting in changes in the value of the price elasticity of tourism demand.

An important caveat also attaches to the significant economic growth path of China. The size of the Chinese economy has grown nearly eight times in real terms from 1992 to 2014 (The World Bank, 2016), and now is the world's largest economy on a purchasing-power-parity basis (International Monetary Fund, 2016). In such an environment, consumer behaviour is changing so rapidly that longer time series data than the sample size currently available to this study may be required.

8. Conclusion

China's economic growth has become a significant stimulus to many countries, including Australia. The sources of stimulus apply across a whole range of industries of Australia. The Chinese economy is shifting toward more sustainable growth based on consumption and services. Thus, growth in Chinese outbound tourism demand has played an important role in the Australian tourism industry, and is expected to continue to grow in the coming years.

Tourism is rapidly developing as a luxury consumption item for Chinese households. As such, demand for tourism is likely to continue to grow ahead of the Chinese GDP growth. On average over the study period, China's GDP per capita grew by 9 per cent, a strong positive influence on the visitor number to Australia. GDP growth of China is the main driver for the Chinese arrivals in Australia. Although China's economy has slowed in recent years, the economic growth of the country still generates double-digit growth in its tourist arrivals to Australia. Chinese visitors are also very responsive to price signals. Hence, it is important to keep prices in Australia to a minimal level, as the impacts of price increases will be detrimental to the level of inbound demand from China.

The Australian government has implemented a raft of tourism reforms in recent years including more direct flights between Australia and selected markets (China included), simplifying tourist visa applications offering online options for a wide range of countries, granting multiple entry options to key markets (including China), widening criteria for the working holiday maker visas, and adding more occupations to the skilled occupational list (Tourism Australia, 2016). These reforms effectively open up market access for the Australian tourism sector, and certainly this is the right direction to boost inbound tourism revenue. The keys to achieving maximum revenue from China tourists are to (a) ensure more convenience for travelling to Australia and (b) maintain cost effectiveness so that the high income demand elasticity for travelling to Australia of Chinese visitors will bring more visitors to Australia from China.

The present study has major policy implications for destination management. The findings advance our knowledge of the elasticities of demand for tourism arrivals from China, a neglected area of tourism research. As such, they have implications for forecasting tourism arrivals from China as well as policies to maintain high growth from this market. For Australia, the combination of high income elasticity with high price elasticity associated with Chinese visitors represents a potentially explosive cocktail. A proposal under consideration is to charge a cheaper multiple entry visa fee for tourists from China (Pham, Son and Dwyer, forthcoming). The potential loss of visa fee revenue will certainly be over-compensated by a large increase in expenditure brought by Chinese arrivals. As the Chinese economy experiences its expected slowdown into the future, the growth rate of visitors to Australia is likely to slow also. In this context, since Australia is already a high price destination ranked 138 from 141 countries in World Economic Forum (2016), any increase in costs could exacerbate this decline. Policies to reduce costs or at least to keep it in check, should continue to support healthy tourism flows from China.

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