A STUDY OF THE DETERMINANTS OF INBOUND TOURISM IN HONG KONG FROM 1998 TO 2009

BY

LE ZHANG

(6134024)

Major Paper presented to the

Department of Economics of the University of Ottawa

In partial fulfillment of the of the M.A. Degree

Supervisor: Prof. Gilles Grenier

Eco 6996

Ottawa, Ontario

April, 2012

Content

Abstract

This paper identifies the determinants that contribute to tourism demand in Hong Kong. Annual data from 20 major origin countries or territories during the period of 1998 to 2009 are used to study tourism demand with panel data models. Since tourism in Hong Kong is strongly dominated by Mainland China, the paper conducts regressions with and without Mainland China to account for the possibility that Mainland China may be an outlier. The empirical results indicate that the most significant factors that determine Hong Kong tourism demand are the level of income in the origin country, the cost of living in Hong Kong and the negative impact of the SARS breakout. A comparison between Asian and Western countries of origin reveals that traveling to Hong Kong is a luxury good for Asian tourists, while it is a necessary good for Western tourists. Asian tourists are more sensitive to changes in prices in Hong Kong than Western tourists. In addition, the price of substitute destinations is an important factor for Western tourists but not for Asian tourists. Finally, the SARS infection dampened the desire of the tourists around the world to travel.

Keywords: Tourism demand, Hong Kong, Panel models

1. Introduction

Over the past several decades, international tourism has grown dramatically. It has generated a significant amount of foreign exchange earnings and has contributed substantially to the economic growth of the world. According to the World Tourism Organization (see Figure A1 and Figure A2 in the Appendix, total tourism foreign earnings reached a record US$ 919 billion in 2010, up from US$455 billion in 2000, averaging an annual growth of 9% since 2000. International tourist arrivals have shown sustainable growth, from 435 million in 1990, to 675 million in 2000, and 939 million in 2010. According to a report by the World Travel and Tourism Council (2012), the tourism industry contributed 9.2% of the world gross domestic product (GDP), and supported directly 98,031,500 jobs (3.3% of total employment) in 2011.

Moreover, the tourism industry does not just create employment opportunities and generate foreign exchange and government revenue; it is also an effective way of enhancing each destination's infrastructural facilities, alleviating poverty in developing countries and promoting understanding and cooperation by building bridges among people of different cultures (Eilat and Einav, 2004). Therefore, tourism is a means for a country to increase its wealth and show its traditional culture.

Hong Kong is one of the most popular tourism destinations in Asia. The tourism industry has facilitated the generation of wealth and employment. The direct and total contributions of the tourism sector to GDP in 2011 were HKD 126.9 billion and HKD 287.6 billion respectively. In addition, 239,000 direct jobs (6.6% of total labor force) and 463,000 indirect jobs (12.8% of total labor force) existed because of the tourism sector (World Travel and Tourism Council, 2012). These numbers demonstrate that tourism is one of the pillar industries in Hong Kong. Therefore, it is important to study the key determinants of tourism flows in Hong Kong to get a better understanding of the factors that are related to those determinants. Knowing why a tourist would select Hong Kong as a destination will certainly

help policy discussions on improving tourism development efforts.

Despite the fact that the influence of the tourism industry on Hong Kong's economy is widely recognized, there has been little research devoted to the analysis of the determinants of international tourism demand in Hong Kong. Only a limited number of empirical studies, especially using econometric approaches, have been done to investigate tourism demand. Therefore the determinants of inbound tourism demand in Hong Kong should be assessed. The goal of this paper is to identify the main factors that contribute to the demand for tourism over the period of 1998- 2009 with the help of panel data econometric methods.

The rest of the paper is organized as follows. Section 2 presents some background on tourism in Hong Kong. Section 3 reviews the literature on the determinants of international tourism demand. Section 4 specifies a model of tourism demand, discusses the variables included in the model, introduces the data and presents the methodology. Section 5 presents the empirical results from panel estimation of the international tourism demand function. Firstly, I will do regressions with 20 countries;[1] I will then redo them without Mainland China, because it dominates tourism demand in Hong Kong and may be considered an outlier; and then I will compare Asian countries and Western countries in order to analyze the different impacts of the factors that affect Hong Kong's tourism demand. The last section summarizes the results and concludes the paper.

1. The 20 origin countries or territories include Macao and Taiwan, which are not independent countries. In the rest of this paper I will use the word "country" to refer to both independent countries and territories.

2. Tourism in Hong Kong

Hong Kong, a Special Administrative region (SAR) of China, has fantastic sights. It is the financial and trade center of Asia and it has a reputation of being the "Pearl of the Orient." Hong Kong is also one of the most popular travel destinations in Asia, and its unique feature of combining Western style with traditional Chinese culture attracts a large number of international tourists.

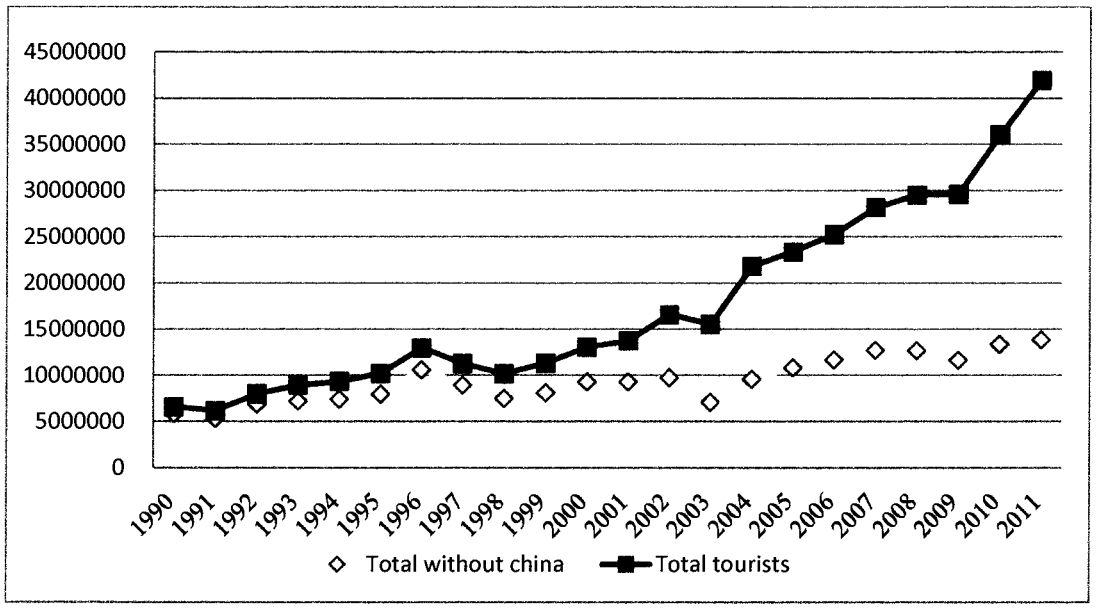
A survey carried out by the Hong Kong Tourism Board indicated that experiencing the city, shopping and enjoying the fine food are the top three reasons for tourists to visit Hong Kong (CGCC Vision, 2010). Moreover, in an Internet survey carried out by CNN in 2009, Hong Kong was voted the "Best destination in Asia Pacific" with the "Most Vibrant City Life," beating Japan, Singapore, Thailand and other popular tourism cities (CNN Asia Pacific, 2009). In addition, an increasing number of Hong Kong restaurants are appearing in the Michelin Guide (Hong Kong Tourism Board Website: Michelin Guide Hong Kong and Macau). All the above recognitions confirm Hong Kong's international reputation as a Gourmet Capital and a Shopping Paradise. Besides, as a tourism city, Hong Kong has good hotel facilities and infrastructure, such as Ocean Park, Disneyland, Wetland Park, Ngong Ping 360 and so on, which provide a hardware foundation for tourism development.

Although most tourism infrastructure is built to attract tourists for pleasure, business travel is also an important part of Hong Kong tourism. As a heart of the world economy, Hong Kong has sophisticated infrastructure, a business-friendly environment and easy accessibility; therefore, it became Asia's premier destination for Meetings, Incentives, Conventions and Exhibitions (MICE). The advantage of Hong Kong for MICE is due to a wide selection of hotels and venues, offering a trade platform to suppliers in Mainland China and the Asia's busiest manufacturing hubs, and showcasing the latest international technology to Asian market (Hong Kong Tourism Board).

In 2010, according to the ranking by tourism receipts, Hong Kong occupied the 9th position in the World Tourism Organization's list of top ten destinations (World Tourism Organization: Tourism Highlight 2011). Furthermore, the number of visitor arrivals in Hong Kong has increased remarkably in recent years. The red line in Figure 1 shows the evolution of total visitor arrivals to Hong Kong from 1990 to 2011. From the chart we can see that Hong Kong received a record high of 42 million tourists from all over the world in 2011 with a growth rate of 16.35% over 2010, greatly exceeding the world's as well as the Asia and Pacific Region's average rates of 4.4% and 5.6%, respectively. This is the first time that the number of tourist arrivals has exceeded 40 million. Moreover, a comparison of the yellow and red lines reveals that before 1997, tourists from Mainland China were just a small part of total tourists in Hong Kong; however, after the handover, Mainland China became the most important contributor to tourism development in Hong Kong. Without Mainland China, the growth of tourism in Hong Kong would have been much smaller.

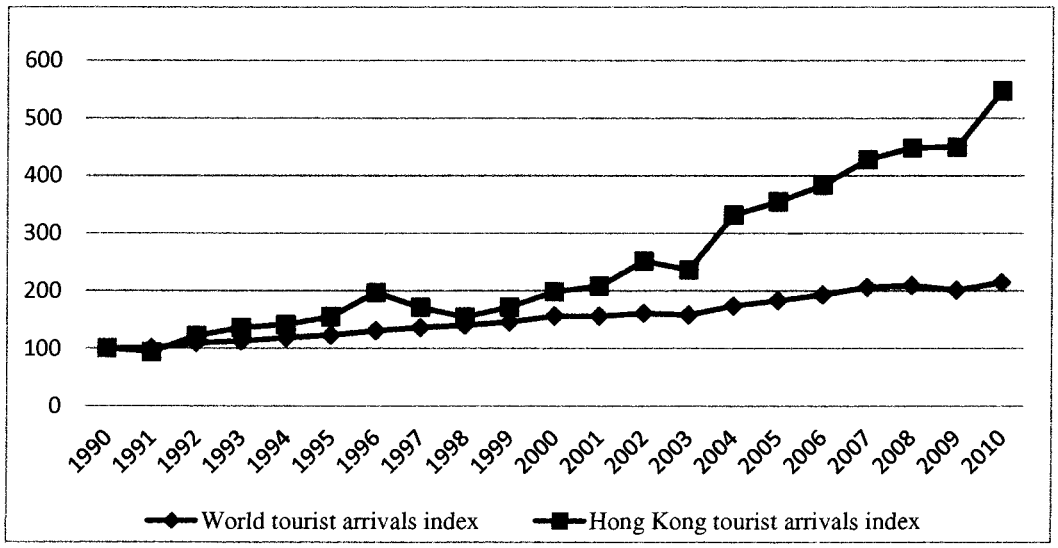
Figure 2 shows the tourist arrivals index of Hong Kong and the World from 1990 to 2010 with the base year 1990=100. We can see that tourism has grown much faster in Hong Kong than in the rest of the world. Especially after 2003, mainly because of Mainland China, the tourist arrivals index has risen substantially in Hong Kong, reaching a level of 550 in 2010, compared to 215 for the world.

Figure 1. Evolution of International Tourist Arrivals to Hong Kong With and Without Mainland China 1990-2011



Source: Hong Kong Tourism Board

Figure 2. Comparison of World and Hong Kong tourist arrivals index 1990-2010 (1990=100)



Source: Hong Kong Tourism Board

The international reputation of Hong Kong for its amazing shopping and hotel service has helped Hong Kong attract numerous visitors from around the world. Zhang and Wong (2001) pointed out that in the 1970s, Japan was the largest visitor source market of tourism in Hong Kong, taking up more than 30% of total international visitors; in the 1980s, the Americas and Southeast Asia replaced Japan as the leading source markets. However, since the hand-over of Hong Kong to China in 1997, Mainland China has become by far the most important origin country of Hong Kong tourism (Raymond, 2001). Table 1 shows that in 2010, 22.7 million tourists were from Mainland China, accounting for 63% of the total. Taiwan came second, with 2.2 million visitors; Japan ranked third as a source market of visitors. In terms of the long-haul market, the United States remained the largest long-haul market ranking fourth, with 1.2 million arrivals, representing a 9.5% increase from 2009.

Table 1. Hong Kong's Top Five Source Markets of Visitor Arrivals in 2010

Ranking in 2010	Markets	No. of Arrivals	Share of Total
1	Mainland China	22,684,388	63.0%
2	Taiwan	2,164,750	6.0%
3	Japan	1,316,618	3.7%
4	USA	1,171,419	3.3%
5	South Korea	891,024	2.5%

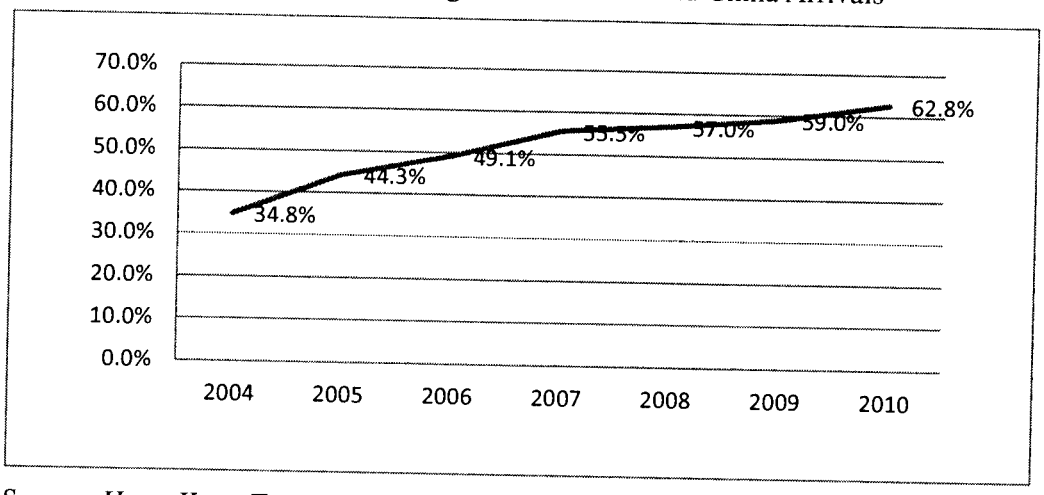
Source: Hong Kong Tourism Board

Although the tourism industry in Hong Kong has developed dramatically over these decades, some fluctuations took place due to unexpected events. During the period of 1997 to 1998, as a result of the Asian financial crisis, tourist receipts from crisis-hit countries declined. In 2003, the SARS epidemic in Asian countries also had a severe impact on the tourism industry in Hong Kong; this event reduced air passenger numbers by nearly 80% and hotel occupancy rates from around 90% to less than 10% (Sui and Wong, 2004). Moreover, in 2009, the spread of the H1N1 Flu Virus and the financial tsunami affected the economy in Hong Kong again. Hong Kong learned the lesson of SARS and controlled the situation well.

But compared with previous years, tourism achievements still dropped a bit in 2009. The occupancy rate of hotels was merely 65% in the first three quarters of 2009, falling by 12% compared to a year earlier.

Nevertheless, tourism from Mainland China was not much affected by these unexpected events as the number of visitor arrivals declined only slightly. Because of its close distance, similar culture and language and the handover of Hong Kong to China in 1997, Mainland China became the leading visitor source market to Hong Kong. From Figure 1, we can see clearly that China is the major factor in the increase in tourism in Hong Kong from 1998 until now. Furthermore, overnight visitor spending from Mainland China is the highest in the world. In addition, in order to boost the economy of Hong Kong, the Individual Visit Scheme (IVS), which allowed travelers from Mainland China to visit Hong Kong on an individual basis rather than on business visas or in group tours, was launched by China in 2003. From the data on tourist arrivals by country of residence, we know that tourism from all over the world declined in 2003 due to the SARS infection, except from Mainland China. Figure 3 reveals that more and more visitors to Hong Kong from Mainland China prefer to come under the IVS, as individual tourism rose from 34.8% of total Mainland China arrivals in 2004 to 62.8% in 2010. Therefore, due to the great contribution from the Mainland China visitors, the Hong Kong government pays much attention to that market and designs special promotion strategies to cater to the consumers from Mainland China.

Figure 3. IVS Arrivals as a Percentage of Total Mainland China Arrivals



Source: Hong Kong Tourism Board

Although the tourism industry makes a tremendous contribution to the economy of Hong Kong, it also faces some vital challenges in maintaining a sustainable competitive advantage and in exploring new opportunities in an environment of increased globalization and economic integration in Asia. Moreover, Hong Kong has to compete with other potential destinations such as Taiwan, Macao, Japan and Singapore for international tourists. Therefore, in order to respond to the new challenges, policy makers need to better understand the competitive position of the tourism industry in Hong Kong and to develop tourism attractions with Hong Kong characteristics. As a result, the concentration on the determinants of inbound tourism demand in Hong Kong needs to be assessed.

3. Literature Review

The increasing contribution of the international tourism industry to GDP, employment, construction of infrastructure and cultural exchange all over the world has stimulated numerous researchers to explore many aspects of that industry.

Generally speaking, the economic literature on tourism has focused on three fields: the economic influence of international or domestic tourism on a destination economy; the analysis of the determinants of tourism demand; and forecasting the future demand for tourism. In this paper, the focus is on the underlying determinants of international tourism demand.

3.1 Determinants of international tourism demand

According to Song and Witt (2000), tourism demand can be defined as the demand for products such as accommodation, transportation, food, services and entertainment in particular destinations, that the consumers are willing to pay during a specified period and under some conditions. The conditions are related to the factors explaining tourism demand. Demand is usually measured by the number of foreign tourist arrivals, tourist receipts in a destination, or the number of nights stayed by foreign visitors. Lim (1997) reviewed about 100 empirical tourism studies and found that 51% of them used the number of tourist arrivals as the dependent variable and 49% used tourist receipts. A more recent literature review (Li, Song and Witt, 2005) found that more than 60% of the studies used visitor arrivals as the dependent variable. The length of stay by tourists has not been studied as frequently. The main reason for choosing number of visitor arrivals is that the data are more available than the data for tourism receipts and length of stay.

There are a huge number of economic, technical, political, cultural and psychological factors

that influence tourism demand; however, most of the studies pay attention to the economic factors such as income, relative price, substitution price, transportation cost, exchange rate and important events and trends that have some impact on the economy.

Based on consumer demand theory, the level of consumption is mostly determined by the disposable income of the consumers and the price of goods and services. Therefore, income and price have been employed most frequently to explain tourism demand.

The level of income in the origin country is deemed to be the most essential factor positively affecting tourism demand, since higher real personal income will encourage travelling. However, alternative measures have been used to proxy this factor. Song and Witt (2000) stated that personal disposal income can be an appropriate variable when travelling is done mostly for the purpose of leisure or visiting friends and relatives. In terms of business travel and the combination of business and leisure tourism, more general income variables, such as gross domestic product (Garin-Munoz and Montero-Martin, 2007) and gross national product (Phakdisoth and Kim, 2007) per capita are good measures for the income variable.

A fundamental research result of Crouch (1994a) is that the income elasticity of international tourism demand is above unity, which means that international tourism is a luxury product. Indeed, much empirical literature has reached this conclusion as well. For instance, according to Li *et al.* (2006), tourists from Europe to the UK are highly sensitive to income changes and the income elasticities are range from1.78 to 2.82. However, there are some exceptions; for some destinations, income elasticities are below unity, such as the elasticities of tourists from Asian countries other than China to Hong Kong, which are from 0.32 to 0.85. This suggests that traveling to Hong Kong is a necessary good for Asian countries (Hiemstra and Wong, 2002).

As is well-known, price plays a significant role in determining the demand for tourism. Due to the complexity and diversity of the products purchased by tourists, the price variable is

difficult to measure, and several proxies can be used. In recent studies, the price influence is divided into two types: the own destination price and the substitute price for competing destinations.

The own price of tourism can be further broken down into two elements: the transportation cost to a destination and the cost of living in the destination. Some proxies are employed to measure the transportation cost. The distance from the capital city to the capital cities of origin countries was employed by Phakdisoth and Kim (2007) in an empirical study of Laos, but the difficulty is that distance is a time-invariant variable. The prices of crude oil and airfare are more appropriate alternatives. However, Mervar and Payne (2007) stated that there exists a problem of data collection in crude oil price and airfare. As far as the cost of living in the destination is concerned, it is usually expressed as the ratio of consumer price indices (CPI) in the destination and origin countries adjusted by the exchange rate (see for example Song and Witt, 2006). The reason why this relative price includes the exchange rate is that the higher it is in the origin country, the more tourists will be stimulated to travel.

Usually, depending on the characteristics and purposes of travel, tourists may select among various destinations. Hence, there can be a substitution effect between several comparable destinations. The price of substitute destinations is a way to affect the selection of traveling destination. In most empirical research, this variable is constructed as an index, which is calculated as the consumer price index weighted by market shares of competing destinations.

Generally, some unexpected events and policies affect the demand for tourism and are entered into the regressions through dummy variables. In the 1970s, the occurrence of oil crises had a negative impact on tourism demand. The outbreak of economic crises and of the SARS and H1N1 Flu virus in the 1990s and 2000s dampened the desire to travel. Song *et al.* (2003), Naude and Saayman (2005) and Garin-Munoz (2006) pointed out that these infectious diseases had a negative impact on tourism.

Apart from these most frequent factors, researchers added other influencing elements. Some articles focusing on social and economic impacts include marketing expenditure and political, environmental and cultural impacts, (Drisakis and Athanasiadis, 2000); a few studies account for both demand side and supply side factors (Proenca and Soukiazis, 2005).

3.2 Modeling of international tourism demand

As the tourism industry is developing dramatically, broader and deeper analyses and forecasts of tourism demand are necessary. The approaches to empirically estimate the determinants of inbound tourism have improved from simple and static econometric models to more sophisticated ones, such as Vector Autoregressions and Error Correction models. Goh and Law (2011) in their survey classified 155 research papers into three categories: structural econometric-based methods, time-series models and artificial intelligence techniques.

The shift in methodology from simple regressions to time-series models was a breakthrough, which overcame the problems of spurious regression results and non-stationary data. Time series models use only historical data to analyze the time trend and stationarity. The exponential smoothing methods, integrated autogressive moving-average model (ARIMA) devised by Box and Jenkins are widely used. Goh and Law (2002) used SARIMA and MARIMA with interventions models, which were based on ARIMA, to analyze and forecast tourism demand. They used monthly data of 10 major origin countries to Hong Kong from 1999 to 2000 and used Dickey-Fuller tests to get the result of stochastic seasonal nonstationary time series with unit root for all 10 countries. Then the existence of interventions, such as financial crises, the handover of HK to China, and the bird flu outbreak, were discovered by step functions and plus functions (an intervention function represented by a special type of dummy variable). Finally, SARIMA and MARIMA models were applied to forecast tourism demand. The empirical results showed that the coefficients of interventions were all significant and had the expected signs. The SARIMA and

MARIMA models could capture stochastic nonstationary and interventions for forecasting tourism demand in Hong Kong accurately.

Another way to analyze tourism demand is through structural econometric models, which pay more attention to the relation between influencing factors and tourism demand. Song and Witt (2006) used vector autoregressive model (VAR) to study and forecast visitor arrivals in Macau from eight countries during the period 1993-2008. The VAR model has an advantage in that it relaxes the assumption of exogenous independent variables and defines all variables to be as endogenous. Moreover, the impulse response function can be used to study the response of external shocks on tourism demand. For the forecast part, the authors noted that visitors from Mainland China were the main source of tourism flows to Hong Kong, and they forecast that the growth of visitor arrivals from Mainland China would be increasing significantly. Therefore, how to attract tourists from Mainland China by catering to their consumption pattern is an essential task for government.

A number of studies used Almost Ideal Demand System Models (AIDS) to discuss tourism demand (De Mello, Pack, and Sinclair, 2002; Han, Durbarry and Sinclair, 2006). For instance, Li, Song and Witt (2004) applied both static and dynamic Linear Almost Ideal Demand System Models (LAIDS) to examine tourism demand in the United Kingdom for 22 Western European countries. They used data on expenditure of tourists from 1995 to 2001, and both short-term and long-term demand elasticities were calculated. The expenditure elasticity revealed that for UK tourists, travelling to Western European Countries is a luxury good in the long-run. In addition, UK tourists were more sensitive to price changes in the long run than the in short run. The substitute price elasticity indicated that different destinations had different competitors; therefore, each destination should quickly respond to the competitors' actions in tourism promotion. To conclude, both static and dynamic AIDS models provided a reliable analysis of UK tourists' behaviour according to the expenditure budget and useful information for policy decision.

In recent research, Panel Data Approach analyses have been adopted for international tourism demand more frequently. Since Panel Data combine both cross-sectional and time-series information and generalize cross-unit and cross-time variation, they increase degrees of freedom and capture unobserved individual heterogeneity. Proenca and Soukiazis (2005) used panel data techniques to analyze tourism demand for Portugal from four source countries, namely, UK, France, Spain and Germany. They took account of both demand factors (such as GDP per capita, price index) and supply factors (such as investment in infrastructure and accommodation capacity) in tourism regressions. The results showed that income and accommodation capacity were the most significant variables from the demand side and supply sides respectively. And under dynamic analysis, the adjustment process between actual and desired variation in tourism demand was slow.

Taking into consideration both determinants and models for international tourism demand and the fact that, to my knowledge, panel data techniques have not yet been employed to the study of Hong Kong tourism demand, this paper will adopt the panel structure with annual data from 1998 to 2009. It will employ pooled OLS, fixed effect, random effect Feasible Generalized Least Squares and Panel Corrected Standard-Errors models for the empirical study of tourism demand.

4. Model, data and methodology

4.1 Model

This paper uses a model which is similar to those of Proenca and Soukiazis (2005), Song *et al.* (2003) and Garin-Munoz (2006). The model contains variables such as GDP, relative price, substitute price, population, distance from the origin country, and the effect of the SARS epidemic in Hong Kong:

$$Tour_{it} = f(Y_{it}, PT_{it}, DIS_{it}, PST_{it}, POP_{it}, dSARS) \quad (1)$$

The variables have the following definitions:

$Tour_{it}$ is the number of tourists arrivals to Hong Kong from country i in year t measured in individual unit.

Y_{it} is Purchasing Power Parity (PPP) Converted gross domestic product per capita, at 2005 constant prices, in the origin country, which measures real disposal income; it should have a positive sign.

PT_{it} is an index of the cost of living in Hong Kong relative to the cost of living in the origin county i, adjusted by the exchange rate. Similarly to Song and Witt (2006) and Song and Fei (2006), it is calculated as follows:

$$PT_{it} = \frac{CPI_{HK,t}/ER_{HK,t}}{CPI_{it}/ER_{it}} \quad (3)$$

CPI_{it} and $CPI_{HK,t}$ represent respectively the consumer price index in the origin country i and in Hong Kong at time t. ER_{it} and $ER_{HK.t}$ denote respectively the exchange rate in the origin country i and in Hong Kong against the U.S. dollar. A negative sign is expected.
DIS is the distance from the capital of the origin country to Hong Kong in kilometers, which

is used to approximate travel cost to Hong Kong; a negative influence is expected.

PST_{it} is a weighted price index for competing destinations. I select Taiwan, Singapore, Japan, Republic of Korea and Thailand as the competing destinations because they have characteristics and purposes for travel that are similar to those of Hong Kong. I do not choose Macao, since usually Macao is a complement destination; Hong Kong and Macao are frequently introduced to tourists as a joint itinerary (Macao Daily, 20, Jan, 2012). Similarly to Song *et al.* (2003), the substitute price index is calculated as a weighted consumer price index of these five alternative destinations and the weights are obtained from the share of total international tourism arrivals:

$$PST_t = \sum_{j=1}^{5}\left(\frac{CPI_{jt}}{ER_{jt}}\right)w_{jt} \quad (4)$$

$$w_{jt} = TTA_{jt} / \sum_{j=1}^{5} TTA_{jt} \quad (5)$$

Where j=1, 2, 3, 4, 5 represent Taiwan, Singapore, Japan, Republic of Korea and Thailand respectively; w_{jt} is the share of international tourism arrivals in country j; and TTA_{jt} is total visitor arrivals in country j. A positive sign is expected.

POP_{it} is total population in the origin country i at time t, in thousands. It is expected to have a positive effect, since the higher the population in a country, the larger the number of potential tourists.

Finally, a dummy variable (DSARS) is applied to capture the effect of the SARS epidemic in Asia. This dummy variable takes the value one for the year 2003, and zero in the other 11 years. The purpose is to account for the negative impact of the disease epidemic on international tourism demand for Hong Kong.

In terms of the specification of the model, most empirical articles used log functions to

estimate tourism demand; reasons for using a log function are that it is easy to interpret the estimated coefficients as demand elasticities and that it provides more accurate estimation results (Kulendran, 1996). According to a review study of tourism demand by Witt and Witt (1995), more than 75% of the models used log-linear function. Therefore, in my paper, I adopt the same specification of a log-linear function.

$$\ln Tour_{it} = c + \beta_1 \ln Y_{it} + \beta_2 \ln PT_{it} + \beta_3 \ln DIS_i + \beta_4 \ln PST_{it} + \beta_5 \ln POP_{it} + \beta_6 dSARS \quad (2)$$

4.2 Data Description

This study uses annual data for 20 main countries of origin in relation to Hong Kong tourism over the period 1998 to 2009, that is, after China took over Hong Kong. The tourists from those countries accounted for about 95% of total tourism in Hong Kong during the decade, a percentage that remained about the same in all the sample years (see table A1. in the appendix). Therefore, it is suitable to choose those 20 countries. The exact sources for all the variables used are provided in the *Data Source section* after the reference list at the end of this paper.

The number of tourists arriving in Hong Kong from each specific country ($Tour_{it}$) is collected from the Hong Kong Tourism Board of Statistics. The PPP converted gross domestic product per capita at 2005 constant prices (Y), the exchange rate with the US dollar (ER) and the total population (POP) in the origin countries are obtained from the Penn World Tables. The consumer price index (CPI) with 2005 as the base year is available from World Development Indicators, World Bank. The total numbers of visitor arrivals in substitute countries are obtained from the tourism organization websites of each country. Lastly, the distance between Hong Kong and 20 origin countries (DIS) is available from timeanddate.com (Distance Calculator).

Table 2 shows the mean values of some of the relevant variables: visitor arrivals, real GDP per capita and population for the 20 origin countries over the entire period of 1998 to 2009. The countries are ranked in descending order of the average number of visitor arrivals. The five top source markets of visitor arrivals to Hong Kong are Mainland China, Taiwan, Japan, the United States and the Republic of Korea. The continental European countries, New Zealand and South Africa rank last. The United Kingdom and Canada rank in the middle. Overall, this information confirms that the Asia and the United States are the leading sources of visitors to Hong Kong. In terms of the other characteristics, larger and richer countries send more tourists, but we need to apply an econometric model to discover the internal relation between tourism demand and these relevant variables.

Table 2. Mean values of some statistics related to Hong Kong tourism from 20 origin countries, over the period 1998-2009

Country	Tourist arrival (thousands)	Income per capita ($)	Population (thousands)
Mainland China	9841	4803	1287585
Taiwan	2159	25787	22508
Japan	1230	31897	127110
United States	1006	40585	291719
Korea, Rep	534	21497	47572
Macao	532	34212	471
Singapore	483	40429	4299
Australia	437	36598	19903
United Kingdom	429	32442	60156
Philippines	375	2486	87726
Malaysia	356	10289	25044
Thailand	294	6696	63499
Canada	287	34972	32016

Indonesia	252	3308	224276
India	226	2353	1065237
Germany	191	31646	82248
France	166	30178	62406
Italy	85	29022	58713
New Zealand	77	25815	3976
South Africa	49	6618	46701

Source: Penn World Table, Hong Kong Tourism Board.

Tourist arrivals: number of tourist arrivals in Hong Kong (in thousands); Income per capita: PPP Converted gross domestic product per capita, at 2005 constant prices; Population: number of population in each country (in thousands).

4.3 Econometric Methodology

This paper uses a panel data approach to analyze the Hong Kong tourism industry. Panel data analysis expresses variation of variables across sectional units within a time period. The benefits of using panel data methods are that they give more informative data, more variability and more degrees of freedom to reduce the problem of collinearity; moreover, they can control for individual heterogeneity, (Baltagi, 2001, p. 5-8).

International tourism demand can be written as a pooled model:

$$y_{it} = c + x_{it}'\beta + \varepsilon_{it} \qquad (6)$$

where, y is the log of demand for international tourism in Hong Kong, x is a vector of the explanatory variables defined earlier in equation (2), i is cross-section subscript, t is time subscript, β is a coefficient vectors, c is a constant and ε is a disturbance. OLS estimation of this model will be efficient if x is exogenous (i.e. uncorrelated with the disturbance) and if the error term is homoskedastic and serially and contemporaneously

uncorrelated. However, in most cases, these conditions are not likely to be satisfied (Woodridge, 2002, p. 421). In order to address those problems, fixed effects and random effects models are used in the literature.

A more general specification is:

$$y_{it} = c + x_{it}'\beta + \alpha_i + \varepsilon_{it} \quad (7)$$

The specification of the model is the same as before except for α_i, which is an individual-specific effect for each country i. In the fixed effects model, this term is allowed to be correlated with the explanatory variables. Compared to the OLS estimator, the advantage of the fixed effects estimator is that it controls for unobserved individual heterogeneity (Woodridge, 2002, p. 441).

We can eliminate the individual effects using the fixed effects transformation. For each i, the average of equation (7) over time is:

$$\bar{y}_i = \bar{x}_i'\beta + \alpha_i + \bar{\varepsilon}_i \quad (8)$$

where $\bar{y}_i = T^{-1}\sum_{t=1}^{T} y_{it}$, and so on. Since α_i is fixed over time, we can eliminate it by subtracting equation (8) from (7) for each t:

$$y_{it} - \bar{y}_i = (x_{it} - \bar{x}_i)'\beta + \varepsilon_{it} - \bar{\varepsilon}_i \quad (9)$$

Equation (9) shows the fixed effect transformation (also called the within transformation). The important thing is that the unobserved effect, α_i, has disappeared. However, there is a drawback of the fixed effects model, as time-invariant variables, such as distance between two countries, have to be excluded from the model.

There is another approach called the random effects model to estimate panel data models. This approach is based on a similar idea to the fixed effects model, which is to capture the effect of unobserved individual heterogeneity. However, the key difference between these two methods is the assumption about the correlation between the explanatory variables and the unobserved heterogeneity. The random effects model assumes that the individual effects are random with respect to the explanatory variables. Then we can use the Generalized Least Square (GLS) estimator to obtain consistent and efficient estimates. The selection between these two methods depends on which assumption is reasonable. Intuitively, the fixed effects model may be a more convincing tool for estimating tourism demand, since some unobserved heterogeneity that affects tourism demand could be at the same time related to the explanatory variables; for example, the unobserved variable "working hours" could be related to tourism as well as to the income that people earn, since the higher the working hours, the less time for leisure and the higher the income. To decide statistically between the fixed and the random effects models, a standard approach is to use a Hausman test, where the null hypothesis is that the correct model is the random effects model.

Furthermore, panel data often presents the typical cross-section property of heteroskedasticity. As mentioned above, there are large discrepancies in the number of tourists between the different countries (for example, the average number of tourists from Mainland China is 200 times that from South Africa); in addition, there can be serial correlation and contemporaneous correlation (residuals from different cross-sections in the same time period are correlated) in residuals. I will present some tests for heteroskedasticity and autocorrelation. I will then apply the Feasible Generalized Least Squares and Panel Corrected Standard-Errors with country dummies methods, which allow one to overcome the problems of heteroskedasticity and autocorrelation.

5. Estimation Results

5.1 Regression results for all the 20 countries

Equation (5) is estimated, first by using pooled OLS and then by using the panel data estimation methods of fixed effects and random effects. The results are presented in Table 3. Overall, most coefficients have expected signs, but some results differ between the three methods

In the pooled OLS regression, all the variables have expected signs. Most coefficients are significant, except for the effect of the SARS epidemic. For instance, if the average income goes up by 1%, visitor arrivals will increase by 0.83%. Similarly, if the relative price goes up by 1%, tourist arrivals will decline by 0.05%. This result is statistically significant, although it is small in magnitude. Theoretically, the SARS dummy variable has negative impact on tourism demand and the substitute price affects tourism demand positively (Yap, 2010). However, these variables are not significant at the 95% level. The reason for this phenomenon may be that the pooled OLS model does not take account of unobserved individual heterogeneity, resulting in an omitted variable bias that produces biased, inconsistent and inefficient coefficients (Woodridge, 2002, p. 421). Coming back to Table 3, the R-square is about 68%, which means that the pooled OLS model can explain 68% of tourism demand variations.

The fixed effects model is expected to present more consistent results than the OLS model. We can see that most of the coefficients are significant, except for the substitute price and population. The population is insignificant and negative, which is against expectation. One possible reason is that the population varied slightly and predictably within the origin countries during these 12 years; the growth rates for most countries have remained largely unchanged, at around 1% for each year. Therefore, the population variable is almost like a time-invariant variable and the fixed effects model cannot capture its impact precisely. In the

random effects model, the population has a positive sign as expected. A 1% increase in population corresponds to a 0.93% rise in tourism demand. Other results are similar to the fixed effects model and are more significant. Finally, the coefficient of the substitute price has a low significance level in all three models. This may reveal that Hong Kong is a complex tourism city with sightseeing, shopping and food, that it is so unique that competing destinations' prices have little impact on the tourism demand in Hong Kong. Also, the choice of competing destinations was a bit arbitrary. I have tried various subsets of the competing destinations (like 3 or 4 countries at a time); the results were similar to what I report here. So the results appear to be robust.

In order to determine the appropriate model of tourism demand, a Hausman specification test is performed. The Hausman test is a classical device for determining the preferred specification of the individual effects model. It tests whether or not there is a correlation between the unobserved individual-specific effects and independent variables. If there is no such correlation, then the random effects model is more powerful. If there is such a correlation, the random effects model is inconsistent and the fixed effects model is a better choice. It can be seen that the Hausman specification test rejects the null hypothesis that the unobserved individual specific effects is uncorrelated with explanatory variables; this suggests that the fixed effects estimator is more appropriate than the random effects estimator (see Greene, 2012, p. 380). Wooldridge (2002) also pointed out that the fixed effects model is more robust than random effects model.

Table 3. Regression results of pooled OLS, fixed effects and random effects models

Methods / Variables	**Pooled OLS (1)**		**Fixed Effect (2)**		**Random Effect (3)**	
	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
lnY	0. 8330***	12.86	1.1340***	9.22	0. 9418***	9.99
lnPIT	-0. 0512**	-2.23	-0.7509***	-9.47	-0. 3866***	-6.40
lnDIS	-0. 9368***	-18.94	NA	NA	-1.3650***	-8.02
lnPST	1.1501*	1.81	0.0058**	0.03	0. 3723*	1.84
lnPOP	0.6843***	18.42	-0.4687	-1.12	0. 9317***	8.64
dSARS	-0. 1526	-0.77	-0. 3545***	-7.05	-0. 2870***	-5.42
Constant	1.8641	1.01	7.0897*	1.82	3.8656**	2.29
R^2	0.68		0.78		0.76	
F/W-test	80.94 (0.00)		152.48 (0.00)		637.83 (0.00)	
Hausman test	NA		47.96 (0.00)			
Observations	240		240		240	

(*), (**), (***) indicate that the estimated coefficient is statistically significant at the 90%, 95% and 99% significance level, respectively.

The models above all assume homoskedasticity and no autocorrelation, which it is too restrictive in this case. Therefore, we need to use some diagnostics tests for heteroskedasticity and serial correlation. For the sake of identifying serial correlation in the idiosyncratic error term in a panel-data model, a test was proposed by Wooldridge (2002). The test requires relatively few assumptions, is easy to implement and robust. The null hypothesis is no first-order autocorrelation. With regard to heteroskedasticity, I apply three types of tests: Breusch-Pagan / Cook-Weisberg test, Modified Wald Test and Likelihood-ratio test for heteroskedasticity. The Breusch-Pagan test is the most common one; it tests whether the estimated variance of the residuals are dependent on the independent variables. If a Chi-Square test confirms that the independent variables are jointly significant then we can reject the null hypothesis of homosckedasticity. The Modified Wald statistic

tests for groupwise heteroskedasticity in the residuals of a fixed effects regression model (Baum, 2001); the advantage of this test is that it is viable even if the assumption of normality is violated. The Likelihood-ratio test is used to compare the fit of two models, and it explains how to what extent the data under one model are more likely than the data under the other. In this case, we apply Generalized Least Squares model (FGLS) with country dummies but without option as null model, FGLS with dummies and heteroskedasticity as alternative model.

Table 4 shows the results of the diagnostics tests. We find that all the tests have zero p-value, which means that I must reject the null hypothesis of no autocorrelation and homosckedasticity. Given the results from the diagnostic tests, the above estimators are not optimal. Therefore, two other estimators specifying a heteroskedastic error structure and panel-specific autocorrelation, the Feasible Generalized Least Squares model (FGLS) (Wooldridge, 2002, p. 266; Parks, 1967) and the Prais-Winsten model with Panel Corrected Standard Errors (PCSE) (Beck and Katz, 1995) are used to obtain more efficient estimates for these data with the specified characteristics.

Table 4. Results of diagnostics tests

Diagnostic Tests	Test Statistic	p-value
Wooldridge test (AR)	F (1,19)= 22.86	0.00
Breusch-Pagan test (heter)	$X^2(6) = 50.77$	0.00
Modified Wald Test(heter)	$X^2(20) = 5771.48$	0.00
Likelihood-ratio test(heter)	$X^2(19) = 158.72$	0.00

The results of FGLS and PCSE model appear in table 5. The results of these two methods do not differ too much. Since we add dummy for each country to control for unobserved country specific effects (Lease Squares Dummy Variable estimation similar to fixed effects), distance (the time-invariant variable) will mimic the country specific constant term. Therefore, I exclude it. However, in the FGLS and PCSE models without country dummies

in the appendix Tables A3 and A4, distance has a significant negative effect on Hong Kong's tourism demand.

The coefficient of the income variable is different from that I obtained in previous OLS and random effects models. It is greater than one and indicates that tourism demand is elastic. It confirms the results of other studies finding that most income elasticities of international tourism demand are above one and that tourism demand is strongly responsive to the conditions in the origin countries' economies.

In terms of tourism price, the relative price in Hong Kong is important for identifying a negative effect on tourism demand. The coefficient of this variable is -0.4270 and -0.5207 for the FGLS and PCSE models, respectively, implying that an increase in tourism price will lead to a fall in Hong Kong tourism demand. For the substitute price, both models give an insignificant result at the 95% confidence level. This confirms our previous belief that the price of competing destinations near Hong Kong does not influence Hong Kong's tourism demand.

With regard to population, both models give insignificant results, supporting our hypothesis that population growth varied little. Nevertheless, we get positive and significant coefficients from FGLS and PCSE models without country dummies (see the appendix Tables A3 and A4). This indicates that the higher the population of a country, the more tourists travel to Hong Kong.

We know that the outbreak of the SARS virus in 2003 had an unfavorable impact on tourism in Asian countries. The dummy for 2003 corresponding to the SARS epidemic is included in the models to see how tourism demand was affected. The result in Table 5 shows a negative sign, which means that this harmful event dampened the desire to travel to Hong Kong. This result is consistent with the findings of Wang (2009).

The coefficients of the country dummies are presented in Table 5 and the U.S. is left out as a reference category since it is a large country that can be a good reference. In general, the two models give similar results. We find that the coefficients of some countries are not different from the U.S., such as Australia, Canada, and the UK. On the other hands, the coefficients of most Asian countries are positive and significant, such as Mainland China, Japan and Korea republic. This conclusion makes sense because distance is not included. In fact, country dummies capture distance. And more frequent trade and culture communication between Hong Kong and Asian countries will attract more leisure and business tourists. This result can also be found in Appendix Table A2 on the tourist arrivals. The visitors from Asian countries were accounting for 75% to 86% of total tourist arrivals during the sample period.

Table 5. Results of FGLS model and PCSE model with heteroskedasticity and autocorrelation for 20 countries

Models / Variables	FGLS (heter, AR1)		PCSE(heter, AR1)	
	Coef.	z-value	Coef.	z-value
lnY	1.1991***	8.47	1.2255***	6.41
lnPIT	-0.4270***	-7.46	-0.5207***	-7.38
lnPST	0.2015*	1.87	0.2023	1.35
lnPOP	0.4103	1.30	0.2443	0.54
dSARS	-0.3505***	-17.70	0.3062***	-11.48
Australia	0.5223	0.63	0.1162	0.10
Canada	-0. 0624	-0.09	-0.3981 **	-0.41
Mainland China	4.9115***	6.62	5.4073 ***	5.23
France	-0.8897*	-1.90	-1.1511*	-1.73
Germany	-0.9002**	-2.30	-1.1179**	-2.03
India	2.9372***	3.73	3.5852***	3.28
Indonesia	5.6086 ***	10.66	6.4981***	9.86
Italy	-1.4898***	-3.08	-1.7593 ***	-2.56

Japan	2.8187***	10.14	3.1267***	8.47
Korea. Rep	3.8085***	7.64	4.1878***	6.02
Macao	3.0935	1.56	2.2224	0.79
Malaysia	2.1461***	3.33	1.8971***	2.06
New Zealand	-0. 0576	-0.04	-0.7072	-0.38
Philippine	4.4890***	16.43	4.7305***	13.47
Singapore	1.1922	0.90	0.5364	0.28
South Africa	0.6357	1.49	0.5672	0.95
Taiwan	3.8305***	5.29	3.7485***	3.62
Thailand	3.0655***	9.82	3.2030***	7.31
UK	-0.1584	-0.32	-0.4617	-0.66
Constant	-5.4394*	-1.70	-3.8204	-0.84
Wald test	12012.83		11440.27	
Observation	240		240	

(*), (**), (***) indicate that the estimated coefficient is statistically significant at the 90%, 95% and 99% significance level, respectively.

Although the FGLS and PCSE models present similar conclusions, Beck and Katz (1995) showed that the FGLS model performs better in large samples. In the case of a small data set, the FGLS model may tend to under-estimate the standard errors. This procedure requires estimating a large number of parameters for error variances, while relative few observations are available. As a result, it will over-fit patterns of residuals. On the other hand, the PCSE estimator produces robust standard error estimates at little loss in efficiency compared to FGLS in small samples. Therefore, the PCSE model appears to be more suitable for small samples and the results are more precise (Beck, 2001).

5.2 Regression results for 19 countries excluding Mainland China

In section 2, I noticed that Mainland China became the most important country of origin in

Hong Kong tourism after the handover of Hong Kong in 1997, accounting for almost two thirds of the total. Due to the large numbers for the population and the tourism variables, the data point for Mainland China in the regression is far away from the others and it produces a large error. Therefore, Mainland China may behave as an outlier. Here, I redo the regression without Mainland China to check if the results are robust to the exclusion of that potential outlier and I compare to the previous results.

Table 6 presents regression results of the FGLS model and PCSE model without Mainland China. The results seem to be more robust as all the coefficients of the independent variables are significant at the 99% confidence level. An important change is that the coefficient of the income variable is now less than one, which means that the demand is inelastic. The result is contradicts some of the previous results. The reason may be that the previous regressions include Mainland China; it drove a large difference in the income variable. Moreover, in the literature review section, some studies showed income inelastic demand when excluding China (Hiemstra and Wong, 2002). The results of tourism price and the effect of the SARS epidemic do not change much in the regression without Mainland China. In terms of the substitute price, the coefficient becomes significant and the elasticity is below one. This result is the same that of Yap (2010): the substitute price elasticities for most of the countries in Asia and the Pacific are smaller than one. Compared to the previous regression, this significant coefficient of the substitute price indicates that tourists from other countries actually are affected by price changes in competing destinations. However, for tourists from Mainland China, Hong Kong is the most popular tourism destination and a large number of business tourists are sent to Hong Kong, so the substitute price is not an important factor. With regard to population, we get the opposite result that the coefficients in both models are significant. The reason may be that the large population in Mainland China influences the population factor to a large extent in the previous regressions, resulting in an insignificant coefficient.

From the comparison above, we conclude that due to the large difference in the results when excluding Mainland China, some of the previous results were driven by Mainland China. We confirm that China may behave as an outlier, and it justifies treating China differently from the other countries.

Table 6. Results of FGLS model and PCSE models without Mainland China

Variables \ Models	FGLS (heter, AR1)		PCSE(heter, AR1)	
	Coef.	z-value	Coef.	z-value
lnY	0.6907***	4.48	0.6714***	3.28
lnPIT	-0.4342***	-8.22	-0.5258***	-7.97
lnPST	0.4946***	4.26	0.4606***	3.09
lnPOP	1.3069***	4.19	1.1701***	2.77
dSARS	-0.3328***	-16.95	-0.3060***	-11.84
Australia	2.8848***	3.51	2.5498**	2.30
Canada	1.8449***	2.76	1.5641*	1.73
France	0.3419	0.75	0.1102	0.18
Germany	0.1078	0.28	0.0860	-0.17
India	0.3462	0.42	0.8158	0.73
Indonesia	4.6411***	8.85	5.4028***	8.05
Italy	-0.2259	-0.48	-0.4659	-0.73
Japan	3.4786***	12.77	3.7879***	11.16
Korea. Rep	5.1426***	10.36	5.5299***	8.71
Macao	8.7660***	4.48	8.0663***	3.06
Malaysia	3.6634***	5.96	3.4178***	4.13
New Zealand	3.5700***	2.78	3.0222*	1.74
Philippine	4.1807	15.50	4.3196***	12.79
Singapore	4.9769***	3.80	4.4414**	2.51
South Africa	1.3688***	3.41	1.2647**	2.41

Taiwan	5.9239***	8.31	5.8847***	6.18
Thailand	3.5351***	11.97	3.6253***	9.60
UK	1.1353**	2.35	0.8663	1.33
Constant	-12.1544***	-4.04	-10.3162**	-2.56
Wald test	9425.59		8882.88	
Observation	228		228	

(*), (**), (***) indicate that the estimated coefficient is statistically significant at the 90%, 95% and 99% significance level, respectively.

5.3 Comparison between Asian and other Countries

In addition to China, there are many tourists from other Asian countries. We know that the number of tourist arrivals from Asian countries is more than four times that from Western countries (see Table A2). The reasons why Hong Kong attracts more Asian tourists are that Hong Kong is a global market center that links the booming economies of Mainland China and Asia with major markets worldwide. Many Asian business tourists come to Hong Kong to attend a variety of meetings, conventions and exhibitions; besides, due to superior geographic location and convenient transportation, it is easy for Asian people to access Hong Kong. For Western countries, because of cultural diversity and the long distance to Hong Kong, tourists are much fewer. In this part, I analyze how the variables discussed above influence Asian tourists and Western tourists differently. Therefore, I divide the sample between 11 Asian countries and 9 Western countries.

Table 7 and Table 8 display the regression results for Asian countries and Western countries, respectively. Overall, the results for the two groups vary greatly. With respect to Asian countries, most variables are significant, except for the substitute price and population. The income elasticity is larger than 1, which means that Asian tourists are sensitive to income changes where tourism to Hong Kong is concerned, so traveling to Hong Kong is a luxury good for Asian tourists, especially for Mainland China; although the price elasticity for

Asian countries is less than 1, it is higher than that of Western countries. This result is in agreement with Crouch (1994b)'s findings that long-haul tourism is less sensitive to price variations than short-term tourism.

The substitute price has no impact on Hong Kong tourism for Asian tourists. The possible reasons are that Mainland China and other Asian tourists are more familiar with Hong Kong and they have a clear purpose for travelling. Furthermore, as a financial and trade center of Asia, Hong Kong has frequent exchanges with other Asian countries, and receives a great number of business tourists from Asia. This kind of tourist is not affected by the prices in surrounding countries.

The insignificant population effect confirms the result above: time-invariant variables are excluded from the fixed effect model. It can be seemed from the table that the SARS outbreak in 2003 affected Hong Kong's tourism significantly; the occurrence of this incident decreased visitor arrivals more than 0.30%, inflicting a severe loss on the Hong Kong economy. In terms of country dummies, China is used as a reference category. We find that all the significant coefficients of country dummies are negative, which demonstrates that Mainland China has more tourists than other Asian countries and it is the leading generator of international tourism in Hong Kong.

Table 7. Results of FGLS model and PCSE model with heteroskedasticity and autocorrelation for Asian countries.

Models / Variables	FGLS (heter, AR1)		PCSE (heter, AR1)	
	Coef.	z-value	Coef.	z-value
lnY	1.2258***	6.63	1.3133***	6.28
lnPIT	-0.7476***	-6.27	-0.8219***	-6.37
lnPST	-0.3365	-1.60	-0.3062	-1.28
lnPOP	0.1204	0.26	-0.5439	-0.94

dSARS	-0.3503***	-10.77	-0.3035***	-7.93
India	-1.4339***	-6.55	-1.3690***	-6.05
Indonesia	2.4968**	2.56	1.9003*	1.69
Japan	-1.9660	-1.48	-3.4776**	-2.18
Korea. Rep	-0.4794	-0.28	-2.4312	-1.17
Macao	-4.1676	-1.06	-9.5919**	-2.00
Malaysia	-4.1626**	-2.11	-6.9067***	-2.88
Philippine	-0.5872	-0.51	-2.1797	-1.53
Singapore	-5.9310**	-1.99	-10.0259***	-2.77
Taiwan	-1.8220	-0.88	-4.5507*	-1.80
Thailand	-2.2037	-1.55	-4.1154**	-2.36
Constant	4.8314	0.81	13.3575*	1.82
Wald test	2015.92		1863.34	
Observation	132		132	

(*), (**), (***) indicate that the estimated coefficient is statistically significant at the 90%, 95% and 99% significance level, respectively.

The regression results for the Western countries look better than those of the Asian countries to the extent that all the variables are significant. The income elasticity is lower than 1, implying that tourism in Hong Kong is treated as a necessary good for Western tourists. As for the discussion above, the price elasticity for Western countries is -0.1122 and -0.1702 in the FGLS model and the PCSE model, respectively. It is much lower than for Asian countries (-0.7476 and 0.8219), which means that Western tourists are less sensitive to price changes. In the regression for Western countries, the substitute price has a positive and significant effect. A 1% increase in the substitute price predicts a more than 0.3% increase in tourist arrivals. This result illustrates that since tourists from Western countries are not as familiar with Asian countries and are more flexible in the selection of a tourism destination, they are more likely to be influenced by the price of substitute destinations. Population has a

significant positive effect on Western tourist arrivals; this agrees with our belief that the larger the population of a country, the more tourists will be travelling abroad. We obtained a similar result for the effect of SARS on Western tourists, as the advent of SARS decreased tourism by about 0.31%.

Table 8 Results of FGLS model and PCSE model with heteroskedasticity and autocorrelation for Western countries.

Models / Variables	FGLS (heter, AR1)		PCSE(heter, AR1)	
	Coef.	z-value	Coef.	z-value
lnY	0.9493***	4.62	0.9112***	3.50
lnPIT	-0.1122**	-2.06	-0.1702**	-2.39
lnPST	0.8332***	7.97	0.8001***	6.63
lnPOP	3.1963***	6.47	3.1133***	5.38
dSARS	-0.3105***	-14.56	-0.3176***	-12.23
Australia	7.8819***	6.01	7.6762***	5.00
Canada	5.9904***	5.58	5.8156***	4.63
France	3.4001***	4.60	3.2505***	3.75
Germany	2.6316***	4.31	2.5061***	3.50
Italy	2.9565***	3.87	2.8005***	3.13
New Zealand	11.6474***	5.66	11.3037***	4.69
South Africa	4.6874***	6.82	4.5799***	5.60
United Kingdom	4.3611***	5.63	4.1893***	4.61
Constant	-38.9958***	-7.69	-37.5684***	-6.17
Wald test	13700.83		13219.00	
Observation	108		108	

(*), (**), (***) indicate that the estimated coefficient is statistically significant at the 90%, 95% and 99% significance level, respectively.

According the analysis above about income elasticity, we can conclude that visiting Hong Kong is a luxury good for Asian tourists; on the contrary, it is a necessary good for Western tourists and all countries when China is excluded. Besides, Western tourists are less sensitive to changes in relative price in Hong Kong than Asian tourists. Apart from that, the substitute price for competing destinations around Hong Kong has almost no influence on Asian tourists' decision to visit Hong Kong. On the other hand, it brings about a positive significant effect on Western tourists. Finally, the effect of the SARS epidemic was global; as a result, the numbers of both Asian tourists and Western tourists visiting Hong Kong experienced dramatic declines in 2003.

6. Conclusion

The basic goal of this paper was to estimate, using panel data approaches, tourism demand in Hong Kong as measured by tourist arrivals over the period 1998-2009. Tourist arrivals from 20 main origin countries that account for more than 95% of total tourism inflows in Hong Kong are analyzed in this study.

Given the relatively small number of countries in this case, fixed and random effects panel data models are capable of producing more accurate results for tourism demand. Moreover, in order to take into account of heteroskedasticity and serial-correlation of the residuals, specific panel data models, such as the Feasible Generalized Least Squares model (FGLS) and the Prais-Winsten model with Panel Corrected Standard Errors (PCSE) were employed.

The empirical results of the analysis with the FGLS and PCSE models reveal that the most important factors of tourism demand in Hong Kong are the level of income in the origin country, the cost of living in Hong Kong and the SARS breakout. There was evidence that the income elasticity was larger than one when including Mainland China, which indicates that tourism in Hong Kong is a luxury good and is extensively influenced by the economic conditions in the origin countries. Therefore, it is necessary for policymakers in Hong Kong to pay close attention to the economic cycles in the major tourists markets. It was also found that changes in the price of living in Hong Kong had a negative effect on tourism demand. The price elasticity is less than 1; this result implies that tourists from these origin countries are less sensitive to tourism prices when choosing Hong Kong as a travel destination. The results also showed that the SARS infection coefficient was negative, implying that the effect of the SARS infection was to depress tourism demand in Hong Kong.

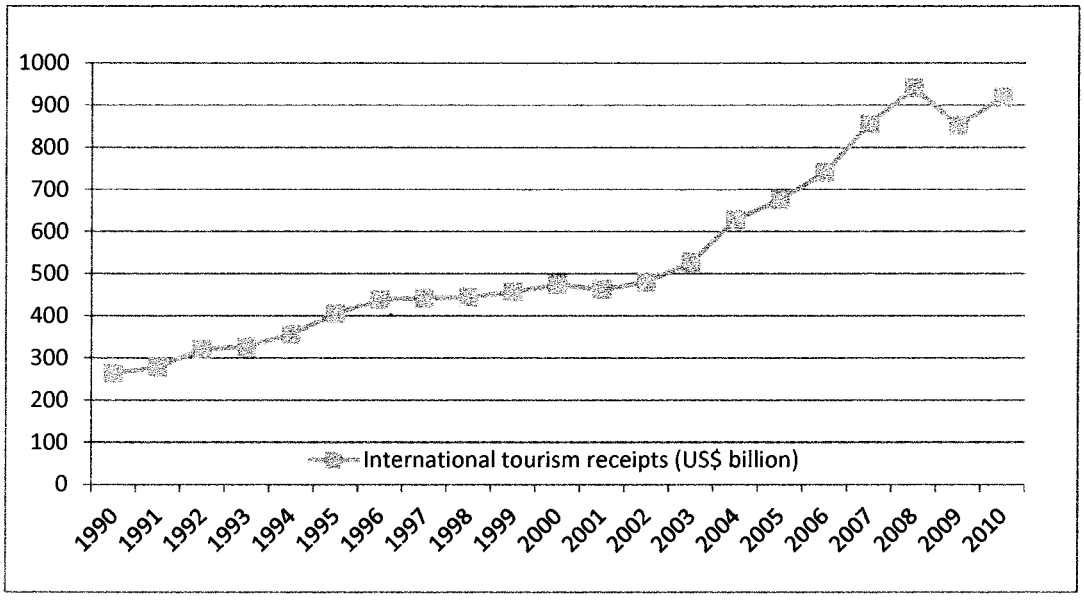
Another interesting thing that we found out in this study is that Mainland China plays a key role in Hong Kong tourism development after 1998. We also redid the regression without

Mainland China and got more robust results. The results supported the hypothesis that China behaves as an outlier and it justifies treating China differently from the other countries. Therefore, due to the large number of tourists coming from Mainland China, the Hong Kong government needs to pay considerable attention to catering to the needs of Chinese tourists.

Furthermore, this paper also examines how economic variables influence Asian tourists and Western tourists differently. Tourists from Asia are more sensitive to income changes, but less sensitive to changes in price. The price of substitute destinations has a significant impact on Hong Kong tourism for Western country tourists, but not for tourists from Asia, since they mostly have a clear purpose for traveling and a large number of business tourists are sent to Hong Kong. Therefore, fully understanding and distinguishing the behavior and needs of tourists from Asia and Western countries and implementing different tourism promotions will attract more tourists and develop tourism diversity.

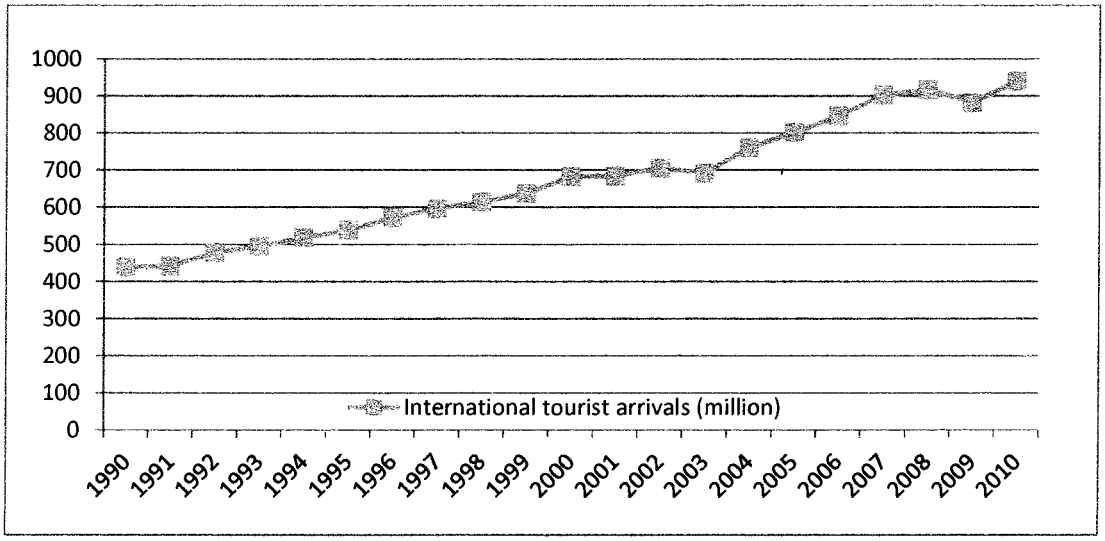
Appendix

Figure A1. International Tourism receipts all over the world 1990-2010



Source: World Tourism Organization (UNWTO)

Figure A2. International Tourist Arrivals all over the world 1990-2010



Source: World Tourism Organization (UNWTO)

Table A1. Tourists from 20 countries of origin as a percent of total tourists in Hong Kong

Year	Subtotal (20 countries)	Total	Share
1998	9630337	10159646	94.8%
1999	10768312	11328272	95.1%
2000	12452500	13059477	95.4%
2001	13114673	13725332	95.6%
2002	15865365	16566382	95.8%
2003	14983357	15536839	96.4%
2004	21072791	21810630	96.6%
2005	22403439	23359417	95.9%
2006	24151134	25251124	95.6%
2007	26947196	28169293	95.7%
2008	28299618	29506616	95.9%
2009	28439735	29590654	96.1%

Source: Hong Kong Tourism Board of Statistics

Table A2. Asian and Western tourist arrivals in percentage of total tourists (1998-2009) in Hong Kong

Year	Western tourist	% of total	Asian tourist	% of total	Total tourist
1998	2588964	0.25	7570682	0.75	10159646
1999	2666003	0.24	8662269	0.76	11328272
2000	2935777	0.22	10123700	0.78	13059477
2001	2816603	0.21	10908629	0.79	13725232
2002	3020151	0.18	13546231	0.82	16566382
2003	2178670	0.14	13358169	0.86	15536839
2004	3262811	0.15	18547819	0.85	21810630
2005	3911119	0.17	19448298	0.83	23359417
2006	4215182	0.17	21035942	0.83	25251124
2007	4729997	0.17	23439297	0.83	28169294
2008	4541979	0.15	24964637	0.85	29506616
2009	4244551	0.14	25346103	0.86	29590654

Source: Hong Kong tourism Board

Table A3. STATA result of FGLS model without country dummies

```
. xtgls lntour lnpop lnrgdpch lnpit lnpst lndis dsars, panels(he) corr(psar1)

Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   panel-specific AR(1)

Estimated covariances      =        20          Number of obs      =       240
Estimated autocorrelations =        20          Number of groups   =        20
Estimated coefficients     =         7          Time periods       =        12
                                                 Wald chi2(6)       =   1325.64
                                                 Prob > chi2        =    0.0000
```

lntour	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnpop	.8261432	.0600372	13.76	0.000	.7084724	.9438139
lnrgdpch	.9185585	.0497996	18.45	0.000	.8209531	1.016164
lnpit	-.0415655	.0199309	-2.09	0.037	-.0806294	-.0025017
lnpst	.5154425	.1219981	4.23	0.000	.2763307	.7545544
lndis	-.969539	.0809705	-11.97	0.000	-1.128238	-.8108398
dsars	-.3122789	.0183587	-17.01	0.000	-.3482613	-.2762966
_cons	1.275708	.851759	1.50	0.134	-.393709	2.945125

Table A4. STATA result of PCSE model without country dummies

```
 xtpcse lntour lnpop lnrgdpch lnpit lnpst lndis dsars , hetonly correlation(psar1)
(note: estimates of rho outside [-1,1] bounded to be in the range [-1,1])

Prais-Winsten regression, heteroskedastic panels corrected standard errors

Group variable:  country                          Number of obs      =       240
Time variable:   year                             Number of groups   =        20
Panels:          heteroskedastic (balanced)       Obs per group: min =        12
Autocorrelation: panel-specific AR(1)                           avg =        12
                                                                max =        12
Estimated covariances      =        20          R-squared          =    0.9967
Estimated autocorrelations =        20          Wald chi2(6)       =    820.66
Estimated coefficients     =         7          Prob > chi2        =    0.0000
```

lntour	Het-corrected Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnpop	.8269169	.0718045	11.52	0.000	.6861826	.9676511
lnrgdpch	.9260808	.0547923	16.90	0.000	.8186898	1.033472
lnpit	-.0195608	.0220369	-0.89	0.375	-.0627524	.0236308
lnpst	.4983359	.1626753	3.06	0.002	.1794981	.8171736
lndis	-.9278379	.0927576	-10.00	0.000	-1.109639	-.7460364
dsars	-.2761292	.0243512	-11.34	0.000	-.3238567	-.2284016
_cons	.8387508	.9658274	0.87	0.385	-1.054236	2.731738
rhos =	1	1	1	.9548992	1 ...	.9327496

References

Baltagi, B. H. (2001). *Econometric Analysis of Panel Data* (Second Edition). West Sussex: John Wiley & Sons Ltd.

Baum, C. F. (2001). Residual diagnostics for cross-section time series Regression models. *The Stata Journal* 1(1), 101–104.

Beck, N. (2001). Time-series–cross-section data: What have we learned in the past few years? *Annual Review of Political Science*, 4, 271–93.

Beck, N. and Katz, J.N. (1995). What do (and not to do) with time-series cross-section data. *American Political Science Review*, 89(3).

CGCC Vision (2010). *Global Vision*: Hong Kong tourism to rise to challenges. June, 2010. http://www.cgcc.org.hk/b5/chamber/bulletin/files/Bulletin_1275982507.37664_6-17.pdf

CNN Asia Pacific (2009). Global Consumer Survey Reveals Travel & Tourism Sector Confidence in Asia-Pacific Despite Recession. 8, May, 2009 http://www.cnnasiapacific.com/press/en/content/452/

Crouch, G. I. (1994a). The study of international tourism demand: A review of findings. *Journal of Travel Research*, 33, 41–54.

Crouch, G. I. (1994b): Demand elasticities for Short-Haul versus Long-Haul Tourism. *Journal of Travel Research*, 33, 2-7.

De Mello, M., Pack, A. and Sinclair, A.T. (2002). A system of equations model of UK tourism demand in neighboring countries. *Applied Economics*, 34, 509-521.

Dritsakis, N. and Athanasiadis, S. (2000). An econometric model of tourist demand: The case of Greece. *Journal of Hospitality and Leisure Marketing*, 7, 39-49.

Eilat, Y. and Einav, L. (2004). Determinants of international tourism: a three-dimensional

panel data analysis. *Applied Economics*, 36(12)

Garin-Munoz, T. (2006). Inbound international tourism to Canary Islands: A dynamic panel data model. *Tourism Management* 27, 281-291.

Garin-Munoz, T. and Montero-Martin, L. F. (2007). Tourism in Balearic Islands: A dynamic model for international demand using panel data. *Tourism Management* 28, 1224-1235.

Goh, C. and Law, R. (2002). Modeling and forecasting tourism demand for arrivals with stochastic nonstationary seasonality and intervention. *Tourism Management*, 23, 499–510.

Goh, C. and Law, R. (2011). The methodological progress of tourism demand forecasting: A review of related literature. *Journal of Travel & Tourism*, 28, 296-317

Greene, W.H. (2012). *Econometric analysis* (seven editions). Pearson: Prentice Hall.

Han, Z., Durbarry, R. and Sinclair, M. T. (2006). Modeling US tourism demand for European destinations. *Tourism Management*, 27(1), 1–10.

Hiemstra, S. and Wong, K. K. F. (2002): Factors Affecting Demand for Tourism in Hong Kong. *Journal of Travel & Tourism Marketing*, 13, 43-62.

Hong Kong Tourism Board: *Michelin Guide Hong Kong and Macau*
http://www.discoverhongkong.com/eng/dining/tips-michelin-list.html

Kulendran, N. (1996). Modeling quarterly tourism flows to Australia. *Tourism Economics*, 2, 203-222.

Li, G., Song, H. and Witt, S. F. (2004). Modeling tourism demand: A dynamic linear AIDS approach. *Journal of Travel Research*, 43(2), 141–150.

Li, G., Song, H. and Witt, S. F. (2005). Recent developments in econometric modeling and forecasting. *Journal of Travel Research*, 44, 82–99.

Li, G., Song, H. and Witt, S. F. (2006). Time varying parameter and fixed parameter linear aids: An application to tourism demand forecasting. *International Journal of Forecasting*, 22, 57-71.

Lim, C. (1997). Review of international tourism demand models. *Annals of Tourism Research*, 24, 835–849.

Longitudinal-Data/Panel-Data Reference Manual (2011). *Stata Press*

Macao Daily, (20 Jan, 2012) (Chinese)
http://www.macaodaily.com/html/2012-02/20/content_674640.htm

Mervar, A. and Payne, J. E. (2007), Analysis of foreign tourism demand for Croatian destinations: long-run elasticity estimates. *Tourism Economics*, 13(3), 407-420

Naude, W.A. and Saayman, A. (2005), The Determinants of Tourism Arrivals in Africa: A panel data regression analysis. *Economics*, 11(3), 365-391

Parks, R. (1967). Efficient estimation of a system of regression equations when disturbances are both serially and contemporaneously correlated. *Journal of the American Statistical Association*, 62, 500-509.

Phakdisoth, L. and Kim, D. (2007). The determinants of inbound tourism in Laos. *ASEAN Economic Bulletin*, 24(2), 225-37.

Proenca S. A. and Soukiazis, E. (2005). Demand for Tourism in Portugal: A panel data approach. *Discussion Paper*, N° 29, February

Raymond Y.C.T. (2001). Estimating the impact of economic factors on tourism: evidence from Hong Kong. *Tourism Economics*, 7(3), 277-293.

Song, H. and Fei, B.G. (2006). Modeling and Forecasting International Tourist Arrivals to Mainland China. *Tourism Management*, 27(2), 214-224

Song, H. and Witt, S. F. (2000). *Tourism demand modeling and forecasting: Modern econometric approaches*. Pergamon, Oxford.

Song, H. and Witt, S. F. (2006). Forecasting international tourist flows to Macau. *Tourism Management*, 27(2), 214-224.

Song, H., Wong, K. F. and Chon, K. (2003). Modeling and forecasting the demand for Hong Kong tourism. *International Journal of Hospitality Management*, 22(4), 435-451.

Sui, A and Wong Y. C. R. (2004). Economic Impact of SARS: The Case of Hong Kong. *Asian Economic Paper*, 3(1), 62-83.

Wang, Y.S. (2009). The impact of crisis events and macroeconomic activity on Taiwan's international inbound tourism demand. *Tourism Management*, 30(1), 75-82.

Witt, S. F. and Witt, C. A. (1995). Forecasting tourism demand: A review of empirical research. *International, Journal of Forecasting*, 11(3), 447-475.

Wooldridge, J. (2002). *Introductory econometrics: A modern approach*. Mason, OH: South-Western College Pub.

World Tourism Organization (UNWTO) (2011). *Tourism highlights*, Madrid.

World Tourism Organization (UNWTO) (2012). *World Tourism Barometer*, 10, January 2012.

World Travel and Tourism Council (2012). *Travel & Tourism Economic Impact: Hong Kong.*

Yap, G.C.L. (2010). An econometric analysis of Australian domestic tourism demand. *Edith Cowan University*, Theses: Doctorates and Masters.

Zhang, Q.H. and Wong, K.F. (2001). An analysis of historical tourism development and its implications to the tourism industry in Hong Kong. *Pacific Tourism Review*, 5, 15-21.

Data Sources

Hong Kong Tourism Board (1998-2010): *A statistical review of Hong Kong tourism Hong Kong*. http://www.tourism.gov.hk/english/statistics/statistics_research.html

Hong Kong Tourism Board (2002-2010): *Visitor arrival statistics.* http://partnernet.hktourismboard.com/pnweb/jsp/comm/index.jsp?pageContent=%2Fjsp%2Frso%2Frso_pub.jsp&charset=en

Penn World Table (1998-209): query for pwt70 data. http://pwt.econ.upenn.edu/php_site/pwt70/pwt70_form.php

Time and Data: Distance Calculator. http://timeanddate.com/worldclock/distance.html

World Bank (1998-2009): *World Development Indicators.* http://databank.worldbank.org/ddp/home.do?Step=12&id=4&CNO=2