

Economic Impact Analysis of Inbound Tourism in China:

An Extended Input-Output Model



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Foreword

This thesis is submitted in fulfilment of the requirements for the degree of master at Wageningen University. It is conducted under the exam code AEP-81333 MSc Thesis Regional Economics and entitled for 33 credits in my master programme Management, Economics and Consumer Studies. The research described in this thesis was financially supported by the Erasmus Mundus EURASIA 2 project.

Tourism industry has aroused my interests since my bachelor's study. Due to my love of travelling, I find the theories and practices of such thriving businesses also attractive. Combining with my economics background, I proposed this topic to investigate the economic impact of inbound tourism in China through an economic model. The writing of this thesis took quite a while longer than I had initially planned but nevertheless proved to be a fruitful learning and reflecting course.

I would like to express my special thanks of gratitude to my supervisor Jack Peerlings for his stimulating ideas, constructive feedback, thoughtful guidance on modelling design and details, and above all, his patience and encouragement. He always encouraged me to take the initiative and showed me the art of modelling. I am greatly indebted to Jack, whose critical but inspiring supervision on my research activities helped me to deliver the thesis.

I am also very grateful to Mr Xia Xianli and Mr Liu Tianjun from my bachelor university Northwest A&F University in China. During their stay at Wageningen University as visiting scholars, they gave me helpful criticism and compliments on my thesis. Moreover, thanks go to two external scholars in China with whom I contacted to ask for more literature on their research to be included as valuable references in my thesis. They are Prof. Li Jie from Xi'an Jiaotong University and Prof. Fan Jin from Jiangsu Applied Economic Research Centre. They showed me great kindness and respect for knowledge exchange.

Last, but certainly foremost, I would like to thank my parents and friends who helped me a lot in encouraging me to finish this research within the limited time and releasing my pressure. At the end, I extend my gratitude to the reader for taking the time to read my thesis.

Keyang

Wageningen, June 2013

Summary

In China, inbound tourism is viewed as a means of attracting foreign exchange and as a stimulus to economic growth. The fast development of inbound tourism attracted the researcher of this study to examine its economic meaning for the Chinese economy. To investigate the inbound tourism development and its impact on the national economy lays an important foundation for a country to formulate tourism and economic policies.

In this research, the economic impact of inbound tourism in China is investigated through an extended Input-Output (I-O) model incorporating input substitution in a general equilibrium framework. The analysis is conducted using the China 2007 I-O table. This methodology advancement fills the gap in improving the application of I-O modeling and providing the most up-to-date assessment of inbound tourism's economic impact on the Chinese economy. This research draws particular emphasis on methodology and modelling.

The main objectives of this thesis are to investigate how an extended I-O model can be used in the economic impact analysis of inbound tourism in China, and to measure the importance of inbound tourism to the Chinese economy and provide policy recommendations accordingly. This research aims to answer the following three research questions by using the extended I-O model: (i) what kinds of data are necessary and available for the I-O model?; (ii) how to extend the I-O model to allow for substitution of inputs in production?; (iii) what is the economic impact of inbound tourism on the Chinese economy?

Throughout the thesis, chapter 1 gives a general introduction of the background of this research. Chapter 2 outlines the context of China's inbound tourism development. Chapter 3 reviews the literature on tourism economic impact analysis. Chapter 4 details the data and model construction. Simulation analyses are made in chapter 5. Chapter 6 concludes the thesis, critically reflects on own research and discusses future research.

The findings confirm the positive contribution of inbound tourist expenditures to the economy through backward linkages which increase domestic production and demand for domestic inputs. Output level in every industry goes up and more jobs are generated in the society. The increased inbound tourism demand also tends to push up the general price level of goods and services across the entire economy. A higher degree of substitution of inputs leads to less use of imports and has a negative influence on the increase of the price level. On industrial level, higher demand from inbound tourists is beneficial to most tourism related sectors, in particular, air transport, lodging, entertainment and travel agencies. Based on the findings, three policy recommendations are made in terms of enhancing inter-industrial linkages in the economy, balancing the industrial response and promoting the diversification of tourism products. At the end, reflections on model improvements and limitations, and thus suggestions for future research, are addressed.

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1. Introduction

Since the implementation of market-oriented reforms in China in the late 1970s, tourism has been developing tremendously. This especially goes for inbound tourism¹. Overnight international tourist arrivals and international tourism receipts are two important indicators to measure the strength of a country's inbound tourism industry and its openness. China has become a major international tourist destination around the world since 1997 when for the first time it was among the top ten countries in terms of international tourism receipts (World Bank Database, 2013). From *UNWTO Tourism Highlights 2012 Edition* (UNWTO, 2012, page 6), among the world's top tourism destinations in 2011, China continued to rank third (after France and US) in international tourist arrivals² (57.6 million) and fourth (after US, Spain and France) in international tourism receipts³ (US\$ 48.5 billion). This shows the strong international attractiveness and competitiveness of inbound tourism in China. Inbound tourism helps China to establish a distinctive and positive tourist destination image worldwide, as well as enhances two-way exchanges between China and rest of the world. With rapid economic development stimulated by on-going economic reforms and rich tourism resources, China is expected to become the largest destination of international tourists in the world in the near future.

Inbound tourism has been seen as the main channel for a country to earn the foreign exchange and create more jobs. The relatively strong purchasing power from inbound tourists leads to increasing demand for goods and services, and therefore, is a strong force to stimulate economic growth. It is also an effective way to market the image of a country. Nations worldwide, both developing and developed economies, positively value the contribution of inbound tourism to their economic development. In June 2012 (G20 Leaders Declaration, 2012, page 4), the G20 world leaders have, for the first time, recognized 'the role of travel and tourism as a vehicle for job creation, economic growth and development' and committed to 'work towards developing travel facilitation initiatives in support of job creation, quality work, poverty reduction and global growth.' This is a significant milestone confirming tourism as a driver of economic growth. Being an important component, the contribution from inbound tourism cannot be underestimated.

¹ According to *International Recommendations for Tourism Statistics 2008* (IRTS 2008, approved by United Nations (2010), page 96), inbound tourism comprises the activities of a non-resident visitor within the country of reference on an inbound tourism trip. In this research, the country of reference refers to China (mainland).

² According to *China Statistical Yearbook 2012* (National Bureau of Statistics of China, 2013), international tourist arrivals count foreigners and compatriots from Hong Kong, Macao & Taiwan who travel to China (mainland) for vacation, sightseeing, visiting friends & families, medical care, shopping, attending meetings or engaging in economic, cultural, sporting or religious activities.

³ International tourism receipts refer to all the expenses paid by inbound tourists during their travel in China (mainland) on transportation, sightseeing, accommodation, catering, shopping and entertainment, etc. (same source as in footnote 2).

China, as a big country, not only has a long history of civilization but also demonstrates a great deal of modern vitality. In China, inbound tourism is viewed as a means of attracting foreign exchange and as a stimulus to economic growth. Throughout history, the growth rates of inbound tourism in China were higher than GDP (see Figure 1.1, for details, see Appendix 1) in most years.

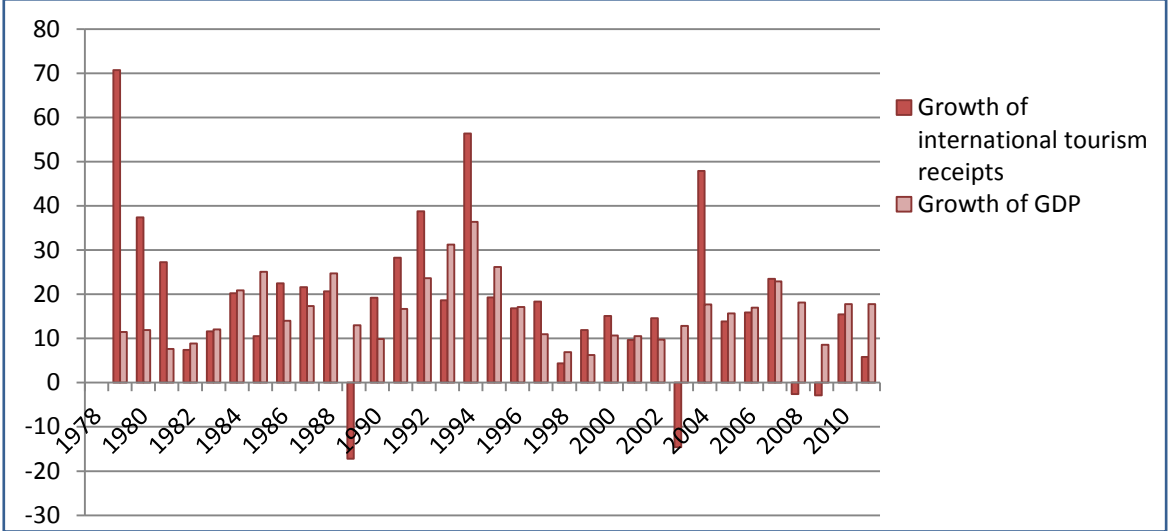


Figure 1.1 Comparison of growth rates of international tourism receipts and GDP (%), 1979-2011.

Source: China Statistical Yearbook (1996-2012); Statistics on China’s Tourism (2001).

The fast development of inbound tourism attracted the researcher of this study to examine its economic meaning for the Chinese economy. To investigate the inbound tourism development and its impact on the national economy lays an important foundation for a country to formulate tourism and economic policies. This connects with the interests in academia to measure the economic impact of inbound tourism and provide policy advice over the last few decades.

Generally, as noted by Fletcher (1989), ‘tourism’s economic impact is complex because it does not occur within the framework of a single commonly acknowledged industrial sector.’ There are various backward linkages active in different industries, e.g. transport, accommodation, catering, attractions, etc. Facing this complicated and broad system, a number of economic impact studies have tried to quantify the economic benefits resulting from inbound tourism.

This research draws particular emphasis on methodology and modelling. The Input-Output (I-O) method is selected as the analytical framework in this research because of its strengths as a well-understood standard methodology with standardized construction and presentation. It has been used extensively to evaluate the economic impacts of tourism development since the 1970s (Sun, 2005). The use of an I-O model supposes various assumptions that are not always satisfied, in particular: fixed input-output structure for each industry. In the real world, however, producers are constantly substituting inputs as a result of relative price changes. This for example happens when a producer decides to import an input he formerly purchased

from domestic suppliers, and vice versa. So the relative input use structure of an industry is constantly varying, affecting outputs and incomes. This is not reflected in the traditional I-O model. Given this limitation, this research aims to make improvements to the traditional I-O model by including input substitution in the input-output framework.

The main objectives of this thesis are to investigate how an extended I-O model can be used in the economic impact analysis of inbound tourism in China, and to measure the importance of inbound tourism to the Chinese economy and provide policy recommendations accordingly. This research aims to answer the following three research questions by using the extended I-O model: (i) what kinds of data are necessary and available for the I-O model?; (ii) how to extend the I-O model to allow for substitution of inputs in production?; (iii) what is the economic impact of inbound tourism on the Chinese economy? The empirical model is built on an input-output framework stemming from general equilibrium approaches. The major extension in this model compared to an I-O model is to allow for substitution of inputs by applying constant-elasticity-of-substitution (CES) production functions. In contrast, the traditional assumption incorporated in I-O models assumes a fixed input-output structure (Leontief production functions) for each sector. The data used in this research is based on the China 2007 Input-Output Table from the *China Statistical Yearbook 2012*, together with data from the tourism expenditure survey published by the China National Tourism Administration.

The remainder of the thesis is organized as follows. Chapter 2 outlines the context of China's inbound tourism development. Chapter 3 reviews the literature on tourism economic impact analysis. Chapter 4 details the data and model construction. Simulation analyses are made in chapter 5. Chapter 6 concludes the thesis, critically reflects on own research and discusses future research.

2. The Development of Inbound Tourism in China

In retrospect the development of inbound tourism in China largely benefited from the market-oriented reforms which started at the end of 1978. It opened a brand-new era of the fast development of the Chinese economy, as well as the tourism industry. Since then, China has opened its door to the outside world and welcomed inbound tourists. With respect to the international standards in 1980, China ranked 18th in terms of international tourist arrivals and 34th in terms of international tourism receipts (CNTOS, 2010a). Given its important and leading position in the current international tourism market, the growth of inbound tourism is remarkable.

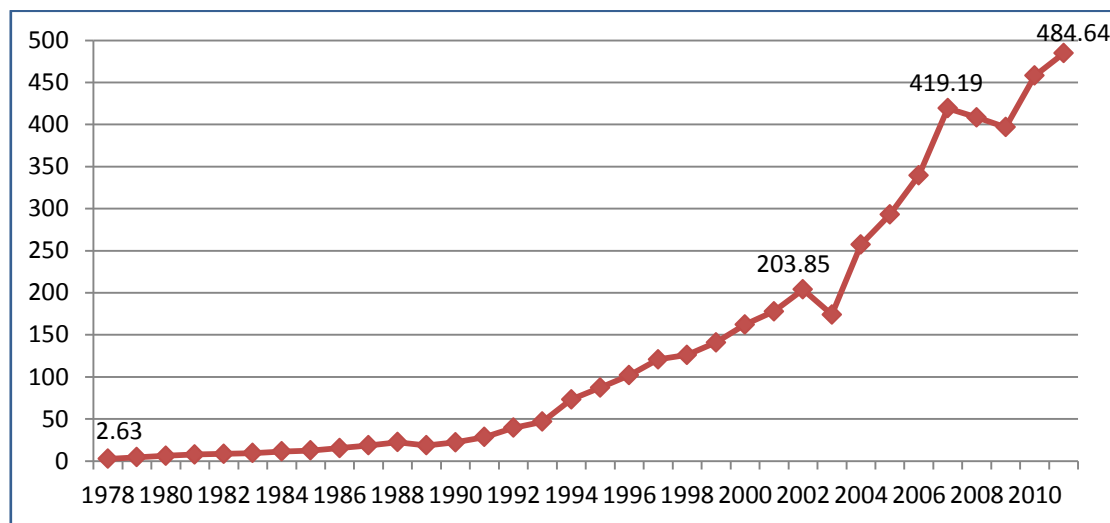


Figure 2.1 International tourism receipts (100 million US\$), 1978-2011.

Source: China Statistical Yearbook (1996-2012); Statistics on China's Tourism (2001).

Figure 2.1 presents the overall picture of the development of international tourism receipts from 1978 to 2011 (for details, see Appendix 1). In 1978, there were 1.8 million inbound tourists (including the same-day visitors) (CNTOS, 2010b) and the tourism foreign exchange income was only 263 million US\$. Compared to the tourism statistics in 2011, during 34 years, international tourism receipts have increased by over 180 times, with an annual growth rate of 18.37%.

Since the beginning of the new century, the continuous development reached a periodic peak at 20.4 billion US\$ in 2002. However, the unexpected SARS epidemic in China in 2003 was a great setback to the overall economy, letting international tourism receipts drop to 17.4 billion US\$, a dramatic decrease of 14.61%. In 2004, inbound tourism recovered quickly with a 47.87% increase rate. Inbound tourism emerged and experienced a strong growth with an average growth rate of 17.73% in 2004-2007. However, it was followed by a two-year decrease of 2.71% caused by the global financial crisis and economic recession until 2009. In 2010, inbound tourism recovered more strongly than expected from the shock it suffered in late 2008 and 2009, and reached a new peak of 48.5 billion US\$ in 2011. International tourist arrivals seem to display similar movements to tourism receipts, growing dramatically over time and dropping in the face of negative shocks.

The extraordinary performance of the Chinese inbound tourism industry may have been the result of many favourable factors, such as general worldwide tourism growth, more frequent international flights, improvements in transport infrastructure, hotel accommodation and tourist attractions, etc. Most importantly, its development is inseparable from a supportive policy environment. From the establishment of the People's Republic of China in 1949 to 1977, inbound tourists reception totalled less than 700 thousand arrivals (Tourhood, 2010). During that period, tourism, as an extension and supplement of China's diplomacy, played the function of civil reception of foreign visitors. Hence for a long time, tourism in China was a 'diplomatic activity', serving political rather than economic goals (Zhang, 1995, page 14). It was not yet a modern industry. Since 1979, right after the implementation of the reform and open policy, with the attention and support from the government aiming to amass foreign exchange reserves, tourism became the earliest sector in China to open up and integrate into international practices. It is inbound tourism that stimulated the initial development of tourism activities in China.

The status of tourism in the national economy has been improved continuously ever since. In 1981, the government reset tourism as an integrated economic industry. The aim of developing tourism, especially inbound tourism, was to make up for the scarcity of foreign exchange. In 1998, tourism was announced to be a growth sector in the national economy by the central government. Tourism became an important instrument to expand domestic demand. The eleventh 'five-year development plan' in 2006 put forward to master tourism as one of the most important industries of the national economy. Its main function was to stimulate consumption and cultivate an international profile. In April 2013, the People's Republic of China Tourism Law was published and will be implemented from October 2013 on. This tourism law is meant to guide the development of tourism industry in its fast growth process. Throughout the process of increasing importance of the tourism industry, inbound tourism has always been actively encouraged. Tourism marketing worldwide plays an import role. The holding of 2008 Beijing Olympic Games, together with the intensive overseas promotion of China Theme Year, helped to create a new China image and attract international tourists. The national tourism development fund also priorities its budget on national tourism image promotion (State Council, 2009).

In addition, analysing the composition of international tourism receipts might give more insights on the development of tourism activities.

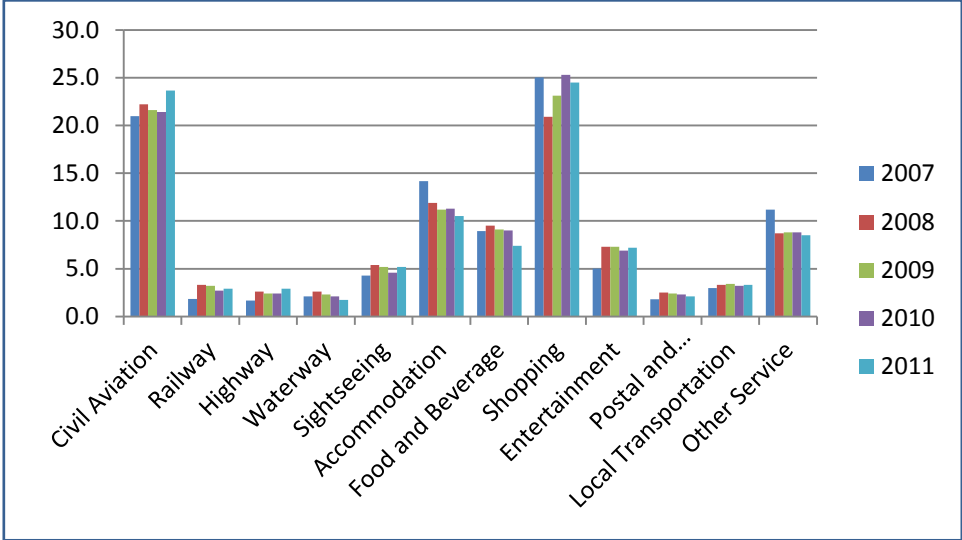


Figure 2.2 Inbound tourism foreign exchange earnings and composition (%), 2007-2011.
Source: China Statistical Yearbook (2008-2012)

Figure 2.2 demonstrates the trends of inbound tourist spending on different consumption item over the recent five years. First, receipts from shopping (almost 25%) and civil aviation (over 20%) contributed the most to foreign exchange earnings. After a drop in 2008 and bounce in 2009 and 2010, the share of inbound tourists’ expenditure on shopping declined a bit in 2011. This can be partly explained by the increasing share of payments on civil aviation. So there has been a shift of spending from shopping to air transport. Other notable changes can be seen in the decreasing proportional spending on accommodation and food & beverage. Their downward importance over years might be a price to pay for the increased proportion of spending on other sectors, e.g. highway transport, sightseeing, and entertainment. Of which, the changing trends of the latter two sectors are almost the same. As the two least foreign exchange earning sectors, shares on waterway transport and Postal & Communication services were further shrinking. While, the percentages of expenditure on local transportation and other services were relatively stable.

3. Literature Review

This chapter aims to outline the research development of economic impact studies on tourism, from both methodological advancements and the development of its supportive statistical tools. Some important literatures that focus on economic impact analysis of inbound tourism in China are highlighted at the end. They are the theoretical underpinning of this research.

Due to its important policy implications, economic impact analysis of tourism has been a popular research area. Song et al. (2012) provide the most up-to-date review of tourism economic impact research and summarise the key trends in its recent development. As noted by the reviewers, the development of tourism economic impact studies can be seen from both its methodological advancement and the development of its supportive statistical tools.

The macroeconomic analysis techniques developed from the most simplistic Keynesian-type multipliers, to more advanced Input-Output (I-O) models, Social Accounting Matrix (SAM) models and Computable General Equilibrium (CGE) models. They share a common theoretical basis that takes into account inter-sectoral linkages in the economy from an equilibrium perspective. Therefore, they provide the policy makers with a comprehensive view of the economy. Each analytical method, with individual advantages and limitations, requires various levels of data input and is designed to investigate different types of research questions.

The tourism multipliers method is the first developed analytical method and has not been used in recent applications (Sun, 2005). Notable studies include Archer and Revell (1977) and Archer (1984). In terms of practical applications, tourism multipliers are oversimplified and do not provide the information needed for policy-making.

Input-Output analysis has been used extensively to evaluate the economic impact of tourism development since the 1970s (e.g. Archer, 1977; Fletcher, 1989; Archer and Fletcher, 1996). Superior to simple tourism multipliers analysis, it is the first model to assess the secondary impact of shocks on a national economy. The framework is built on an I-O table on national or regional level. It assumes a linear relationship between inputs and outputs in an economic system as proposed by Leontief in 1936. A variety of multipliers relating to output, income, government revenue, employment, and imports can be derived from input-output analysis.

The Social Accounting Matrix (SAM) is an extension of I-O modelling. It adds to the I-O structure by presenting income transactions in the national economy. Based on the availability of an I-O table, the construction of a SAM requires much more social economic development statistics, thus incorporating comprehensive information on representative economic agents i.e. households, enterprises, government and rest of the world. A recent study is by Akkemik (2012), who employs a SAM analysis in assessing the importance of international tourism for the Turkish economy.

The Computable General Equilibrium (CGE) approach is the latest, most complete and comprehensive method in assessing tourism economic impact. A CGE model consists of a set of equations to depict the supply, demand, market relationships and income flows in an

economic system. The mathematical specification follows from microeconomic optimisation principles. Constrained by several accounting conditions, the model finds the optimal solution when all markets reach the equilibrium simultaneously. Besides providing a comprehensive tourism economic impact analysis, CGE models are also powerful tools to evaluate the effectiveness of tourism policies (see Meng et al., 2013).

The parallel development of the supportive statistical tool Tourism Satellite Account (TSA) has largely facilitated tourism economic impact researchers. Its unique approach derives from employing the principles and structure of the internationally-adopted System of National Accounts (SNA) to measure direct economic contributions of tourism consumption to a national economy (Frechtling, 2011). The TSA is a satellite account of SNA 2008, which aims to provide comprehensive, consistent and comparable tourism statistics to assess tourism's direct contribution to GDP and employment by industry for a given year. This tourism accounting system is designed to be comparable worldwide, updated annually, and benchmarked every 5 years. Frechtling (2011) explicitly elaborated on the extension of the use of the TSA through above mentioned economic analysis models. He points out that the basic tasks of measuring tourism demand and industry response to it is to be accomplished by the TSA and this information can be then used in an I-O model, a SAM or a CGE model to perform economic analyses for policymaking.

Several studies have modelled the economic impact of inbound tourism in China (e.g. Oosterhaven and Fan, 2006; Li and Han, 2009; Li et al., 2011). Oosterhaven and Fan (2006) estimated the direct, indirect and induced dependence of the Chinese economy on international tourism in 1997 by using an extended I-O model with SAM-based endogenous consumption demand. They indicated that although the impact of international tourism in China is still small, its high value added intensity shows its future potential for the Chinese economy. Basing on a CGE model, Li and Han (2009) made an overall quantitative analysis on the impact of change in inbound tourism demand on Jiangsu Province, China. It is the first attempt to assess Chinese tourism issues in a CGE model, although on a regional level. In accordance with the tourism SAM of Jiangsu Province, the paper measured the resulting change in GDP and social welfare. Li et al. (2011) applied CGE modelling to forecast the economic contribution of international tourism generated by the Beijing 2008 Olympics. This is the first time that CGE modelling has been applied to evaluate inbound tourism from a national perspective. The model was calibrated to the China 2002 I-O table (2002 prices have been updated to 2005 prices) with the inclusion of data on tourism expenditures in 2005. Due to a 'follower' status of Chinese tourism research, these studies all draw lessons from international experience on modelling techniques, and suit the measures to local conditions of inbound tourism and economic characteristics of China.

In designing the research methodology used in this thesis, all techniques are considered and compared carefully. The CGE approach is not used, mainly because of its requirement of massive amounts of input data and difficult-to-obtained elasticity values. Besides, there is only a limited development of regional TSAs in some tourism-advanced regions (e.g. Jiangsu, Zhejiang and Guangxi) (Li, 2009). The development of a Chinese TSA is not such that it can

provide valuable statistical support to a comprehensive CGE analysis. In addition, as argued by Oosterhaven and Fan (2006) and Akkemik (2012), if the aim is to examine the importance of the tourism sector in an economy, SAM analysis is sufficient. However, as an expansion of I-O model, SAM analysis is subject to the same limitations associated with I-O models. Moreover, it has the same data requirements as CGE models.

Given the time constraints and data available for the study, we decide to follow an I-O approach and to investigate a specific model improvement. As summarized in *2008 Tourism Satellite Account: Recommended Methodological Framework* (TSA: RMF 2008) (UNSD, et al. 2008, page 97), one of the not satisfied assumptions supposed in the use of models based on I-O relationships is the linear relationship between inputs and outputs, expressed through the matrix of technical coefficients. This is the key assumption in traditional I-O analysis. However, it does not meet the economic reality that producers are constantly substituting inputs in response to price changes. Thus we focus our methodological design on including input substitution in production in an I-O framework. The choice of functional forms is crucial and depends on research objective. Peerlings (1993) indicates that if substitution of intermediate inputs is important, production functions that allow for intermediate input substitution should be used (no Leontief production functions). CES is an appropriate functional form to be investigated. Moreover, the inclusion of CES production functions naturally brings price relations in the I-O framework. CES functions are commonly used in general equilibrium models. In the next chapter we give a full account of the technical details of this approach.

4. Data and Model

The extended Input-Output model for inbound tourism analysis developed in this chapter is a single-country static model, which aims to capture the importance of inbound tourism to the Chinese economy. Section 4.1 presents the data. Then the empirical model is elaborated in section 4.2. Finally, section 4.3 explains the calibration of the model in detail.

4.1 Data

The I-O model for China is calibrated for 2007, as this is the most recent year for which a basic I-O table is available from the *China Statistical Yearbook 2012* compiled by the National Bureau of Statistics of China. The most detailed I-O table consists of 135 sectors, of which there are 5 agricultural sectors (primary industry), 90 manufacturing sectors (secondary industry), and 40 service sectors (tertiary industry). The unit of measurement is 100 million Yuan (RMB) at producers' prices in 2007⁴. This is a snapshot of input-output relationships in Chinese economy at the year 2007. It shows the flow of production materials (in monetary values) between producing sectors and factor inputs providers, as well as the demand for commodities and services from final customers. In this economic system, both production and consumption sides are integrated in an input-output framework, and through inter-sectoral linkages, the value of the gross input of the whole economy is equal to its gross output.

Next, how to position inbound tourism in this mega system is crucial to this research. It is not a single sector linking up clearly with other sectors, nor a reported economic unit in final demand. This implies that additional data sources are required. Data of foreign exchange earnings from inbound tourism is the choice of many researchers. The composition of foreign exchange earnings from inbound tourism in 2007 is presented in Table 4.1.

Table 4.1 Foreign exchange earnings from inbound tourism and its composition in 2007.

Item	Percentage	Value	
	(%)	(Million US\$)	(100 million Yuan)
Total	100.0	41919	3188
Long Distance Transportation	26.6	11143	847
Civil Aviation	21.0	8791	668
Railway	1.8	771	59
Highway	1.7	694	53
Waterway	2.1	887	67
Sightseeing	4.3	1800	137
Accommodation	14.2	5938	452
Food and Beverage	8.9	3748	285
Shopping	25.0	10494	798

⁴According to Li and He (2008), the major tax in China is a value-added tax and this is included in the 2007 producers' prices at which all the input-output flows in the original 2007 China I-O table were valued. Besides, the imports value reported also includes import duties.

Entertainment	5.0	2110	160
Postal and Communication Services	1.8	761	58
Local Transportation	3.0	1242	94
Other Service	11.2	4683	356

Note: Reference exchange rate of RMB (2007 Average): 100 US\$ = 760.40 Yuan. China Statistical Yearbook (2012).

Source: China Statistical Yearbook (2009).

Table 4.1 shows that (direct) consumption demand of inbound tourists solely takes place in the service sectors, where the tourism industry has its most direct economic activities. With the help of this consumption structure of inbound tourists and the detailed sector disaggregation, it is possible and necessary to re-construct an I-O table pointing out the inter-linkages between inbound tourism related activities and other sectors in the economy. Following this idea, a specific I-O table for inbound tourism analysis is made with a new sector classification and the inclusion of inbound tourism demand in final demand. First, the sectors that account for foreign exchange earnings from inbound tourism are kept in the new table, while other sectors are aggregated. Table 4.2 shows the aggregation and classification of sectors in the new table. To be noticed, the set-up of sectors 3-14 corresponds exactly to the classification of expenditure items in Table 4.1. Second, for the sake of modelling tourism impact, expenses paid by inbound tourists have been regarded as tourism exports (Li, et al., 2011). Thus inbound tourism demand is added in the final demand section and non-tourism exports are obtained by subtracting inbound tourism demand from the original total exports.

Table 4.2 Aggregation and classification of sectors in I-O table

Sector description	Sector codes in the China 2007 I-O table (135)
1. Primary Industry ¹	001-005
2. Secondary Industry ²	006-095
3. Air Transport	100
4. Railway Transport	096
5. Highway Transport	097
6. Water Transport	099
7. Urban Public Transport	098
8. Travel Agencies ³	116
9. Lodging	109
10. Catering	110
11. Wholesale and Retail Trades	108
12. Entertainment	134
13. Postal & Communication Services	104-105
14. Other Services	101-103, 106-107, 111-115, 117-133, 135

Notes: 1. Primary industry refers to agriculture, forestry, animal husbandry and fishery.

2. Secondary industry consists of mining, manufacturing, production and supply of electricity, gas and water, and construction.

3. Travel agencies refer to services offered by tour operators and travel agents. It corresponds to expenditure on sightseeing.

To be in line with a standard I-O table format, the table is further modified by repositioning “Imports” from a column counted in the gross output to a row beneath the “Value added” part, accordingly contributing to new values of gross output and total input. In addition, there is an

4.2 Empirical model

The empirical model is built from a general equilibrium perspective. By using a set of equations, we model the supply and demand of inputs and outputs in an economic system. The equilibrium prices and quantities are reached when all the conditions are matched under optimizing assumptions.

Suppose there are I (alias: J) industries and five economic agents as final demanders (household, government, investment, inbound tourism and export) in the economy. Each industry (i.e. a row industry in the I-O table) produces one homogenous commodity or service i ($i = 1, \dots, I$) sold to each other industry and final demanders. At the same time, each commodity or service i is used as an intermediate input demanded by each other industry j (i.e. a column industry in the I-O table). Each industry j also uses factor inputs i.e. labour and capital, as well as imports in its production. For each industry j , the total amount of inputs (intermediate inputs plus factor inputs plus imports) is N ($n = 1, \dots, N$, $N > I$). In addition, there are taxes imposed on the use of intermediate inputs and imports.

The model employs standard neoclassic economic assumptions: a perfectly competitive economy with constant returns to scale and simultaneous market clearing (quantity supplied equals the quantity demanded). Moreover, cost minimization is assumed to drive behavior of producers.

The outcome of cost minimisation given a CES production function is the CES cost function with only one output (Peerlings, 1993):

$$C_j = y_j \cdot \Gamma_j^{-1} \cdot \left(\sum_{n=1}^N \alpha_{nj}^{\sigma_j} \cdot w_{nj}^{1-\sigma_j} \right)^{\frac{1}{1-\sigma_j}}$$

$$0 < \sigma_j < \infty; \alpha_{nj} > 0 \quad n = 1, \dots, N \quad j = 1, \dots, J \quad (1)$$

where: C_j production costs of industry j , y_j output quantity of industry j , Γ_j scale or efficiency parameter of industry j , α_{nj} distribution coefficient of input n in industry j , w_{nj} price of input n in industry j , σ_j substitution elasticity of industry j .

Using Shephard's lemma the (conditional) input demand functions for each industry (conditional to the only output of the sector) can be obtained:

$$x_{nj} = y_j \cdot \Gamma_j^{-1} \cdot \alpha_{nj}^{\sigma_j} \cdot w_{nj}^{-\sigma_j} \cdot \left(\sum_{n=1}^N \alpha_{nj}^{\sigma_j} \cdot w_{nj}^{1-\sigma_j} \right)^{\frac{\sigma_j}{1-\sigma_j}}$$

$$n = 1, \dots, N \quad j = 1, \dots, J \quad (2)$$

where: x_{nj} conditional demand for input n in industry j .

In addition, representing a situation of perfect competition in the economy, zero profit conditions are assumed for all industries. Profits are zero because of constant returns to scale assumption and the extremely low (near-zero) cost of entry. If there would be profit, more

firms would enter the industry, dividing up the profit margin to zero. So, output value (revenue) equals total input value (costs). The total value of inputs of each industry is equal to the total value of intermediate inputs plus the value of factor inputs and imports.

$$y_j \cdot p_j = \sum_{n=1}^N x_{nj} \cdot w_{nj}$$

$$n = 1, \dots, N \quad j = 1, \dots, J \quad (3)$$

where: p_j output price of industry j .

Moreover, the total demand for each product or service is equal to its total intermediate demand plus final demand.

$$y_i^{TD} = \sum_{j=1}^J x_{ij} + y_i^{FD}$$

$$i = 1, \dots, I \quad j = 1, \dots, J \quad (4)$$

where: y_i^{TD} total demand for product or service i , y_i^{FD} final demand for product or service i , x_{ij} intermediate demand for input i in industry j .

Finally, as a result of the simultaneous market clearing assumption, total quantity demanded for a specific product or service is equal to its total quantity supplied:

$$y_i^{TD} = y_j \quad i = j \quad i = 1, \dots, I \quad j = 1, \dots, J \quad (5)$$

Apart from supply-demand relations, there are relations between input and output prices. We know that an industry as a seller charges the same output price to all demanders for the homogenous product or service supplied. Whereas, an industry buying a specific product or service as an intermediate input in its production pays higher prices due to the tax levied in that industry. It is the government that imposes this tax creating a price wedge between the price suppliers actually receive and the price demanders have to pay.

Next we explain the determination of tax rates and input prices. Actually in the I-O table, there is a tax row, which counts the amount of tax revenue charged by the government and paid by an industry on intermediate inputs and imports demanded. Thus, for each industry if we divide the tax revenue by its tax base (= total value of intermediate inputs and imports), we get the value of the ad valorem tax rate, which determines the relation between the input price and output price of an intermediate product or service, and between the price of an imported input and the world market price. Consequently, the tax rate in each industry can be derived:

$$t_j = \frac{v_j^{TAX}}{\sum_{i=1}^I x_{ij} \cdot p_j + x_j^{IM} \cdot p_j^W} \quad i = 1, \dots, I \quad j = 1, \dots, J \quad (6)$$

where: t_j ad valorem tax rate of industry j , v_j^{TAX} net indirect taxes on production and import in industry j , x_j^{IM} demand for import in industry j , p_j^W world market price of import in industry j .

It is assumed that the percentage tax rate (ad valorem tax rate) is identical for all intermediate

inputs and imports demanded by an industry. For each industry, the price relation between intermediate inputs and output is given by:

$$w_{ij} = (1 + t_j) \cdot p_j \quad i = 1, \dots, I \quad j = 1, \dots, J \quad (7)$$

where: w_{ij} price of intermediate input i in industry j .

Furthermore in the model the ‘small’ country assumption is employed, which reflects that import prices are determined by world prices. China is a large country in terms of population and territory, but its participation in international trade is not such that it could affect world prices (Li et al. 2011). Thus the price equation on imports is specified below:

$$w_j^{IM} = (1 + t_j) \cdot p_j^W \quad j = 1, \dots, J \quad (8)$$

where: w_j^{IM} price of import in industry j .

Until now, the set of the equilibrium conditions has been established. After solving the model, GDP can be calculated. First, we can derive GDP by applying the income approach. This method takes the first step to measure GDP at factor prices by adding up the factor incomes to the factors of production in society. Then, adding net indirect taxes on production and import converts GDP at factor prices to GDP at market prices. It equals the amount of total value-added in the I-O table.

$$GDP^I = \sum_{j=1}^J (x_j^{FA} \cdot w_j^{FA}) + \sum_{j=1}^J v_j^{TAX} \quad j = 1, \dots, J \quad (9)$$

where: x_j^{FA}, w_j^{FA} quantity and price of factor inputs in industry j

Using the expenditure method, GDP also equals the total spending on all final goods and services i.e. total final demand plus net export. In principle, these two methods give the same result.

$$GDP^E = FCE + GCF + IT + \left(X - \sum_{j=1}^J x_j^{IM} \cdot p_j^W \right) \quad j = 1, \dots, J \quad (10)$$

where: FCE final consumption expenditure, GCF gross capital formation, IT inbound tourism demand, X export.

The calibration of the model and the set of exogenous variables are specified in the next section.

4.3 Calibration

Based on the I-O table which serves as baseline data, the empirical model is modeled in the General Algebraic Modeling System (GAMS). All algebraic expressions are transcribed into GAMS language. In the first step the model is calibrated. The Harberger convention is used throughout, so that the model is calibrated in the way that all prices (other than defined prices of intermediate inputs and imports) are equal to one in baseline equilibrium. Next the model is

specified and can be solved for alternative values of the exogenous variables.

Parameters in the model are calibrated such that the model replicates the baseline data. First, the substitution elasticity σ_j in case of CES input demand functions has to be exogenously defined. We assume a value of 0.5 for all industries which reflects a limited degree of substitution between different inputs in every industry. Then for each industry, the substitution parameter (ρ_j), distribution coefficient of input n (α_{nj}) and scale or efficiency parameter (Γ_j) are calculated successively.

$$\rho_j = \frac{1}{\sigma_j} - 1 \quad (11)$$

$$\alpha_{nj} = \frac{w_{nj} x_{nj}^{1/\sigma_j}}{\sum_{n=1}^N w_{nj} x_{nj}^{1/\sigma_j}} \quad (12)$$

$$\Gamma_j = y_j / (\sum_{n=1}^N \alpha_{nj} x_{nj}^{-\rho_j})^{-\frac{1}{\rho_j}} \quad (13)$$

Since the total number of variables in the model is more than the number of equations, some variables have to be declared exogenous. The ad valorem tax rate is fixed to its calibrated baseline value. Furthermore, consumption demand, gross capital formation, inbound tourism demand and export volume are set equal to their initial benchmark values. World market prices are also fixed. In addition, the supplies of factor inputs labor and capital in each industry are kept equal to their baseline quantities.

Finally, the model is solved in GAMS to get the calibrated benchmark equilibrium.

5. Simulation Analysis

The scenarios in this chapter are designed to reflect the economic impact of inbound tourism on the Chinese economy. Then simulation results are presented and discussed in detail on both macroeconomic and industrial level. At the end, sensitivity analyses are applied to test the reliability and confidence of the model.

5.1 Scenarios

Taking the I-O table data as benchmark equilibrium, this study focuses on inbound tourism demand as an exogenous final demand category. When it changes, this external shock will generate an overall impact on the economy through interdependences of industries, leading to a new equilibrium. Comparing the benchmark equilibrium with new equilibrium quantities and prices, the economic impact of inbound tourism on the Chinese economy on the macro level can be traced, as well as the resulting effects on each sector.

Historical data shows that during the development of inbound tourism in China over more than 30 years after the opening of the Chinese economy in 1979, the annual average growth rate from 1980 to 2011 is 16.73%. During the decade of 1990s, it experienced a continuous and steady increase of 22.78%. Since the beginning of the new century, inbound tourism grew over time but dropped in the face of negative shocks, maintaining an annual average growth of 11.50%. Due to the fluctuation of its growth rate, it is justified to design several scenarios with different levels of growth rates to capture a general picture.

Therefore, to examine the impact of inbound tourism on the Chinese economy, three scenarios are simulated, i.e., inbound tourism demand has an increase of 10%, 15% and 20%, respectively. Assuming a fixed consumption structure, inbound tourists' demand for each product or service has a proportional change of +10%, +15%, and +20%, respectively. The economic impact of inbound tourism is expected to be positive, and this effect is predicted to be more significant as inbound tourism demand grows.

5.2 Simulation results

This section will analyse the simulated macroeconomic effects and industrial effects. The baseline case and three scenarios are simulated and compared on macro level in sub-section 5.2.1. The two determination methods in measuring GDP are discussed briefly at the end of this sub-section. In sub-section 5.2.2, taking scenario 2 as reference, the industrial effects resulting from the increased inbound tourism on individual sector are analysed in detail.

5.2.1 Macroeconomic effects

The simulation results on macro level are presented in Table 5.1. The selected indicators are meant to reflect the impact on GDP and trade over three levels of external positive shocks brought by increased inbound tourism demand. In each scenario, the new equilibrium value is shown, together with relative changes compared to the baseline scenario.

Table 5.1 Effects of a percentage increase in inbound tourism demand on macro level

Index	Baseline	Scenario 1		Scenario 2		Scenario 3	
	case	(+10%)		(+15%)		(+20%)	
	(Billion Yuan)	(Billion Yuan)	%	(Billion Yuan)	%	(Billion Yuan)	%
Real GDP^I	26,604	26,610	0.020	26,612	0.030	26,615	0.040
Real GDP^E	26,604	26,610	0.019	26,612	0.029	26,614	0.037
Import value	7,402	7,429	0.361	7,442	0.543	7,456	0.727
Export value	9,235	9,286	0.552	9,312	0.830	9,338	1.111

Notes: Real GDP^I: real GDP measured by income approach;
Real GDP^E: real GDP measured by expenditure approach. (the same below)

First, we have a look at the impact on overall economic growth measured by GDP. Real GDP at market prices is calculated using base year prices. Getting rid of the influence of simultaneously changing prices, real GDP only changes with the changing production level and therefore is a better size measure for the economy. Two approaches are used in the determination of GDP: income method and expenditure method. In principle, they should give the same result. However, different GDP values are obtained from the model, which will be compared in detail later in Table 5.2 and 5.3. Based on both methods, it shows that the positive increases in inbound tourism demand give rise to a higher GDP in all scenarios. Furthermore, we use GDP elasticity as an indicator to examine the degree of impact. In this approach, the percentage reaction of GDP to a percentage change in inbound tourism demand is calculated, i.e. $E_{GDP,IT} = \frac{\Delta GDP / GDP}{\Delta IT / IT}$. Keeping other things equal, in three scenarios, GDP elasticity equals 0.002 in the income approach. That is to say, 1% increase in inbound tourism demand consistently leads to a 0.002% increase in GDP.

The increased inbound tourism demand also promotes trade. Both imports and exports grow. The more the inbound tourist expenditures increase, the higher values are generated in trade. Of which, exports rise more than imports. It is important to mention that in the calculation of trade value, we multiply by new equilibrium prices, instead of base year prices as in the determination of real GDP. Because export volume is fixed exogenously, the rise in export value can be explained by a general rise in output prices. Conversely, the import prices are determined by fixed tax rates and world market prices. Thus, it is the increased import volume that contributes to a higher import value.

Next, we analyze the differences in GDP determination using two methods. Table 5.2 and 5.3 show the composition of GDP from two approaches: income method and expenditure method, respectively. Changes in each composition item are compared with the baseline case.

Table 5.2 shows the changes in the income method components. The sum of return on labor and capital is called total factor income, which counts the gross revenue of all of the factors of production in society. It measures the value of GDP at factor prices. Because of the exogenously fixed amount of labor and capital, there is no change in these two revenue sources. So, GDP at factor prices remains the same in all scenarios. The difference between GDP measured at factor prices and market prices is the total net indirect taxes on production and import. Thus, tax revenue contributes solely to the increase in GDP at market prices. In the model, tax rates are assumed to be fixed. The increase in tax revenue is due to a higher tax base, i.e., higher intermediate demand plus import.

Table 5.2 Effects of a percentage increase in inbound tourism demand on real GDP composition (income method)

Index	Baseline case	Scenario 1 (+10%)		Scenario 2 (+15%)		Scenario 3 (+20%)	
	(Billion Yuan)	(Billion Yuan)	%	(Billion Yuan)	%	(Billion Yuan)	%
Return on labor (+)	11,005	11,005	0	11,005	0	11,005	0
Return on capital (+)	11,748	11,748	0	11,748	0	11,748	0
Net indirect tax revenue (+)	3,852	3,857	0.138	3,860	0.208	3,863	0.277
Real GDP^I	26,604	26,610	0.020	26,612	0.030	26,615	0.040

Table 5.3 Effects of a percentage increase in inbound tourism demand on real GDP composition (expenditure method)

Index	Baseline case	Scenario 1 (+10%)		Scenario 2 (+15%)		Scenario 3 (+20%)	
	(Billion Yuan)	(Billion Yuan)	%	(Billion Yuan)	%	(Billion Yuan)	%
Household consumption (+)	9,655	9,655	0	9,655	0	9,655	0
Government consumption (+)	3,519	3,519	0	3,519	0	3,519	0
Investment (+)	11,278	11,278	0	11,278	0	11,278	0
Inbound tourism (+)	319	351	10	367	15	383	20
Export (+)	9,235	9,235	0	9,235	0	9,235	0
Import (-)	7,402	7,429	0.361	7,442	0.543	7,456	0.727
Real GDP^E	26,604	26,610	0.019	26,612	0.029	26,614	0.037

Table 5.3 presents the changes in the expenditure method components. We see that the increase in GDP is composed of growing import (negative) and increased inbound tourism demand itself (positive). Other components are fixed exogenously.

The two methods measure GDP from two sides: income and expenditure, which should give exactly the same outcome. But they do not - the expenditure method gives a slightly smaller increase rate in every scenario. The reason is that in this model there is no explicit link between the income and expenditure side of the economy. Especially final demanders' expenditure is fixed exogenously.

5.2.2 Industrial effects

Next, we focus on the effects on different sectors. Taking a medium growth rate of 15% in inbound tourism demand in scenario 2, changes on industrial level of several important indicators are presented in Table 5.4. GDP is taken from the income method.

Table 5.4 Effects of a 15% increase in inbound tourism demand (scenario 2) on industrial level

Industry	Code	Contribution to GDP		Gross Output Volume		Output Price	Factor inputs prices	Import Volume
		Base	%	Base	%	%	%	%
Primary Industry	01	0.108	-0.030	5,122	0.042	0.909	0.993	0.495
Secondary Industry	02	0.506	-0.007	64,345	0.095	0.768	0.958	0.478
Air Transport	03	0.003	0.326	347	2.867	1.936	7.866	3.858
Railway Transport	04	0.009	-0.008	396	0.191	1.431	1.820	0.906
Highway Transport	05	0.018	-0.010	1,051	0.120	1.097	1.339	0.667
Water Transport	06	0.011	0.002	684	0.177	1.125	1.483	0.739
Urban Public Transport	07	0.004	0.076	226	0.551	1.818	2.944	1.461
Travel Agencies	08	0.002	0.084	172	1.172	2.359	4.773	2.358
Lodging	09	0.004	0.477	314	1.826	2.488	6.265	3.085
Catering	10	0.016	0.024	1,220	0.408	1.259	2.086	1.038
Wholesale & Retail Trades	11	0.065	0.101	2,883	0.293	1.602	2.199	0
Entertainment	12	0.002	0.285	113	1.653	2.812	6.239	3.072
Postal & Communication Services	13	0.021	-0.016	855	0.097	1.278	1.474	0.734
Other Services	14	0.230	-0.015	11,562	0.090	1.123	1.306	0.651

First, we look deeper into the contribution of each industry to GDP. There is a general rise in tourism related sectors, except for a few minor declines in railway and highway transport, postal & communication services and other services. In addition, there is a slight fall in the share of GDP in primary and secondary industries, of which primary industry decreases most. Generally, it shows the increasing share of most tourism related industries in the whole economy, driven by higher demand from inbound tourists. Of which, lodging, air transport and entertainment industries have the largest growth of 0.48%, 0.33% and 0.29%, respectively.

In terms of gross output volume, every industry grows. Among all increases, the air transport sector stands out with a growth rate of 2.87%, followed by the lodging sector (1.83%) and entertainment sector (1.65%). In contrast, the primary industry increases the least (0.04%).

Second, we examine the impact on prices of a 15% rise in inbound tourism demand. Because of this higher demand, there is a universal rise in prices of commodities and services across the entire economy, with the largest growth in entertainment (2.81%), lodging (2.49%) and

travel agencies (2.36%). In contrast, the secondary industry shows the smallest price change (0.77%). The overall increase in output price in turn leads to an overall increase in input prices. With respect to prices of factor inputs, because the quantities of labor and capital are assumed to be fixed, their shadow prices change in response to the external positive shock, indicating increased profitability. The largest growth is seen in air transport (7.87%), lodging (6.27%) and entertainment (6.24%).

Finally, because the import prices are fixed, we take a look at the change in import volume. The import volume in every industry rises except for wholesale & retail trades sector, which reports no import in the base case. Among those who import, air transport (3.86%), lodging (3.09%) and entertainment (3.07%) show the largest increases. The changes are in line with their leading increases in gross output volume, which implies that increased import is the main instrument to push up output volume. In addition, due to fixed import prices, effects on import value at macro level are considered to show similar changes.

To sum up, the simulation results show that an increase in inbound tourism demand, as part of final demand, has a positive impact on the Chinese economy. The size of the economy grows, which at the same time favors trade. Export goes up due to the increase in inbound tourism and more due to a general increase in output prices. While increase in import is supported by higher quantities demanded. As inbound tourism demand continues to grow, this effect becomes stronger. In addition, prices of inputs, especially factor inputs, rise across the entire economy.

Due to the fixed consumption structure of inbound tourists, its impact on different industries is interesting. In terms of contribution to GDP, most tourism related industries show increasing shares, while shares of primary and secondary industries go down. This reflects the positive effect of inbound tourists' consumption on domestic tourism industries.

Among all beneficiaries, there are four eye-catching industries: air transport, lodging, entertainment and travel agencies. Their industrial output increases the most. Their shares in GDP go up the most. The output prices of these sectors also increase the most. Especially regarding the change in factor prices, the increase is significant. Besides, their import quantities go up most. So, increased inbound tourism favors these industries most.

5.3 Sensitivity tests

The sensitivity analyses in this section are designed to investigate the sensitivity of the model results with respect to some model assumptions, i.e. whether there are potential influences caused by these assumptions and if so, to what extent they influence the model output.

First, compared to a traditional input-output analysis, the main contribution of the model is that it allows for substitution between inputs. We want to test what the effect of the substitution elasticity is on the results. In normal sensitivity tests for parameters, they often halve and double the values which are used in model application and compare the new

simulation results with the baseline case. In this model, the base substitution elasticity is 0.5. We follow the conventional approach but assign a higher (triple) value to substitution elasticity to avoid a Cobb-Douglas case (when the value of substitution elasticity is 1). The results are shown in Table 5.5. We use a 15% increase of inbound tourism demand in scenario 2 as reference. All changes are compared to the baseline case.

Table 5.5 Results of sensitivity tests for substitution elasticity (scenario 2)

Index	Half value - 0.25	Base value- 0.5	Triple value-1.5
	%	%	%
Real GDP^I	0.030	0.030	0.030
Real GDP^E	0.027	0.029	0.030
Import value	0.549	0.543	0.540
Export value	1.689	0.830	0.274

The simulation result shows that real GDP based on the income approach is independent of the level of the substitution elasticity. However, real GDP measured by the expenditure method is sensitive to the changing degree of substitution. It shows a smaller increase in face of more limited substitution among inputs. In case of increasing substitution among inputs, the growth rate increases along, till it reaches the same growth rate of 0.03% as in the income method.

In contrast, as substitution becomes easier, the growth rate of the import and export value is decreasing, of which the change in export value declines dramatically. It suggests that the effect of inbound tourism on trade is larger when input substitution possibilities are smaller.

Second, we investigate the treatment of the fixed factor input endowment. It is known that in an I-O model, labour and capital are not fixed. There is a linear relationship between input and output. While in this study, we introduce the CES input demand function to allow for substitution and fix the quantities of labour and capital. This implies that supply of primary factors in every industry is saturated and only the (shadow) prices may adjust in response to an external shock. This is a short run assumption in which factors of production are fixed as to changing the output level. Actually, there is another alternative: to fix the prices of labour and capital. This case suggests a surplus in the factor markets and any addition in demand can be met by just using more factors. The price level is unchanged. Given the reality in Chinese economy, both cases are reasonable. Especially in the labour market, the (absolute) labour surplus has become a part of history and a general increase in wage rate can be observed in recent years. But at the same time there are still many people who have difficulty in finding a job due to structural unemployment reasons. Thus, in this sensitivity test, we fix prices and make a comparison between both extreme cases (see Table 5.6). The reality might be somewhere in between. We use a 15% increase of inbound tourism demand as in scenario 2 as reference. All changes are compared to the baseline case. The substitution elasticity is set back to 0.5.

Table 5.6 Results of sensitivity tests for exogenous factor inputs (scenario 2)

Index	Quantities fixed	Prices fixed
	%	%
Real GDP^I	0.030	0.148
Real GDP^E	0.029	0.148
Import value	0.543	0.115
Export value	0.830	0
Employment	0	0.126
Capital volume	0	0.166

Compared to the original model, employment and capital volume in the society go up because of the increased inbound tourism. Although not reported here, employment in every industry goes up with the largest increases in air transport (3.11%), lodging (2.39%) and entertainment (2.29%).

Based on both methods, GDP goes up to a much larger extent (GDP elasticity being 0.010) as the quantity of factor inputs goes up. At the same time, import goes up much less, and export value shows no change at all. We know that export volume is fixed, so output prices remain unchanged. It implies that the availability of surplus factor stock could stimulate the economic progress to a higher degree without pushing up general output price level. Less increase in import indicates that domestic production makes more use of factor inputs to meet the increasing demand. In addition, it is interesting to note that changes in each indicator under this assumption always give the same results regardless of different substitution levels.

6. Conclusions and Discussion

In this research, the economic impact of inbound tourism in China is investigated through an extended I-O model incorporating input substitution in a general equilibrium framework. The analysis is conducted using the China 2007 I-O table. This methodology advancement fills the gap in improving the application of I-O modeling and providing the most up-to-date assessment of inbound tourism's economic impact on the Chinese economy. The three specific research questions that structured this thesis have been answered and concluded in section 6.1. Based on the conclusions several policy recommendations are provided. The last section 6.2 wraps up the whole thesis by reflecting critically on the research performed.

6.1 Conclusions and recommendations

In this section, we resume each research question and answer them according to our findings.

❖ What kinds of data are necessary and available for the I-O model?

An I-O model theoretically bases on an I-O table which provides sufficient information for inbound tourism analysis. For the sake of data consistency, the original data served in this research is solely extracted from *China Statistical Yearbook 2012* that is compiled by National Bureau of Statistics of China and published by China Statistics Press. The 2007 I-O table, on which the model is based and calibrated, is part of the National accounts and provides the most recent year of reference. Another important data source, foreign exchange earnings from inbound tourism and composition, is taken from statistical reports on tourism provided by China National Tourism Administration. In order to measure the impact of inbound tourism activities on the whole economy, we practically merge these data together to construct a specific I-O table for inbound tourism analysis. It is an I-O table with a new sector classification corresponding with the expenditure item in inbound tourism receipts, and the inclusion of inbound tourism demand in final demand. It enables us to track the change in the whole economic system resulting from an external injection from inbound tourism demand.

❖ How to extend the I-O model to allow for substitution of inputs in production?

Instead of following the traditional I-O approach that calculates the Leontief inverse matrix and ends up with linear I-O multipliers, this research builds a general equilibrium framework for the supply and demand of inputs and outputs. The model employs standard neoclassic economic assumptions to design the market relationships. As the core of the modelling, we apply CES production functions with restricted substitution possibilities to model the input demand relationships in each industry. Apart from supply-demand relations, the linkages between input and output prices are also highlighted. After the set-up of all the equations, the model is calibrated to the specific I-O table complied under the previous research question and solved in each simulation scenario. The results are further tested in sensitivity analyses.

❖ What is the economic impact of inbound tourism on the Chinese economy?

Based on the simulated results and sensitivity tests, the findings confirm the positive contribution of inbound tourist expenditures to the economy through backward linkages which increase domestic production and demand for domestic inputs. Output level in every industry goes up and more jobs are generated in the society. The increased inbound tourism demand also tends to push up the general price level of goods and services across the entire economy. A higher degree of substitution of inputs leads to less use of imports and has a negative influence on the increase of the price level.

In terms of industrial share in GDP, higher demand from inbound tourists is beneficial to most tourism related sectors. In particular, air transport, lodging, entertainment and travel agencies are gaining the most. They can be seen as the important channels through which the impact of inbound tourism on the economy works. But it also has a slight crowding-out effect on primary and secondary industries, of which, the agricultural sector suffers most.

The results of the analyses have important policy implications. First, the government should take the initiative to further enhance inter-industrial linkages in the economy. This can be done by facilitating the input mobility in production, both in the primary factors labor & capital and in intermediate inputs. We see that with increasing input substitution, less import is needed and the price level goes up to a smaller extent. More economic benefits brought by increased inbound tourism can then be gained by domestic producing industries and consumers. It is their closer linkages with other sectors that enable the four beneficial sectors to stand out and reap the benefits from inbound tourism receipts. Reducing taxes on production and breaking down industrial barriers might be effective policy instruments.

Second, some regulating works could be done by the government to balance the industrial response to booming inbound tourist spending. Except the four beneficiaries (air transport, lodging, entertainment and travel agencies), the catering sector could benefit more. The effect of inbound tourist expenditure on catering sector is now just modest. As a country with a fascinating catering culture, the attractiveness of food and beverage for inbound tourists could be a selling point. As a traditional labor-intensive industry, its contribution to GDP and employment is expected to be relatively large. Overseas tourism promotion focus could be shifted a bit to Chinese food culture. In addition, food safety problem should be seriously dealt with by the government to build consumers' confidence.

Third, with respect to the crowding-out effect on primary industry, government could promote the diversification of tourism products. Tourism consumption can be led to the agricultural domain. Rural tourism, such as agricultural sightseeing or 'pick-your-own-fruits' experiencing projects, can be encouraged with more supporting policies and funds.

As an integrated economic industry, inbound tourism incorporates many national economic activities. This, on one hand, makes it hard to measure its full impact. On the other hand, through a proper model, its impact on the Chinese economy gives valuable insights for policy and economic decision-making.

6.2 Discussion

In this section, the research and results are reflected critically. Based on that, several suggestions for future research are given.

To begin with, the major findings of this research are that the effect on total GDP of inbound tourist expenditure is positive but rather modest (GDP elasticity being 0.002-0.010). This is in accordance with the findings in most economic impact studies. According to the research done by Oosterhaven and Fan (2006), there was a small dependence of Chinese GDP on international tourism of 1.6% in 1997. Another empirical finding from Li and Han (2009) was that GDP of Jiangsu Province (China) will grow by 0.114% when inbound tourism demand increases by 10%. Besides, Akkemik (2012) calculated the GDP elasticity of international tourism sector in Turkey, which was 0.001 in 1996 and 0.011 in 2002. Compared with conclusions from above mentioned studies, the findings in this research are reasonable and more conservative. In the studies by Oosterhaven and Fan (2006) and Akkemik (2012), they follow the SAM analysis which doesn't take into account the change in prices and assumes linear production functions. With changing prices and substitution of inputs in our research, the resulting impact from increased inbound tourism on GDP is weakened by the price reaction and the adjusted input use structure.

Scholars have also tried to explain this minor effect brought by (inbound) tourism activities. Min and Wall (2002) argue that tourism in China has provided only a limited stimulus to economic development at the national level, due to the size and diversity of the Chinese economy. This could also be seen in the comparison between our research and the study by Li and Han (2009). Their findings of economic impact brought by changing inbound tourism demand on regional level are larger than our research findings on national level. Based on our research, the small impact might be also partly explained by the simultaneously increased import, which implies leakage of inbound tourist expenditures. Of the above mentioned beneficial sectors, the increases in use of imported goods and services are also the largest. This implies large amount of inbound tourism receipts leaks out of the economy by using more imports. Domestic production and employment are not stimulated as much as expected.

Moreover, the empirical results of this thesis should be interpreted with caution due to several limitations in modeling design.

First, the income and expenditure sides of the economy are not explicitly linked. The input-output linkages between sectors are properly expressed through CES demand functions. However, we didn't model the economic behavior of end consumers. The domestic consumption demand, which could be stimulated by additional inbound tourist purchases, is ignored. This calls for a proper SAM and CGE analysis in future research.

Second, the assumption of a fixed supply of factor inputs, which is tested in sensitivity analyses, is a simple dichotomy that either fixes quantity or price. Take labor supply for example. In the model, we have a fixed stock of labor per sector assuming that labor is immobile between sectors. In the sensitivity test, we switch to fix a wage rate of labor and

witness an increase of employment in every sector. In that case there is no quantitative restriction on the supply. However, neither treatment is completely satisfying. In reality labor supply is dependent on wages and (imperfectly) mobile between sectors as a result of changing wage rates. One option could be to build a constant-elasticity-of-transformation (CET) function to model labor supply (see Peerlings, 1993).

With respect to future research methodology advancement, a static CGE analysis could be one step forward. This would require the construction of a SAM as an extension of the I-O table. It would provide data on income flows in the economy between economic institutions and with rest of the world. For a first step in constructing a SAM see Appendix 3.

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Appendices

Appendix 1

Table A.1 International tourism receipts and GDP with their growth rates, 1978-2011

Year	International tourism receipts (100 million US\$)	Growth (%)	GDP (100 million Yuan)	Growth (%)
1978	2.63	---	3,645	---
1979	4.49	70.72	4,063	11.45
1980	6.17	37.42	4,546	11.89
1981	7.85	27.23	4,892	7.61
1982	8.43	7.39	5,323	8.83
1983	9.41	11.63	5,963	12.01
1984	11.31	20.19	7,208	20.89
1985	12.50	10.52	9,016	25.08
1986	15.31	22.48	10,275	13.97
1987	18.62	21.62	12,059	17.36
1988	22.47	20.68	15,043	24.75
1989	18.60	-17.22	16,992	12.96
1990	22.18	19.25	18,668	9.86
1991	28.45	28.27	21,782	16.68
1992	39.47	38.73	26,924	23.61
1993	46.83	18.65	35,334	31.24
1994	73.23	56.37	48,198	36.41
1995	87.33	19.25	60,794	26.13
1996	102.00	16.80	71,177	17.08
1997	120.74	18.37	78,973	10.95
1998	126.02	4.37	84,402	6.87
1999	140.99	11.88	89,677	6.25
2000	162.24	15.07	99,215	10.64
2001	177.92	9.66	109,655	10.52
2002	203.85	14.57	120,333	9.74
2003	174.06	-14.61	135,823	12.87
2004	257.39	47.87	159,878	17.71
2005	292.96	13.82	184,937	15.67
2006	339.49	15.88	216,314	16.97
2007	419.19	23.48	265,810	22.88
2008	408.43	-2.57	314,045	18.15
2009	396.75	-2.86	340,903	8.55
2010	458.14	15.47	401,513	17.78
2011	484.64	5.78	472,882	17.77

Source: China Statistical Yearbook (1996-2012); Statistics on China's Tourism (2001).

Appendix 2

Table A.2 The China 2007 inbound tourism I-O table with 14 sectors

Data are calculated at producers' prices in 2007 (100 million Yuan)

Input \ Output		Intermediate Demand (Production activities)														Total	Final Demand					Gross Output (Total demand)
																	H	G	I	IT	E	
Code	1	2	3	4	5	6	7	8	9	10	11	12	13	14								
Inter-mediate Input	1	6877	24917	0	1	0	0	0	0	1777	8	19	0	744	34344	11156	342	4713	0	666	51221	
	2	10260	364783	1452	866	3363	2576	771	87	946	4742	3289	310	1755	28056	423256	39549	0	99032	0	81608	643445
	3	23	584	144	0	9	6	2	19	12	18	173	2	59	847	1898	167	89	22	668	625	3469
	4	145	2130	2	44	4	2	1	139	9	13	432	1	14	435	3371	258	68	11	59	192	3959
	5	310	6178	4	12	631	4	2	110	8	26	945	2	23	514	8769	467	824	82	53	311	10506
	6	90	3080	4	2	9	509	2	0	2	30	598	1	3	87	4418	345	135	93	67	1781	6840
	7	16	226	2	0	5	1	0	1	3	5	67	1	4	383	713	862	506	80	94	0	2255
	8	5	137	1	1	6	1	4	122	2	3	9	14	39	182	525	1031	0	27	137	0	1720
	9	32	592	10	8	51	7	2	200	48	9	153	3	25	1466	2605	92	0	-12	452	0	3137
	10	98	2533	76	12	133	15	8	222	33	32	532	21	52	2135	5900	5656	0	361	285	0	12202
	11	722	11234	50	26	105	88	23	3	59	354	188	36	276	1548	14714	7748	0	2364	798	3210	28833
	12	1	287	3	3	14	4	1	6	8	8	133	2	7	339	816	133	0	20	160	0	1129
	13	204	2703	4	45	34	161	5	3	64	16	332	7	138	1631	5347	2753	0	301	58	89	8548
	14	1452	23701	301	352	1174	381	185	197	433	590	4642	120	521	12090	46138	26335	33228	5687	356	3871	115615
Total		20234	443086	2053	1371	5538	3756	1006	1109	1625	7623	11500	541	2914	50458	552815	96553	35191	112780	3188	92353	892880
Value Added	W	27182	45994	179	949	1290	739	361	319	522	1016	4189	109	958	26241	110047						
	T	48	27010	69	113	486	336	120	36	227	389	4205	56	308	5116	38519						
	D	1430	18162	264	446	894	580	242	59	341	192	1231	66	2492	10857	37256						
	S	0	43329	164	962	2209	1381	459	99	101	2780	7708	242	1752	19036	80222						
Total Value Added		28659	134495	675	2470	4879	3035	1182	514	1191	4376	17332	474	5510	61250	266044						
Import		2328	65864	741	118	88	49	67	97	321	203	0	114	123	3907	74021						
Total Input (Supply)		51221	643445	3469	3959	10506	6840	2255	1720	3137	12202	28833	1129	8548	115615	892880						

Where: **Value Added:** W= Compensation of Employees T= Net Taxes on Production
D= Fixed Capital Depreciation S= Operating Surplus
Final Demand: H= Household Consumption Expenditure G= Government Consumption Expenditure
I= Gross Capital Formation IT= Inbound Tourism E= Export

Industries:

1.Primary Industry 2.Secondary Industry 3.Air Transport 4.Railway Transport 5.Highway Transport 6.Water Transport 7.Urban Public Transport 8.Travel Agencies 9.Lodging 10.Catering
11.Wholesale and Retail Trades 12.Entertainment 13.Postal & Communication Services 14. Other Services.

Appendix 3

Table A.3 China 2007 macro-SAM

(100 million Yuan)

Notes: There are 10 accounts in the macro-SAM: two production accounts (commodities and activities), two factors of production (labour and capital), three institutions (households, enterprises and government), a saving-investment account, an inbound tourism account and a rest of the world (ROW) account. The set of the structure of accounts is based on the framework by Round (2003). All input data is extracted from Establishment of China's Macro-Social Accounting Matrix by Fan et al. (2010), which contains 12 accounts originally. Careful adjustment is done in order to update the data to fit in the defined 10 accounts. For the construction of each account in detail, please contact the author.

Account		1	2	3	4	5	6	7	8	9	10	Total	
Production	Commodities	1		Intermediate demand			Household consumption		Government consumption	Gross capital formation	Inbound tourism consumption	Exports	Demand for products
	Activities	2	Domestic production										Sales of commodities
Factors	Labour	3		Labour compensation									Labour income receipts
	Capital	4		Return on capital									Capital income receipts
Institutions	Households	5			Labour income	Household Capital revenue		Distributed profits to households	Government transfers			Net transfers from ROW	Household receipts
	Enterprises	6				Enterprise Capital revenue			Government production subsidies				Enterprise receipts
	Government	7	Tariffs	Net indirect taxes on production			Individual income tax	Direct taxes		Debt revenue		Foreign transfer income	Government receipts
Saving-investment		8					Household savings	Corporate savings	Government savings				Total savings
Inbound tourism		9										Tourism exports	Foreign demand for tourism
Rest of the world		10	Imports			Foreign capital investment income			Payments to ROW				FX spending
Total			Supply of products	Costs of production activities	Labour outlay	Capital outlay	Household expenditures	Enterprise expenditures	Government expenditures	Total investment	FX earnings from inbound tourism	FX earnings	
Account			1	2	3	4	5	6	7	8	9	10	Total
Production	Commodities	1		552815			96553		35191	114213	3188	92353	894313
	Activities	2	818859										818859
Factors	Labour	3		110047									110047
	Capital	4		117478									117478
Institutions	Households	5			110047	8660		24419	7276			2951	153353
	Enterprises	6				110440			5913				116353
	Government	7	1433	38519			3186	16196		52075		-13	111396
Saving-investment		8					53614	75738	62892				166288
Inbound tourism		9										3188	3188
Rest of the world		10	74021			-1622			124				72523
Total			894313	818859	110047	117478	153353	116353	111396	166288	3188	72523	