

DIRECT REGULAR FLIGHTS: POLICY EFFECTS ON COMPETITION IN THE TAIPEI-  
HONG KONG MARKET

---

A Thesis

Presented to

The Faculty of the Department

of Economics

University of Houston

---

In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

---

By

Shih-Hsien Chuang

August, 2013

DIRECT REGULAR FLIGHTS: POLICY EFFECTS ON COMPETITION IN THE TAIPEI-  
HONG KONG MARKET

---

An Abstract of a Dissertation

Presented to

The Faculty of the Department

of Economics

University of Houston

---

In Partial Fulfillment

Of the Requirements for the Degree of

Master of Arts

---

By

Shih-Hsien Chuang

August, 2013

## **ABSTRACT**

In the past few years, there have been significant policy changes involving Taiwan and Mainland China. Since Aug 31, 2009, regular direct flights between Taiwan and China resumed. The paper looks at whether this policy change has an impact on the air passenger service market between Taipei and Hong Kong, a major layover for people traveling from Taiwan to China prior to the policy change. At the industry level, the policy change has led to a decrease in the number of airlines, flights, passengers, total seats available, and the passenger load factor. For individual airlines, results are mixed. A decrease in the number of flights is estimated for China Airlines. China Airlines and Eva Airways has experienced a decrease in the number of passengers. Cathay Pacific's increased number of passengers is unexpected. China Airlines has provided less number of total seats. Cathay Pacific has experienced increased passenger load factor.

*Keywords:* Taiwan, Hong Kong, China, competition, direct flights, airline industry, aviation

## TABLE OF CONTENTS

<b>Chapter 1 Introduction</b>	<b>1</b>
<b>Chapter 2 Background</b>	<b>7</b>
<b>Chapter 3 Data</b>	<b>13</b>
<b>Chapter 4 Empirical Framework</b>	<b>16</b>
<b>Chapter 5 Results &amp; Discussion</b>	<b>19</b>
<b>Section 5.1 Industry Level Analysis</b>	<b>19</b>
<b>Section 5.2 Individual Airline Level Analysis</b>	<b>20</b>
Subsection 5.2.1 China Airlines	21
Subsection 5.2.2 Eva Airways	22
Subsection 5.2.3 Cathay Pacific Airways	23
<b>Section 5.3 Discussion</b>	<b>25</b>
<b>Chapter 6 Conclusion</b>	<b>30</b>
<b>Appendix</b>	<b>32</b>
<b>Bibliography</b>	<b>36</b>

## **LIST OF TABLES AND FIGURES**

Table 1: Summary of the airlines offering service between Taipei and Hong Kong as of June 2013 _____	<b>8</b>
Figure 1: Mainland Chinese destinations from Taiwan via Hong Kong (obtained from Chang, Hsu and Lin (2011)) _____	<b>9</b>
Table 2: Descriptive statistics from the Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China aggregate level, by route_	<b>15</b>
Table 3: Descriptive statistics from the Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China by route, airline _____	<b>15</b>
Table 4: Model (1) Regression Results _____	<b>19</b>
Table 5: Model (2) Regression Results – China Airlines _____	<b>21</b>
Table 6: Model (2) Regression Results – Eva Airways _____	<b>22</b>
Table 7: Model (2) Regression Results – Cathay Pacific Airways _____	<b>24</b>
Table 8: Summary of the effect of the opening of direct regular flights between Taiwan and Mainland China on measures in the airline industry and specific airlines _____	<b>27</b>
Figure A1: The number of flights in the Taipei-Hong Kong market between 2000 and February 2013 _____	<b>32</b>
Figure A2: The number of passengers served in the Taipei-Hong Kong market between 2000 and February 2013 _____	<b>33</b>
Figure A3: The number of total available seats served in the Taipei-Hong Kong market between 2000 and February 2013 _____	<b>34</b>
Figure A4: The passenger load factor in the Taipei-Hong Kong market between 2000 and February 2013 _____	<b>35</b>

## 1. Introduction

Tensions between Taiwan and mainland China have been a major problem in Asia.<sup>1</sup> Since 2008 when Kuomintang resumed presidency in Taiwan, the relationship between Taiwan and mainland China advanced substantially. In the past, due to political conflicts, no airlines would fly between Taiwan and mainland China<sup>2</sup>. People flying from Taiwan to China would need to transfer to other flights at locations such as Hong Kong, Macau, Seoul and other cities. This is the reason for which the city pair of Taipei (TPE) and Hong Kong (HKG) was the busiest international passenger route in the world as of 2011.<sup>3</sup> According to *the Economist*, 5,827,183 people were served in this route in 2011. The fact that it is so popular and so profitable has earned this route the name “the Golden Route.”<sup>4</sup>

However, since Aug 31, 2009, regular direct flights were resumed between Taiwan and China. This policy change marked a great milestone in the aviation history between Taiwan and China. As many researchers have noted, expanding tourism can serve as a way to alleviate conflicts, tension or any political mistrusts (Guo, Kim, Timothy & Wang, 2006).

The paper looks at the changes in the competition and capacity condition in the airline industry and in individual airlines resulting from the policy change. Specifically, at the industry level, I investigate whether this policy change leads to more airlines, higher quantity of tickets sold, higher number of total seats available or higher passenger load factor. In addition, at the individual airline level, I investigate whether this policy change leads to more flights, higher quantity of tickets sold, higher number of total seats available or higher passenger load factor.

---

<sup>1</sup> Many researchers have also focused on the political relationship between Taiwan and mainland China (Yu, 1997) and between China and Hong Kong prior to 1997 (Hobson and Ko, 1994).

<sup>2</sup> In the paper, Republic of China refers to Taiwan. China, People’s Republic of China refer to mainland China.

<sup>3</sup> The world’s busiest route is within South Korea (Republic of Korea) between the capital, Seoul, and Jeju.

<sup>4</sup> Hsu and Chang (2010) argue that this route’s popularity is due to the fact that no direct flights between Taiwan and mainland China were permitted.

This policy has been an interesting research subject as it allows one to examine how the policy change between Taiwan and mainland China affects the airline market dynamics between Taipei and Hong Kong. The hypothesis is that the number of airlines, the total seats available and the number of passengers will decrease at the industry level and the number of flights, the total seats available and the number of passengers will decrease within any particular airline. However, I do not have a hypothesis for the policy effect to the passenger load factor, which is defined as the number of passengers divided by the total number of seats.

To answer the above questions, I will use monthly data, between January 2000 and February 2013, for the number of flights, the number of passengers, the number of airlines, the number of total available seats and the passenger load factor, for both Taipei-Hong Kong and Taipei-Tokyo routes. The data is provided by the Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China. To analyze the policy effects, I will use an econometric technique called the difference-in-differences strategy where Taipei-Hong Kong route is used as the treatment group and Taipei-Tokyo route is used as the control group.

In order to justify the choice of using the Taipei-Tokyo route as the control group, three explanations are provided. First, Taipei-Tokyo ranks the second, next to Taipei-Hong Kong, as the most popular international routes that depart from Taiwan. Second, few passengers transfer to cities in mainland China via Tokyo. Finally, several common airlines operate in both, the Taipei-Hong Kong market and the Taipei-Tokyo market. The idea is to use the difference in outcomes of the treatment group and the control group to evaluate the effect of the policy.

A widely researched topic in the airline industry is the effect of different market

structures on schedules, airfares, etc (see Brander and Zhang (1990)<sup>5</sup>). Some papers investigate the effect of the adoption of the hub-and-spoke system on flight frequency, fares and welfare, aircraft (see Brueckner and Zhang (2001)<sup>6</sup>; Brueckner (2004)<sup>7</sup>; Hendricks, Piccione and Tan (1997)<sup>8</sup>). Whether an airline enters a new market or not is a big decision to be made on the airline's behalf. The airline needs to evaluate many factors, including one of the most important measures, profitability. Several papers have been investigating issues related to airlines' entry, such as barriers to entry (see Ciliberto and Tamer (2009); Liu (2009)<sup>9</sup>; Berry (1992); Dresner, Windle and Yao (2002); Johnson (1985); Hurdle, Johnson, Joskow, Werden and Williams (1989)). Another common topic in the airline industry is market equilibrium and market structures (see Ciliberto and Tamer (2009)<sup>10</sup>).<sup>11</sup>

Investigating specific policy effects is also a widely researched topic in the airline industry. Snider and Williams (2011) applied regression discontinuity framework to investigate the effect of the Wendell H. Ford Aviation Investment and Reform Act for the

---

<sup>5</sup> Brander and Zhang (1990) found that the market conduct in selected duopoly routes is consistent with the Cournot model.

<sup>6</sup> Brueckner and Zhang (2001) examine the effect of adopting a hub-and-spoke system on flight frequency, fares and welfare (see also Berechman and Shy (1998)). Using a simple profit maximization problem, they conclude that for a hub-and-spoke network, flight frequency is higher than that in a fully-connected network. Excessive flight frequency is also shown in Brueckner and Zhang's (2001) paper.

<sup>7</sup> Brueckner (2004) examines about how such hub-and-spoke network affects airline scheduling. He finds that a hub-and-spoke network leads to an increase in the aircraft size and the flight frequency.

<sup>8</sup> Hendricks, Piccione and Tan (1997) provide an answer to why regional carriers might not be able to survive in such a hub-and-spoke network. They use both microeconomic theory and game theory to point out that it is a dominant strategy for a hub operator (incumbent carrier) to stay in the market as long as the profits in the connecting markets are large enough to cover the losses resulting from the entry of regional carriers. Regional carriers then are forced to exit the market. Those large airlines, usually incumbent, are able to successfully control costs and quality heterogeneity (see Borenstein (1991)).

<sup>9</sup> Liu (2009) investigates the link between financial distress and an airline's entry in a market. She finds that for legacy carriers, financial distress may drive them not to enter new markets, whereas for low cost carriers, such link is weak.

<sup>10</sup> Ciliberto and Tamer (2009) used the idea of static complete information entry game and found competitive effects for large airlines (Delta, United, etc.) are different from that for low cost carriers (Southwest). Several papers have looked at effects of policy changes in the airline industry.

<sup>11</sup> Some papers also look at the effect of joining international airline alliance (see Flores-Fillol and Moner-Colonques (2007)). Brueckner and Whalen (2000) used two of the current major international airline alliances, Star Alliance and oneworld, to discuss the effect of membership in such alliances on fares. They suggest alliance partners are able to charge interline fares about 25% lower than fares charged by airlines who are not members in any of the international airline alliances.



21st Century (AIR-21), which mandates airports above a certain threshold to take concrete steps to allow any new entrants to have sufficient access to airport facilities. They found that AIR-21 had a substantial increase in competition and airfare in the airline industry and it also reduced hub premia. Ciliberto and Tamer (2009) also designed a policy experiment to assess the effect of repealing the Wright Amendment, which was passed in 1979, on competition in Dallas airport markets. They find such repealing would lead to an increase in the number of markets served out of Dallas Love Field Airport (DAL).

Since the opening of direct regular flights between Taiwan and mainland China can be treated as a form of deregulation in the airline industry, these papers provide great insights about how this liberalization of flight availability may affect the airline industry. Much of the existing literature examines the effect of airline industry deregulation, focusing on how liberalization affects the airline industry. Moore (1986) used ordinary least squares and two-stage least squares to assess the effects of the Airline Deregulation Act, which was enacted on 1978, on passengers, removing Civil Aeronautics Board's controls so that passengers would be exposed to only the market equilibrium in the airline industry.<sup>12</sup> He concluded that such deregulation had led to a substantial increase in the number of passengers. He also stated that such deregulation led to lower wages. Manuela (2007) used airline-related data<sup>13</sup> from the Philippines and applied a simple OLS to estimate three equations simultaneously in order to assess how deregulation affected the airline industry and stated that the airfare per kilometer fell by 10% on routes served by two or more airlines. Unexpected events, such as bankruptcies and mergers, also shifts market equilibrium (see

---

<sup>12</sup> See Moore (1986) for details in the Airline Deregulation Act.

<sup>13</sup> Airline-related variables are variables" such as the number of passengers, fare, flight frequency, cost, capacity, distance, and the number of operators." The data also contains published data on income, population, and consumer price index. See Manuela (2007) for details.

Berry and Jia (2010)<sup>14</sup>; Brueckner and Luo (2013)<sup>15</sup>).

Recently, more and more research has been focusing on the effect of the direct regular flights between Taiwan and mainland China on the airline industry. A notable paper by Chang, Hsu and Lin (2011) provides a discussion on what the probable winners and losers are likely to be from this policy change. They suggest that direct regular flights between Taiwan and cities in mainland China have led to a considerable reduction in travel time for passengers, and to economic growth, which could help relieve the recent economic downturn in the airline industry. They also state that Cathay Pacific Airways, a dominant carrier in Taipei-Hong Kong, and its subsidiary, Dragon Air, which also fly Taipei-Hong Kong, has dropped their airfare from US\$185 to US\$130 to attract passengers, indicating that cross-strait direct regular flights have been hurting those airlines. Lau, Lei, Fu and Ng (2012) used operational performance for mainland Chinese airlines and Taiwanese airlines to conduct an analysis on the implications of direct regular flights. They suggest that such direct regular flights open more markets for companies in mainland China and Taiwan, while induces negative impacts on firms in Hong Kong and Macau, previously popular layover points, who had benefitted from no direct flights for many years. They also believe that while firms in mainland China and Taiwan have benefitted, Taiwanese airports and carriers will benefit more than their counterparts in mainland China.

This paper assesses the policy effect differently from other existing research. Both Lau,

---

<sup>14</sup> Berry and Jia (2010) looked at four major bankruptcies, two major mergers and various changes in the 2000s in the US airline industry network structure, and tried to estimate the impact of the demand and supply changes on profitability. They compared the conditions in 1999 and figured that in 2006, air travel demand was more price sensitive, and passengers preferred nonstop flights over any-stops flights. They further concluded that the expansion of low cost carriers contributed partly to the reduction in profits for legacy carriers. One of the questions in this paper to be answered is whether the policy change has any effect on the number of flights for any specific airlines.

<sup>15</sup> Brueckner and Luo (2013) used an instrumental variables approach to derive flight-frequency reaction function relating the frequency on a route to its own characteristics and competing airlines' frequencies. That is to say, the number of flights is dependent on other firm's event or reaction. They found some positive reaction functions, which also reflects the strategic interactions within the industry.

Lei, Fu and Ng's (2012) and Chang, Hsu and Lin's (2011) papers use demographic and geographic data, and operational performance data to support their arguments. However, these papers did not provide an econometric framework. In this paper, I use an econometric method, difference-in-differences, to assess the policy effects. In addition, I use data for the Taipei-Hong Kong route and the Taipei-Tokyo route as opposed to Lau, Lei, Fu and Ng using mainly data between Taiwan and mainland China. To distinguish this paper from theirs, this paper focuses on the policy effect on passenger services between Taiwan and Hong Kong whereas Lau, Lei, Fu and Ng's focuses on the economic implications to airports and airline networks and Chang, Hsu and Lin's focuses on travel time saving and probable winners and losers. Nevertheless, these examples serve as a way to convey that many interesting topics can be derived from a single policy change, and even with similar topics, researchers can utilize different economic techniques to assess the policy effect.

To preview the results, for the airline industry between Taipei and Hong Kong, the policy change has led to a decrease in the number of airlines, the number of passengers, the number of total seats available and the passenger load factor. At the individual airline level, the results are mixed. For China Airlines, the policy change has led to a decrease in the number of flights, the number of passengers, and the number of total seats available. Its effect on the passenger load factor is negative but statistically insignificant. For Eva Airways, it has a negative impact on the number of passengers served between Taipei and Hong Kong. The policy effects on the number of flights, the number of total seats available and the passenger load factor are all negative but statistically insignificant. For Cathay Pacific Airways, the policy change has led to an unexpected positive impact on the number of passengers. The policy effect also leads to an increase in the passenger load factor. Its effect on the number of total seats available, however, is positive but statistically insignificant.

Achieving such policy assessment can provide the airline industry with information regarding the effects of opening a new route on existing routes. It not only provides the airline companies useful information to reform their strategies, but also offers related authorities with information so they can reshape their policies if necessary. In addition, the underlying results may stimulate the market, attracting more carriers to compete, rendering the customers more choices and freedom to choose an airline.

The remainder of the paper is organized in the following manner: in section 2, I will discuss the policy change. Details about the data will be provided in section 3. In section 4, I will illustrate the empirical framework. In section 5, results at both the aggregate industry level and at individual airlines level are provided and interpreted in subsections. In section 6, I will conclude by reiterating the results and discussing policy implications.

## **2. Background**

Taipei is the capital of the Republic of China, more commonly known as Taiwan. There are four airports in Taiwan serving international routes: Taiwan Taoyuan International Airport (TPE)<sup>16</sup>, Taipei Songshan Airport (TSA), Taichung Ching-Chuan-Kang Airport (RMQ) and Kaohsiung International Airport (KHH). The Taipei-Hong Kong market is directly served by six airlines currently: Taiwan-based China Airlines (IATA: CI) and Eva Air (IATA: BR), Hong Kong-based Cathay Pacific Airways (IATA: CX), Hong Kong Airlines (IATA: HX) and Dragon Air (IATA: KA), and Thailand-based Thai Airways International (IATA: TG). Table 1 below summarizes the airlines currently offering service between Taipei and Hong Kong as of Jun 2013. Since 2000, participants include Japan Asia Airways (IATA: EG), British Asia

---

<sup>16</sup> Taiwan Taoyuan International Airport was previously more commonly known as the Chiang-Kai-Shek (C.K.S.) International Airport. It is also abbreviated as Taipei-Taoyuan.

Airways (IATA: BA), Singapore Airlines (IATA: SQ), Thai Sky Airlines (IATA: 9l), Vietnam Airlines (IATA: VN), Mandarin Airlines (IATA: AE), and Uni Air (IATA: B7).

Table 1  
Summary of the airlines offering service between Taipei and Hong Kong as of June 2013

Airlines	Based Hub	Number of flights served in 2012	Total Number of Seats available in 2012	Passenger served in this route in 2012	Overall passenger load factor in 2012
China Airlines	Taipei, Taiwan	8,228	2,417,626	1,739,093	71.93%
Eva Airways	Taipei, Taiwan	5,604	1,534,322	1,123,670	73.24%
Thai Airways International <sup>17</sup>	Bangkok, Thailand	128	39,040	12,867	32.96%
Cathay Pacific Airways	Hong Kong, China	11,307	3,860,574	2,605,174	67.48%
Dragon Air	Hong Kong, China	2,039	519,103	335,051	64.54%
Hong Kong Airlines <sup>18</sup>	Hong Kong, China	1,769	518,585	325,188	62.71%

Cross-strait direct flights were terminated in 1949. Prior to resuming regular direct flights, those who want to go to cities in mainland China would have to transfer at another airport. Hong Kong, Macau and Seoul were all possible choices. However, Hong Kong was the most popular one. Among the three mentioned cities, Hong Kong has the shortest distance to Taipei. Chang, Hsu and Lin (2011) illustrate the importance of Hong Kong as a layover when people would like to travel to cities in mainland China prior to the policy change. Prior to the policy change, one could transfer to various cities in mainland China via Hong Kong (Figure 1).

<sup>17</sup> Thai Airways International previously exited this route after March 2010, but returned to this route since October 2012.

<sup>18</sup> Hong Kong Airlines entered this route at March 2012.

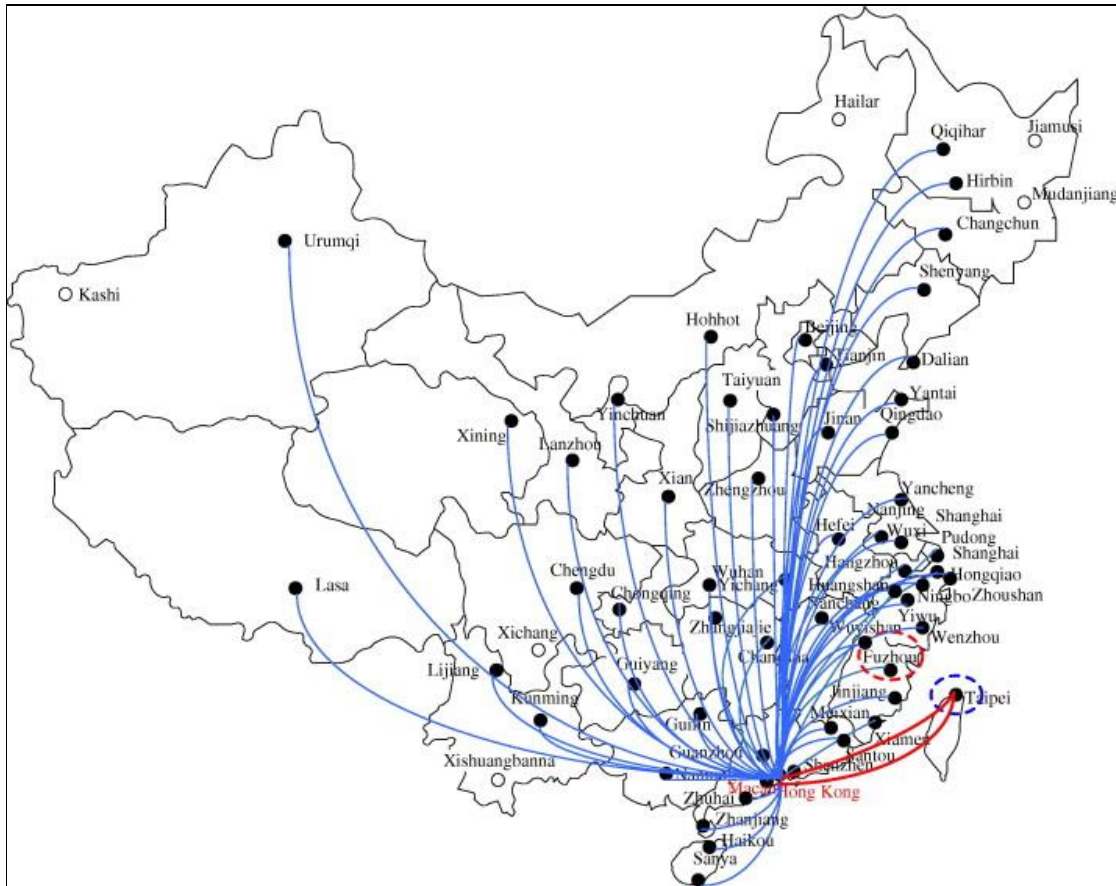


Figure 1: Mainland Chinese destinations from Taiwan via Hong Kong (obtained from Chang, Hsu and Lin (2011))

Kuang-Shih Yeh, Ph.D., the current Minister of the Ministry of Transportation and Communications of the Republic of China, suggested that before 2003, there were no direct flights between Taiwan and any cities in mainland China. Cross-strait openness has been a slow but steady progress. The first direct flight between Taiwan and mainland China was known as the cross-strait charter and took place between January 26, 2003 and February 10, 2004 (Chinese Lunar New Year). At that time, those who could take the flights were only those Taiwanese businessmen investing in mainland China and their families. There were sixteen flights. Flights would depart from either Taipei (TPE) or Kaohsiung (KHH) without any passengers and arrive at either Shanghai-Pudong (PVG) or Shanghai-Hongqiao (SHA)

with a technical layover in either Hong Kong or Macau, in which no passengers could board or leave the plane. The charter flights were all one-directional, which means that passengers can only board in Shanghai and arrive in either Taipei or Kaohsiung. The airlines in-charge were six Taiwan-based airlines.

In 2005, a cross-strait charter took place once again during Chinese Lunar New Year, which was from January 29, 2005 to February 20, 2005. Participating airports include Taipei (TPE), Kaohsiung (KHH), Beijing (PEK), Shanghai (PVG or SHA), and Guangzhou (CAN). Unlike the charter in 2003, passengers could board at both endpoints. The charter flights were direct flights, but would need to fly through Hong Kong Flight Information Region. Six airlines from both Taiwan and China participated in the charter. Besides Taiwanese businessmen, some contracted traveling groups and students also took the flights. During the 2006 Chinese Lunar New Year, any Taiwanese citizen with legal identification documents was able to take the Lunar New Year charter during January 20 and February 13. Six airlines from both Taiwan and China participated in the charter. The flights were direct but would need to again fly through Hong Kong Flight Information Region. On January 23, 2007, emergency medical charter took off from Shanghai-Pudong to bring sick Taiwanese people living in China back to Taiwan for treatment.<sup>19</sup>

According to the Mainland Affairs Council of the Republic of China, Charter flights stopped for several years and restarted once again in 2008. On May 12, 2008, the Sichuan Earthquake hit. Four Taiwan-based airlines flew to Chengdu (CTU) and Chongqing (CKG) to carry Taiwanese back to Taiwan on May 16, and were known as the 2008 Humanitarian Charters. Later in June 13, the Taiwanese and Chinese governments reached an agreement to start weekend charter flights. A total of eighteen flights between Friday and Monday with a

---

<sup>19</sup> This was the first emergency medical charter between Taiwan and Mainland China.

total of twelve airports participated in this charter. The first weekend charter arrived in Taipei-Taoyuan (TPE) on July 4, 2008.<sup>20</sup> On December 15, 2008, weekday charter flights started regularly.<sup>21</sup> Airports continued to join the charter and during the Third Chiang-Chen Talks in April 2009, it was suggested to convert charter flights into direct regular flights. The request was later approved and announced on April 26, 2009 under the law “Supplementary Agreement on Cross-Strait Air Transport.”

According to the “Supplementary Agreement on Cross-Strait Air Transport,” both parties agreed to open a new air way, a south way connecting Taipei and Guangzhou Flight Information Region, and a second north way connecting Taipei and Shanghai Flight Information Region. The Taiwanese government agreed that regular flights can depart from and arrive at both Taipei-Taoyuan (TPE) and Kaohsiung (KHH) while Taipei-Songshan (TSA), Taichung (RMQ), Penghu (MZG), Hualien (HUN), Kinmen (KNH), and Taitung (TTT) were used as charter destinations. The Chinese government agreed to open six more regular flight destinations, on the basis of the current twenty-one destinations, reaching a total of twenty-seven regular flight destinations. Both parties were to offer a total of 270 round-trip flights per week, each party with 135 round-trip flights per week, with some limitations made to specific airports on both sides. In addition, regular cargo routes were also opened. For those routes with regular services, it was generally prohibited to have more charter flights.

The direct regular flights between Taiwan and cities in Mainland China formally began on August 31, 2009. Such policy change was foreseeable as openness between Taiwan and mainland China had been growing over time.

---

<sup>20</sup> The routes for weekend charters at that time can be retrieved at:  
[http://upload.wikimedia.org/wikipedia/commons/0/04/Cross-strait\\_charters\\_weekends08.jpg](http://upload.wikimedia.org/wikipedia/commons/0/04/Cross-strait_charters_weekends08.jpg).

<sup>21</sup> The routes for weekday charters at that time can be retrieved at:  
[http://upload.wikimedia.org/wikipedia/commons/5/58/Cross-strait\\_daily\\_charter\\_route\\_map.jpg](http://upload.wikimedia.org/wikipedia/commons/5/58/Cross-strait_daily_charter_route_map.jpg).



After the policy change, the number of airlines serving Taipei-Hong Kong has been volatile. It was observed that Thai Airways International exited the market in April 2010. From May to July 2010, Uni Air and Mandarin Airlines offered service in this route. Vietnam Airlines operated two regular flights in September 2010 but decided to exit the market. Four carriers remained in competition before Hong Kong Airlines joined the market in March 2012. Previously-exited Thai Airways International reentered the market in October 2012. The policy change appears to have some effect on the number of airlines operating in this market.

To successfully assess the effect of the policies, the Taipei-Tokyo market is used as a control group while the Taipei-Hong Kong market is used as a treatment group. The Taipei-Tokyo market is currently served by seven airlines: Taiwan-based China Airlines and Eva Airways, Hong Kong-based Cathay Pacific Airways, Singapore-based low cost carrier Scoot (IATA: TZ), Japan-based Japan Airlines (IATA: JL) and Air Nippon (IATA: NH), and US-based Delta Airlines (IATA: DL). Since 2000, airlines participating in this route have included Japan Asia Airways (IATA: EG)<sup>22</sup>, Northwest Airlines (IATA: NW), which has merged with Delta Airlines in 2010, Singapore Airlines (IATA: SQ), United Airlines (IATA: UA), Mandarin Airlines (IATA: AE), and Uni Air (IATA: B7).

Unlike the Taipei-Hong Kong market, the effect of the opening of direct flights between Taiwan and cities in mainland China is expected to be less for Taipei-Tokyo than for Taipei-Hong Kong due to the fact that Tokyo was rarely used as a transfer layover to mainland China prior to the policy change. The number of airlines has remained relatively stable and simple. As stated earlier, Northwest Airlines exited the market starting February

---

<sup>22</sup> Japan Asia Airways was founded on August 8<sup>th</sup>, 1975 to operate flights from Japan to Taiwan. The airline ceased operation on April 1<sup>st</sup>, 2008, when freedoms of the air between Japan and Taiwan was re-modified and Japan Airways were allowed to operate in this market. Japan Airlines and Japan Asia Airways are effectively the same company.

2010 as it merged with Delta Airlines and Delta took over its Taipei-Tokyo operation. From May to July 2010, Uni Air and Mandarin Airlines also participated in this route. In October 2012, low cost carrier Scoot joined the market. Later in November 2012, United Airlines terminated its Taipei-Tokyo service.

There are some airlines that offered services in both Taipei-Hong Kong and Taipei-Tokyo routes during the sample timeframe (January 2000 to February 2013). However, there are only three of them that never exited both markets or only exited the market for a short duration. China Airlines operates in both routes and did so interruption. Eva Airways operates Taipei-Hong Kong and did not exit the market. It has also been operating Taipei-Tokyo since September 2000 and did not exit the market at all. Cathay Pacific exited Taipei-Tokyo only during May 2003 due to SARS. It operated the Taipei-Hong Kong route without interruption. I will further investigate the policy effect at the individual airline level.

In succeeding paragraphs, data from Taipei-Hong Kong and Taipei-Tokyo will be analyzed to assess policy effects, both at the industry level and at the individual airline level.

### **3. Data**

The data used in this paper come from the Aviation Statistical Monthly Report<sup>23</sup> published by the Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China. The sample timeframe of the data used in this paper is from January 2000 to February 2013. Data from January 2000 to December 2008 is not available online, but for sale in local bookstores in Taiwan. However, the agency was

---

<sup>23</sup> The report is printed in Chinese under the title “民航統計月報.”

kind enough to provide that information specifically for use in this paper. I also obtained those data for 2009 to 2013 on the agency's website<sup>24</sup>.

The dataset includes all the international regular flights departing from and arriving at any of the airports in Taiwan. Two routes will be selected for analysis. I am ultimately interested in the policy effects in the market between Taipei and it is therefore used as the treatment group. On the contrary, Taipei-Tokyo is a market that should not be affected by the policy change. As a result, Taipei-Tokyo is the chosen control group.

Five variables in the dataset will be used in this paper. The number of airlines operating in a particular route in a particular month includes only fully operating airlines. For example, if airline B is code-sharing with airline A but not using its own aircraft or crews to operate flights, then only airline A is counted towards the number of airlines. The total number of flights accounts for all flights that depart from and arrive in Taipei by all airlines participating in this route. Similarly, the number of flights does not include any code-share flights. All code-share flights are only counted once under the operating airline.<sup>25</sup> In other words, the number of flights for each airline includes those flights operated by that specific airline, disregarding any codeshare tickets sold by that specific airlines but operated by another airline. The passenger load factor is simply a measure of flight capacity, which is mathematically defined as the number of passengers divided by the number of total available seats. Table 2 summarizes descriptive statistics of the variables at the aggregate industry level.

---

<sup>24</sup> Data from 2009 onward can be found online at <http://www.caa.gov.tw/big5/content/index.asp?sno=186> (website written in Traditional Chinese).

<sup>25</sup> For example, if airline A is code-sharing with airline B and C, but the flight is operated by A, then such the flight is counted only once, and under airline A.

Table 2

Descriptive statistics from the Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China aggregate level, by route

	Taipei-Hong Kong		Taipei-Tokyo	
	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
<u>Total</u>	Observations: 158		Observations: 158	
Number of Airlines	5.54	(.99)	6.607595	(.75)
Number of Flights	2242.15	(266.57)	792.8481	(178.63)
Number of Passengers	516447.4	(85977.4)	190380.8	(31466.35)
Number of Total Seats	704751.2	(90807.49)	247536.3	(32869.01)
Passenger Load Factor	.73	(.09)	.7687975	(.09)

For policy effects at individual airline level, I will look at those airlines that never exit both markets or only exited the market for a really short duration. Those airlines, as stated in the preceding section, are China Airlines, Eva Airways, and Cathay Pacific Airways. Table 3 summarizes descriptive statistics of the variables at the individual airline level.

Table 3

Descriptive statistics from the Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China by route, airline

	Taipei-Hong Kong		Taipei-Tokyo	
	<u>Mean</u>	<u>S.D.</u>	<u>Mean</u>	<u>S.D.</u>
<u>China Airlines</u>	Observations: 158		Observations: 158	
Number of Flights	715.55	(69.02)	210.0443	(38.33)
Number of Passengers	167587.9	(29329.11)	60158.45	(9222.35)
Number of Total Seats	222680.3	(27883.39)	77363.31	(9286.89)
Passenger Load Factor	.75	(.08)	.7773418	(.09)
<u>Eva Airways</u>	Observations: 158		Observations: 150	
Number of Flights	376.36	(99.42)	125.31	(59.97)
Number of Passengers	77698.51	(22293.31)	26272.03	(12931.99)
Number of Total Seats	108170.2	(31871.65)	32363.99	(15381.73)
Passenger Load Factor	.73	(.10)	.81	(.10)
<u>Cathay Pacific Airways</u>	Observations: 158		Observations: 157	
Number of Flights	860.75	(105.74)	60.44586	(3.94)
Number of Passengers	209867	(37130.96)	16381.48	(3525.80)
Number of Total Seats	287412.1	(36781.56)	21731.57	(2466.40)
Passenger Load Factor	.73	(.10)	.7507643	(.13)

Since there are no flights originating from Taipei-Songshan (TSA) to Hong Kong (HKG), all the data related to Taipei-Hong Kong only contains flights from TPE to HKG. However, from Taipei to Tokyo, there are two different routes. One is from Taipei-Taoyuan to Tokyo-Narita, and the other is from Taipei-Songshan to Tokyo-Haneda. Flights between Taipei-Songshan and Tokyo-Haneda started on October 31, 2010. Since Taipei-Taoyuan is geographically close to Taipei-Songshan and Tokyo-Narita is close to Tokyo-Haneda, I aggregate both routes to reflect the real data for the market between Taipei and Tokyo.

In the succeeding section, I formally state the framework to assess the policy effects using econometric methods.

#### **4. Empirical Framework**

The empirical analysis focuses on a panel data of direct regular flights between Taiwan and Hong Kong. I would like to know whether the opening of regular direct flights between Taiwan and mainland China has any impact on the passenger service market between Taipei and Hong Kong.

The choice of using the Taipei-Tokyo route as the control group can be justified by several facts. First, the Taipei-Tokyo route is the second most populous international route that originates from Taipei. Second, Tokyo was rarely used as a layover to fly into cities in mainland China. Third, there are several airlines operating in both Taipei-Hong Kong and Taipei-Tokyo. Taipei-Seoul was once considered to be the control group. However, it fails because Seoul is generally the fourth or fifth most populous international destination that originates from Taipei. It was also often used as a layover to fly into cities in mainland China. In addition, in the sample timeframe, 2000 to February 2013, there was another policy

change in Taipei-Seoul route that increased the number of airlines in that route dramatically. As a result, Taipei-Tokyo is picked over Taipei-Seoul.

As mentioned above, I will approach the problem using difference-in-differences strategy. Using this strategy allows us to evaluate the effect of both policies by comparing the outcomes in the control group and the treatment group. An important underlying assumption has to be made before using the strategy. It is assumed that the secular effect from time to time in the Taipei-Tokyo route is the same as that of the Taipei-Hong Kong route. As a result, the difference remaining in the treatment group must be the effect of the policy. This is formally identified as the parallel trend assumption. Mathematically, the policy effect can be described as:

$$DD = \{E[y_{treatment,after}] - E[y_{treatment,before}]\} \\ - \{E[y_{comparison,after}] - E[y_{comparison,before}]\}.$$

In order to assess the effect of the opening of regular direct flights between Taiwan and China on the passenger service between Taipei and Hong Kong, one can estimate the general regression model as follows:

$$Y_{jt} = c_1 + \mu_1 * M_t + \alpha_1 * country_j + \beta_1 * after\_time1_t + \gamma_1 * after\_policy1_t + \varepsilon_1 \quad (1)$$

Y is the dependent variable in the route j at a particular time t. There are four dependent variables: the number of airlines serving in the route j at a particular time t, the number of passengers being served in the route j at a particular time t, the number of total seats available in the route j at a particular time t, and the passenger load factor in the route j at a particular time t. The passenger load factor is calculated by dividing the number of passengers over the number of total seats available.

There are some explanatory variables which need some clarification. Country is a dummy variable which is 1 if the route is Taipei-Hong Kong and 0 if it is Taipei-Tokyo.

After\_time1 is a time dummy at a particular time  $t$  which is 1 if the date is at or after the policy change, which is September 2009, and after\_policy1 is a dummy variable which is 1 if the route is Taipei-Hong Kong and the date is at or after the policy change.  $M_t$  is a set of monthly dummy variables. Ideally, the coefficient of after\_policy1,  $\gamma_1$ , should be the treatment effect of the policy. Group  $j$  refers to the fact whether it is a treatment group (Taipei-Hong Kong) or a comparison group (Taipei-Tokyo).

Model (1) looks at the policy effect for direct regular flights on the number of airlines, the number of total seats available, the number of passengers, and the passenger load factor. It examines the policy effect for the passenger service market between Taipei and Hong Kong at the industry level. One can also investigate such policy change at the individual airline level. As existing literatures suggested, Cathay Pacific and Dragon Air may be hurt from such policy change. I am interested in whether the policy change has the expected effect on the number of flights, the number of total seats available and the number of passengers. I am also interested in determining how the policy change will affect the passenger load factor. The objective is to determine whether the policy change caused airlines to be more efficient in terms of carrying more passengers with decreased number of seats.

To estimate the policy effect at the individual airline level, instead of having dependent variables measured at the aggregate industry level, I will use those measured at the individual airline level. Specifically, consider the following model:

$$Y_{ijt} = c_2 + \mu_2 * M_t + \alpha_1 * country_j + \beta_2 * after\_time1_t + \gamma_2 * after\_policy1_t + \varepsilon_2 \quad (2)$$

The dependent variable now takes the form  $Y_{ijt}$ , different measures for a specific airline  $i$  in the route  $j$  at the time  $t$ . Four different measures for each individual airline are used, including: the number of flights, the number of total seats available, the number of passengers and the passenger load factor. The airlines being analyzed in model (2) are

restricted to those which operated in both the Taipei-Hong Kong market and the Taipei-Tokyo market for the entire sample time. By assessing the parameter of interest, model (2) looks at the policy effect for direct regular flights on the number of airlines, the number of total seats available, the number of passengers, and the passenger load factor at individual airlines level.

## 5. Results & Discussion

### 5.1 Industry Level Analysis

Model (1) analyzes the policy effect at the industry level. After\_policy1 is the parameter of interest since it captures the intended policy effect. Table 4 presents results for the industry level regression.

Table 4  
Model (1) Regression Results

Dependent Variable	The number of airlines	The number of passengers	The number of total seats available	Passenger load factor
Country dummy	-.59*** (.11)	340,687.9*** (8,857.07)	471,514.3*** (9,735.49)	-.03*** (.01)
Time dummy	.72*** (.10)	37,395.24*** (5,648.33)	36,882.83*** (6,181.00)	.03*** (.01)
Policy dummy	-1.82*** (.18)	-55,003.58*** (11,561.51)	-53,793.29*** (13,362.56)	-.03** (.01)
Constant term	6.30*** (.16)	227,766.4*** (9,491.22)	251,590.5*** (10,594.51)	.84*** (.01)
R <sup>2</sup>	.43	.89	.92	.29
RMSE	.79	60,405	67,109	.08
Observations	316	316	316	316
*** significant at 1% significance level (p < 0.01)				
** significant at 5% significance level (p < 0.05)				
* significant at 10% significance level (p < 0.1)				

Remark:

1. Country dummy equals to 1 if the route is Taipei to Hong Kong, 0 if it is Taipei to Tokyo.
2. Time dummy equals to 1 if the time is after Aug 31, 2009, 0 if otherwise. Aug 2009 has the value of 0 since for most of the days that month, there were such policy changes.
3. Policy dummy equals to 1 if both country dummy and time dummy equal to 1, 0 if otherwise.
4. Coefficients are provided and the numbers in parentheses are robust standard errors.
5. Monthly dummies are included to control for fixed effects.



I first analyze the panel data for the industry as a whole. The sample consists of 316 months (observations). The regressions use robust standard errors. Monthly dummy variables are included to control for monthly fixed effects.

The central results obtained from this table are the estimation of the policy effect, which are the coefficients of the policy dummy. The coefficient of -1.82 suggests that the policy change has caused 1.82 airlines to exit from this market. The opening of direct regular flights between Taiwan and cities in mainland China has also led to a decrease in the number of total seats available being provided between Taipei and Hong Kong. The coefficient of -53793.29 suggests that the policy change has caused the airlines in total to provide 53793.29 fewer seats in this route. It is also estimated that the policy change has caused 55003.58 fewer people to travel between Taipei and Hong Kong via aviation transportation. The policy change has caused the passenger load factor to drop by 3%.

## 5.2 Individual Airline Level Analysis

In addition to the panel data for the industry used in model (1), for individual airlines, another panel dataset is analyzed. The regression model being run is model (2). The sample consists of three airlines: China Airlines, Eva Airways, and Cathay Pacific Airways. They all provide uninterrupted service between Taipei and Hong Kong during the sample timeframe but not the case between the Taipei and Tokyo route. As a result, the number of observations differs by airlines. Next, I break down the analysis into three subsections, one for each airline stated.

### 5.2.1 China Airlines

To analyze the policy effect specifically for China Airlines, regression model (2) is run.

Table 5 presents results for regression model (2) with China Airlines.

Table 5  
Model (2) Regression Results – China Airlines

Dependent Variable	The number of flights	The number of passengers	The number of total seats available	Passenger load factor
Country dummy	529.35*** (6.93)	114,618.1*** (2,831.24)	15,3383.8*** (2,836.28)	-.03** (.01)
Time dummy	65.08*** (7.63)	9,365.885*** (1,856.34)	13,471.22*** (1,885.96)	-.01 (.01)
Policy dummy	-89.71*** (11.92)	-27,043.03*** (4,046.83)	-30,346.64*** (3,918.47)	-.01 (.02)
Constant term	212.54*** (7.82)	73,345.82*** (3,045.61)	79,285.2*** (2,904.48)	.86*** (.01)
R <sup>2</sup>	.96	.89	.94	.24
RMSE	50.72	19,698	19,580	.08
Observations	316	316	316	316
*** significant at 1% significance level (p < 0.01)				
** significant at 5% significance level (p < 0.05)				
* significant at 10% significance level (p < 0.1)				
Remark:				
1. Country dummy equals to 1 if the route is Taipei to Hong Kong, 0 if it is Taipei to Tokyo.				
2. Time dummy equals to 1 if the time is after Aug 31, 2009, 0 if otherwise. Aug 2009 has the value of 0 since for most of the days that month, there were such policy changes.				
3. Policy dummy equals to 1 if both country dummy and time dummy equal to 1, 0 if otherwise.				
4. Coefficients are provided and the numbers in parentheses are robust standard errors.				
5. Monthly dummies are included to control for fixed effects.				

I analyze the panel data for China Airlines. The sample consists of 316 months (observations). The regressions use robust standard errors. Monthly dummy variables are included to control for monthly fixed effects.

The central results obtained from this table are the estimation of the policy effect, which are the coefficients of the policy dummy. As opposed to the case at the industry level, where I look at the change in the number of airlines resulting from the policy change, at the individual airline level, I look at the change in the number of flights resulting from the policy change. The policy change has led to a decrease in the number of flights being provided by China Airlines between Taipei and Hong Kong. The coefficient of -89.71 suggests that the

policy change has prompted China Airlines to offer approximately 90 few flights in this market. The opening of direct regular flights between Taiwan and China has also led to a decrease in the number of total seats available on China Airlines between Taipei and Hong Kong. The coefficient of -30346.64 suggests that the policy change has caused the airlines in total to provide approximately 30347 fewer seats in this route. It is further estimated that the policy change has caused approximately 27043 fewer people to travel between Taipei and Hong Kong via aviation transportation with China Airlines. The policy effect on the passenger load factor is not statistically significant.

### 5.2.2 Eva Airways

Table 6 presents results for regression model (2) with Eva Airways.

Table 6  
Model (2) Regression Results – Eva Airways

Dependent Variable	The number of flights	The number of passengers	The number of total seats available	Passenger load factor
Country dummy	255.15*** (10.75)	53,234.3*** (2,386.34)	78,035.36*** (3,464.22)	-.08*** (.01)
Time dummy	79.68*** (9.22)	19,308.14*** (2,099.60)	23,310.45*** (2,508.20)	.02 (.01)
Policy dummy	-10.91 (15.70)	-5,820.27* (3,326.32)	-7,062.53 (4,635.73)	-.01 (.02)
Constant term	114.23*** (14.92)	29,430.93*** (3,405.06)	29,235.45*** (4,741.43)	.89*** (.01)
R <sup>2</sup>	.76	.74	.74	.33
RMSE	75.61	16,619	2,959	.09
Observations	308	308	308	308

\*\*\* significant at 1% significance level ( $p < 0.01$ )

\*\* significant at 5% significance level ( $p < 0.05$ )

\* significant at 10% significance level ( $p < 0.1$ )

Remark:

1. Country dummy equals to 1 if the route is Taipei to Hong Kong, 0 if it is Taipei to Tokyo.
2. Time dummy equals to 1 if the time is after Aug 31, 2009, 0 if otherwise. Aug 2009 has the value of 0 since for most of the days that month, there were such policy changes.
3. Policy dummy equals to 1 if both country dummy and time dummy equal to 1, 0 if otherwise.
4. Coefficients are provided and the numbers in parentheses are robust standard errors.
5. Monthly dummies are included to control for fixed effects.

I analyze the panel data for the panel data for Eva Airways. The sample consists of 308 months (observations) since Eva Airways started to offer services between Taipei and Tokyo after September 2000. The regressions use robust standard errors. Monthly dummy variables are included to control for monthly fixed effects.

The opening of direct regular flights between Taiwan and Mainland China has led to a decrease in the number of flights being provided by Eva Airways between Taipei and Hong Kong. The coefficient of -10.91 suggests that the policy change has made Eva Airways to offer approximately 11 fewer flights in this market. However, this drop is not statistically significant. A probable explanation is that Eva Airways was at that time expanding its flying network. The opening of direct regular flights between Taiwan and China has also led to a decrease in the number of total seats available being provided between Taipei and Hong Kong by Eva Airways. However, the effect is not statically significant. The number of passengers also has decreased due to the policy change. It is estimated that Eva Airways has lost approximately 5820 passengers flying between Taipei and Hong Kong due to the opening of direct regular flights between Taiwan and mainland China. The policy effect on the passenger load factor for Eva Airways is also not statistically significant.

### 5.2.3 Cathay Pacific Airways

Table 7 presents results for regression model (2) with Cathay Pacific Airways.

To start the analysis, the panel data for Cathay Pacific Airways is analyzed. The sample consists of 315 months (observations) since Cathay Pacific Airways exited the Taipei-Tokyo market due to SARS during May 2003. The regressions use robust standard errors. Monthly dummy variables are included to control for monthly fixed effects.

Table 7  
Model (2) Regression Results – Cathay Pacific Airways

Dependent Variable	The number of flights	The number of passengers	The number of total seats available	Passenger load factor
Country dummy	802.90*** (9.98)	190,569.2*** (3,811.63)	262,970.4*** (3,521.27)	-.05*** (.01)
Time dummy	-.13 (2.23)	-3,898.25*** (1,291.61)	-4,115.544*** (684.92)	-.07*** (.03)
Policy dummy	-9.56 (18.57)	11,089.02** (4,731.07)	10,216.58 (6,322.10)	.09*** (.03)
Constant term	52.19** (23.10)	11,431.54 (8,000.35)	20,831.05*** (7,960.11)	.70*** (.03)
R <sup>2</sup>	.97	.94	.96	.17
RMSE	75.40	25,913	26,285	.11
Observations	315	315	315	315
*** significant at 1% significance level (p < 0.01)				
** significant at 5% significance level (p < 0.05)				
* significant at 10% significance level (p < 0.1)				
Remark:				
1. Country dummy equals to 1 if the route is Taipei to Hong Kong, 0 if it is Taipei to Tokyo.				
2. Time dummy equals to 1 if the time is after Aug 31, 2009, 0 if otherwise. Aug 2009 has the value of 0 since for most of the days that month, there were such policy changes.				
3. Policy dummy equals to 1 if both country dummy and time dummy equal to 1, 0 if otherwise.				
4. Coefficients are provided and the numbers in parentheses are robust standard errors.				
5. Monthly dummies are included to control for fixed effects.				

The opening of direct regular flights between Taiwan and mainland China has not led to statistically significant effect on the number of flights being provided by Cathay Pacific Airways between Taipei and Hong Kong. Perhaps the most unexpected changes resulting from the policy is the increase in the number of passengers. For Cathay Pacific Airways, the policy change also had led to an increase in the number of passengers. The coefficient 11089.02 implies that approximately 11089 more passengers flew with Cathay Pacific Airways between Taipei and Hong Kong as a result of the policy. This change is completely unexpected. The policy effect on the number of passengers is statistically significant at 5% significance level. It is estimated the policy effect on the number of total seats available is not statistically significant. Based on the regression results, the passenger load factor for Cathay Pacific Airways actually increases with the policy change. It has increased by 9 percentage

points. It suggests that such policy change allowed Cathay Pacific Airways to have more efficient use of their aircraft.

### 5.3 Discussion

To start the analysis, I first categorize passengers from Taipei to Hong Kong and from Hong Kong to Taipei into different categories. Passengers flying from Taipei to Hong Kong may be categorized into three mutually exclusive groups with different destinations: (1) those whose destination is Hong Kong, (2) those whose destination is cities in mainland China with a stopover in Hong Kong, and (3) those whose destination is any other places with a stopover in Hong Kong, for example, London, Paris, and so on. Passengers flying from Hong Kong to Taipei may also be categorized into two mutually exclusive groups with different destinations: (1) those whose destination is Taipei, (2) those whose destination is anywhere other than Taipei with a stopover in Taipei. Note that passengers flying from Hong Kong to Taipei whose final destination is Taipei include those passengers originating from cities in mainland China.

The opening of direct regular flights between Taiwan and mainland China signifies a decrease in demand for airline passenger services in the Taipei-Hong Kong market since a significant proportion of the passengers flying Taipei-Hong Kong route were those whose final destinations are cities in mainland China prior to the policy change. I hypothesize that the number of airlines, the number of passengers, and the number of total available seats will drop after this policy change. The results shown in section 5.1.1 and Table 4 supports those hypotheses.

There are two groups that were most affected by this policy change: one is the passengers traveling from Taipei to cities in mainland China via Hong Kong, and the other is

the passengers departing from Hong Kong whose final destination is Taipei. The demand for airline passenger service between Taipei and Hong Kong has dropped due to this policy change, as a result, the drop in the number of airlines, the number of passengers, and the number of total seats available is foreseeable. Passengers traveling from Taipei to cities in mainland China via Hong Kong and passengers departing from Hong Kong who initially departed from cities in mainland China and whose final destination is Taipei, however, may not drop to zero after the policy change even though the demand for such services decreased. Airlines usually charge higher prices for direct flights than for flights with stops. Passengers evaluate what option (direct or transfer) better suits their need. As Chang, Hsu and Lin (2011) suggests, travel time decreased substantially with the policy change. Passengers valuing money more than time may choose to take flights with stop(s). There may be travelers who are traveling to both Hong Kong and cities in mainland China, and taking flights with stop(s) seems to be more economically feasible and reasonable. Passengers valuing time more than money, for instance, businessmen, may choose to take direct flights.

Airlines can take several different steps in order to decrease the number of total seats available. Airlines can decrease the number of flights, cancel flights below certain profit-cost line, change the type of operating aircrafts, code-share flights with other carriers, shrink seat size to accommodate more passengers in a single flight (to decrease the number of flights subsequently), etc. For this reason, the decrease in the number of total seats available may come from any of the above options. Based on the results, there has been an approximately 3% drop in the passenger load factor. The origin for the drop ultimately comes from the interaction between the number of passengers and the number of total seats available.

Table 8

Summary of the effect of the opening of direct regular flights between Taiwan and Mainland China on measures in the airline industry and specific airlines

	The number of airlines	The number of flights	The number of passengers	The number of total seats available	Passenger load factor
Industry	Negative*	-	Negative	Negative	Negative
China Airlines	-	Negative	Negative	Negative	Insignificant
Eva Airways	-	Insignificant	Negative	Insignificant	Insignificant
Cathay Pacific Airways	-	Insignificant	Positive	Insignificant	Positive

Remarks:

\* The table should be interpreted as, for example, “the opening of direct regular flights between Taiwan and Mainland China has a negative impact on the number of airlines in the airline industry.”

By examining the policy effects across all the airlines investigated (China Airlines, Eva Airways and Cathay Pacific Airways), some similarities and some differences are observed. Table 8 summarizes the main finding in this section. The policy effects for the number of flights are negative across airlines. The reason for that should be obvious. The demand for such passenger service drops because of the direct regular flights. In addition, some of the drop of the number of flights may be reallocated towards flights between Taiwan and cities in mainland China. Airlines have fixed number of aircrafts in the short run. Basic theory in industrial organization suggests firms’ ultimate goal is to maximize their profits. Airlines do the same. The attractiveness of the new emerging market (of Taiwan to/from cities in mainland China) plus the drop in demand for services between Taipei and Hong Kong cause Taiwan-based China Airlines and Eva Airways to shift some focus to the new emerging market. That is the reason that decrease in the number of flights is observed for China Airlines. Eva Airways is still a relatively young airline.<sup>26</sup> The policy effect estimated may be offset by its entering and provide more service in the control group, the Taipei-Tokyo route. For this reason, statistically insignificant policy effect is observed.

<sup>26</sup> Eva Airways, which was founded in 1989, is relatively young as compared to its main Taiwanese rival China Airlines, which was founded in 1959, and Cathay Pacific Airways, which was founded in 1946.



For the number of passengers, results are a mixed. For Taiwanese carriers China Airlines and Eva Airways, their shifts towards the newly open market (of Taiwan to cities in mainland China) causing them to provide less flights, thus provide less seats, which subsequently leads to less passengers served. Taiwanese carriers shift some of their presence to the newly opened market. However, such market is inexistent for Cathay Pacific Airways. In fact, Cathay Pacific Airways' decrease in the number of flights is statistically insignificant, unlike competing Taiwanese carriers. Such phenomenon may be explained by the context of national loyalty. There has been extensive research on national loyalty in the context of airline competition. Dolnicar, Grabler, Grun and Kulnig (2011) stated that being a national carrier can be used to best discriminate against those who are not. Bruning (1997) conducted an ordered probit analysis at a Canadian airport and concluded that national loyalty plays a significant role in terms of selecting the airlines to travel with, ranks next to price. Based on previous theory, Taiwanese passengers are more likely to fly with Taiwan-based airlines, China Airlines or Eva Airways, while travelers from Hong Kong are more likely to fly with Hong Kong-based Cathay Pacific Airways (or Dragon Air). This phenomenon further strengthens the increase in the number of passengers for Cathay Pacific as Taiwanese carriers shift some of their attention to the new-emerging Chinese markets, as well as lowering market presence in Taipei-Hong Kong market. Cathay Pacific may have dispatched different aircrafts to serve this route. It may have contributed to the result that the policy effect on the number of total seats available is statistically insignificant. People originating from Hong Kong have the tendency to fly with Cathay Pacific Airways. China Airlines and Eva Airways' decrease in the number of flights made passengers less choices to fly with a non-Hong Kong-based carrier. With the interaction of these two conditions, passengers flying with Cathay Pacific Airways may increase.

The decrease in the number of total seats available comes from the decrease in the number of flights, and any aircraft change (from bigger planes to smaller planes). The interaction between the number of passengers and the number of total seats available determine the effect on the passenger load factor.

There are winners and losers resulting from this policy change. The market between Taipei and Hong Kong is definitely hurt from the policy change. In addition, this policy change would do harm to Hong Kong's economy as the demand for this market decreased, thus decreasing their income or profits. Taiwanese carriers China Airlines and Eva Airways were able to enter a new market (between Taipei and mainland China). They are the winners from this policy change as they gain profits from the new market. Even though they might have shifted some of their presence in the market between Taipei and Hong Kong, I believe the profits gained would be larger than the losses. Cathay Pacific Airways, even though based on these results it has gained more passengers in this route, may be the loser from the policy change. Nevertheless, it may not be a loser in the long run. Cathay Pacific foresaw the coming of this policy change in the past. It merged with Dragon Air several years ago, allowing the parent company to expand its network within cities in mainland China, expecting to discover new markets in the event of such a policy change. As found out by Chang, Hsu, and Lin (2011), Cathay Pacific Airways' airfare between Taipei and Hong Kong dropped from US\$185 to US\$130, all taxes exclusive. It might lose profits in the short run, but it expected this trend to be smoothed out as time goes. Whether profits from the new markets that Cathay Pacific Airways has obtained by merging with Dragon Air outweigh the loss induced from this policy change remains to be seen, as Chang, Hsu, and Lin (2011) explained.

In overall, the airline passenger service market between Taipei and Hong Kong is hurt because of the opening of direct regular flights between Taipei and cities in mainland China. China Airlines and Eva Airways have been benefited from the policy change. Cathay Pacific Airways might be a loser from this policy change in the short run, but it might be able to overturn the situation in the long run, as long as its investment in the Chinese market starts to pay off.

## **6. Conclusion**

Political conflict has always been a problem between Taiwan and mainland China. Such conflict affected the travelers between the two regions since they would have to transfer via Hong Kong, Macau, Seoul, or other places to get to their destinations in mainland China. The situation improved on Aug. 31, 2009 as direct regular flights between Taiwan and mainland China resumed. The ultimate goal for this paper is to look at the changes in the competition and efficiency condition in the industry and for specific airlines resulting from the policy change. Specifically, the paper investigates whether such policy change leads to more airlines, higher quantity of tickets sold, more seats being offered, and higher passenger load factor in the airline industry. In addition, for specific airlines, I investigate if more flights are being operated, more passengers are being served, more seats are being offered, or if there is higher passenger load factor.

The results in this paper suggest that the policy change has led to a decrease in the number of airlines, the number of passengers, the number of total seats available and the passenger load factor for the airline industry between Taipei and Hong Kong. In terms of policy effects for specific airlines, for China Airlines, the policy change led to a decrease in the number of flights, the number of passengers, and the number of total seats available. Its

effect to the passenger load factor is statistically insignificant. For Eva Airways, the policy had a negative impact on the number of passengers served between Taipei and Hong Kong. The effects on the number of flights, the number of total seats available and the passenger load factor are all statistically insignificant. For Cathay Pacific Airways, the policy change led to an unexpected positive impact on the number of passengers. It also allowed Cathay Pacific Airways to have more efficient use of their aircrafts as the passenger load factor increased after the policy change. Its effect on the number of total seats available, however, was statistically insignificant.

The results in this paper enlighten an interest in future research. First, when more variables are added into the regression framework, the results should be more informative. Also, it may be worthy to investigate the reasons behind the current result: why does the number of passengers for Cathay Pacific Airways increase as direct regular flights are open? This may require more in-depth investigation into the interaction of the Taiwan-mainland China market, the Taiwan-Hong Kong market and the Hong Kong-mainland China market.

## Appendix

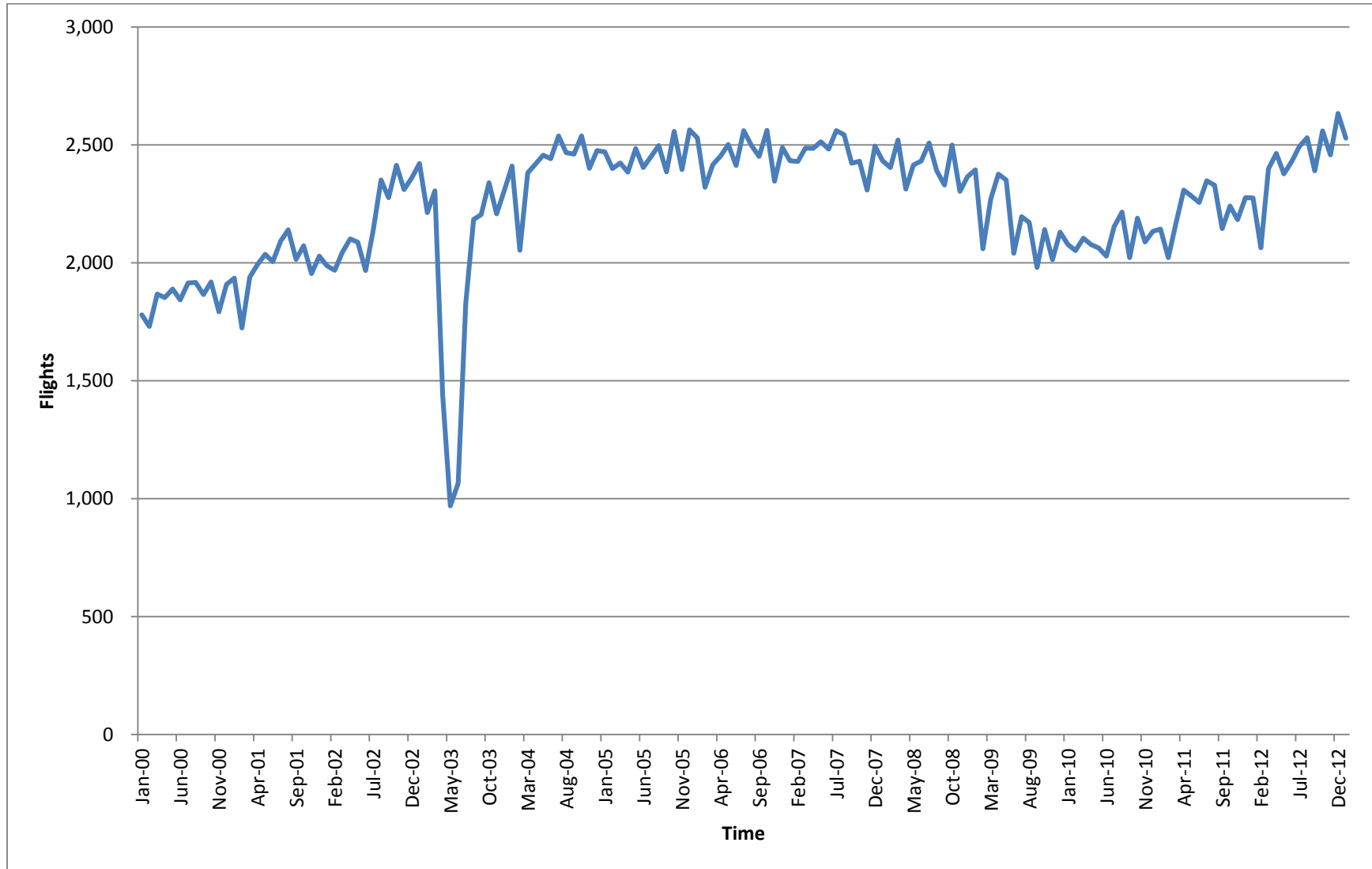


Figure A1: The number of flights in the Taipei-Hong Kong market between 2000 and February 2013.

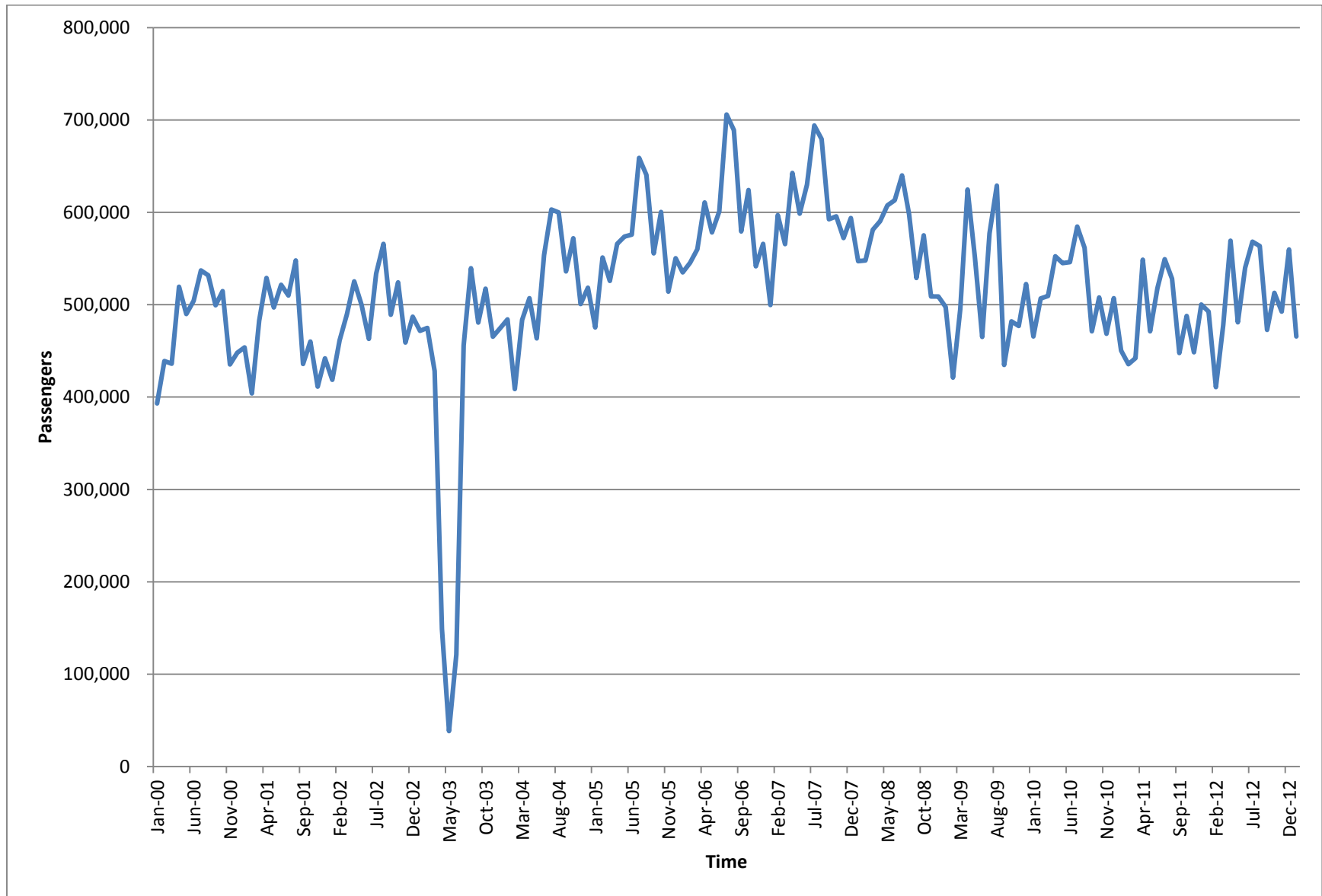


Figure A2: The number of passengers served in the Taipei-Hong Kong market between 2000 and February 2013.

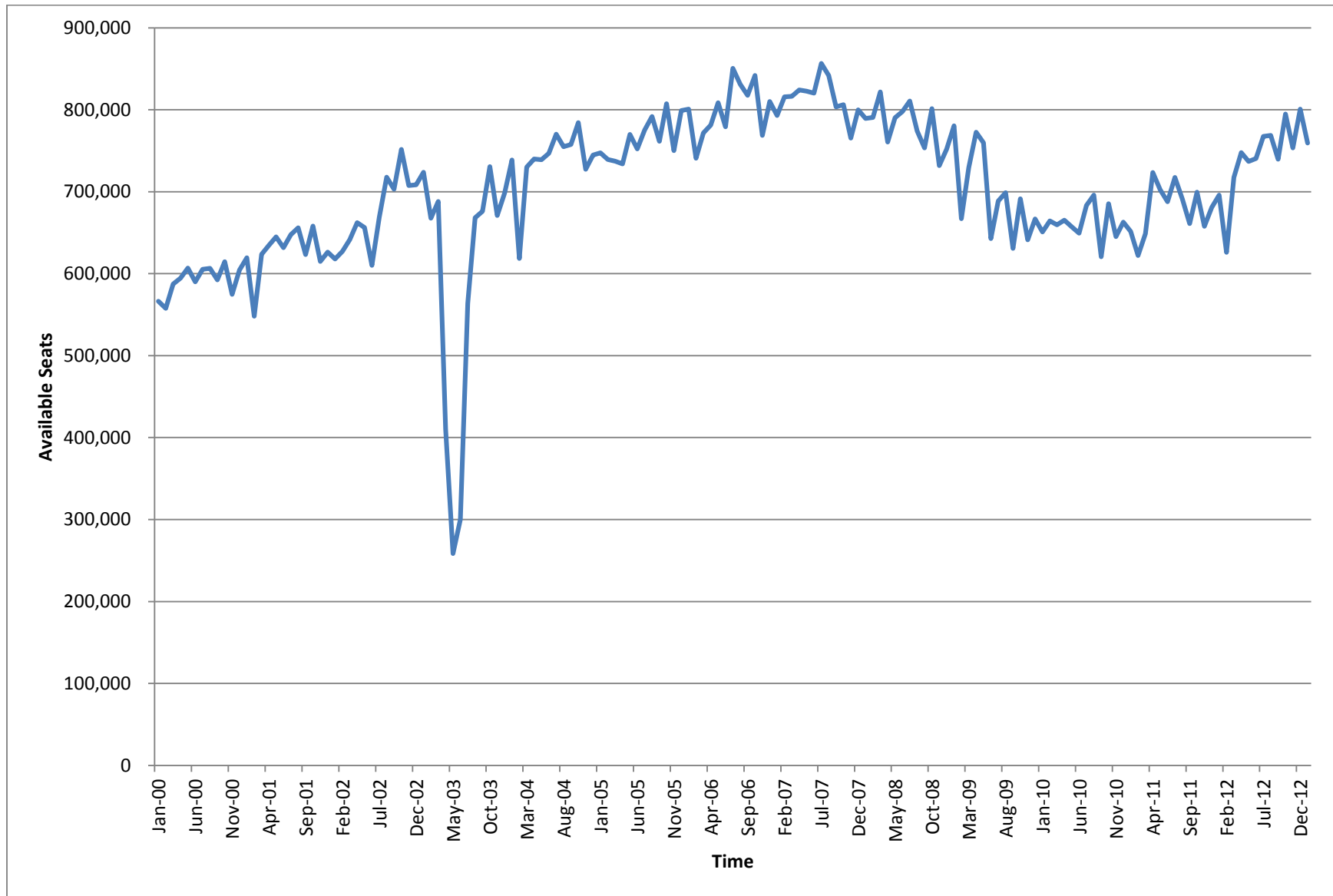


Figure A3: The number of total available seats served in the Taipei-Hong Kong market between 2000 and February 2013.

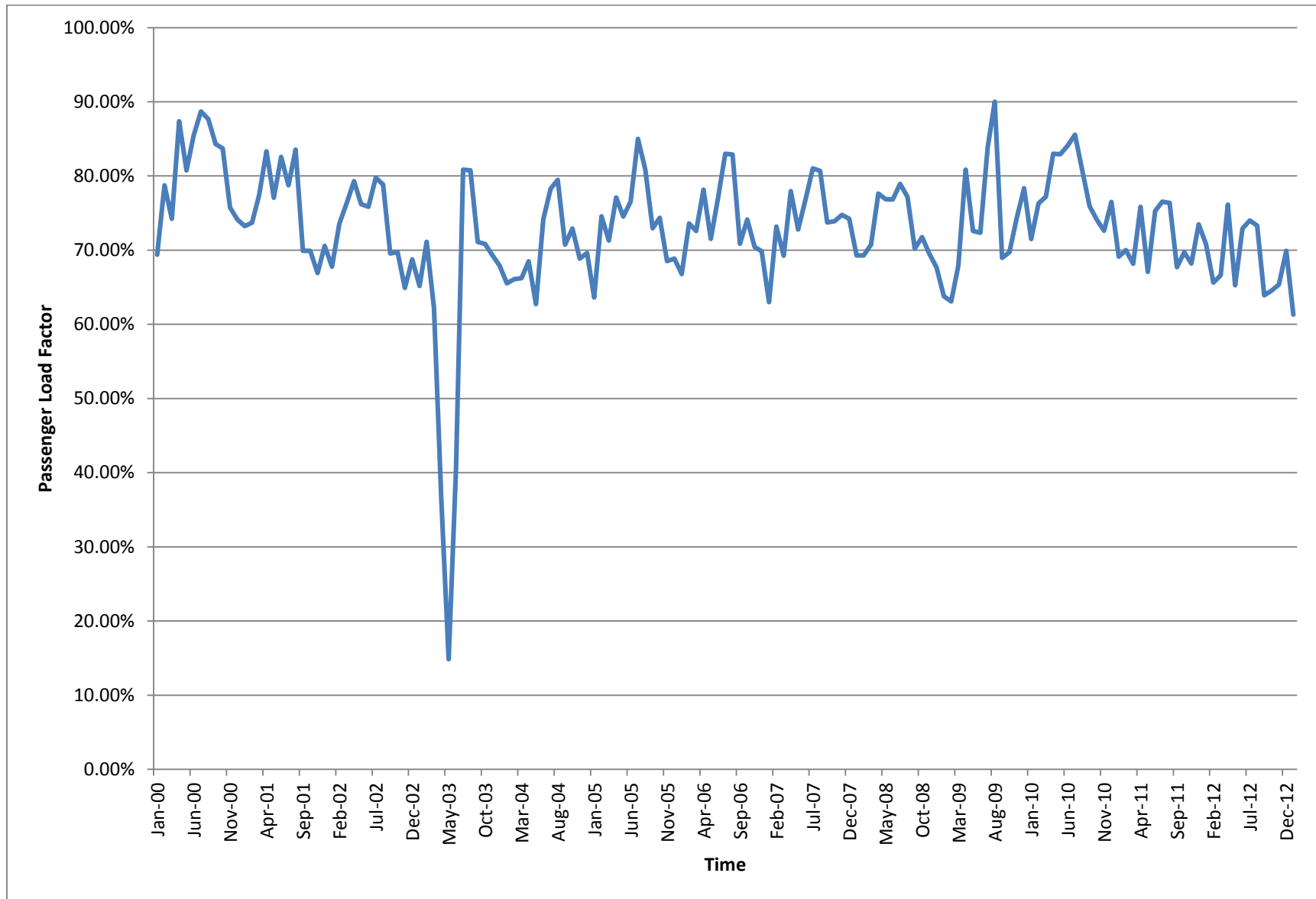


Figure A4: The passenger load factor in the Taipei-Hong Kong market between 2000 and February 2013.



## Bibliography

### English Sources:

- BBC News. (2008, July 04). *Direct china-taiwan flights begin*. Retrieved from <http://news.bbc.co.uk/2/hi/asia-pacific/7488965.stm>
- Berry, T. (1992). Estimation of a model of entry in the airline industry. *Econometrica*, 60(4), 89-917.
- Berry, S., & Jia, P. (2010). Tracing the woes: An empirical analysis of the airline industry. *American Economic Journal: Microeconomics*, 2(3), 1-43.
- Borenstein, S. (1991). The dominant-firm advantage in multiproduct industries: Evidence from the u.s. airlines. *Quarterly Journal of Economics*, 106(4), 1237-1266.
- Brander, J., & Zhang, A. (1990). Market conduct in the airline industry: An empirical investigation. *The RAND Journal of Economics*, 21(4), 567-583.
- Brueckner, J., & Whalen, W. (2000). The price effects of international airline alliances. *Journal of Law and Economics*, 43(2), 503-546.
- Brueckner, J., & Zhang, Y. (2001). A model of scheduling in airline networks: How a hub-and-spoke system affects flight frequency, fares and welfare. *Journal of Transport Economics and Policy*, 35(2), 195-222.
- Brueckner, J. (2004). Network structure and airline scheduling. *The Journal of Industrial Economics*, 52(2), 291-312.
- Brueckner, J., & Luo, D. (2013). *Measuring strategic firm interaction in product-quality choices: The case of airline flight frequency*. Unpublished manuscript, Department of Economics, University of California-Irvine, Irvine, CA, Retrieved from [http://www.socsci.uci.edu/~jkbrueck/empirical\\_frequency.pdf](http://www.socsci.uci.edu/~jkbrueck/empirical_frequency.pdf)
- Bruning, E. R. (1997). Country of origin, national loyalty and product choice the case of international air travel. *International Marketing Review*, 14(1), 59-74.
- CBC News. (2008, July 04). *Historic china-taiwan flights a sign of warming relations*. Retrieved from <http://www.cbc.ca/news/world/story/2008/07/04/china-taiwan.html>
- Central News Agency. (2010, June 10). *Shanghai most popular destination for cross-strait flights*. Retrieved from [http://www.etaiwannews.com/etn/news\\_content.php?id=1284453&lang=eng\\_news](http://www.etaiwannews.com/etn/news_content.php?id=1284453&lang=eng_news)
- Chang, Y. C., Hsu, C. J., & Lin, J. R. (2011). A historic move – the opening of direct flights between Taiwan and China. *Journal of Transport Geography*, 19(2), 255-264.
- Chang, Y. J. (2002, June 05). Hk, taiwan said to be nearing deal on air pact. *Taipei Times*. Retrieved from <http://www.taipeitimes.com/News/taiwan/archives/2002/06/05/0000139021>

- Ciliberto, F., & Tamer, E. (2009). Market structure and multiple equilibria in airline markets. *Econometrica*, 77(6), 1791-1828.
- Dolnicar, S., Grabler, K., Grun, B. & Kulnig, A. (2011). Key drivers of airline loyalty. *Tourism Management*, 32 (5), 1020-1026.
- Dresner, M., Windle, R., & Yao, Y. (2002). Airport barriers to entry in the us. *Journal of Transport Economics and Policy*, 36(3), 389-405.
- Flores-Fillol, R., & Moner-Colonques, R. (2007). Strategic formation of airline alliances. *Journal of Transport Economics and Policy*, 41(3), 427-449.
- Gowrisankaran, G. (2002). *Competition and regulation in the airline industry*. San Francisco, CA: Federal Reserve Bank of San Francisco.
- Graham, D., Kaplan, D., & Sibley, D. (1983). Efficiency and competition in the airline industry. *The Bell Journal of Economics*, 14(1), 118-138.
- Guo, Y., Kim, S. S., Timothy, D. J., & Wang, K. C. (2006). Tourism and reconciliation between mainland china and taiwan. *Tourism Management*, 27(5).
- Hendricks, K., Piccione, M., & Tan, G. (1997). Entry and exit in hub-and-spoke networks. *The RAND Journal of Economics*, 28(2), 291-303.
- Hobson, J. S. P., & Ko, G. (1994). Tourism and politics: the implications of the change in sovereignty on the future development of hong kong's tourism industry. *Journal of Travel Research*, 32(4), 2-8.
- Hsu, C. J., & Chang, Y. C. (2010). The potential effects of direct flights between Taiwan and China provided by low-cost carriers. *Transportation Research Board Business Office*, Retrieved from <http://trid.trb.org/view.aspx?id=910094>
- Hurdle, G., Johnson, R., Joskow, A., Werden, G., & Williams, M. (1999). Concentration, potential entry, and performance in the airline industry. *The Journal of Industrial Economics*, 38(2), 119-139.
- Johnson, R. (1985). Networking and market entry in the airline industry: Some early evidence from deregulation. *Journal of Transport Economics and Policy*, 19(3), 299-304.
- Lau, Y. Y., Lei, Z., Fu, X., & Ng, K. Y. (2012). The implications of the re-establishment of direct links across the Taiwan Strait on the aviation industries in greater China. *Research in Transportation Economics*, 35(1), 3-12.
- Liu, C. M. (2009). Entry behaviour and financial distress: An empirical analysis of the us domestic airline industry. *Journal of Transport Economics and Policy*, 43(2), 237-256.
- Manuela Jr., W. S., (2007). Airline liberalization effects on fare: The case of the Philippines. *Journal of Business Research*, 60(2), 161-167.
- Moore, T. G. (1986). U. S. airline deregulation: Its effects on passengers, capital, and

- labor. *Journal of Law and Economics*, 29(1), 1-28.
- Snider, C., & Williams, J. (2011). *Barriers to entry in the airline industry: A regression discontinuity approach*. Manuscript submitted for publication, Department of Economics, University of California-Los Angeles, Los Angeles, CA, Retrieved from <http://www.econ.ucla.edu/people/papers/Snider/Snider507.pdf>
- Top flights*. (14, May 12). Retrieved from <http://www.economist.com/blogs/graphicdetail/2012/05/daily-chart-8>
- Yu, L. (1997). Travel between politically divided china and taiwan. *Asia Pacific Journal of Tourism Research*, 2(1), 19-30.
- Chinese Sources:
- 2007 两岸首例紧急医疗包机上海浦东机场起飞. (2007, January 24). Retrieved from [http://www.china.com.cn/overseas/txt/2007-01/24/content\\_7703223.htm](http://www.china.com.cn/overseas/txt/2007-01/24/content_7703223.htm)
- Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China, (2013). *Aviation transportation statistics*. Retrieved from website: <http://www.caa.gov.tw/big5/content/index.asp?sno=186>
- Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China, (2013). *Aviation transportation statistics*. Retrieved from website: <http://www.caa.gov.tw/big5/content/index.asp?sno=776>
- Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China, (2012). *Aviation transportation statistics*. Retrieved from website: <http://www.caa.gov.tw/big5/content/index01.asp?sno=1407>
- Civil Aeronautics Administration of Ministry of Transportation and Communications of the Republic of China, (2010). *Aviation transportation statistics*. Retrieved from website: <http://www.caa.gov.tw/big5/content/index01.asp?sno=1406>
- Huang, S. W. (2012, September 07). 兩岸運籌歷史回顧與未來發展. *Digitimes*. Retrieved from <http://www.digitimes.com.tw/tw/dt/n/shwnws.asp?CnIID=13&Cat=20&Cat1=&id=300934>
- Mainland Affairs Council, (2010). *政府大陸政策重要措施*. Retrieved from website: <http://www.mac.gov.tw/ct.asp?xItem=87021&ctNode=6826&mp=1>
- Strait Exchange Foundation. (2009). *Supplementary agreement on cross-strait air transport*. Retrieved from Strait Exchange Foundation website: <http://www.sef.org.tw/public/Attachment/9426127571.doc>
- Yeh, K. S.. Ministry of Transportation and Communications, (2009). *三通直航的經濟效益與競爭優勢*. Retrieved from Mainland Affairs Council website:

<http://www.mac.gov.tw/public/Attachment/911723505129.pdf>