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# Analysing passenger network changes: The case of Hong Kong

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ABSTRACT

Passenger throughput at Hong Kong International Airport (HKIA) has shown steady growth since its opening. Various aspects relating to HKIA have been studied in prior literature. This paper investigated changes in HKIA's passenger network for the period of 2001–2012 and used the gravity model to examine the key factors explaining its passenger traffic flows. The findings suggested that HKIA's passenger network has changed significantly and expanded to many new different destinations. Two regions (East Asia and Southeast Asia) were the most important markets for HKIA, and most key destinations connected by Hong Kong showed healthy growth. Nine factors could explain passenger traffic flows between Hong Kong and its key destinations: Hong Kong GDP per capita, GDP per capita of destinations connected by HKIA, distance, airport hub status of the destination airport, tourist destinations connected by HKIA, numbers of passenger airlines in service, bilateral trade flows, speaking a common language and having strong cultural/colonial links with Hong Kong, and the route presence of Cathay Pacific.


## 1. Introduction

Hong Kong is one of the key international financial and banking centres worldwide and one of the main international hub airports in the Asia-Pacific region, as well as the gateway to the Pearl River Delta (PRD) in Mainland China (García-Herrero, 2011; Tsui et al., 2014). Hong Kong International Airport (HKIA) has maintained steady growth since its opening in July 1998, except for the periods covering the Asian economic crisis, the September 11 terrorist attacks in the United States (US), the outbreak of Severe Acute Respiratory Syndrome (SARS), and the global economic downturn (McKercher and Hui, 2004; Sadi and Henderson, 2000; Siu and Wong, 2004; Tsui et al., 2014; Tsui and Fung, 2015). These exogenous shocks caused significant declines in passenger traffic travelling through HKIA. In addition, HKIA faces fierce competition from nearby airports in the region, including sub-national competition from the other A5 Group airports in the Pearl-River Delta (PRD) Region,[1] national competition from three major Chinese international hub airports (Beijing, Shanghai/Pudong, and Guangzhou Airports), and regional competition from the major Asian international gateway hub airports (Bangkok, Seoul/Incheon, Kuala Lumpur, Tokyo/Narita, Singapore, and Taipei/Taoyuan Airports) (Williams, 2006; Zhang, 2003; Zhang et al., 2004).

To date, a substantial body of literature has investigated various aspects relating to HKIA and Hong Kong's aviation sector such as tourist arrival demand and forecasting (Cheng, 2012; Cho, 2003; Song et al., 2003; Tsui et al., 2014), business travel (Tsui and Fung, 2015), air cargo hub status (Wang and Cheng, 2011; Zhang, 2003; Zhang et al., 2004), HKIA's performance and service standards (Lam et al., 2003, 2009; Tam and Lam, 2004), HKIA's network connectivity and competitiveness (Burghouwt et al., 2009; de Wit et al., 2009; Park, 2003), and the Hong Kong aviation sector's economic contributions (Fung et al., 2006; Yeung et al., 2010). The important points arising from these studies are as follows:

(1) Tourist arrivals and business visitors to Hong Kong have a significant impact on HKIA's passenger throughput, and tourism is one of the key business activities facilitating the growth of Hong Kong's aviation sector.
(2) HKIA is maintaining itself as the leading international air cargo hub airport worldwide; however, its long-term success will depend on the future development processes of other international air cargo hub airports in Mainland China and around the Asia-Pacific region.
(3) HKIA offers relatively good quality services to attract international travellers using Hong Kong as a stopover to their destinations.

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[1] The A5 Group airports in the Pearl River Delta region consist of HKIA, Guangzhou, Shenzhen, Macau, and Zhuhai Airports.

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(4) HKIA has built a strong and extensive flight network and connectivity for air travellers to different cities worldwide.
(5) Hong Kong's aviation sector is a significant contributor in supporting the development of Hong Kong's economy.

However, researchers have not paid much attention to the empirical assessment of HKIA's passenger network and traffic flows; to our best knowledge, this empirical study is one of the first studies to investigate this issue. The knowledge gained about the factors explaining the changes in HKIA's passenger traffic flows will assist policy makers in Hong Kong to maintain HKIA's status as a key aviation hub in Asia. This study investigated these factors by using a gravity model.

The format of this paper is structured as follows: Section 2 analyses the changes in HKIA's passenger network for the period of 2001–2012, along with the performance and contributions of Hong Kong-based carriers; Section 3 uses the gravity model to investigate the significant factors that influence HKIA's passenger traffic flows; and Section 4 summarises what are believed to be the key results and highlights the key contributions and limitations of this study.

## 2. Passenger network changes in Hong Kong

The list of HKIA's top 45 routes (direct routes) represented a share of at least 85% of HKIA's total passenger traffic between 2001 and 2012 although air passenger traffic slipped from the peak of 91% in 2005 to 85% in 2012 (see Table 1). The decline suggests that HKIA's flight network has expanded to new destinations recently, as HKIA's passenger throughput also maintained healthy growth during the study period. Again, this indicates that the relative importance of the top 45 routes towards the growth of HKIA's passenger throughput is diminishing. With regard to the total passenger numbers of HKIA's top 45 routes, there was a 74% increase during the study period, equalling approximately 6% growth per annum. Among 11 regions, East Asia and Southeast Asia were the two largest regions served by HKIA, followed by Northeast Asia and North America.

East Asia decreased its share of HKIA's passenger throughput from 35% in 2001 to 31% in 2012, but it was still the busiest region connected by HKIA over the years. In this region, Taipei/Taoyuan was the busiest route for HKIA over the years but showed a decline after 2005: passenger numbers fell from 6.56 million in 2005 to 6.06 million in 2012. This was as the result of the establishment of direct air links across the Taiwan Straits (Chang et al., 2011; Lau et al., 2012; Zhang et al., 2004; Tsui and Fung, 2015). In addition, HKIA's connectivity to the two key Chinese hubs (Shanghai/Pudong and Beijing) remained robust. Shanghai/Pudong became the second busiest route for HKIA after 2005, but showed a 6% fall in passenger numbers between 2010 and 2012 due to the competition of Shanghai/Hongiao. Another key Chinese hub airport (Guangzhou) exited the top 45 list in 2012. Fewer Chinese cities appear in the list—12 in 2001 and decreasing to seven Chinese routes in 2012.

Southeast Asia's market share was relatively stable and maintained a level of 22–25% of HKIA's passenger throughout the study period, with this region's total passenger numbers reaching 13.9 million in 2012. Bangkok, Manila, and Singapore were the most popular cities in the region over the years, having approximately 39%, 2%, and 20% growth in passenger numbers, respectively, between 2010 and 2012. Moreover, passenger numbers for Denpasar and Phuket (the tourist destinations) grew by approximately 61% and 73% between 2010 and 2012. Kota Kinabalu also joined the list in 2012.

Northeast Asia maintained more than 10% of HKIA's passenger throughput and the total passenger numbers grew over the years. Seoul/Incheon overtook Tokyo/Narita in 2012, becoming the busiest route in the region served by HKIA, followed by Osaka. More importantly, Tokyo/Narita showed significantly negative growth (−33%) between 2010 and 2012 as Hong Kong carriers preferred Tokyo/Haneda (its convenient location being near the centre of Tokyo metropolitan) over Tokyo/Narita; this decline was the largest negative growth among HKIA's top 45 destinations in recent years. Additionally, Busan (a tourist destination) appeared in the list in 2012.

South Asia has become another important market for HKIA mainly because of India's large population. Its share of HKIA's passenger throughput demonstrated remarkable growth prior to 2010 (having a fivefold increase from 0.4% in 2001 to 2% in 2010), but decreased slightly to 1.5% in 2012 (passenger traffic at Delhi and Mumbai dropped by 18% and 13% between 2010 and 2012). It should be noted that Mumbai has appeared in the list since 2005, representing recent rapidly growing air transport demand in the Indian market.

North America had approximately 5–6% of HKIA's passenger throughput over the study period; this region maintained healthy growth over the years and the largest growth (23%) occurred between 2010 and 2012. Five cities (Los Angeles, New York/JFK, San Francisco, Toronto, and Vancouver) continuously appeared in the list. In 2012, San Francisco and New York/JFK replaced Vancouver's leading position in the region, handling more than 0.80 and 0.59 million passengers, respectively. Also, Vancouver showed a decline (−0.4%) in air passenger volumes in 2012.

London/Heathrow was the only destination in Northern Europe. It had approximately 3–4% of HKIA's total passenger volumes during the study period, and also increased by more than 57% between 2001 (0.95 million passengers) and 2012 (1.49 million passengers). It is worth noting that London/Heathrow was the seventh busiest route of HKIA across the study years,[2] but suffered negative growth (−7%) in 2012. In addition, Western Europe's market share fell slightly from 3.9% in 2001 to 2.6% in 2012; Frankfurt showed a −3% decline for the period of 2010–2012. Furthermore, Zurich dropped out the list after 2005, whereas three routes (Amsterdam, Frankfurt, and Paris) retained their significance as the most popular destinations in the region. For Southern Europe, Rome only appeared once in the list in 2005.

Furthermore, Australasia took a share of 3.6% of HKIA's passenger throughput in 2001, and rapidly slipped from 4.6% in 2005 to 3.4% in 2012. Melbourne and Sydney were the two most important markets for HKIA in the region, followed by Auckland. Auckland experienced negative growth of −13% between 2010 and 2012, and Brisbane dropped out the list in 2012.

The Middle East's market remained relatively small and continued to increase from 0.6% to 1.4% of HKIA's passenger throughput during the study period. Dubai was the only destination in this region that appeared in the list over the years, and the recorded growth was more than fourfold between 2001 and 2012. Africa was always the smallest market connected by HKIA among all of the regions with minimal connectivity. Johannesburg showed significant growth prior to 2005 but air passenger traffic dropped by over 13% from 2010.

### 2.1. Performance and contributions of Hong Kong-based carriers

In 2012, the four Hong Kong-based carriers (Cathay Pacific Airways, Dragonair, Hong Kong Airlines, and Hong Kong Express Airways) largely dominated (50% or more) passenger traffic between Hong Kong and any of the 11 regions, except for the Middle East (see Fig. 1). In the previous years, they had control over just three regions in 2001 (Africa, Australasia, and the Middle East), seven

[2] The top six busiest routes for HKIA consist of Taipei/Tauyuan, Shanghai/Pudong, Beijing, Bangkok, Singapore, and Manila over the years (see Table 1).