THE EMPIRICAL VALUATION OF THE POTENTIAL SUCCESS IN LOW COST BUSINESS MODEL IN ASIAN AVIATION MARKET

by

Natthida Taweelertkunthon

B.Econ., Chiang Mai University, 2001
M.A. Econ., The University of British Columbia, 2004

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Abstract

The first low cost carrier phenomenon was observed in the US in the early 1970s even prior to deregulation in its domestic aviation in 1978. In the 1990s, this low cost evolution came across the Atlantic and it has been repeated in Europe. In Asia, the low cost challenge is a more recent phenomenon, but it is growing rapidly particularly in Southeast Asia, a unique region where economics and the aviation environment are unlike that of either the US or EU. This thesis thus asks a fundamental question of whether low cost carriers (LCCs) will enter and gain market share in Southeast Asia, in a similar fashion to what has happened in the US and EU. This thesis investigates two principal questions: (1) how serious a threat do Asian budget carriers pose to traditional state-owned carrier's core business; we do this by examining what is the degree of demand substitutability among carriers?, (2) is there any risk of cannibalization in the 'airline within an airline model' in this region, implying the major carrier's launch of a low cost offshoot may not be a sustainable strategy to respond to low cost competition.

Discrete choice models, multinomial logit (MNL) and nested logit (NL) models have been applied to estimate the factors affecting carrier choices based on data obtained from a passenger survey conducted at Bangkok International Airport in November 2005. The demand substitutability analysis reveals that for short haul leisure market, low cost carriers can easily penetrate this market with low fare no frills offerings. Short haul leisure passengers do not value differences in product offerings between network carrier and low cost carrier, and among the low cost carriers. Unlike leisure passengers, business passengers do value the competitive distance between the two different types of products offered by legacy carriers and low cost carriers. Market share simulations have provide some evidence of cannibalization in airline within an airline between Thai Airways and its low cost subsidiary Nok Air. The cause of their inadvertent self-cannibalization comes from the incompatibility and inadequate level of uniqueness and distinction between the mainline parent and its low cost offshoot.

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Summary

This thesis examines two principal questions: (1) how serious a threat do Asian budget carriers pose to traditional state-owned carrier's core business; we do this by examining what is the degree of demand substitutability among carriers?, (2) is there any risk of cannibalization in the 'airline within an airline model' in this region, implying the major carrier's launch of a low cost offshoot is not a sustainable strategy to respond to low cost competition. The first low cost carrier phenomenon has been observed in the US since its deregulation in domestic aviation in 1987. In 1990s, this low cost evolution came across the Atlantic Ocean and it has been repeated in Europe. In 2000s, the low cost phenomenon has arrived in Asia, and it is growing rapidly particularly in Southeast Asia, a unique region where economics and the aviation environment are unlike that of either the US or EU. This thesis therefore asks a fundamental question of whether low cost carriers (LCCs) will enter and gain market share in Southeast Asia, in a similar fashion to what has happened in the US and EU.

The success and sustainability of low cost carriers in this region are questionable. With a massive population of 500 million people and rising middle income class, low cost carriers are believed to prosper in the countries where ground and surface transportation are limited and not viable. However, the scarcity of secondary airports and the lack of open sky agreements among Southeast Asian countries lead many analysts to conclude that these budget carriers would have a more difficult time to succeed and survive. Not all low cost carriers can be accommodated by the market. As a result, the rise of Southeast Asian low cost carriers may not threaten network carriers quite as much as forerunners such as Southwest and JetBlue, and Ryanair and easyJet have in the US and Europe. The growth potential of low cost carriers is not disputable but just as the Europe model for low cost carriers was only an adaptation of what American pioneered, so the Southeast Asian model will find its own way.

The review of the literature on low cost carriers reveals that the study on the challenge of low cost carriers to Asian major network carriers is in its infancy. Existing analyses on this issue are descriptive and anecdotal, based on aggregate statistical data, and

comparative study drawing information from secondary sources. They are unable to shed light on the level of challenge low cost carriers have on major network carriers' core business. This thesis thus attempts to investigate the level of low cost challenge through the degree of demand substitutability among network and low cost carriers. This empirical analysis will provide an insight in the impact of low cost carriers on network carriers in Southeast Asia.

Like their US and European network carriers, Asian legacy carriers have created the airline within an airline model. In response with low cost competition, they launched low cost subsidiaries; Tiger Airways by Singapore Airlines, Nok Air by Thai Airways, and Citi-link by Garuda Indonesia are examples. Nevertheless, the success of airline within an airline in Asia is still uncertain. A large number of US and EU defunct low cost offshoots have led to the conclusion that launching a low cost offshoot is not a sustainable solution for network carriers to respond with the low cost era. Moreover, there is a likelihood that these Asian low cost offshoots will unavoidably take away their parent mainlines' core business, creating an inadvertent self-cannibalization. As a result, this thesis also investigates the risk of cannibalization in the airline within an airline model in Southeast Asia.

We thus focus on a short haul domestic Thai aviation market. A passenger survey for separate leisure and business travel was conducted at Bangkok International Airport. Survey respondents were passengers of a legacy carrier, Thai Airways, and Thai low cost carriers which were Nok Air, Thai AirAsia and One-Two-Go. Discrete choice models, multinomial logit (MNL) and nested logit (NL) models have been applied to estimate the demand of carrier choices. From the MNL and NL models, we derived own and cross elasticities with respect to fare and flight frequency. We then analyzed the derived cross elasticity values to assess the degree of demand substitutability between Thai Airways and low cost carrier and among low cost carriers.

The demand substitutability analysis reveals that for short haul leisure market, low cost carriers can easily penetrate this market with low fare no frills offerings. Short haul leisure passengers do not recognize the differences in product offerings between network carrier and low cost carrier, and among the low cost carriers. Leisure passengers are more

likely to postpone trips to specific locations and time in response to high fare, or to spend more time shop around for more affordable fares. For business market, low cost carriers have to spend more time and provide more effort to attract business passengers. Unlike leisure passengers, business passengers do recognize the competitive distance between the two different types of products offered by legacy carrier and low cost carriers. Competitive distance is appreciated through frills including comfort, service level, flight frequency, brand, frequent flyer program, ticket flexibility and physical product itself. However, our elasticity analysis further shows that business passengers are increasingly price sensitive for short haul domestic service as well. Frills are becoming less important for short haul trips. Our findings should be of concern to legacy carriers for a potential loss of their short haul market presence, first in leisure market and then business market. We thus anticipate that the low cost phenomenon would be repeated in Asia, but it may take a longer time.

From the basic choice models, we also conducted several market share simulations. This demand forecast helped us to assess the likelihood of cannibalization in airline within an airline between Thai Airways and Nok Air. We have found some evidence of cannibalization between Thai Airways and Nok Air. This empirical finding supports our initial analysis on Nok Air business model which we conclude that its product and service offerings as well as customer target are overlapping with those of Thai Airways for short haul domestic service. Since we have observed that Tiger Airways can avoid cannibalizing Singapore Airlines, we then conclude that the likelihood of cannibalization is just the way Thai Airways does it, and the way Nok Air business model is. This conclusion leads to another conclusion that the airline within an airline model is not a viable and sustainable strategy for network carrier. It could only be short-to-medium response for network carriers to the challenge of low cost carriers.

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Chapter 1 Introduction

The low cost business model innovated by Southwest Airlines has been evolving in the US since 1970s. After the European airline market was deregulated in the mid 1990s, the US low cost evolution has been repeated in Europe. It took more than 15 years in the US and 20 years in Europe before major network carriers began to take the challenge of this new business model seriously. In Asia the low cost challenge is a more recent phenomenon. But here too Asian network carriers may fail to react adequately and appropriately. The study of the challenge of low cost carriers (LCCs) to Asian major network carriers is in its infancy. This thesis asks the fundamental question of whether we can expect a repeat in Asia of what has happened in the US and EU; will LCCs enter and gain market share in Southeast Asia? To explore this question the thesis investigates the degree of demand substitutability between network carriers and low cost carriers in Southeast Asia. The thesis also attempts to assess the risk of cannibalization between a network carrier and its low cost offshoot in the region when the competitive response of a legacy carrier has been to form 'an airline within an airline'; an ill-conceived strategy followed by a number of legacy carriers in the US and to some degree the EU. The next section reviews the evolution of the US, Europe and Asian low cost phenomenon respectively which provides background for motivation and purpose of our study

1.1 Background, purpose and motivation

The US low cost experience

The first experience with low cost carriers began with the formation of Southwest Airlines in the early 1970s when they flew intrastate routes in Texas. After the US congress deregulated domestic aviation in the U.S. in 1978, a number of low fares with low frills or no frills carriers entered the airline business such as People Express and Muse Air. Though some were initially successful, it became clear in a matter of a few years that low fares alone were not enough. Most of these new entrants failed, either because they lacked sufficient financing to do battle with network carriers, or because they were offering a product that passengers did not want, with infrequent flights using inefficient aging aircraft. The failure rate of the new entrants was much as a result of aggressive competitive response of the incumbent carriers as it was from poorly thought out or executed business plans. Network carriers successfully use their yield management

systems to sell spare capacity at equally low fares, a hub and spoke system to take advantage of economy of traffic density (Barkin et al., 1995) and frequent flyer programs (FFP) to raise switching costs as well as create brand loyalty.

It was not until the early 1990s that a new generation of low cost, low fare carriers emerged. The most profitable and successful low cost airline, Southwest Airlines has proven repeatedly that strict adherence to the low cost business model that it initiated in 1971 is a key for success. It has inspired many independent low cost followers around the world to enter the low cost market. Examples of new low cost players in the US include ValuJet, AirTran, Frontier and Air South. These carriers came with strong financial backup and younger aircraft than their forerunners. They have rewritten the business model and basis of competition in the commercial airline market in the US; shifting from product differentiation to low cost. Learning from the past, they have served price sensitive passengers with more frequent flights, efficient and new fleets and at low fares. Further, they have avoided head-to-head competition with network carriers, flying routes that network carriers would not. Because of their efficiency, they have gained a cost advantage over network carriers. Their operational effectiveness has forced network carriers to bring their own costs down.

Network carriers attempted to replicate some of the cost advantage of low cost competitors by establishing their own low cost offshoot. Continental was a pioneer of the first generation of airline within an airline; it launched Continental Lite in 1994. After operating for only one year, its low cost unit was forced to leave the market with tremendous losses. Porter (1996) concluded that Continental has failed to successfully run the offshoot because it attempted to compete in two ways at once. On some routes, operated by its offshoot, Continental eliminated meals and first class cabin, increased departure frequency, lowered fares and shortened turnaround time. But on other routes, it remained full service, continued to use travel agents, used mix fleets of aircraft, and provided baggage transfer as well as seat assignment.

Other mainline offshoots joining the first generation of airline within an airline were Shuttle (1994) by United, Delta Express (1996) by Delta, and MetroJet (1998) by US Airways. With the lesson from Continental Lite, they closely duplicated fundamental

attributes of Southwest model by using a single type of aircraft (B737s), eliminating meals, simplifying fare structure, and using e-ticketing. At the same time, the offshoots would remain legally part of the mainline carriers. They attempted to beat off other independent low cost competitors by allowing their passengers to accumulate miles in parent airline frequent flyer program. For example, in addition to earning miles in United Mileage Plus frequent flyer program, Shuttle's passengers would still enjoy pre-assigned seating, and transfer seamlessly to and from mainline service. Moreover, passengers could attain Shuttle tickets via the United's Apollo Computer Reservation System.

During the dot-com bubble, the offshoots became profitable. However, they encountered mounting operation problems and labor unrest. They also found it difficult to avoid cannibalizing their core business. In fact, MetroJet did not improve US Airways' loss making record. Moreover, many of MetroJet's passengers were cannibalized from other US Airways operation, such as its major presence at Ronald Reagan Washington National Airport. When air travel demand dropped drastically in 2001, it became apparent that cost savings had not materialized to justify the separate operation of the offshoots. As a result, MetroJet, Shuttle by United and Delta Express were folded back into their mainline by 2002.

By the end of 1990s, the impacts of low cost phenomenon became apparent. Initially, the low cost, low fare carriers drew passengers who were disenchanted with the traditional carriers. Next, they obtained market share from passengers who had switched from non-aviation modes such as car and bus or who were shifting between activities. Only then did they begin to "steal" passengers from the traditional carriers. High-end business passengers, a high yield target group of network carriers, were no longer willing to pay expensive ticket fares for air travel. LCCs have stolen network carriers their last source of passengers. They have gained more market share and done the unthinkable; they moved beyond the secondary airport, they had conquered and challenged the network carriers in their own way.

Today, LCCs in the US operate more and more flights in direct competition with network carriers, even in the heavily-traveled region, such as New York and Los Angeles, Philadelphia and Dallas. JetBlue Airways, established in 2000, flies from NY's Kennedy

Airport to a set of cities, targeting high-end leisure and frequent flyer business passengers. It is famous for luxurious in-flight services such as leather seats, and free satellite-television programming from DIRECTV (Blum, 2005). The LCC segment now has approximately 30 percent of the US market in term of revenue per miles (RPMs). The success of Southwest, JetBlue and AirTrans encouraged network carriers to join the low cost market again. The second generation of airline within an airline began with Tango (2001) and Zip (2002) by Air Canada. Next, United's Ted made its debut in Denver with more meticulous branding in 2003, while Delta relaunched Song in the same year.

This time, United and Delta were significantly concerned with brand strategy, and how to position two potentially different company brands. After conducting customer research, United drew two conclusions. First a new brand, Ted requires a level of uniqueness and distinction from United. Thus, Ted would offer low and simplified fares and fly to where United will not fly. Second, it would maintain the strengths of the mainline brand, United Mileage Plus frequent flyer program. Delta also put more distance between itself and Song. The importance of brand strategy for the success of low cost offshoots became evident when Zip and Tango had to fold back to Air Canada in 2004.

The European low cost experience

Across the Atlantic Ocean, the glory of Southwest inspired Ryanair, an Irish loss-making full service airline, to transform itself to be the first European low cost airline in 1991. After the European airline market was deregulated in three stages in the mid 1990s, the US low cost evolution has been repeated in Europe. A large number of low cost carriers, beyond Ryanair and easyJet, entered the market with hope to success like their forerunners. However, many of them failed, and went bankrupt as well as went out of business through acquisition. Examples of failures include European mainline offshoots, such as Go (1998) by British Airways (BA) and Buzz (1999) by KLM.

While Buzz failed because of its poor business plan and misalignment between its marketing strategy and operational strategy, Go became a liability for BA because it was cannibalizing the airline core business. Both KLM and BA introduced low fares on their main routes, diverting passengers from their own subsidiaries, and creating further confusion in the mind of passengers. Furthermore, BA experienced an internal difficulty

in launching Go. It believed that it would be harder to convince staff of the need for radical cost cutting on the existing unprofitable short haul operations if Go was still part of the group. In 2002, BA decided to sell its low fare airline Go to easyJet, while KLM sold Buzz to Ryanair in 2003. Similar to the US experience, the first generation of airline within an airline in Europe did not last long.[1]

After 2000s, the number of LCCs grew incredibly fast. It was estimated that there were 54 low cost carriers operating in Europe in the summer of 2004, compared with just 12 in 2000 (Baker et al., 2005). Some emerging LCCs are from former Eastern Europe, including Wizzair, Air Polonia, Centralwings, SkyEurope and Smart Wings. A prominent player among new low cost entrants is germanwings by Lufthansa. After failing to launch its first offshoot Lufthansa Express, Lufthansa now has gained sufficient insight from the past failures and the key success factors for new low cost offshoot. With unique and distinctive brand and management team, germanwings has been set as the JetBlue of Europe, a premium low cost carrier flying mostly to primary airports and offering leather seats with in-flight entertainment. The second generation of airline within an airline in Europe seems to succeed, following to their counterpart in the US.

In fact, many of these 54 carriers are very small. Only a few of low cost carriers are operating with outstanding performances in term of traffic and revenue. Ryanair, easyJet, Air Berlin and germanwings have proven to be the winners of low cost battle for intra-European travel, becoming the four respective largest European carriers in term of network. They have expanded aggressively and adversely affected European network carriers. In Europe, LCCs now have about 25 percent of the EU market. This is growing as unlike North America, LCCs are garnering market share from charter carriers as the low cost carriers enter 4+hour flight segments (see Table 1.1 for a list of LCCs in each area of the world).

The Asian low cost experience

In the US and Europe, presently LCCs account for roughly 25 percent of market share by seat capacity (Baker et al, 2005). The current intra-regional traffic of Southwest is not too

[1] Interestingly BA realized a substantial profit when it sold off GO.

far behind Delta and American while Ryanair has overtaken Lufthansa to become the largest intra-European carrier. In Asia, the low cost phenomenon is in its infancy, but it is growing rapidly particularly in Southeast Asia [2](SEA). Despite the problem of restrictive bilateral agreements among Southeast Asian countries, Kuala Lumpur based AirAsia became a successful pioneer.

AirAsia took to skies in November 2002. Today it has a 30 percent domestic share of Malaysian market (O'Connell and Williams, 2005). Hoping to imitate the success of AirAsia, a half dozen low cost carriers have opened for business or plan to do by the end of 2002. One-Two-Go and Thai AirAsia have launched in Thailand, Valuair is flying out of Singapore, and Lion Air offers daily flights from Jakarta to Singapore, Kuala Lumpur and other destinations in Indonesia. In response, major carriers have set up low cost subsidiaries: Tiger Airways by Singapore Airlines, Nok Air by Thai Airways, and Citi-link by Garuda Indonesia. However, the future of the first generation of airline within an airline in Asia is still uncertain. Will the new low cost offshoots take away flag carriers' mainstream business, an inadvertent self-cannibalization?

The boom of low cost carriers is being facilitated by the governments of Malaysia, Thailand, Indonesia and Singapore, which are easing their aviation regulatory, granting landing rights to the low cost entrants in hopes of boosting tourism and business travel. Nevertheless, views still vary on whether lo w cost carriers will blossom in Southeast Asia.

Just as flag carriers like Air France, Alitalia ad Olympic in Europe, most Southeast Asian major network carriers are government-owned and influenced. They expect their governments to protect them. History says otherwise. Based on the low cost experiences in the US, Europe and Australia, many airline industry experts extrapolate that incumbent major airlines will unavoidably have to give up some of their market share, undergo restructuring and redesign their business models. The Southwest effect is expected to spread across Europe to Asia. The US and European network carriers have lost a significant proportion of their passengers to low cost carriers. Currently, low cost carriers

[2] Southeast Asian countries are composed of Thailand, Indonesia, Malaysia, Philippines, Singapore, Cambodia, Laos, Myanmar and Vietnam.

are accounting for a 40 percent share of the air travel market between UK and European Economic Area (EEA) (Williams et al., 2003). Many US and a number of European network carriers are having serious financial difficulties while some of low cost models appear to be profitable, reinforcing the extrapolation.

Proponents of LCCs cited reasons for their success. The fact that Southeast Asia has a massive population is crucial, more than 500 million people with a rising middle class and a growing propensity for travel. The geography location of surrounding islands without viable and competitive alternative modes of transportation in Southeast Asia will enhance LCCs an enormous competitive advantage over surface and ground modes. For example, an express coach trip on the 690 kilometer trip by road from Bangkok to Chiang Mai in northern Thailand takes about 10-11 hours, while flying time is only 70 minutes. The journey by coach from Bangkok to Siem Reap, the sight of AngKor Wat in Cambodia, involves a road trip of 6 hours, while a flight takes 60 minuets (Hooper, 2005). Due to the inefficiency and inconvenience of ground and surface modes, LCCs are anticipated to drastically attract passengers from other modes and budget-conscious passengers to fly more often. It is further believed that LCCs would pose serious threat to existing major network carriers in the long run, taking away a proportion of their valuable business passengers just as in Europe and the US.

Nevertheless, some aviation industry analysts argue that the rise of Southeast Asian LCCs may not threaten established airlines quite as much as upstarts such as Southwest and JetBlue, and Ryanair and easyJet have in the US and Europe. They do not dispute the growth potential of LCCs, but they do believe that just as the Europe model for LCCs was only an adaptation of what American pioneered, so that Southeast Asia model will fine its own way. The success of Southwest Airlines came after deregulation when state boarders did not matter. Ryanair and easyJet have enjoyed the prosperity after the European Union reached the open skies agreement and formed a single market. The difference in Southeast Asia is not only that the boarders are international but also involved with bilateral air service agreements. Customs and immigration procedures would hamper the quick turnarounds that Southwest or Ryanair models rely on to enhance productivity and keep costs down. It would also appear that the principle sources of lower costs available to US and European low cost carriers may not be available to aspiring Asian LCCs.

How and where cost differentials between network carriers and their low cost competitors would be replicated, is still questionable. European and American LCCs enjoy substantial cost advantage over network carriers in term of labor issue and landings fees at secondary airports (Lawton, 2002). Strong labor unions force network carriers to pay expensive labor rates and follow work rule classifications which low cost players have avoided. But Southeast Asia is known as a region of employment opportunity, skill shortage, labor flexibility and labor union weakness (Thomas, 2005). A scarcity of secondary airports within commuting distance of Southeast Asia's capital cities means that low cost airlines there cannot avoid congested and pricey primary airports as easily as US and European counterparts can. This limits their ability to save on landing fees, have quick turnaround times and reach high aircraft utilization rates.

Southeast Asia's major airlines, such as Singapore Airlines and Thai Airways, are more cost competitive then their European and American counterparts. They already enjoy lower average costs per kilometer than other global carriers, even as low as no frills airlines. They can sell a round trip economy class at a discount for short haul regional routes by keeping a wide body aircraft busy with several daily flights, and then using the same plane for an overnight long haul international route. Network carriers can match cheap tickets offered by low cost carriers because they have first and business classes plus cargo. Thus, one of the big distinguishers between network and budget carriers in Europe and the US may not play an important role in Southeast Asia.

The new Southeast Asian budget carriers also face more competition than low cost carriers elsewhere. In Europe or the US, LCCs target routes that are dominated by just one or two carriers. However, in Southeast Asia, competition is more rigorous. In flying between Singapore and Bangkok, Valuair and Thai Air Asia compete with a dozen of other competitors. On the Hong Kong-Singapore route, Valuair has to fight against seven other carriers.

The history in other continents is that not all new low cost carriers can be accommodated by the market. As an industry shakes out, many of low cost entrants are unlikely to survive. The common prediction is that any Southeast Asia budget carriers would have a more difficult time to succeed and survive. Thus, it is likely to see a wave of mergers and

failures in Southeast Asia's highly competitive low cost airline industry. The first merger was already started in Singapore between Jetstar Asia and Valuair in July 2005.

In light of the experiences in North America and Europe, low cost carriers are able to deliver 80% of the service quality at less than 50% of the costs of network carriers on continental travel routes (Franke, 2004). Consequently they at least tackle more than 70% of O&D, taking them far from their origins as niche businesses (Franke,2003). With the peculiar characteristics of Southeast Asian market, the impact of low cost carriers posing on major network carriers is still disputable. It is questionable how serious budget carriers can pose threat to traditional state-owned carrier's core business, what is the degree of demand substitutability among carriers? Does the major carrier's launch of low cost subsidiary provide a viable solution to respond with low cost competition? Is there any risk of cannibalization in airlines within airlines?

The objectives of this thesis are thus to investigate the following two questions: (1) on short haul routes, how serious a threat can budget carriers pose to traditional state-owned carriers' core business in Southeast Asia?, (2) is there any risk of cannibalization in an airline within an airline model in the context of Southeast Asia?

A survey of short haul domestic air travelers using a major carrier, Thai Airways (TG), and other low cost airlines in Thailand, which are Nok Air (NOK), Thai Air Asia (TAA) and One-Two-Go (OTG) will be conducted. By using the data obtained from the survey, the thesis attempts to examine both questions qualitatively and quantitatively. We examine Southeast Asian LCC business models and compare each with other successful LCC strategies in the US and Europe. Discrete choice models are applied to derive the own and cross elasticity reflecting the degree of demand substitutability between Thai Airways and other low cost competitors. Using market share simulation, we further assess passengers' perception and attitude on product differentiation between Thai Airways and LCCs and among LCCs themselves.

1.2 Outline of the thesis

Chapter 2 reviews the literature on low cost carrier phenomenon in the US, Europe and Asia especially Southeast Asia, focusing in particular on any competitive threat facing the

network carriers. This chapter includes the history, albeit abridged, of low cost carriers in the three continents, their competitive advantage and sustainability, reasons why legacy carriers were so vulnerable, and change in passenger's perception on product differentiation offered by network and low cost carriers. The chapter also provides both facilitating and obstacles for the success and growth potential of low cost carriers in Southeast Asia.

Chapter 3 begins to assess strengths and weaknesses of selective low cost carriers in Southeast Asian. The chapter describes their history, and then examines their routes, market share and business models as well as marketing, operating and distribution strategies used. In addition, the chapter compares successful low cost business models used by Southwest, JetBlue, easyJet, and Ryanair with business models used by Southeast Asian low cost carriers.

Chapter 4 reviews the literature on consumer choice theory concentrating in discrete choice model used to derive the degree of demand substitutability. This chapter provides an overview of the most widely used discrete choice model, the logit model, its advantages and its limitations. It also describes the more complex and flexible model, nested logit model which was developed to overcome some of the limitations of the multinomial logit model. In addition, this chapter reviews applications of discrete choice models in the air transportation literature.

Chapter 5 describes the source of data used to investigate the primary questions of interest. In addition, the chapter illustrates the structure of the survey instrument to be used in primary data collection. There will be a business and leisure passenger survey. Information will include data on such items as location, number of passengers, types of passengers, period of survey conducted. We also report descriptive statistic analyses based on surveyed leisure and business questionnaires.

Chapter 6 presents estimated results of demand models. Using elasticity analysis, the chapter discusses the degree of LCC penetration to network carrier's core business, focusing in aviation market in Thailand in terms of demand substitutability. This chapter

further assesses Thai passengers' perception on product differentiation between Thai Airways and LCCs with the use of market share simulation.

Chapter 7 concludes this thesis. This chapter summaries the approach and results and addresses the issue of whether all questions posed by the thesis have been adequately answered. In addition, the chapter provides summary of findings and contribution including final thoughts and future research direction.

The evolution of detailed literature covering the LCC phenomenon in the US and Europe, their ability to pose threat to network carrier's core business will be reviewed in the next chapter.

Table 1.1: List of low-cost airlines in each area of the world

1. North America		
Country	**Low cost airline**	**Note**
United States	AirTran Airways	
	Allgiant Airways	
	America West Airlines	
	American Trans Air	
	Frontier Airlines	
	Independence Air	
	JetBlue Airways	
	Primaris Airlines	
	Song	
	Southwest Airlines	
	Spirit Airlines	
	Sun Country Airlines	
	Ted	
	USA 300 Airlines	
Canada	Canjet	
	Harmony Airways	ex HMY Airways
	Tango Airlines	now Air Canada
	WestJet	
	ZIP	now Air Canada
Mexico	Click Mexicana	
2. Europe		
Country	**Low cost airline**	**Note**
Austria	Niki	
Belgium	SN Brussels Airlines	
	Virgin Express	
Czech Republic	Smart Wings	
Denmark	Maersk Air	
	Sterling Airlines	
Finland	Bluel	
France	Flywest	
Germany	Air Berlin	
	Dba	
	Eurowings	part of the Lufthansa Regional group
	Germania	
	Germnwings	wholely owned by Eurowings
	Hapag-Lloyd Express	
Hungary	Wizzair	
Iceland	Iceland Express	
Ireland	Aer Arann	
	Aer Lingus	
	Ryanair	
Italy	Air Service Plus	operating with French Axis Airways
	Alpi Eagles	
	Evolavia	
	Jet X	Icelandic company operating in Italy
	Meridiana	
	Myair	

	Volare	
	Windjet	
Netherlands	Transavia Airlines	
Norway	Norwegian Air Shuttle	
Poland	Centralwings	
Romania	Blue-Air	
Serbia and Montenegro	Air Maxi	
Slovakia	Skyeurope	
Spain	Air Madrid	
	Vueling Airlines	
Sweden	Snowflake	
	FlyMe	
	FlyNordic	
Switzerland	Helvetic Airways	
Turkey	Onur Air	
United Kingdom	Air Southwest	
	Air Wales	
	BMIbaby	
	EasyJet	
	Flybe	
	Flyglobespan	
	Jet2.com	
	Monarch Airlines	
	My Travel Lite	
	Thomsonfly	
3. Asia		
Country	**Low cost airline**	**Note**
Hong Kong	Hong Kong Express	
	Oasis Airways	
	WOW Asia	
India	SpiceJet	
	Air Deccan	
	Air India Express	just launched, subsidiary of Air India
	Kingfisher Airways	
	Go Air	just launched
	IndiGo	lauching by Feb 2006
	Paramount Airways	just launched
Indonesia	Awair	subsidiary of Air Asia
	Citilink	subsidiary of Garuda Indonesia
	Lion Air	
	Adam Air	
Japan	Hokkaido International Airlines	also known as Air Do
	Skymark Airlines	
	Skynet Asia Airways	
Kuwait	Al Jazeera Airways	
Macao	Macao Eagle	known as WOW Macao
Malaysia	Air Asia	
Philippines	Air Phillippines	
	Asian Spirit	
	Cebu Pacific	

	South East Asian Airlines	known as SEAIR
Singapore	Jetstar Asia Airways	subsidiary of Qantas
	Tiger Airways	subsidiary of Singapore Airlines
	Valuair	
Thailand	Nok Air	subsidiary of Thai Airways International
	One-Two-Go	domestic brand of Orient Thai
United Arab Emirate	Air Arabia	
4. Oceania		
Country	**Low cost airline**	**Note**
Australia	Jetstar Airways	subsidiary of Qantas
	OzJet	
	Pacific Blue	brand of Virgin Blue for international operations
	Virgin Blue	
New Zealand	Freedom Air	subsidiary of Air New Zealand
	Jetstar Airways	
5. South America		
Country	**Low cost airline**	**Note**
Brazil	Bra	
	Gol	
	Webjet	
Uruguay	U Air	
6. Africa		
Country	**Low cost airline**	**Note**
South Africa	Kulula	
	Itime	

Source: Wikipedia.org and airline websites

Chapter 2 Literature review

2.1 Introduction

This chapter reviews the evolution of the economics literature on low cost carriers (LCCs) in the US, Europe and Asia. The chapter investigates their ability to pose a threat to a major network carriers' core business. In addition, the chapter explores the sources of their competitive advantage and reasons why legacy carriers were particularly vulnerable. Both negative and positive views on the potential long term success and growth of Asian low cost carriers will be discussed. Before leaving this chapter, literature gaps on various issues will be presented.

The US and EU Experience

The first low cost phenomenon was evident in the US prior to US deregulation. The states of California and Texas were large enough both geographically and in terms of population to support intrastate carriers. Western Pacific Airlines in California and Southwest Airlines in Texas operated as low cost – low fare unregulated carriers. In fact it was the existence of these carriers operating in competitive markets that provided the necessary empirical support that underlay the move to deregulate the US domestic market.

After the US congress deregulated the US domestic aviation industry in 1978, opportunities for new entrant low cost carriers emerged. The deregulation attracted a large number of new entrants; most came in the market with low fare, low frills or no frills. However, many of them failed as the matter of years, revealing that low fares alone were not sufficient to succeed in the market. One of the most publicized failures was that of People Express, which expanded aggressively by using its low-fare, no frills concept. It tried to expand, but over extended itself and began to incur massive losses. It thrived until full service carriers (FSCs) or network carriers have successfully come up with several strategic innovations: hub and spoke system (H&S), frequent flyer programs (FFPs), and yield management system. In 1987, People Express was acquired by Texas International.

Since deregulation, H&S systems have emerged as the most effective logistical systems for moving passengers. By creating fortress hubs, dominant carriers at hubs can channel

traffic from a very large number of cities onto a particular hub city pair flight segment. This will allow dominant carriers to increase schedule frequency which in turn significantly reduce passengers' schedule wait and add many origin and destination (O&D) pairs to the network (Tretheway and Oum,1992). The impact of H&S systems on aircraft planning and operation are discussed by Kanafani and Ghobrial (1985). To further understand the mechanism concepts of the H&S system, Oum et al. (1990) investigate the forces and economic underpinning the systems. Their study reveals that the addition of one spoke station to the hub network results in the economy of traffic density because of the traffic stimulation at hubs. It is also the case in a hub and spoke environment there are 2(n-1) links in the network while in a fully connected point to point system there are n(n-1). If the traffic level is Q, density in a hub and spoke network is Q/[2(n-1)] while it is lower in a point to point network, [Q/[n(n-1)].

Major network carriers successfully built Frequent Flyer programs [FFPs] to create brand loyalty. Since the programs incur costs in start-up, operating and providing redeemed rewards, economists regard FFPs as a kind of entry barriers (Gillen et al, 1988). Tretheway (1989) also describes the airline FFPs as a powerful entry barrier because it is much cheaper and easier for the large network airlines to provide these programs than it is for entrants. The size of the network and the power of H&S systems induce passengers to fly with a large network carrier so that they can redeem rewards in which many O&D city pairs are available to choose from.

With the use of yield management systems, network carriers can sell spare seats to those who may not flown at very low prices relative to prices offered by low cost entrants. Kraft et al. (1986) outline the concept of airline yield management, the economic underpinnings of the concept and its mechanism. They point out a key aspect of a successful yield management system; to employ the system efficiently, an airline has to attach sufficient and appropriate restrictions to the discount fares to prevent those who would have flown anyway to divert to the lower fares, and thus lower flight revenue, while likely empty seats are sold at a significant discount to those passengers who otherwise would not have flown.

Most of new low cost entrants immediately after deregulation did not succeed in establishing a niche market, and many quickly dropped out from the competition after operating in very short period. They did not have a sustainable advantage of lower costs in that in many cases the low costs stemmed from low factor prices (cheap aircraft from other carriers having exited the market) rather than from superior economics. As a result, LCCs received very little attention in the 1980s economic literature. Surprisingly, among the new entrants, Dallas-based Southwest Airlines (SWA) is one of the two survivors since deregulation. The airline has been continuously profitable since operating in 1971 even during the economic downturn. It seems it has found the integrated keys to success in low cost business. The success of Southwest has inspired many low cost operators around the world to reemerge and emulate its successful business model in the 1990s.

Some loss- making network carriers transformed to be successful low cost players based on Southwest model. In 1991, Dublin based Ryanair closely cloned Southwest Airlines and it has become a low cost leader in Europe. Combining its previous H&S system with a point-to-point service, AirTrans has turned to profitability. Southwest model also has adapted further with the innovation of new entrants. JetBlue adjusts the model to target high-end and business travelers with brand-new aircraft luxuriously equipped with satellite TV and leather seats. It also flies from New York JFK airport to primary airports with longer stage length. In UK, easyJet is positioned to attract both leisure and business markets by flying from secondary airports to primary airports in Europe. It went further in cost reduction with an absolute of no travel agent.

2.2 Threat that low cost carriers pose to network carriers in the US and Europe

The threat and challenge of LCCs became vivid in the late 1990s. LCCs offered very low fares but still gained profitability, whereas FSCs suffered from the loss in market share and the drop of revenue yields. The impacts of the LCC model may be inferred in several ways. First, in term of passengers they carry, LCCs now account for about 25% of market share measured by seat capacity in each of the US and Europe ((Baker et al.,2005). Intra-regional traffic carried by Southwest is just slightly behind trunk majors, Delta and American Airlines. With an aggressive network expansion, Ryanair has become the largest intra-European carrier, overtaking the legacy carrier like Lufthansa.

Second, the LCC entry leads to the decline in prices on routes where they start operation. Dresner and Windle (1999) examine the impact of LCCs on airport and route competition. Previous research has found that the entrance of Southwest Airlines, leads to lower prices on routes it has entered. They thus extend this analysis by examining the impact of entry on routes by a low cost carrier ValuJet, into an established carrier's hub, Delta, and by examining price changes on routes not entered by ValuJet. They found that Delta lowered its fares on competitive routes terminating in Atlanta and on routes flowing through its Atlanta hub in response to competition by ValuJet. Other studies, such as Whinston and Collins (1992) have focused on the route-level impact of LCC entry on incumbent carriers. They use the reactions of incumbent airlines' stock prices to announcements of entry by People Express to understand competitive structure. Their study shows that stock reactions reveal significant route-specific profits or sunk costs of incumbent airlines, and also provide evidence on the degree of competitive localization present in the industry.

Third, the so-called Southwest effect has become widely known. Bennett and Craun (1993) started to study the effect. Vowles (2001) describes this effect as a rapid increase in traffic and a simulation reduction of the average ticket prices at airports close to those where Southwest initiates operations, even on routes that Southwest does not directly operate. Franke (2004) also shows that the market entry of LCCs has created massive stimulation effect on demand especially the biggest O&D market in Europe, Dublin-London. Since Ryanair entered this market in 1986, demand has quadrupled, pushing down the market shares of former incumbents British Airways (BA) and Aer Lingus. This can be called the Ryanair effect as well.

Fourth, FSCs have responded to the impact of LCC market presence by launching their own LCCs. Delta operates Song, United operates Ted, Air Canada operated Zip and Tango, and BA operated Go. However, a number of defunct low cost subsidiaries in both continents have raised the relatively unexplored issue whether the incompatibilities of the low cost and network carrier business model are the causal reason for failure of earlier attempts. Graft (2005) attempts to examine the above issue. An inductive and qualitative research approach was employed using case studies. To understand the economic rationale of the incumbent airlines, he firstly highlights the motives for setting up a

parallel low cost carrier to respond to the threat and opportunity of the low cost incursion. The exploitation of economies of scale and scope is a key objective of setting up an internal low cost unit. After that, he explores the chance and risks of establishing a low cost carrier within the same grouping of a network carrier business model based on the analysis of 5 case studies in the European airline industry.

Graf finds that the incompatibilities in operating two business models simultaneously appear for two reasons as follows: (1) the contrary and conflicting configuration in the two business models; (2) the inconsistencies in the way the business model of a low cost unit has been applied to the new unit. In addition to operating low cost offshoots, network carriers have attempted to remove a significant amount of cost from their operations, without changing their business model or reducing service levels to their business passengers. However, Morrell (2005) shows that the unit cost gap with Southwest has narrowed only very slightly between 1995 and 2002 for Northwest, Continental and Delta, but for Untied and American it has widened somewhat (after allowing for sector length changes). He thus concludes that having LCC offshoot did not improve the chances of unit cost reductions in the major's mainline operations.

Morrell further points out that even though some offshoots in the US conformed strictly to the Southwest model, they still suffered from brand confusion and union restrictions on their operations. Examples of these offshoots were MetroJet by US Airways, Delta Express by Delta and Shuttle by United. A recent re-launched offshoot Ted by United is likely to have the same problem. Ted flights are bookable through United's Apollo reservations system showing some markets being served by both Ted and United's own flights. In addition, Ted's passengers can accumulate miles from United's Plus frequent flyer program. Because Ted flights are operated by United, this would possibly repeat the earlier mistake of brand confusion..

Both recent studies by Graft (2005) and Morrell (2005) have raised another unexplored question whether launching LCC offshoots are only short to medium best strategy for network carrier to defend the LCC threat. It may not be a viable solution to do so when taking the risk of cannibalization and incompatibilities in two distinct business models into account.

2.2.1 Competitive advantage and sustainability of low cost carriers

Since 2000, the severe crisis of the global airline industry has threatened the sustainable financial position of many airlines. Network carriers, particularly in North America have suffered significant losses with the crisis, whereas low cost carriers have, for the most part, enjoyed profitability and rapid growth. Legacy carriers in Europe and Australasia have faired much better than their North American counterparts. It is reasonable to believe that a simple and efficient business model with a lean cost structure (up to 60% lower unit costs in comparison with network carriers, Franke 2004) have created low cost carriers substantial cost advantage over network carriers. This might be one of the reasons why LCCs were not only spared, but boosted by the massive downturn. Doganis (2001) shows that the LCC business model can successfully operate on a sustained basis at 40-50% of the stage-length adjusted unit cost of the average network carriers. The initial cost advantage arises from the nature of their operation: higher seating density and higher daily aircraft utilization.

Hansson et al. (2002; 2003) further shows that the cost gap could be about 5-8 US-Cent per ASK (LCCs) compared to 10-15 US Cent per ASK (FSCs). Low frills and lower wages marginally account for this cost gap, while lean production model underpinned by quick, streamlined processes is the root basis of the success. In addition, the main drivers of cost difference between LCCs and FSCs are discussed by Franke (2004). At least one-third of the cost gap comes from the typical LCC production pattern with high-frequency commuter flights between major destinations such as with easyJet or one aircraft serving a few destinations from a given base such as with Ryanair, resulting in a considerable higher productivity of aircraft and crew.

What drives the LCC success especially Southwest Airlines has become an appealing issue for economists after they observed its continued profitability and gradual growth during its 35 years of operations. Low cost operators enjoy specific cost advantages that make them a credible competitor to traditional carriers based on low fares. Many thus believe that their operational efficiency is a source of the cost advantage and also a key for their success.

However, Porter (1996) argues that operational effectiveness is not a strategy. Competitive strategy is about being different, meaning deliberately choosing a different set of activities to deliver a unique mix of value. He claims that Southwest Airline's essential strategy is in activities-choosing to perform activities differently or to perform different activities than rivals. The airline offers short haul, point-to-point service between midsize cities and secondary airports in large cities, trading off with the economies of hub and spoke systems. With no meals, no seat assignment, no interlining transfer, Southwest avoids having to perform activities that slow down other airlines. Its sustainable competitive advantage comes from strategic fit, the way its activities fit and reinforce one another. Therefore, Southwest's strategy involves a whole system of activities not a collection of parts and this is sustained by simplicity; simplicity in product, process and organization.

Gillen and Lall (2004) develop Porter's notion of strategic fit to argue that the Southwest model is not generic, contrary to popular belief. By identifying strategic choices and sources of operational efficiency, they show that Southwest story is a people story based on the work of Gittell (2000; 2001; 2003). The choice of low cost business model with point-to-point service provides the strategic advantage and the operational effectiveness complements this choice. The simplicity in product results in simplicity of processes and organization. The people story of Southwest reflects team organization leading to greater relationship coordination. The system coordination is a key factor to conclude that Southwest model is not generic because it is difficult to duplicate.

2.2.2 Why were legacy airlines so vulnerable?

Both Porter (1996) and Gillen and Lall (2004) reveal that when LCCs provides point-to-point service, they have to give up the economies of H&S systems. Network carriers gain dramatic benefits by exploiting the H&S systems which allow consolidation of traffic and therefore high load factors. It then became questionable why network carriers were so vulnerable during the crisis. Only cost competitive advantage of LCCs over network carriers may not be the only cause of FSC loss. A few recent papers attempted to understand the plight of full service carriers.

Franke (2004) suggests that the current crisis has not been caused, but deepened by 4 additional drivers as follows: (1) the 2000 economic downturn, (2) the terrorist attacks of September 11, 2001 resulting in a rapid decline in travel demand, (3) the 2003 Iraq war together with (4) the SARS health scare causing a second downward trend in airline travel. In fact, the original root cause of the crisis was the decline of the historically unequalled high yield level in the late 1990s (after the first Iraq war) and, in parallel, considerable cost increase. In the golden 1990s, network carriers were allured by the bubble economy, and then massively expanded capacity. In the last quarter of 2000, the unprecedented gap between revenue and cost (per ASK[3]) turned negative. The crisis thus was initially a revenue crisis, followed by the cost impact of growing overcapacity. The entire process was exacerbated by the large buildup in capacity in the mid to late 1990's riding the dotcom boom. When this sector collapsed in 1999 not only did the legacy airlines lose a large price inelastic market but they were faced with unprecedented amounts of capacity that would lead to significant downward pressure on fares.

For the cost crisis, after the end of the golden 1990s network carriers found themselves bundled with cost complexity. Their H&S business model is designed to seamlessly take anyone, from anywhere to everywhere (Franke,2003). Hub airlines are inevitably tied to a massive physical infrastructure, complex fleets of aircraft, legacy information system, and expensive labor pool. While they had to face this cost burden, LCCs like Southwest and Ryanair are prospering by exploiting a huge cost-of-operations advantage.

The revenue crisis developed during the second half of 2000 when, faced with an economic downturn, high value passengers (traveling with first and business classes), showed a growing unwillingness to pay premium prices. Business passengers accounted for 60% of FSC's revenue are increasingly switching to use LCCs. Economic downturn pressures business passengers to cut down their travel budget, resulting in change in demand choice. The change in demand choice is an original cause of revenue crisis, a considerable drop in high yield level of major legacy airlines.

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[3] ASK = available seat kilometer

2.2.3 Change in passengers' perception and attitude on product differentiation between low cost and network airlines

The change in demand choice also reflects the change in business passengers' perceptions and attitude on product and service differentiation between LCCs and FSCs. A number of researchers show that a significant proportion of business travelers are using LCCs for business related trips. easyJet reports that over 50% of their customers are business passengers (Mason,1999), indicating that either the business travelers using these LCCs are travelers who previously did not fly to do business or that these carriers are winning a significant proportion of business passengers away from the traditional network carriers. In fact easyJet's business model and network design is aimed at attracting business passengers much more so than, Ryanair, for example.

Mason (2000) then conducted a stated preference survey of European business travelers to assess the propensity for business travelers to use short haul low cost airlines. His study assesses the utility placed by travelers on prices, airline FFPs, flight frequency, and in-flight comfort service. By forcing a sample of short haul business travelers to trade product benefits against travel expenditures, he could estimate the value of a number of product elements in monetary terms. His study finds that price is the most important purchase factor followed by in-flight comfort and then flight frequency. Company size has an influence on the price elasticity of business passengers and on the value placed on those purchase factors. Small and medium business passengers are more likely to use LCCs.

In 2001, Mason conducted another survey of short haul business travelers using a major carrier at Heathrow airport and then compare with travelers of a low cost airline at a secondary London airport. His study concludes that business travelers using low cost airlines do not form a separate market segment from business travelers using network airlines. His research provides evidence that low cost airlines have drawn traffic away from traditional carriers as business travelers attribute less value to the frills provided by traditional carriers for short haul service. In other words, for short haul business trips, in-flight service has become less important for customers. Business passengers are increasingly becoming price sensitive; as a result, LCCs can easily attract those working with small and medium firms.

Evangelho et al.(2005) extend the findings conducted by Mason (2000; 2001) on the UK-European market in the context of Brazil. They firstly note that Gol, a Brazilian low cost carrier, adapted the low cost model to the Brazilian context. However, Gol deviates from short haul service because of the country's demography and population distribution in Brazil. This reduces aircraft rotation and utilization. It also does not use uncongested secondary airports, against Windle and Dresner (1999) which say that the LCC paradigm is based on short haul routes, and relies on secondary under-used airports, or those not dominated (Borenstein, 1991; Doganis, 2001). In Brazil, all airports are state-owned, and there is no competition between airports. The lack of competitive airport forces Gol to use the same airports of its network competitors, Thus, Gol cannot gain lower airport charges, and avoid direct competition with network airlines.

Contrary to Mason's results, Evangelho et al. (2005) find that there is segmentation in the Brazilian business travel, suggesting that the preference for traditional airlines is largely a matter of the culture of larger organizations. Their findings support the notion that LCCs are capturing travelers from other modes of transportation and, therefore, that these travelers captured would consist of a distinct group of business travelers from those using network carriers. The contrast in the findings by Mason (2000; 2001) and Evangelho et al. (2005) has created an interesting comment. The unique characteristics of country's demography and culture do matter and influence passengers' perception and attitude on service differentiation offered by LCCs and FSCs.

2.3 Threat potential of low cost carriers posing to Southeast Asian major airlines

After 2000, the LCC phenomenon arrived in Asia. The boom and proliferation of LCCs particularly in Southeast Asia came after the success of Air Asia, based in Malaysia and the ease of aviation regulations by the governments in the region. The research of this field is relatively unexplored and limited because the LCC industry in Asia is still in its infancy. The unique characteristics of the region may well have dramatic influence on their success and growth potential. Views vary whether LCCs will achieve success and establish a sustainable position in Southeast Asia.

2.3.1 Positive views on the growth and success of LCCs

Many industry analysts and economists suggest that LCCs will prosper in Southeast Asia. They cited reasons for their success. The fact that the region has massive population with an increasing middle class is important. The propensity for travel across Asia is growing, boosting an intra-Asian tourism market. Moreover, they positively believe that the regulatory regime is gradually easing toward greater openness and eventually open skies. Each government is likely to use the boom of LCCs to promote its tourism. The region is an exotic destination where tourism and low cost airlines would complement the growth of each other. For example, from Bangkok, visiting the world renowned temple Angor Wat by bus or automobile is painstaking. The roads are not well-paved and constructed. LCCs then will make the trip faster and more convenient with affordable fares for both international and local tourists. The geography of Southeast Asian countries also facilitates the use of low cost carriers. People need to fly because alternative transport modes such as buses and ferry are time and money consuming.

To better understand the operating, marketing and distribution strategies, Goh (2005) conducts a preliminary analysis of the state of the LCCs operating within Southeast Asia. Using single comparative analysis drawing information from secondary sources, he assesses the approach of the LCCs' business model. His preliminary evidence suggests that the LCCs in Southeast Asia are no different from those in the US and Europe when it relates to pricing, in that low fares are snapped up quickly. However, the LCCs have to face challenges of meeting fast turnaround time and minimizing landing charges.

Another proponent study was completed by O'Connell and Williams (2005). They adopt a similar methodology to Mason (2001) to conduct the survey of passengers' perceptions of low cost airlines and full service carriers. Their work involves a case study of Aer Lingus, Ryanair, Malaysia Airlines (MAS) and Air Asia. They attempt to investigate the difference in passengers' perceptions between low cost carriers and full service incumbents in a mature European market and in a rapidly developing Asian economy. They find that while there are differences between passengers traveling on a low cost carrier and those on a full service airline, there appears to be no difference in the attitude and perception of passengers from two very contrasting geographical markets. Their study concludes that the success of Air Asia, which was based on the Ryanair model and

which in turn was modeled on the Southwest model, can be successfully replicated in any part of the world as passengers' opinions and expectation appear consistent. With at least one rapidly growing low cost carrier like Air Asia, it is very likely that the challenge of LCCs to network carriers' core business will soon be serious.

2.3.2 Negative views on the growth and success of LCCs

Some economists and aviation industry analysts argue that the low cost phenomenon in Southeast Asia may not encroach major network airlines quite as much as LCC counterparts have in the US and Europe. The region's peculiar aviation atmosphere causes their concerns.

Southeast Asia is a region where the aviation regulatory regime is quite restrictive and there are no open skies agreements, unlike EU and the US. There are a few secondary airports, while there are not many trunk routes within 2-5 hour flying. The majority of populations are low income earners who are unlikely to access the Internet or cell-phone. Existing major carriers such as Singapore Airline and Thai Airways are now operating wide body aircraft on domestic routes and attain high aircraft utilization. Their unit cost per available seat mile (ASM) is very low relative to their US and Europe counterparts. It is even as low as that of Ryanair and easyJet in some instances. It is then questionable how and where the cost differential between LCCs and FSCs will be duplicated in Southeast Asia. The degree of LCC penetration to FSCs core business is uncertain. The past low cost experiences in the US and EU show that most of these new entrants were unlikely to survive as an industry shake out. The long run survival of Southeast Asian LCCs depends on their ability to compete with full service legacy airlines.

After the invention of the low cost business model by Southwest in the early 1970s, it took more than 15 years in the US and 20 years in Europe before major network carriers began to take the challenge of this new business model seriously (Franke,2004). However, recently Asian major network carriers expressed the sentiment that low cost airlines are not a threat to Asian majors. Lawton and Solomko (2005) examine the optimism from Asian network carriers. They suggests that the profit and growth potential of Asian LCCs are hampered not just by remaining regulatory barriers, but also by the embedded revenue and cost advantage of their full service competitors. The LCC

business model can survive and succeed in Asia so long as these companies can ensure an even lower operating cost than their already cost-efficient FSC competitors. Any LCC would have a more difficult time surviving in Asia, where a cost gap between a traditional full service airline and a potential low cost entrant would be much narrower than in the North America or European markets. They also point that LCCs based in low-income countries with a relative lack of viable land transport infrastructure such as Malaysia are likely to achieve the greatest market stimulation and penetration.

It is believed that the competition in Southeast Asia will be shaped by environmental and industry factors. Hooper (2005), therefore, analyzes environmental factors that will have a significant bearing on the success or otherwise of competitive strategies for LCCs. His environmental analysis investigates travel markets, conditions of access to markets, potential for airlines to reduce costs, and policies that set competition rules. Based on the region's distinct context, the revolutionary outcome of airline competition in Southeast Asia could well prove to be a different type of business model suited to the region's unique geography and stage of economic development. Significant departures from the established models of success for low cost carriers in the US and Europe are likely to be required for Southeast Asian LCCs.

2.4 Research gap

2.4.1 Research gap on the challenge of LCCs to major network carriers in Southeast Asia

The study on the challenge of LCCs to Southeast Asian major network carriers is in its infancy. Existing analyses on this issue are descriptive and anecdotal, based on aggregate statistical data, and comparative analysis drawing information from secondary sources. They are unable to shed light on the level of challenge LCCs has on major network carriers' core businesses. A review of the available literature shows that the change in demand choice is a cause of revenue crisis threatening the position of network carriers around the world. None of previous studies on the impacts of low cost carriers have attempted to empirically study the change in demand choice of air travelers. One reason is the lack of data. Based on air travel passenger's survey in Thailand, this thesis attempts to fill in this research gap in the literature by investigating the degree of demand substitutability between network carriers and low cost carriers.

2.4.2 Research gap on the risk of cannibalization of Southeast Asian airlines within airlines

A review of literature reveals that little has been studied on the risk of cannibalization in airlines within airlines (Graf 2005; Morrell 2005). Moreover, previous studies only focused on case studies in the Europe and North America airline industries. Recently, Southeast Asian major carriers, such as Thai Airways, Singapore Airlines and Garuda Indonesia, launched their offshoots to respond LCC competition as well. However, existing research on low cost carriers in the region has not explored the likelihood of this risk yet. Graf (2005) cites that brand confusion between network carrier and its offshoot, and the level of their product differentiation are significant factors which can result in cannibalization within the airline grouping, indicating the incompatibility of their business models. Existing research on this kind of risk has not studied the influences of brand confusion and product differentiation on passenger level, but focusing in airlines' management and operating levels. This thesis is, therefore, the first attempt in the literature to assess the risk of cannibalization between an airline and its offshoot with the use of market share simulation.

In the next section, we will examine business models of Southeast Asian low cost carriers, and compare each with other successful low cost strategies in the US and Europe.

Chapter 3 LCC business models in Southeast Asia

3.1 Introduction

The proliferation of low cost carriers (LCCs) in North America and Europe has emerged after their aviation markets were liberalized. Interestingly, the boom of low cost carriers in Asia is driven not by liberalization per se but by the support of government agencies and major airports that regard low cost carries as weapons in the ongoing battle for hub domination and the economic benefits of tourism. Hub competition among the governments of Singapore, Hong Kong, Thailand and Malaysia resulted in the ease of their aviation regulatory, generously granting landing rights to low cost entrants. Singapore's government has made it clear to Singapore Airlines union that it has preferred to protect Changi's hub status to preserve its assets in Singapore Airlines. Changi Airport and the aviation industry altogether contribute S$13.3 billion or 9.2% of Singapore's GDP (Thomas, ATW August 2004). Without a domestic market, three low cost carriers Jetstar Asia by Qantas, Valuair and Tiger Airways by Singapore Airlines are daily flying out of Singapore.

Whereas Malaysia has AirAsia, the most outstanding and successful low cost pioneer in Asia, in Thailand there are 3 local budget carriers which are Nok Air, One-Two-Go and Thai AirAsia. Since LCCs entered into Thai domestic market in late 2003, Thai travelers find air travel more affordable. Just as the LCC effects in the US and EU, the number of air travelers traveling the county has dramatically increased (see Table 3.1 for the jump of traffic in Thai domestic market due to the LCC effect). Though legacy incumbent, Thai Airways is holding the largest domestic market shares, it is unavoidably having head-on competition with LCCs in short haul routes (see Table 3.2for domestic market share of major Thai carriers in 2005).

Despite the optimistic views in the region, there are signs that LCCs in Southeast Asia are overcrowded and that some of the start-ups might not survive for long. By August 2005, there are approximately 14 low cost carriers operating within the region (see Table 3.3for a list of LCCs. These low cost players entered the markets with the hope to imitate the success of their US and European-based winners, such as Southwest, JetBlue, Ryanair and easyJet. In order to duplicate the same cost advantage and operating effectiveness,

they imitate strategies and business models of successful low cost grandfathers above. However, each of them adapts some distinguishing product and operating features to differentiate itself and to fit its local market and environment.

Table 3.1: Air travel traffic in Thailand from 1999-2005

Airport	1999	2000	2001	2002	2003	2004	2005
Chiang Mai	2,010,397	2,097,594	2,091,791	1,926,286	1,846,559	2,620,513	3,011,917
Phuket	2,035,836	2,171,146	2,240,264	2,230,663	2,104,548	2,826,022	3,472,652
Hat yai	609,592	674,249	664,593	622,370	635,947	1,058,313	1,287,477
Udon Thani	379,049	376,188	367,858	351,747	354,649	606,781	657394*
Chiang rai	516,340	577,540	534,355	457,731	418,301	612,108	677,407
Surat Thani	172,549	176,895	178,104	163,007	162,753	205,321	204146*
Ubon Ratchathani	226,554	245,163	258,756	229,021	252,057	350,020	386266*
Total	5,950,317	6,318,775	6,335,721	5,980,825	5,774,814	8,279,078	8,449,453

Source: Airport of Thailand, *www.aviation.go.th; LCCs entered its domestic market in late 2003

Table 3.2: Number of passengers each Thai carrier carried to and from in 2005

From/To Bangkok	TG	NOK	TAA	OTG
Chiang mai	1,564,077	368,197	202,353	409,918
Phuket	1,267,827	166,915	273,723	147,504
Hat yai	403,302	278,154	252,504	143,331
Udon Thani	330,896	238,811	79,974	
Chiang rai	412,353		143,120	126,652
Surat Thani	183,643			19,278
Ubon Ratchathani	298,929		81,435	
Total	4,461,027	1,052,077	1,033,109	846,683

Source: Department of Civil Aviation, Thailand (2005)

Table 3.3: Low cost carriers currently operating in Southeast Asia

Carrier	Base	Start date	Fleet
Adam Air	Indonesia	Dec 2003	B737-300/400/500
Air Asia	Malaysia	Jan 2002	B737-300
Air Philippines	Philippines	Feb 1996	B737-200
Awair*	Indonesia	1999	B737-300
Bangkok Airways	Thailand	1968	ATR72, B717, A320
Cebu Pacific	Philippines	Mar 1996	B757-200, DC-9
Citilink**	Indonesia	July 2001	B737-300, F28-3000
JetStar Asia***	Singapore	Nov 2004	A320-200
Lion Air	Indonesia	Jun 2000	MD-82/-83
Nok Air****	Thailand	Jun 2004	B737-400
One-Two-Go	Thailand	Dec 2003	B757-200
Thai Air Asia	Thailand	Feb 2004	B737-300
Tiger Airways	Singapore	July 2004	A320
Valuair	Singapore	May 2004	A320

Source: O' Connell and Ionidies (2004), official airline websites, www.gotomanager.com
*joint venture with Air Asia in December 2004; **subsidiary of Guruda Indonesia
***partnership with Qantas; ****subsidiary of Thai Airways

This chapter examines only visible and prominent Southeast Asian low cost carriers currently operating, which are Singapore-based Jetstar Asia, Valuair, Tiger Airways, Bangkok-based Nok Air, One-Two-Go, Thai AirAsia and Kuala Lumpur-based Air Asia. We start with an analysis of successful US and European-based low cost stories. Variation in their business models, particularly in cost cutting strategies in term of service quality, network structure, and ticket distribution are analyzed. After that, we proceed to examine each of these Southeast Asian low cost carriers, in term of fleet and route network size, consider their respective business models, and compare each with other low cost strategies in the US and Europe.

Since low cost carriers in each continent are slightly different, we firstly begin with the general definition of a low cost carrier and what its typical business model is. A low cost carrier, also known as a no-frills or discount carrier, is an airline that offers low fares but eliminates most traditional passenger services. The typical LCC business model practices include (http://www.en.wikipedia.org/definition/low-cost_carrier):

- a single passenger class
- a single type of airplane, commonly the Airbus A320 or Boeing B737s (reducing
- training and servicing costs)
- a simple fare scheme (typically fares increase as the plane fills up, which reward
- early reservation, known as "yield management")
- unreserved seating (encouraging passengers to board early and quickly)
- flying to cheaper, less congested secondary airports (avoiding air traffic delays and taking advantage of lower landing fees)
- short flights and fast turnaround times (allowing maximum utilization of planes)
- simplified routes, emphasizing point-to-point transit instead of transfers at hubs
- (enhancing aircraft utilization)
- emphasis on direct sales of tickets, especially over the Internet (avoiding fees and
- commissions paid to travel agents and corporate booking systems)
- employees working in multiple roles, for example flight attendants also clean the
- aircraft or work as gate agents (limiting personal costs)
- "free" in-flight catering and other "complimentary" services may be eliminated, and replaced by optional paid for in-flight food or drink.

3.2 The US low cost winners

3.2.1 Southwest Airlines: the original and most copied LCC

Based in Dallas, Texas, Southwest was founded by Herb Kelleher in 1971. With 3 Boeing 737, its first intra-state flights were from Love Field in Dallas to Houston and San Antonio, short haul point-to-point services with no frills and a simple fare structure. These product and service features became the basis for Southwest popularity and rapid growth in the coming year. The airline has been profitable every year since 1973. In 1990s, prominent airlines such as Pan Am, Eastern and Midway collapsed, whereas large airlines like Continental and TWA had continual financial problems. During this entire period, Southwest continued to expand gradually and turn a profit. Since 2000, all large major airlines recorded substantial losses every year. Yet throughout this period Southwest has been consistently profitable. In 2004, the airlines carried 81 million passengers, 8.5% increase from previous year (see Table 3.5 for Southwest consolidated highlights). Now it has grown to become the largest domestic airline in the United States, serving 61 destinations with 429 Boeing 737s aircraft (see Table 3.4 for its key company profile).

Table 3.4: The key company profile of Southwest

Found	1971
Bases	McCarren International Airport
	Sky Harbor International Airport
	Midway Airport
	Baltimore-Washington Int'l Airport
	William P. Hobby Airport
Focus cities	Oakland International Airport
	Los Angeles International Airport
	Dallas Love Field Airport
	San Diego International Airport
	Nashville International Airport
Fleet size	429
Destination	61
Headquarters	Dallas, Texas
Key people	Herb Kelleher (chairman)
	Gary C. Kelly (CEO)
	Laura Wright (CFO)
Website	www.southwest.com

Source: http://en.wikipedia.org/wiki/Southwest

Table 3.5: Southwest Airlines consolidated highlights

SWA (dollars in millions)	2004	2003	2002	2001	2000	1999
Passenger(millions)	81.2	74.8	63.0	64.4	63.7	57.5
Operating revenues	6,530	5,937	5,522	5,555	5,650	4,736
Operating expenses	5,976	5,454	5,104	4,924	4,628	3,954
Net income	313	442	241	511	625	474
RPMs (millions)	53,418	47,790	45,392	44,494	42,215	36,479
Available seat miles(millions)	76,861	71,790	68,887	65,295	59,910	52,855
Passenger load factor	70	67	66	68	71	69
Size of fleet at yearend	417	388	375	355	344	318
Number of employees	31,011	32,847	33,705	31,580	29,274	27,653
RASM(US dollar)	0.085	0.083	0.080	0.085	0.094	0.090
CASM(US dollar)	0.078	0.076	0.074	0.075	0.077	0.075

Source: Southwest annual reports
Note: RASM=revenue available seat mile, CASM=cost available seat mile

Since the first year of operations, Southwest has been strictly adhering to a strategy of short-haul services (less than 800km), offering low and unrestricted fares, high point-to-point frequencies and excellent on-time performance. Its product features are simple; it does not offer hot meals and expensive alcohols, pre-assigned seats, in-flight entertainment. However, it provides passengers with snack and soft drinks, and offering only a single coach class. Its fare structure is also simple: a two tiered pricing structure-peak and off-peak.

Its operating features are simple as well. It uses a uniform type of aircraft; B737s. Southwest avoids head-on competition with major airlines by flying to secondary or uncongested airports to serve major cities. These include Love Field in Dallas, Midway in Chicago and Providence for Boston instead of congested Logan International, Islip on Long Island for New York. The combination of all these unique product and operating features has enabled Southwest to attract not only leisure and price sensitive passengers, but also substantial portions of business passengers for whom high frequency and punctuality are important. The airline aims to compete with ground transportation, attracting passengers to fly rather than drive the relatively short distances between most of the cities it serves. When it enters new markets, it prices 60 percent or more below prevailing air fares in these markets. For instance, the airline offered $59 one way unrestricted fare from Cleveland to Chicago, while other carriers' one way was $310 (Doganis,2001). To be able to offer low fares and still attain profitability, the airline must operate at very low costs. How does Southwest manage this?

Table 3.6: The key concepts of the Southwest model

Product concepts	
Fare	Low (60% ore more below network carriers)
	Unrestricted, simple (two tiered pricing: peak and off-peak)
	Point-to-point (70-80% non-stop)
	No interlining, no baggage transferring
Distribution	Travel agents but no CRS systems
	Direct sales via internet, call centre and using ticketless
In-flight	Single class, high density
	Non assigned seat
	No meals but providing snacks and soft drinks
Frequency	High
Punctuality	Excellence
Frequent Flyer program	Rapid Rewards: flying 8 roundtrips gets one free roundtrip
	Earn miles through car rental, hotel partners and Visa card
Operating concepts	
Aircraft	Young, single type (B737s)
Sectors	Short to average below 800 km/500miles
Airports	Secondary or uncongested but convenient
Growth	Target 10% per year, max 15%
Staff	Competitive wage
	Profit sharing since 1973
	High productivity
Customer concepts	
Target group	Price and convenient sensitive travelers
	Leisure and time sensitive business travelers
Customer service	Caring, friendly and fun-loving
Revenue concept	
Revenue management	Maximize capacity rather than yield
	On off-peak flight, offer lower prices to fill in as many seats as possible

According to Porter's concept of competitive advantage, Southwest's core strategy is short haul point-to-point services. The strategy comes from a trade off with economy of traffic from hub and spoke system. However, it results in simple activities which can be complement one another. For short haul point-to-point services, passenger interlining and baggage transferring are not required, while hot meals and frills then become unnecessary. Open seating system and automated ticket check-in help to speed up boarding time. All of these simple product features fastens turnaround time, keeping planes flying longer hours than competitors and provide frequent departure with fewer aircraft. By using secondary or uncongested airports, the airline pays cheaper landing fees, shortens ground taxi time, and has fewer delays at the airport gates, which in turn quickens turnaround time and increases aircraft utilization rates.

With limits on the type and length of routes, the use of standardized fleet of B737 becomes possible. A uniform fleet creates the airline economy of scale in maintenance and pilot training. The airline also encourages on-line and direct ticket sales to bypass travel agent commission. It can be seen that the whole system of Southwest activities support its core strategy. Southwest competitive advantages thus come from the way its activities fit and reinforce one another. These are key factors in Southwest's success. Southwest also place considerable emphasis on corporate culture as a vital factor in their success. Southwest's staff are highly motivated and flexible because Southwest has developed a work ethnic and culture in which individuality, taking initiative and ownership of problems is encouraged. Since 1973, Southwest has offered profit sharing to its employees. A percentage of the profits before taxes are divided among employees based on their wages each year. With highly motivated staff and flexible work rules, Southwest labor productivity is high and this also helps to reduce costs. Moreover, motivated staff creates a customer-friendly atmosphere. The key concepts of the Southwest model are summarized in Table 3.6.

3.2.2 JetBlue Airways: the innovative LCC

A former Southwest executive, David Neelem founded JetBlue in 1999. He started up the airline with $130 million financing and 10 brand-new A320s aircraft, the largest capitalization in history of any start up airlines. The company is headquartered in New York City, NY, and runs a majority of its flights to and from its base, JFK Int'l Airport to primary airports such as Long Beach Airport and Logan Int'l Airport. JetBlue took to the air on February 11, 2000 with the inauguration of service between New York and Fort Lauderdale, Florida. The airline is well planned, structured and financed; it turned a profit within 6 months of its operations, and now expands at steady pace from its NY base. Its passengers grew double within its first year of operation, from 1.1 million to 3.1 million passengers, while 11 new aircraft were added to its fleet by the end of 2001. In 2004, it carried 11.7 million passengers and it has become the second largest US based low cost airline (see Table 3.8 for JetBlue consolidated highlights). Now, JetBlue serves 32 cities around the country and the Caribbean with a fleet of 77 new A320s (see Table 3.7 for key company profile).

JetBlue's success and continual profitability has proven that decent deviation from the Southwest model is feasible. The airline attempts to distinguish itself through service innovation by introducing in-flight services and entertainment on board. It offers leather seats which costs twice but more durable. Moreover, it provides free satellite TV and radio at every seat. In September 2002, JetBlue spent $80 million for LIVE TV to equip with 36 channels (Flint, ATW June 2003). It added 100 channels of XM satellite radio and FOX TV program, while extra movies on flight cost only $5. All seats on its A320s also have oversized overhead storage bins, and more legroom than competing economy class with 32 inches seat pitch. Last, JetBlue offers pre-assigned seating via an Internet. This is convenient for families and business groups to fly together.

Table 3.7: The key company profile of JetBlue

Founded	2000
Bases	JFK Int'l Airport
Focus Cities	Long Beach Muni. Airport
	Logan Int'l Airport
	Dulles Int'l Airport
	Ft. Lauderdale Int'l Airport
	Oakland Int'l Airport
Fleet size	77
Destination	32
Headquarters	New York City, NY
Key people	David Neeleman (CEO)
Website	www.jetblue.com

Source: http://en.wikipedia.org/wiki/JetBlue

Table 3.8: JetBlue Airways consolidated highlights

JetBlue(dollars in millions)	2004	2003	2002	2001	2000
Passenger(millions)	11.7	8.4	5.7	3.1	1.1
Operating revenues	1,266	998	635	320	105
Operating expenses	1,153	830	530	294	126
Net income	47	104	55	39	-21
RPMs (millions)	15,730	11,527	6,836	3,282	1,004
Available seat miles(millions)	18,911	13,639	8,240	4,208	1,372
Passenger load factor	83	85	83	78	73
Size of fleet at yearend	69	53	37	21	10
Number of employees	6,413	4,892	3,572	1,983	1,028
RASM (US dollar)	0.067	0.073	0.077	0.076	0.076
CASM(US dollar)	0.061	0.061	0.064	0.070	0.092

Source: JetBlue annual reports
Note: RASM=revenue available seat mile, CASM=cost available seat mile; :year ended December31

JetBlue also deviates from the original low cost model by operating to and from major airports. For example, it chose New York JFK Int'l Airport to be its base though landing

fees are expensive. However, its management team believes that the airline can gain substantial advantages from this airport for some aspects. First, the JFK Airport is under-utilization during most hours of the day because of its heavy proportion of international flights. Second, New York population is enormous and mobile, about 18 million people living in NY metropolitan. Third, New York is a business and tourist destination from all over the world. All of these benefits are believed to outweigh high landing fees of JFK Airport.

Table 3.9: The key concepts of the JetBlue model

Product concepts	
Fare	Competitive
	Unrestricted; no Saturday overnight requirement
	Simple; 5 tiered pricing structure (14 day and 7 day advance w/peak and off-peak)
	Point-to-point; no interlining and baggage transferring
Distribution	Direct sales via internet, call center and using ticketless
In-flight	Free satellite TV and radio
	Leather seats with oversized overhead bins
	More legroom and wider seat bottom
	No meals, snacks and drinks are sold on board
Frequency	High
Punctuality	Very good
Frequent Flyer program	trueBlue; get a free restricted roundtrip after purchasing a certain roundtrip flights
Operating concepts	
Aircraft	Uniform A320s with more fuel efficient than the 737s
Sectors	Short to average
Airports	Some major airports to induce business passengers
Growth	Steady pace
Staff	Union free
Customer concepts	
Target group	Frequent flyer business passenger
	Frugal but style and convenience conscious leisure passenger
Customer service	Friendly and professional
Revenue concept	
Revenue management	Maximize yield with 5 fare structures

In addition, JetBlue's strategy of flying to primary airports is consistent with its consumer target groups. The airline aims to attract frequent flyer business passengers from legacy airlines, and also frugal but style and convenience conscious leisure passengers. To create brand loyalty, JetBlue has its frequent flyer program, called trueBlue which gives out a free roundtrip ticket after purchasing a certain amount of roundtrip tickets.

As with Southwest, some key elements of original low cost recipe have remained. JetBlue's fare structure is simple with one way basis. There are 5 fares on each routes with 14 day and 7 day advance booking (with peak and off-peak), and more expensive fares purchased on the day of departure. Its fare is also competitive compared to other competitors. In 2001, it offered one way fares from NY to Orlando ranging in prices from $70-199 while on the same route Delta offered $70-584. Moreover, its fare is unrestricted; there is no requirement for a Saturday night stay over. The airline does not have overbooking because all fares must be paid within 24 hours, and the ticket is non-refundable. But passengers who cancel or miss their flights will receive a one year credit for future flight (minus a $25 rebooking charge). In addition, JetBlue's ticketing focuses on direct sale particularly via the Internet and all is ticketless to save commission fees and administrative costs.

JetBlue still enjoys cost advantage in fuel, training and maintenance by using a young uniform fleet of A320s. Its management team decided to operate with A320s rather than B737s for several reasons. First, A320s allows for 24 more seats than certain B737s models. Second, it offers more legroom (32 inches seat pitch) for passenger. Third, it consumes less fuel than the certain types of B737s. The management team further believes that brand-new aircraft can help to create sense of safety and reliability to the airline. The key concepts of the JetBlue model are summarized in Table 3.9.

Though JetBlue has 30-minute turnaround time compared with 20 minute of Southwest, its impressive operating statistics reveal that experienced management team, well financing, young aircraft, and good business plan do play essential roles for its success. After 2000, the airline has been profitable in every subsequent quarter and year, even after the sharp drop in air travel following the September 11, 2001.

3.3 The European low cost winners

3.3.1 Ryanair: the best imitator of Southwest

Dublin-based Ryanair was founded in 1985 as a full service carrier serving Ireland and UK routes. The airline incurred substantial losses even though its traffic grew steadily. In 1991, it was transformed to be the first European low cost airline, closely cloning the Southwest model. After restructuring, Ryanair has become profitable in every year. It has

chosen to base in London Stansted and to focus on London-Dublin route for Irish expatriates. Since then this route is the most busiest and profitable route for the airline.

After the deregulation of airline industry in Europe was complete in 1997, Ryanair has been expanding rapidly. In 1998, Ryanair placed a massive $2 billion order for 45 new B737-800 aircraft, using new capital after highly successful floatation on the Dublin Stock Exchange and the NASDAQ Stock Exchange. Ryanair launched its first continental base at Charleroi, Brussels in 2001. Taking advantage of the downturn in airplane order after the plump in air travel following the September 11, Ryanair ordered 155 new B737s aircraft fro Boeing with a substantial discount. It also launched 26 new routes and new base in Frankfurt-Hann Airport in 2002 (http://en.wikipedia.org/wiki/Ryanair).

In 2003, it announced a further order of 100 new B737-800 aircraft, and in February it lunched a third continental base in Milan-Bergamo, Italy. Within the same year, in April Ryanair acquired Buzz from KLM with a knock down price. And by the end of 2003, it flew 127 routes of which 60 had operated in the previous 12 months. Now, Ryanair is as of Europe's largest low cost carriers, operating 209 routes to 94 destinations across 17 European countries, having 11 bases in total (see Table 3.10 for the key company profile of Ryanair). Operating at remarkable margins by relentlessly driving cost down (see Table 3.11 for Ryanair consolidated highlights), Ryanair has become the world's most profitable airline over the years. In 2005, it carried 27.6 million passengers and had net income of 266 million euro (Ryanair annual report, 1999-2005). However, the airline is reputable and notorious for cost cutting strategies at the same time.

Since restructuring in 1991, Ryanair strictly adheres to the low cost Southwest mode and has likely refined it in many respects.. As with Southwest, its logic for success is that low fares produce more passengers, which means lower costs, which means lower fares. The airline aims to target all cost conscious passengers; business passengers, students and visiting family and relatives passengers. It offers non assigned seat with single coach class to obtain more seat density and to speed up boarding time. Despite its continual and rapid expansion, Ryanair adheres to fly point-to-point to and from secondary airports. It thus gains from lower landing fees, and no baggage and passenger transfer. Secondary or

uncongested airports also increase its on-time performance, reduce turnaround time, and achieve high aircraft utilization rate.

Table 3.10: The key company profile of Ryanair

Ryanair profile	
Founded	1985
Hubs	London Stansted Airport
	Dublin Int'l Airport
	Ciampino Airport
	Frankfurt Hann Airport
Focus cities	Cork Int'l Airport
/secondary hubs	Liverpool Airport
	Prestwick Airport
	London Luton Airport
	Girona Airport
	Stockholm-Skavsta Airport
	Shannon Int'l Airport
	Charleroi Brussels South
	Orio al Serio Airport
	Nottingham East Midlands Airport
	Gal Galilei Airport
Fleet size	91
Destination	95
Headquarters	Dublin , Ireland
Key people	Michael O' Leary (CEO)
Website	www.ryanair.com

Source: http://en.wikipedia.org/wiki/Ryanair

Moreover, Ryanair employs a young uniform aircraft to gain economies in maintenance and training. It promotes ticket's direct sales particularly via an Internet and call centre to reduce travel agent commission fees. Like Southwest, Ryanair also aims to maximize overall passenger load factors or seats rather than yield ratios to reduce its costs per unit of output. As a result, its' goal is to fill as many seats as possible on every flight, rather than to achieve the maximum revenues per passenger on every flight. Its profit is thus a consequence of high capacity and low profit margins (see Table 3.12 for Ryanair business model).

Table 3.11: Ryanair consolidated highlights

Ryanair (Euro in millions)	2005	2004	2003	2002	2001	2000	1999
Passenger(millions)	27.6	23.1	15.7	11.1	8.1	5.6	4.9
Load factor	n/a	83.6	85	74.1	73.8	77.5	n/a
Operating revenues	1336.6	1074.2	842.5	624.1	487.4	370.1	295.8
Operating expenses	1007.1	803.3	579	461.1	373.4	286.1	227.9
Net income	266.7	206.6	239.4	150.4	104.5	72.5	57.5
RPK(millions)	n/a	22550	14725	7251	6844	4772	n/a
Size of fleet at yearend	87	72	54	41	36	26	21
Number of employees	2604	2288	1897	1531	1476	1388	1203
ASK(millions)		26,974	17,324	9,785	9,274	6,157	
ASM(millions)		16,761	10,764	6,080	5,762	3,826	
RASM(Euro)		0.064	0.078	0.103	0.085	0.097	
CASM(Euro)		0.048	0.054	0.076	0.065	0.075	
(year ended March31)							

Source: Ryanair annual reports, Airline business (July 2005)
Note: RASM=revenue available seat mile, CASM=cost available seat mile

Table 3.12: The key concepts of the Ryanair model

Product concepts	
Fare	Simple
	Very low
	Point-to-point
	No interlining and baggage transferring
Distribution	Travel agent
	Direct sales via call centre and internet is encouraged
In-flight	No free meal, drinks and snacks are sold on board
	Single class, high density
	Unassigned seat
Frequency	Medium to high
Punctuality	Very good
Frequent Flyer program	No
Operating concepts	
Aircraft	Young uniform B737-800
Sectors	Short to medium but intra-EU routes too
Airports	Secondary airports
Growth	Rapid expansion in network, not focus on frequency
Staff	employee compensation linked to productivity-based pay incentives
Customer concepts	
Target group	All cost conscious passengers: business passengers, students
	and leisure passengers
Customer service	not good
Revenue concept	
Revenue management	Maximize load factors /seats rather than yields

Table 3.13: Ryanair's ancillary revenues included in total revenues

(euro in thousands)	2005	2004	2003	2002	2001	2000	1999
Car hire	45087	35110	27615	18905	12562	7885	4604
In-flight	34939	30100	23142	18030	14186	13624	20208
Internet income	24360	17721	12159	4831	1023	0	0
Non flight scheduled	104084	66616	35291	16662	12802	8779	5633
Charter	0	111	12350	14631	13892	9278	6441
Total	208470	149658	110557	73059	54465	39566	36886

Source: Ryanair annual report

Some cost cutting strategies are somewhat extreme. Ryanair has been criticized for its poor treatment of disabled passengers and antipathy to trade unions. In 2002, it has been charged because it refused to provide wheelchairs for disable passengers at Stansted Airport. It also refused to recognize trade unions representing workers in the airline industry. In addition, Ryanair's staff are banned from charging their own mobile phones at work to reduce the company's electricity bill. In March 2005, Ryanair has introduced charges for hold baggage. The airline charges 5 UK pounds for each bag checked in at the airport, and reduced to 2.5 UK pounds for online check-in. Ryanair estimates that the new baggage system and online check-in will allow it to cut fares by 9% (Ionides, Airline Business March 2006). Consequently, Ryanair is one of Europe's most controversial companies, praised and criticized at the same time.

3.3.2 easyJet: the Ryanair's contender

Stelio Hajiloannou, son of a Greek shipping tycoon, launched a low cost airline easyJet in October 1995. After flying on Southwest Airline, he believed that he had found the right concept for a European airline. With two leased B737-200, easyJet began operations from its base, London Luton to Glasgow and Edinburgh. It launched an extensive media slogan saying that "Fly to Scotland for the prices of a pair of jean". easyJet charged only 29 pounds for one way fare for a 50 minute flight from Luton to Glasgow (Sull,1999). The prices were much lower than British Airways' fares and even cheaper than rail fares. The campaign was successful as its first flight was all booked.

When it first started operations, easyJet made travel agents furious. The airline encouraged passengers to bypass and cut travel agents off. Initially tickets were sold through its call center only, attempting to save costs with direct sales. In 1998, it was the first UK airline which introduced an online booking and 15% of booking were made via

an Internet within a year. By April 2004 the online booking jumped to 98% (http://en.wikipedia.org/wiki/easyJet). In order to reflect the reduced call centre costs, internet booking prices are cheaper than booking over the phone.

In March 1998 it decided to expand into European continent by acquiring 40% stake in TEA Switzerland and renamed as easyJet Switzerland. To access more capitals for expansion, the company was floated on the London Stock Exchange in 2000. Then, the airline took over its main UK rival, Go Fly in 2002. By the end of 2003, its passengers grew nearly 50% within a year, from 11.4 million to 20.3 million people. The airline broke its previous philosophy of operating a single type of aircraft by ordering 120 A319s from Airbus in September 2003. By end of 2005, easyJet has 114 aircraft in total; operating frequent scheduled services for leisure and business passengers and serving more than 200 routes between 67 European airports (see Table 3.14 for the key profile of easyJet). In 2005, it carried 29.6 million passengers, and obtained net income of 42.6 million UK pounds (see Table 3.15 for its consolidated highlights).

easyJet's operation mirrors in most respects the model pioneered at Southwest Airlines. The airline uses a single type of aircraft to reduce training overhead and increase operational flexibility. Though it deviated from B737s, its management team believes that a substantial single fleet of A319 still generates the same savings on maintenance and training. To avoid passenger and baggage interlining, it flies point-to-point services. It serves only short to medium haul routes so that frills become less necessary. easyJet does not have in-flight catering or a lounge. All ticketing is paperless to reduce administrative costs. All seats are unassigned and single class cabins.

It also attempts to maintain rapid turnaround time and high aircraft utilization by using young and reliable aircraft. To create sustainable competitive advantage, the airline recreates Southwest's culture of teamwork and cooperation, called "Orange culture". Its customer service is presented as professional, informal and friendly. Nevertheless, easyJet modifies the original recipe to benefit from Southwest's experience.

Table 3.14: The key company profile of easyJet

Founded	1995
Bases	London Luton Airport
	Basel Airport
	Edinburgh Airport
	Glasgow Airport
	London Stansted Airport
	Berlin-Schonefeld Int'l Airport
	Liverpool John Lennon Airport
	London Gatwick Airport
	Newcastle Airport
	Belfast Int'l Airport
	Dortmund Airport
	Nottingham East Midlands Airport
	Geneva Cointrin Int'l Airport
	Orly Airport
	Bristol Int'l Airport
Fleet size	114
Destinations	67
Headquarters	Luton, England
Key people	Andrew Harrison (CEO)
Website	www.easyjet.com

Source: http://en.wikipedia.org/wiki/easyJet

The airline eliminates all sales intermediaries between customer and easyJet, except airport sales desks. Currently, all flights can only be booked via the Internet, except during the 2 weeks before departure when telephone booking is available. The airline also cut off all travel agents to avoid commission and CRS fees since 1995. easyJet does not offer free drinks and snack but sell them with reasonable prices. On board, only an airline's magazine is available for free. Like Ryanair, easyJet does not operate a frequent flyer program.

Table 3.15: easyJet consolidated highlights

EasyJet (UK pound in millions)	**2005**	**2004**	**2003**	**2002**	**2001**	**2000**
Passenger(millions)	29.6	24.3	20.3	11.4	7.1	5.6
Load factor	85.2	84.5	84.1	84.4	83	80.8
Operating revenues	1341.4	1091	931.8	551.8	356.8	263.6
Operating expenses	1132.5	901.7	750.9	419.5	276.2	202.4
Net income	42.6	41.1	32.4	49	37.9	22.1
RPKs (millions)	27448	21566	17735	9218	59.3	4730
Available seat kilometers (millions)	32141	25448	21024	10769	7003	5801
Size of fleet at yearend	103	90	74	64	26	19
RASM (UK pound)	0.067	0.069	0.071	0.082	0.082	0.073
CASM(UK pound)	0.057	0.057	0.057	0.063	0.063	0.056

Source: easyJet annual reports

Table 3.16: The key concepts of the easyJet model

Product concepts	
Fare	Simple
	competitive and low
	Point-to-point
	No interlining and baggage transferring
Distribution	Direct sales only via the Internet mainly and call center
In-flight	No free meal, drinks and snacks are sold on board
	Single class, high density of 148 seats
	Unassigned seat
Frequency	high
Punctuality	Very good
Frequent Flyer program	No
Operating concepts	
Aircraft	Young uniform B737 and A319
Sectors	Short to medium intra-EU routes
Airports	Mainly primary airports to attract business passengers
Growth	Focus on building network density, a spider's web
Staff	Orange culture of teamwork and cooperation
Customer concepts	
Target group	All cost conscious passengers: business passengers, students
	and leisure passengers
Customer service	Professional, friendly and informal
Revenue concept	
Revenue management	Maximize yield rather than capacity

It also maximizes capacity of B737s with 148 seats so its aircraft has high density. Whereas Southwest and Ryanair maximize their capacity or load factor, easyJet maximizes yield fares. Its fare structure is simple; offering a single fare at any one time for a specific flight. Fares increase in-line with demand toward the date of departure. easyJet's fares are not necessary the lowest fares for any given route but they offer value for money. Its simple yield management is consistent with a strategy of flying to some primary airports to attract more cost conscious business passengers. All deviations are cost cutting tactics that easyJet develops to create efficiency improvement and achieve unit cost saving.

By far easyJet and its main competitor Ryanair are the two largest low cost airlines in Europe. Though both airlines were modeled based on Southwest, the two companies have different strategies. Firstly, easyJet does not rely on travel agents since its first operations. It only focuses on direct sales through its call centre and website, while Ryanair still depends on travel agents. Secondly, easyJet mainly flies to primary airports while Ryanair adheres to use secondary or regional airports to reduce costs. By emphasizing yield

management, easyJet is aiming to attract cost-conscious business travelers as well as leisure travelers, though all its aircraft have single-class cabins. It has built a loyal customer base because of its multiple daily flights to places such as Amsterdam and Barcelona. Thirdly, easyJet's operating strategy is like a spider's web. It aims to increase the frequency of service from its bases and consolidate its existing routes, while Ryanair keeps adding more routes from each base. In other words, easyJet focuses on building network density whereas Ryanair focuses on network expansion. Key concepts of easy business model are summarized in Table 3.16.

3.4 The Southeast Asian low cost airlines

3.4.1 Air Asia: the Asian LCC pioneer

Air Asia challenges conventional wisdom that the low cost model would not work in Southeast Asia, an area characterized by tightly regulated bilateral agreements. Now it has proven to be the most prominent and successful low cost pioneer in Asia. In 2005, Air Asia group carried 6.3 million passengers and generated net profit of 111 million ringgits ($30 million).

Initially AirAsia was established in 1993 and started operations in 1996 as a subsidiary of Malaysia Airlines. However, it incurred substantial losses and it was re-launched as a private company by Tony Fernandes in December 2001. Akin to Ryanair, Air Asia has transformed itself from money- losing regional airline into a profitable and robust low cost airline. Its first flight was started in January 2002 and the airline is based at Kuala Lumpur International Airport. On domestic routes, it offered fares 50% or more below fares offered by flag carrier Malaysia Airlines. Its promotional fares at 31 ringgits ($10) were offered from Kuala Lumpur to Penang, undercutting the 40 ringgits charged for the bus trip.

The airline turned a profit after only 7 months of operations. Revenue has more than doubled since the relaunch. The revenue reached RM 666 million in 2005 despite rising fuel prices (AirAsia annual report, 2001-2005). Table 3.17 shows AirAsia consolidated highlights. Currently, Air Asia has about 30% of domestic market in Malaysia (O'Connell and Williams, 2005). In 2003, Air Asia opened its second hub at Senai Airport in Johor Bahru, close to Singapore, and launched its first flight to Bangkok, Thailand. To expand

into intra-Asian markets, Air Asia has started a joint venture, Thai AirAsia so that it could bypass ownership rules and bilateral agreements among Asian countries. Air Asia holds 41% stake of its subsidiary with the remaining shares being taken by Shin Corporation, a company of the Thai Prime Minister's Thaksin Shinnawatra. It expanded further into Indonesian market, starting another joint venture with Awair to fly from Jakarta to Surabaya and Bandang.

Table 3.17 : AirAsia consolidated highlights

Air Asia (RM million)	2005	2004	2003	2002	2001
Passenger(millions)	4.4	2.8	1.5	0.6	0.3
Load factor	75	77	74	66	62
Operating revenues	666	392.7	330	217.4	167.7
Operating expenses	532.6	332.1	318.5	218.7	182.3
Net income	111.6	49.1	18.8	1.4	19.1
RPKs (millions)	4881	2771	1539	672	363
Available seat kilometers (millions)	6525	3592	2086	1018	586
Size of fleet at yearend	27	17	7	3	2
Number of employees	2016	1382	648	322	241
RASM (Malaysian Ringgit)	0.164	0.176	0.255	0.344	0.461
CASM(Malaysian Ringgit)	0.131	0.149	0.246	0.346	0.501

Source: Air Asia annual report (Not including AirAsia group)
Note: 2002=for the 15 months ended June 2002, 2001= for the year ended March31
RASM=revenue available seat mile, CASM=cost available seat mile

As July 2005, AirAsia fleet consists of 23 Boeing737s aircraft and operating more than 100 flights a day across 5 countries (see Table 3.18 for the key company profile). It has placed an order of 60 A320s from Airbus, with the option of 40 more to replace their aging B737s fleet. The first A320 is expected to arrive in January, 2006.

Air Asia uses new and innovative cost optimizing techniques to obtain quick turnaround time and high aircraft utilization while maintaining safety and service quality. The airline is modeled based on European low cost grandfathers, Ryanair and easyJet. It employs simple fare structure, a one-way basis based on demand and supply. Prices increase as seats are sold on every flight, and as the date of departure comes. This pricing strategy is the same as easyJet's. However, it also imitates Ryanair's revenue concept, maximizing seat capacity or load factor by attempting to fill in as many seats as possible. (see Table 3.19 for its fare management)

Table 3.18: The key company profile of Air Asia

Founded	Relaunched as LCC in late 2001
Bases	Kuala Lumpur Int'l Airport
	Senai Airport
	Bangkok Int'l Airport
	Jarkata Int'l Airport
Focused cities	Penang Airport
	Changi Airport
	Chaing Mai Int'l Airport
	Hat Yai Int'l Airport
	Phuket Int'l Airport
Fleet size	23
Destinations	100
Headquarters	Kuala Lumpur, Malaysia
Key people	Tony Fernandes
Website	www.airasia.com

Source: http://en.wikipedia.org/wiki/AirAsia

The airline often launches promotional fares and gives out free seats. Air Asia is aimed to attract all cost-conscious passengers, leisure and business passengers, students and visiting friend and relative passengers. Direct sales through website and call center are used to cut costs. The airline uses the website to take booking for its operations of more than 100 routes across 5 countries. In 2005, 60% of booking are made online. Air Asia is also the first airline to use SMS (short message sending) to send out passengers booking codes for tickets. Like Ryanair, it has also attempted to generate ancillary revenues through hotel and plane ticket packages, car rental and internet.

Table 3.19:Air Asia 's fare management on Kuala Lumpur-Penang route

To Penang (Ringgit)	**10-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 29 Oct 2005								
Dep. 7:05	55.99	55.99	55.99	65.99	69.99	75.99	85.99	99.99
Dep. 13:40	65.99	69.99	49.99	69.99	99.99	109.99	129.99	139.99
Dep. 21:05	55.99	69.99	49.99	75.99	85.99	99.99	129.99	129.99
From Penang (Ringgit)	**10-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 29 Oct 2005								
Dep. 8:20	75.99	49.99	85.99	69.99	75.99	85.99	99.99	99.99
Dep. 14:55	55.99	49.99	65.99	65.99	69.99	75.99	85.99	99.99
Dep. 22:20	55.99	55.99	55.99	49.99	49.99	55.99	55.99	65.99

Source: AirAsia website from 9 Sept-29 Oct, 2005

Table 3.20: The key concepts of Air Asia business model

Product concepts	
Fare	Simple;one way basis
	competitive and 50% or more lower than flag carriers
	Point-to-point
	No interlining and baggage transferring
Distribution	Direct sales via the Internet (60%) and call center, ticket outlets at airports
	Ticketless; booking number sent out by SMS
In-flight	No free meal, drinks and snacks are sold on board
	Single class, high density of 148 seats on B737s
	Unassigned seat
Frequency	High
Punctuality	Good
Frequent	No
Flyer program	
Operating concepts	
Aircraft	Young uniform B737s and A320s
Sectors	Short to medium (less than 4hours) and intra-Asian routes too
Airports	Capital cities and tourist destinations
Growth	Focus on both building network density and rapid network expansion
Staff	Encourage culture of teamwork and cooperation
Customer concepts	
Target group	All cost conscious passengers: business passengers, students , VFR
Customer service	Professional, friendly
Revenue concept	
Revenue management	Maximizing capacity or load factor but taking yield management into account
	Boosting ancillary revenues through hotel, rental car, internet and space ad

The airline only serves short to medium haul (less than 4 hours) point-to-point flights from its bases in Malaysia, Thailand and Indonesia. Capital cities, tourist destination and secondary airports are its route targets. Passenger and baggage interlining is avoided, and there are no frill on board. Like its European prototypes, no free meals, but snacks and drinks can be purchased on board with a reasonable price. Moreover, the airline does not allow outside foods and drinks to be consumed on board. It does not operate a frequent flyer program but focuses on high flight frequency. All seats are not pre-assigned. First come, first seated system is used to speed up boarding time. Its single coach class increases seat density and operating young uniform of B737s and A320s reduces training overhead and maintenance costs. Corporate culture and teamwork are encouraged to create sustainable competitive advantage. The airline emphasizes both building network density and rapid network expansion. Table 3.20 summarizes key concepts of Air Asia business model. As can be seen, besides aiming to be a price leader, AirAsia imitates

Ryanair operational strategy, a Southwest people strategy, and an easyJet branding strategy. AirAsia thus places equal emphasis on brand reputation, customer service and people management.

With cost cutting activities above, Air Asia has reached the world's lowest unit cost of $0.023/ASK and a passenger break even load factor of 52%. Aircraft turnaround is about 25 minutes and its aircraft utilization rate is 13 hours a day. (O' Connell and William, 2005) . Its on-time performance was averagely 78% in 2005. In March 2006, AirAsia was reported that it has agreed to have its ticket sold though travel agents with global distribution system (GDS) provider Galileo Int'l. A deal between AirAsia and Galileo would give the airline sales prospects through 50,000 travel agencies. AirAsia says it expects bookings to increase as much as by 15% this year as a result of the arrangements which cover AirAsia's main airline operation in Malaysia as well as associate airlines Thai AirAsia and Indonesia AirAsia. The three group airlines now serve more than 60 destinations in 9 Asian countries.

3.4.1.1 Thai AirAsia

In 2003, AirAsia attempted to fly to Changi Airport, at Singapore. However, its negotiation with Singapore government for lower landing fees was rejected. To further expand into intra-Asian market, it has established a partnership in Thailand, Thai AirAsia. The partner airline was launched in January 2004. This strategic move of Air Asia was timely and wise. The Thai government has eased foreign ownership rules from 39% to 49% to promote foreign investment. The government also has already had bilateral agreements with China. By launching a joint venture with Thai company Shin Corp., Air Asia took advantage of unused rights of Thailand to fly to Singapore and Macau from Bangkok. Flights to Macau started in June 2004, and Thai AirAsia flies to Mainland China (Xiamen) and the Philippines (Manila) in April 2005 (see Table 3.21 for the key company profile of Thai AirAsia).

Table 3.21: The key company profile of Thai AirAsia

Founded	2004
Bases	Bangkok Int'l Airport
Domestic	Chiang Mai
destination	Chiang Rai
	Ubon Ratchathani
	Udon Thani
	Phuket
	Hat Yai
	Nara Thiwat
International	Kuala Lumpur
destination	Penang
	Kota Kinabahru
	Singapore
	Macau
	Xiemen (China mainland)
	Hanoi
	Phanom Phen
Fleet size	6
#destination	15
Headquarter	Bangkok, Thailand
Key people	Tatsapon Blackwell (CEO)

Source: AirAsia website

The airline offered a one way fares starting at THB1499 ($40 US) from Bangkok to Macau, and at THB999 for Bangkok to Phanom Phen. Within its first year of operations, Thai AirAsia carried 1.2 million passengers (The Nation, 8 June 2005). In 2005, soaring fuel prices, unpredictable flood in Chiang Mai, and political unrest in the Southern Muslim provinces caused its traffic and load factor to decline in the third quarter of that year (see Table 3.22 for its consolidated highlights). As a result, the airline has attempted to seek more non-airside revenue by selling space advertisement on fuselage, food tray and baggage bin. The whole advertisement package is charged for approximately THB 7 million a year. Thai AirAsia expects to earn advertisement income of THB 30-50 million in 2006. To further stimulate domestic traffic growth; during the last quarter of 2005 the airline launched promotional fares at THB 999 for all domestic flights and all seats. The fares did not include a fuel surcharge of THB 200, airport taxes of THB 50 and insurance of THB50. All promotional tickets had to be booked 5 days prior departure. Thai AirAsia has the same business model as its parent associate AirAsia's.

Table 3.22: Thai AirAsia consolidated highlights

Thai AirAsia Statistics	Q3-2005	Q2-2005	Q1-2005	Q4-2005
Average load factor	69%	77%	84%	74%
#Passengers	410,005	434,865	369,340	230,831
Average fare (RM)	120	115	99	99
Cost/ASK(US cents)	2.05	2.57	3.14	2.83
RPK(million)	351	409	314	182
ASK(million)	508	544	371	247
#aircraft (end)	6	6	4	3

Source: Third quarter results, 25th May 2005, www.airasia.com

Table 3.23 shows its fare management between Bangkok and Chiang Mai. Its marketing plan for year 2006 is to launch a new promotion every two weeks including every long holidays. In February 2005, Thai AirAsia offered promotional fares of THB 0 (not including airport taxes) for Chinese New Year celebration. The airline also has started distributing tickets through cell phone outlets and supermarkets such as Telewiz and Tesco Lotus respectively. As January 2006, Thai AirAsia serves 7 domestic and 8 international destinations.

Table 3.23: Thai Air Asia 's fare management on Bangkok-Chiang Mai route

To Chiang Mai (BHT)	**9-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 29 Oct 2005								
Dep. 06:45	1,800	1,800	1,800	1,500	1,600	1,700	1,800	1,800
Dep. 10:00	999	999	799	499	999	999	999	999
Dep. 12:50	1,000	1,050	999	499	999	999	999	999
From Chiang Mai (BHT)	**9-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 29 Oct 2005								
Dep. 08:20	1,000	999	799	499	499	499	799	799
Dep. 11:40	999	999	799	499	499	499	799	999
Dep. 14:35	1,000	999	799	499	499	499	799	999

Note: fare not include insurance (50 baht), airport tax (50 baht), administration fee (50baht), fuel surcharge (300 baht), and vat (7%)
Source: Thai AirAsia website from 8 Sept- 29 Oct, 2005

3.4.2 Nok Air

Nok Air was established in 2004 as a low cost subsidiary of Thai Airways International (TG). Nok, which means bird in Thai, had a start up cost of THB 500 million, in which TG has invested THB195 million to hold 39% stake (Dennis, Aviation Daily May 2004b). With two leased B737s (150 seats) from its parent, Nok Air initially flew from its base, Bangkok Int'l Airport to major cities and regional tourist destinations, such as Chiang Mai, Hat Yai and Phuket. The airline is aiming to attract visiting friend and relative passengers as well as cost-conscious business passengers. The first operation was

started in July 2004. Promotional fares starting at THB595 were offered from Bangkok to Chiang Mai. Now the airline operates 6 routes out of 5 airports (see Table 3.24 for key company profile of Nok Air).

The airline flies short-to-medium haul point-to-point services. All routes are domestic only, less than 2 hour radius of Bangkok. The restraint of being given only two aircraft from parent has been reflected in its limited and slow network expansion. No passenger and baggage interlining is required. As a low cost, no frills, Nok Air does not serve meal but snacks and drinks can be purchased on board. Since the leased aircraft contain business cabins, Nok Air thus differentiates itself from others by offering two class cabins: business class (called Nok Plus), and economy class. Business class is charged THB500 ($10) extra on top of economy class fares, in exchange for larger seat, ticket flexibility being able to change travel date without surcharge (THB500), a free snack, newspapers, and a total of 30 kg baggage allowance as opposed to 15kg in economy class

Table 3.24: The key company profile of Nok Air

Nok Air profile	
Founded	July 2004, 39% stake owned by TG
Base	Bangkok Int'l Airport
Destination	Chiang Mai
	Hat Yai
	Phuket
	Udon Thani
	Nakhon Si Thammarat
Fleet size	4
#destination	5
Headquarters	Bangkok, Thailand
Key people	Patee Sarasin (CEO)
Website	www.nokair.com

Source: Nok Air website

Its one-way fare structure is simple, like easyJet's. A single fare is offered at any one time for a specific flight. Nok Air's fares generally increase in-line with demand toward the date of the flight. Nok Air invested in sophisticated fare management software so that it can adjust fares in response to bookings and enquiries. This allows the airline to post fares changes almost by hour, responding to sales on the website and call centre. Apparently, Nok Air utilizes yield management to maximize revenue per flight (see Table 3.25 for Nok's fare structure).

Nok Air is positioned as a premium low cost carrier. Ticket fares are 15% higher than local low costs rivals, but still 30% lower than TG. All seats are pre-assigned and can be allocated on its website, appealing to family travelers. Direct sales are focused with call centre and website booking, while ticket kiosks are available only at airports. Though adopting the standard channels, Nok Air has attempted to gain the widest distribution possible, making its methods of payment accessible and convenient. After receiving a SMS booking code, passengers can pay for tickets by cash at ATMs, banks and convenient stores such as 7-11. Credit cards can be paid through call centre, website and mobile phone. Currently, 40% of payments are made by credit card. To reflect the saving from reduced intermediary costs, there are no service charges when booking and paying through the website. But if a 7-11 store is used as a purchase point a THB 30 fee applies. Call center bookings are surcharged THB 20.

Table 3.25: Nok Air's fare management on Bangkok-Chiang Mai route

To Chiang Mai	**9-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 29 Oct 2005								
Dep. 06:00	1,195.33	1,195.33	1,195.33	n/a	n/a	n/a	n/a	n/a
Dep. 09:05	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1095.33	1282.24	n/a
Dep. 13:20	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	908.41	1001.87
Dep. 15:20	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	1001.87	1001.87
Dep. 20:25	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	1001.87	1001.87
From Chiang Mai	**9-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 29 Oct 2005								
Dep. 07:40	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	908.41	1001.87
Dep. 10:40	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	908.41	1001.87
Dep. 14:55	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	1001.87	1001.87
Dep. 17:00	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	1001.87	1095.33
Dep. 22:00	1,008.41	1,008.41	1,008.41	1001.87	1001.87	1001.87	908.41	1001.87

Source: Nok Air website from 8 Sept- 29 Oct, 2005

Nok Air has also started selling space advertisement on overhead baggage bin, seat trays and fuselage to increase ancillary revenues (Asia Time, 8 January 2005). Nok has attempted to differentiate itself from other LCCs via punctuality (90%) and convenient variety of ticket distribution. In addition, it has taken advantages of being TG offshoot by emphasizing that it has reached the same standard of safety and reliability as its parent mainline. The airline is aiming to attract leisure and cost conscious business passengers who are concerned with safety. Table 3.26 summarizes key concepts of Nok Air business model.

Table 3.26: The key concepts of Nok Air business model

Product concepts	
Fare	Simple, one way basis
	30%lower than TG but 15% higher than local LCC competitors
	Point-to-point, domestic routes only
	No interlining and baggage transferring
Distribution	Direct sales via the Internet and call center, ticket outlets
	Ticketless; booking number sent out by SMS
In-flight	No free meal, drinks and snacks are sold on board
	Two tiered classes; business and economy cabins
	Pre-assigned seats via the Internet
Baggage allowance	15kg
Method of payment	Cash through ATM, Banks and Convenient Store (7-11)
	Credit card through website, call centre and cell-phone
Frequency	High
Punctuality	Very good
Frequent Flyer program	No
Operating concepts	
Aircraft	Uniform B737s (150 seats including 12 business seats)
Sectors	Short to medium (less than 2hours), domestic only
Airports	Tourist destinations
Growth	Gradual network expansion
Staff	Encourage culture of teamwork and cooperation
Customer concepts	
Target group	VFR and cost conscious business passengers concerned with safety and reliability
Customer service	Friendly, Fun
Revenue concept	
Revenue management	Maximizing yield management following easyJet
	Boosting ancillary revenues through space ad on baggage bin, fuselage etc.

Similar to easyJet, Nok Air has focused on establishing strong brand in its low cost market with commitment to customer service. Its customer service is presented with fun and friendly. Similar to Southwest, strong corporate culture is encouraged, which Nok Air believes it helps substantially to motivate employees to implement its strategies. Centre of Asia Pacific Aviation reported that Nok Air incurred losses from July to December 2004 (Ross, August 2005). However, the airline claimed that it turned into profits since 2005, due to its efficient yield management and high load factor. Average load factor is more than 80% on every flight, and can be 90% during high season (November-February) for popular routes such as Hat Yai and Phuket. Nok Air also reported that it carried 1.4 million passengers after a full year of operations (Manager, November 2005).

While Tiger Airways put more distance between itself and its parent Singapore Airlines, the level of distinction and uniqueness between Nok Air and Thai Airways is minimal on short haul domestic routes. Most routes Nok is currently operating are also served by TG. Given the used B737s, Nok is using aircraft in which TG logo is covered on seats and everywhere inside the aircraft. It also has taken advantage of being TG offshoot by advertising that it has reached the same standard of safety and reliability as TG. Moreover, Nok is targeted itself as a premium LCC which customer target group is more likely overlapping with TG's. The airline also offers a business class with free on-board frills and ticket flexibility. But it charges 10-15 percent lower than TG's full fares. The two airlines are subject to cannibalizing one another because travelers may not be able to distinguish their product differentiation.

Since February 13, 2006, Thai Airways and Nok Air have started to codeshare operation flight between Bangkok and Chiang Mai, resulting in 14 daily flights of Nok Air to Chiang Mai. Nok Air passengers who fly on flights operated by Thai Airways will receive several benefits as follows: no change fee for changing flight, receive in-flight service as Thai Airways customer, 20kg baggage allowance and check – in at Thai Airways counter. Though TG frequent flyer program is not applicable to Nok travelers on their codeshare flights, product differentiation between the two airlines has become narrower. The risk of cannibalization in the airline within an airline model between Thai Airways and Nok Air will be investigated in Chapter 6.

3.4.3 One-Two-Go by Orient Thai

At the end of 2003, One-Two-Go (OTG) was established and financed by Orient Thai, a scheduled charter operator initially launched in 1992. One-Two-Go is a low fare, low frills airline. It offers short to medium haul domestic services with some frills on board, and charging flat fares on every routes. Its first flight was started in January 2004 from its base Bangkok Int'l Airport to Chiang Mai. Currently, it is operating 4 daily flights to Hat Yai, Phuket, Chiang Rai and 6-7 flights to Chiang Mai (see Table 3.27 for its key company profile). During the first quarter of 2004, it reported bearable losses due to price competition with Thai Airways and rapid expansion by Thai AirAsia (Dennis, Aviation Daily April 2004). However, the airline resisted continuing services. After the first full

year of operations, it reported that it carried 1.5 million passengers (Bangkok Post, 2 August 2005)

One-Two-Go was the first low cost airline to introduce routes, Bangkok-Surat Thani and Ubon Ratchathani. Unfortunately, its service to Ubon Ratchathani was temporarily suspended in July 2004 because of inadequate traffic demand. Now only Thai Airways and Thai AirAsia are flying to Ubon Ratchathani. When it inaugurated these two routes, it offered promotional fares at THB 1649 for a way flight to Surat Thani, and at THB 1249 to Ubon Thani.

Table 3.27: The key company profile of One-Two-Go at July 2005

One-Two-Go profile	
Founded	2003
Base	Bangkok Int'l Airport
Destination	Chiang Mai
	Chiang Rai
	Hat Yai
	Phuket
	Surat Thani
Fleet size	9
#destination	5
Headquarters	Bangkok, Thailand
Key people	Udom Tantiprasongchai (CEO)
Website	www.fly12go.com

Source: One-Two-Go website; fleet size including its parent mainline Orient Thai

Interestingly, its business model is significantly different from other rivals. Among low cost carriers in Thailand, One-Two-Go is the only budget airline using flat fares on every route. Its price structure is very simple, for example, it charges THB1600 (after taxes) from Bangkok to Chiang Mai for any period of booking (see Table 3.38 for OTG fare management). The tactic of one price, every seat, every day is used because the airline's management team believes that Thai people do not plan domestic trip weeks in advance (Fullbrook, Asia Times November 2003). Its pricing structure would suit the way Thai people travel more. The airline thus maximizes seat capacity. Moreover, One-Two-Go generously makes its tickets flexible by allowing passengers to change their travel date and time for free. Though its tickets are non-refundable, they are valid for 30 days. Contrary to other low cost carriers, One-Two-Go uses B757s and B747s with the reasons of higher seat density and more fuel efficiency, similar to some Indonesian domestic

airlines. Because of its larger fleet compared to other low cost competitors, One-Two-Go allows passengers baggage limit of up to 20 kg.

Table3.28: One-Two Go 's fare management on Bangkok and Chiang Mai route

Route	Fare quotation on internet (baht)
Bangkok-Chiang Mai	1,299.00
Bangkok-Hat Yai	1,699.00
Bangkok-Phuket	1,299.00

Note: flat fare not include 100 BHT of airport taxes
Source: One-Two-Go website from 8 Sept – 29 Oct, 2005

The airline serves point-to-point domestic routes only, less than 2 hours radius of Bangkok. It flies to major cities and tourist destinations. It also differentiates itself by providing some in-flight frills. In addition to pre-assigned seating, passengers are served free soft drinks and snack on board. Its customer service focuses on nice and friendly. The airline emphasizes direct sales through website, call centre, ticket sales desks at airports and department stores. Ticketless is used to save administrative costs. In addition, One-Two-Go seeks to reward loyal customers through its frequent flyer program called 9+1. Customers would get a free one-way ticket after flying 9 sectors. The airline is aimed to target all cost-conscious passengers. However, the airline has limited and slow route expansion due to inadequate financing backup (see Table 3.29 for key concepts of One-Two-Go business model).

Recently, One-Two-Go has introduced refill payment cards, called Access Card. Its pre-paid card replicates the causal walk-up approach taken by bus companies. Card holders will receive a maximum discount up to 12% off based on traveling zone. Access card, holding personal information and a photo, will be used to replace tickets, boarding passes and cash. Card holders can refill credits at convenient stores such as 7-11, and also receive bonus credits, special offers, for example, baggage allowance up to 30kg.

Table 3.29: The key concepts of One-Two-Go business model

Product concepts	
Fare	Simple, flat prices
	Point-to-point, domestic only
	No interlining and baggage transfer
Distribution	Direct sales via the Internet, call centre, ticket boots in and outside airports
	Ticketless
In-flight	No meals but snacks and drinks are provided
	Pre-assigned seat
	Single class
Frequency	High
Punctuality	Average to high
Frequent	9+1
Flyer program	Promotional reward program; buy 9 one way tickets, get one free
Operating concepts	
Aircraft	B757s and B747s
Sectors	Short to medium (less than 2 hours), domestic only
Airports	Major tourist cities
Growth	Slow
Staff	friendly
Customer concepts	
Target group	All cost conscious passengers
Customer service	Nice and friendly
Revenue concept	
Revenue management	Maximize seat capacity

3.4.4 Tiger Airways

Established in December 2003, Tiger Airways is a low cost low fare offshoot of Singapore Airlines (SIA) in which SIA owns 49% of stake. The remaining founding shareholders are Singapore government's Temasek Holdings (11%), Tony Ryan and David Bonderman (16%), and Indigo Partners (24%). Based at Singapore's Changi Int'l Airport, Tiger Airways took to the air on 15 September 2004 with the inauguration of service between Singapore and Bangkok. It initially started operations with 2 new A320s. Target destinations encompass airports within 4 hour flying radius of Singapore. Now, Tiger has a network covering 11 cities in 6 countries (see Table 3.30 for key company profile).

Unsurprisingly, Tiger Airways mirrors the Ryanair business model. The airline is modeled based on 3 customer-focused core strategies. First, market stimulation is emerged by creating opportunities for first-time air travelers and encouraging budget conscious passengers to fly more often. Second, stringent cost controls throughout

operations so that the airline can keep low fares for travelers. Third, high capacity utilization is reached through maximizing number of sectors served per plane in a day with an efficient air traffic planning. To sum up, its core strategies are to use low fares to generate more passengers, resulting in lower costs which in turn create lower fares.

Table 3.30: The key company profile of Tiger Airways

Founded	December 2003
Base	Changi Airport
Destination	Darwin, Australia
	Macau
	Bangkok
	Chiang Mai
	Hat Yai
	Krabi
	Phuket
	Danang, Vietnam
	Hanoi
	Ho Chi Minh City
	Padang, Indonesia
	Manila, Phillippines
Fleet size	4
#destination	11
Headquarters	Singapore
Key people	Tony Davis
Website	www.tigerairways.com

Source: http://en.wikipedia.org/wiki/Tiger_Airways

Tiger offers short to medium haul point to point services, without baggage and passenger interlining and complimentary meals. However, food and drinks can be purchased on board. All seats are open with high density for a single class. The airline does not run a frequent flyer program, nor provide any in-flight entertainment, except its in-flight magazine. Fare structure is simple; one–way basis. Flights are either morning or afternoon. Tickets are non refundable, but flight dates, times and routes are changeable subject to availability and upon payment of a charge fee of S$35. Like Ryanair, Tiger maximizes load factor or seat capacity, trying to fill as many seats as possible. (see Table 3.31 for Tiger fare management).Tiger distribution channels are call centre, website, local travel agencies and ticket counters at airports in Singapore, Bangkok, Phuket and Macau. However, online booking is most encouraged; the airline would give online passenger a discount of S$5 ($3) per flight.

Table 3.31: Tiger Airways's fare management on Bangkok-Singapore route

To Singapore	9-Sep	16-Sep	23-Sep	30-Sep	7-Oct	14-Oct	21-Oct	26-Oct
Saturday 29 Oct 2005								
Dep. 10:40	19.98	32.49	39.98	38.49	38.49	38.49	89.98	39.98
Dep. 14:50	19.98	32.49	39.98	38.49	38.49	38.49	74.98	89.98
From Singapore	**9-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 28 Oct 2005								
Dep. 08:35	39.98	39.98	39.98	38.49	38.49	38.49	38.49	38.49
Dep. 12:50	39.98	39.99	89.98	62.99	69.99	69.99	69.99	69.99
Dep. 17:50	n/a	n/a	149.98	119.98	119.98	119.98	119.98	84.98

Source: Tiger website from 9 Sept- 29 Oct, 2005

Note: fares in Singapore dollar

Within 5 months of operations, Tiger has taken over Singapore's number 1 spot for web visits to low cost carrier sites on the internet. It has managed to gain a larger market share of web traffic than Jetstar Asia and Valuair combined. In October 2005, Tiger reported that it has achieved 75% of its sales on the internet. Both from the public and travel agents, while the balance 25% comes from call center and airport outlets. Its successful online booking reveals that the LCC model of using online marketing and technology to reduce operating costs is working in Asia, especially in Singapore. Tiger has the largest internet shares of LCC websites visited by users at 14.86%. This compares with 10.87% for Jetstar Asia, 8.87% for Air Asia, and 4.2% for Valuair. The airline also has used its website to boost ancillary revenues through package tour, hotels, and car rental.

Similar to its Singaporean LCC peer, Tiger utilizes a uniform fleet, 4 brand new A320s with 180 seats each. In June 2005, it announced an order of 8 new a320s, valued at more than $500 million to support the next phase of its expansion. The airline will take delivery of 2 aircraft in March 2006, 3 more aircraft in winter 2006 and 3 more in summer 2007. Tiger flies to business and popular tourist destinations such as Bangkok, Chiang Mai, Krabi, Phuket, Hanoi and Manila. Now it operates 4 daily flights to Bangkok, one daily service to Phuket and Hat Yai, and 4 daily flights per week to Chiang Mai. The airline attempts to keep cost down by outsourcing all ground services such as check-in counter staff at both Singapore and overseas stations. Cost savings are then translated into lower fares. Table 3.32 summarizes key concepts of Tiger business model.

Table 3.32: The key concepts of Tiger Airways business model

Product concepts	
Fare	Point-to-point
	Simple; 1 way excluding taxes and charges
	Single class (180 seats)
Distribution	Direct sales: website, call center and ticket counters at airports
	Travel agents
In-flight	No meal, food and drinks can be purchased on board
	No IFE
	Open seating
Baggage allowance	15kg
Method of payment	Credit card, Cash
Frequency	Average to high
Punctuality	Excellent
Frequent Flyer program	No
Operating concepts	
Aircraft	Brand new A320s
Sectors	Short to medium, within 4 hours flying radius of Singapore
Airports	Primary and secondary airports
Growth	Rapid network expansion
Staff	-
Customer concepts	
Target group	All cost-conscious passengers
Customer service	Reliable and safety
Revenue concept	
Revenue management	Maximize load factor rather than yield
	Trying to fill in as many seats as possible with very low fares
	Boost ancillary revenues through onboard-merchandise, internet, car rental and hotel

Tiger maximizes seat capacity or load factor by adopting Ryanair's aggressive pricing, operating and marketing strategy. On its augural services to Thailand, the airline offered a promotional fare at S$1 for a one way ticket (excluding taxes) from Singapore to Bangkok, Hat Yai and Phuket. Because of its sensational pricing strategy, it had 4.5 million hits on the airline's website in 10 hours (Goh,2005). When it launched the flight to Chiang Mai from 18 February 2005, Tiger offered a special promotional sale of 3,000 low fare tickets at S$9.98 (one-way) or THB 249 (Tiger Airways Press release, February 3, 2005).. In August 29, 2005 Tiger again offered promotional fares every Wednesday until the end of September 2005 to celebrate the first anniversary of ticket sales. It kicked off the promotion offering a special one day sale with a $1 fare available on selected flights between Singapore and Thailand.

The airline also has rapidly expanded network. After offering flights to most major cities in Thailand, Tiger started a major network expansion on with new flights Macau from 25 March, Ho Chi Mihn City from 1 April, and Hanoi from 7 April, 2005. It also flies a secondary flight to Phuket from 25 March, 2005. Apparently, Tiger focuses on building network expansion rather than on network density, following Ryanair network strategy. After the first full year of operations, Tiger reported that it has achieved an excellent punctuality record of 94% of all flights departing on time and 90% of all flights arriving on time. It has also operated more than 5,000 scheduled flights and carried more than 500,000 passengers. Tiger recently agreed to purchase eight A320s directly from Airbus to grow its operation furthers (Ionides, Airline business August 2005).

Although Tiger is a low cost offshoot of Singapore Airlines, both require a level of distinction and uniqueness from one another. Tiger put more distance between itself and its parent mainline. Tiger is a real LCC modeled after Ryanair while Singapore Airline is a full service legacy carrier. Their product and service differentiation is distinctive, unlike Thai Airways and its offshoot Nok Air.

3.4.5 Valuair

Valuair is a privately owned Singapore based low cost carrier. It initially was run by a former Singapore Airlines Vice chairman, Lim Chin Beng. The airline was established in May 2004, flying out of its base Changi Airport with 2 A320s aircraft. It firstly offered 3 routes of less than 4 hours to Bangkok, Jakarta and Hong Kong. Valuair is positioned as the region's quality, semi-frills budget airline operating out of Singapore. It offers a JetBlue style of product for sectors that are typical 4-5 hours.

Some of its product and operating features are different from basic low cost model. It has chosen to differentiate itself by offering some frills. The airline serves free but simple meals, providing better seats than other low cost rivals with 32 inch seat pitch while other has 28 inch. It generously allows 20 kg baggage limit whereas other offer only 15 kg. All seats are pre-assigned at reservation. It seeks to reward loyal customers with free flights through its frequent flyer program (FFP) called Valupoints. Its FFP structure is simple, based on number of boarding passes accumulated points. A free ticket is redeemable with 40-60 points. Each boarding pass is worth 2-3 points depending on length of travel.

Direct sales through website and call center are used to save intermediary costs. However, Valuair still relies on travel agents, as it has joined global distribution system (GDS) with Abacus to gain code share with network carriers. The airline flew to primary airports or capital cities such as Jakarta, Hong Kong and Bangkok. The airline also does not focus on 20 minute turnaround time, but has reached 40 minute turnarounds. Its management team believes that loading cargo and interlining passengers would provide greater benefits than controlling 20 minute turnaround.

Table 3.33: The key company profile of Valuair

Valuair profile	
Founded	May 2004
Base	Changi Airport
Destination	Danpasa
	Jakarta
	Surabaya
Fleet size	4
#destination	3
Headquarters	Singapore
Key people	Ken Ryan (CEO)
Website	http://www.jetstarasia.com/valuair/

Source: http://en.wikipedia.org/wiki/Valuair

Similar to other low cost airlines, Valuair uses uniform new A320s aircraft to save training overhead and maintenance costs. It maximizes seat load factor by using simple fare structure. Its three tiered pricing structures are children, discounted fares with terms and conditions (Saver Fares), and standard fares without restriction (Flexi Fares). Table 3.35 shows its fare structure on BKK-Singapore route. Moreover, the airline has started a strategic alliance with Star Cruise, the world's third largest cruise line, offering fly/cruise packages. To further boost non airside revenues, Valuair offers complete air and hotel packages to customers online (see Table 3.34 for key concepts of Valuair business model).

Valuair's target groups are tourists and business passenger from small and medium firms who want convenient and affordable way to get to and from Hong Kong. In the first quarter of 2004, it carried 75,000 Singaporean passengers who went on vacation to Hong Kong. The airline deviated from the original LCC model by expanding routes to serve more than 5 hour radius to include destinations in Eastern Australia and Northeast Asia, for example, Perth (6 hours) and Cheung Du (5 hours). In July 2005, the airline has

merged with Jetstar Asia, creating the first consolidation in low cost market in Asia. Industry analysts believed that Valuair's major problems lie in its poor business model (Ross, July 2005), in addition to overcapacity in Singaporean market. Singapore has a population of around 4 million people and there is no domestic market. As a result, Singapore is too small to support three low cost carriers.

Table 3.34: The key concepts of Valuair business model

Product concepts	
Fare	Point-to-point (allow passenger interlining)
	Simple; 1 way excluding taxes and charges
	Single class (180 seats)
	Two tired pricing system: Saver Fares and Flexi Fares
Distribution	Direct sales: website, call center
	Travel agents
In-flight	Free but simple meal
	No IFE, Assigned seat
Baggage allowance	20kg
Method of payment	Credit card, Cash
Frequency	Average
Punctuality	Excellent
Frequent Flyer program	Valupoints
Operating concepts	
Aircraft	Brand new A320s
Sectors	Short to medium, within 6 hours flying radius of Singapore
Airports	Primary airports (40 minute turnaround)
Growth	Slow
Staff	No profit sharing or incentive program
Customer concepts	
Target group	Leisure passengers and business passengers from SMEs
Customer service	Enthusiastic and friendly
Revenue concept	
Revenue management	Maximize load factor rather than yield
	Join GDS with Abacus to gain code share
	Strategic Alliance with Star Cruise for fly/cruise package
	Boost ancillary revenues through onboard-merchandise, internet, car rental and hotel
	Load cargo

As can be seen from its business model, the airline attempted to fill the niche between a full service carrier and low cost carrier. It has attempted to be everything for everyone. It charges the fares closer to full service carrier. For instance, it offered fares for Singapore-Hong Kong route that only S$1 cheaper than Cathey Pacific. It flies to the market that full service carrier does such as Perth, Bangkok, Jakarta. It offers service like a frill-like full service carrier. However, Valuair does not have network, unlike full service carrier. Its

strategy is thus stuck in the middle, according to Porter's notion of competitive advantage.

Table 3.35: Valuair 's fare management on Bangkok-Singapore route

To Singapore (BHT)			
Fare type	**Bk.Class**	**Flexi**	**Conditions**
1 Yr Return	M	6300	1.Ticket valid on flight/date shown only 2.Change fees: waived 3.No-show fee: THB1200 4.Ticket must be purchased no more than 72 hrs after reservation is made or immediate if travel is within 72 hrs.
One-Way	M	4100	
6 Mth Return	N	5400	
3 Mth Return	V	4700	
One-Way	V	3100	
Fare type		**Saver**	
1 Mth Return	W	4100	
14 days Return	L	3500	
7 days Return	R	3000	
From Singapore (S$)			
Fare type	**Bk.Class**	**Flexi**	**Conditions**
1 Yr Return	B	320	1.Ticket valid on flight/date shown only 2.Change fees: waived 3.No-show fee: THB1200 4.Ticket must be purchased no more than 72 hrs after reservation is made or immediate if travel is within 72 hrs.
6 Mth Return	M	275	
One-Way	M	1800	
3 Mth Return	N	240	
1 Mth Return	V	205	
One-Way	V	135	
Fare type		**Saver**	
14 days Return	W	175	
7 days Return	L	145	

Source: Valuair website from 8 Sept-29 Oct, 2005
Note: THB= Thai Baht, S$= Singapore Dollar

After the merger, Ken Ryan, CEO of Jetstar Asia has been appointed as a new CEO of Valuair. Valuair still remain operating, however, its services to many cities were dropped. The airline first dropped service to Perth, then schedule services to Chinese cities of Chengdu and Xiamen were dropped by the end of October, 2005. The airline now only provides services to the Indonesian destinations which are Surabaya, Denpasar and Jakarta (see Table 3.33 for key company profile of Valuair). The focus of Valuair on the Indonesian destination has come after the Indonesian government does no longer allow low cost carriers to serve their destinations above. However, the government does not regard Valuair as a true low cost carrier due to its business model. This may be one of reasons why Valuair and Jetstar Asia are not merging operation to avoid losing operating rights in foreign countries.

3.4.6 Jetstar Asia Airways

Jetstar Asia is a Singaporean- based partnership between Qantas (49%), local businessmen (32%) and Singapore government' Temasak Holdings (19%) (Jetstar Asia website). The airline was established in April, 2004 with a start up cost of S$100 million in which Qantas contributing S$50 million ($40 million) (Jetstar Asia Press Release, 8 April 2004). This Qantas's offshoot is the third low cost carrier launched in Singapore. It thus differentiates itself from other local rivals by flying further anywhere less than 5 hours radius of Singapore, serving popular tourist and business destinations. Its first services were started in November 2004, flying to 3 destinations which are Hong Kong, Taipei and Pattaya. During the first week of operations, Jetstar Asia offered promotional fares at S$48 to Hong Kong, S$88 to Taipei and S$28 to Pattaya for a one-way ticket. During this period, more than 3 million people hit on its website. It further announced a route plan to fly to Indonesia and China.

The airline flies point-to-point with 4 brand new A320s (180 seats). Food and drinks are sold on board. It matches Valuair's product features by offering assigned leather seats and allowing 20kg baggage limit. Flights are either in morning or afternoon. Fare structure is simple, two tiered pricing system. There are discounted fares with terms and conditions (JetSaver) and standard fare without restriction (JetFlex). Prices increase as date of departure comes, reflecting yield management (see Table 3.36 for its fare management). Fares may be the lowest, but still offer value for money.

Direct sales through website and call centre are available. However, online ticket prices are slightly cheaper than tickets bought over phone call to reflect cost savings. Similar to JetBlue, Jetstar Asia also provides in-flight entertainment, called Video on Demand, featuring movie, television programs and radio, with an extra charge of S$12. The in-flight entertainment kits are only available on flights more than 3 hours flying of Singapore such as Hong Kong, Bangalore, Taipei and Manila.

The airline flies to business and tourist destinations in Southeast and Northeast Asian region such as Bangkok, Taipei, Siem Reap, Phuket and Manila. Its customer target groups are both leisure and business passengers. Customer services are presented as friendly and enthusiastic. Jetstar Asia has attempted to build up network density. From 30

October 2005 it flies 3 times daily to Bangkok, services timed for morning, lunch, and evening. Its high frequency to business destinations aims to attract more cost and time conscious business passengers.

Table 3.36:Jetstar Asia 's fare management on Bangkok-Singapore route

To Singapore (BHT)	9-Sep	16-Sep	23-Sep	30-Sep	7-Oct	14-Oct	21-Oct	26-Oct
Saturday 29 Oct 2005								
Dep. 11:35	1,325	1,750	1,500	1,500	1,500	1,500	1,750	2,000
Dep. 20.05	1,200	1,250	1,250	1,250	1,500	1,500	1,500	1,500
From Singapore (S$)	**9-Sep**	**16-Sep**	**23-Sep**	**30-Sep**	**7-Oct**	**14-Oct**	**21-Oct**	**26-Oct**
Saturday 29 Oct 2005								
Dep. 09:20*	178	249	119	119	119	119	249	249
Dep. 18:00	68	89	58	109	249	249	n/a	n/a

Source: Jetstar Asia website from 9 Sept-29 Oct, 2005

Note:*jetflex only

In July 2005, Jetstar Asia has consolidated with Valuair, forming a new Singaporean company to own and operate both airlines. Ken Ryan, chief executive of Jetstar Asia, now is a CEO of Valuair as well. The merger was driven by soaring fuel prices, stiff competition and failure to fly to mass markets such as China and Indonesia. Jetstar Asia had difficulties in gaining landing rights for trunk Indonesian routes as a consequence of Singapore's fully utilized bilateral agreements. In addition, it flew to Taiwan first, creating political conflict with China where a market has far greater growth potential and stronger link with Singapore. Jetstar Asia struggled to enter China because Chinese government claims that it is really an Australian airline. Though, Singapore and China have further liberalized their air service agreement, LCCs are not allow to fly to Beijing and Shanghai for the first two year. The airline also picked the wrong choice, flying to Pattaya where an airport is far away from the downtown. Then it switches to Bangkok Int'l Airport which itself is a competitive market.

It was reported that Jetstar Asia lost S$25 million from June to December 2004 (Ross, July 2005). The consolidation would generate economies of scale in term of fleet which likely to emerge at around 6 aircraft. As December 2005, Jetstar Asia has 5 A320s aircraft whereas Valuair has 4 A320s aircraft. After the merger, Valuair has withdrawn overlapping routes with Jetstar Asia. Now Valuair serves only 3 destinations in Indonesia, whereas Jetstar Asia serves 13 destinations across 8 countries. (see Table 3.38 for key

company profile of Jetstar Asia). Both Valuair and Jetstar Asia would continue to operate their normal routes under their own brands.

Table 3.37: The key concepts of Jetstar Asia business model

Product concepts	
Fare	Point-to-point
	Simple; 1 way excluding taxes and charges
	Single class (180 seats)
	Two tired pricing system: JetSaver and JetFlex
Distribution	Direct sales: website, call center and travel agents
In-flight	No free meal, food and drinks are sold on board
	extra charge for IFE (S$12)
	Assigned leather seat
Baggage allowance	20kg
Method of payment	Credit card, Cash
Frequency	Average
Punctuality	Good
Frequent Flyer program	No
Operating concepts	
Aircraft	Brand new A320s
Sectors	Short to medium, within 5 hours flying radius of Singapore
Airports	Business and tourist destinations
Growth	Buiding network density, gradual network expansion
Staff	No profit sharing
Customer concepts	
Target group	Leisure passengers and business passengers who are cost and time conscious
Customer service	Friendly and enthusiastic
Revenue concept	
Revenue management	Maximize yield
	Boost ancillary revenues through onboard-merchandise, internet, car rental and hotel

The push to expand into Indonesia may be one of the reasons why the airlines are not merging operations. Indonesian tourist cities such as Bali, Jakarta, and Surabaya have been off limits to low cost carriers because the Indonesian government has claimed that it would only allow these cities to be served by full service carriers. The Indonesian government does not consider Valuair to be a true low cost carrier, as it has some in-flight frills. Jetstar Asia plans to add the Qantas code to some of its flights from Singapore to Kolkata and the Thai cities of Bangkok and Phuket. This is an unusual move for a low cost airline. However, Thai Airways and Nok Air (its low cost subsidiary) have already started codesharing flights on BKK-Chiang Mai route since February 2006. This peculiar move in Asia needs more time to justify the appropriateness. Nevertheless Jetstar Asia is

likely able to avoid cannibalizing its parent mainline, Qantas because both are serving in different markets and different country bases.

Table 3.38: The key company profile of Jetstar Asia

Founded	April 2004
Base	Changi Int'l Airport
Destination	Bangalore
	Bangkok
	Denpasar (Bali)
	Hong Kong
	Kalkata
	Jakarta
	Manila
	Phanom Penh
	Phuket
	Siem Reap
	Surabaya
	Taipei
	Yangon
Fleet size	5
#destination	13
Headquarters	Singapore
Key people	Ken Ryan (CEO)
Website	www.jetstarasia.com

Source: http://en.wikipedia.org/wiki/Jetstar_Asia, Jetstar Asia website

3.5 Summary

In this chapter, we firstly have analyzed core business models of successful LCCs in the US and EU. We further examined LCC models of outstanding Southeast Asian LCCs and pointed out their variations especially in cost cutting and distribution strategies. As can be seen, all Singapore-based LCCs are using A320s in single class configuration. However some variations among their business models are practiced. Tiger Airways is modeled strictly following the Ryanair model with open-seating, no free frills and in-flight entertainments (IFE), whereas Jetstar offers hot meals on longer sectors at a price. Bangkok-based Thai AirAsia strictly adhere the LCC model following its parent associate, AirAsia. However, Nok Air, deviates itself from others with an introduction of business cabin with ticket flexibility and free on-board frills, and now it has codesharing flights with Thai Airways.

The risk of cannibalization between Thai Airways and its low cost offshoot Nok Air needs to be further investigated. Airlines within airlines in Southeast Asia needs more time to justify its sustainability. The following chapter provides a review of the literature on discrete choice model used in the empirical modeling for the thesis. Specifically, multinomial logit and nested logit models will be presented including their advantages and limitations. In addition, chapter 4 will review applications of discrete choice model in the air transportation literature.

Chapter 4 Review of choice models in the context of aviation markets

4.1 Introduction

In a liberalized air transportation market, passengers typically have the choice between several fare class products on one or more available flight itineraries offered by the airlines serving the desired markets. Air travel passengers will choose a particular airline, flight and fare class' to satisfy their travel needs, based on their characteristics, needs and preferences. As a result, demand for air travel at the class level is the consequence of the tradeoffs individual air travelers make when they choose among different airlines, flights and fare classes. For airline managers, key airline planning decisions, for instance, flight scheduling, pricing, fare class restriction design and seat allocation among classes (yield management) require comprehensive information on passenger demand. It is then crucial to gain insight about air travel preferences and understand the determinants of demand for air travel at the class level.

In reality when planning a trip, air travelers have a choice between various travel alternatives. The number of available alternatives varies market by market based on the number of airlines serving that market, the number of flights offered by each airline, and the number of fare class products they actually market. For a given time period, this number is always finite. Each individual air traveler has to make a choice among a finite number of possible travel alternatives. This means the set of alternatives called the choice set is collectively exhaustive. The choice set might vary across decision makers based on their preferences or on their access to information, however, the number of alternatives is always finite. Moreover, air traveler's decision to buy a plane ticket, which airline he will take, when to travel, and by what route are all decision that reflect an "either-or" choice. The air traveler either takes airline A or he does not. If he takes an airline A to Florida, he cannot simultaneously take an airline B. As a result, the set of alternatives is mutually exclusive.

The choice set of air travel choice problem exhibits three characteristics: the alternatives are mutually exclusive from the decision maker's perspective, the choice set is exhaustive, and the number of alternatives is finite. Because of these three properties, the

choice of air travel alternative by an individual air traveler thus fits within discrete choice model framework. Discrete choice model describe and evaluate a decision makers' choice among various alternatives. We then employ discrete choice models as a major methodology to better understand the nature of air travel demand and degree of substitutability (cross elasticity) among airlines in Thailand. This chapter reviews the most widely used discrete choice models: logit and nested logit models with their respective strengths and weaknesses. Then we move on to some applications of discrete choice models in the air transportation literature.

4.2 Discrete choice models

In the mid 1980s, the breakthrough concepts that defined discrete choice models have been made. The basic models mainly logit model (McFadden,1974) and nested logit model (Williams,1977) had been introduced, and the statistical and economic properties of these models had been derived. Discrete choice models are used to understand the behavior process that leads to the decision maker's choice. As a result, choice models are used in transportation and other different fields such as energy, housing and marketing to represent the selection of one among a set of finite, exhaustive and mutually exclusive alternatives.

Discrete choice models are usually derived under an assumption that the decision maker has rational behavior. This means the decision maker will choose the alternative that maximizes his utility. However, the utility that each alternative brings to the decision maker is not known with certainty but it is divided into two parts: an observed element known to the researcher and a random element, which remain unknown. The researcher is thus not able to precisely predict the utility maximizing alternative of the decision maker but rather estimate the probability that each alternative might be chosen. This probability depends on the observed part of the utility known to the researcher and the assumed distribution of the random element, error terms. Therefore, discrete choice models are referred to as random utility maximizing models.

4.2.1 The logit model

The description of the logit model in this section is based on Ben-Akiva and Lerman (1985) and Train (2003). The logit model is the most widely used discrete choice model.

The popularity of logit model comes from its simple mathematical structure and ease of estimation. Not only the formula for the choice probabilities takes a closed form such that the choice probabilities can exactly calculated, but it is also readily interpretable. The logit formula is originally derived by Luce (1959) from assumptions about the characteristics of choice probabilities, namely the independence from irrelevant alternatives (IIA) property discussed later in this section. Marschak (1960) shows that these axioms implied that the logit model is consistent with utility maximization. Marley (1965) further proves that the extreme value distribution of unobserved utility leads to the logit formula. McFadden (1974) completes the analysis by showing the converse. He mathematically proves that the logit formula for the choice probabilities necessarily implies that unobserved utility is distributed extreme value.

To derive the logit model, we firstly introduce the following notation[4]. A decision maker labeled n faces a choice among J alternatives. The utility that decision maker n obtains from alternative j is U_{nj}, $j = 1,.....,J$ .This utility is known to the decision maker but not by the researcher. The decision maker is assumed to choose the alternative that provides the greatest utility. The behavior model is thus: choose alternative i if and only if $U_{ni} > U_{nj} \ \forall i \neq j$.

Now consider the researcher. The researcher does not observe the decision maker's utility. However, the researcher observes some attributes of the alternatives as faced by the decision maker, labeled, $X_{nj} \ \forall j$, and can specify a function that relates these observed factors to the decision maker's utility. The observed utility is denoted $V_{nj} = V(X_{nj}) \ \forall j$. This function is often called representative utility. Since there are aspects of utility that researcher does not or cannot observe, $V_{nj} \neq U_{nj}$. Utility is then decomposed as

$$U_{nj} = V_{nj} + \varepsilon_{nj}, \qquad j = 1,.....,J$$

where ε_{nj} are the factors that affect utility but are not included in V_{nj} . The researcher does not know $\varepsilon_{nj} \ \forall j$ and thus treats these error terms as random. The logit model can be

[4] Throughout the chapter, we refer to the researcher as "she" and the decision maker as "he". This usage will avoid confusion when both people are refereed to in the same paragraph.

derived under the assumption that each random element ε_{nj} is independently and identically distributed (iid) extreme value. The probability that a decision maker n select alternative i ($i = 1,....,J$) equals the probability that the utility associated with i (U_{ni}) is greater than the utility associated with all other alternatives. That is

$$\begin{aligned} P_{ni} &= \text{Prob}(U_{ni} > U_{nj}) \\ &= \text{Prob}(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj}) \\ &= \text{Prob}(\varepsilon_{nj} - \varepsilon_{ni} < V_{ni} - V_{nj}), \qquad i = 1,.....,J; i \neq j \end{aligned}$$

Given the iid extreme value distribution of error terms, the differences in error terms $(\varepsilon_{nj} - \varepsilon_{ni})$ follows the logistic distribution. The choice probability of selecting alternative i then becomes:

$$\begin{aligned} P_i &= \frac{\exp(V_i)}{\exp(V_1) + \exp(V_2) + ... + \exp(V_J)} \\ &= \frac{\exp(V_i)}{\sum_{j=1}^{J} \exp(V_j)}, \qquad i = 1,....,J \end{aligned}$$

If we further assume that V_j is a linear function such that $V_j = \beta X_j \; \forall j$ where X_j are observed by the researcher and β is a vector of coefficient parameters. The formula for choice probabilities then becomes:

$$P_i = \frac{\exp(\beta X_i)}{\sum_{j=1}^{J} \exp(\beta X_j)}, \qquad i = 1,....,J$$

By using maximum likelihood techniques, we can estimate the value of parameters β .In the logit model, own or direct elasticity for alternative *i*, change in P_i due to change in X_i, can be derived as follows:

$$E_{X_i}^{P_i} = (1 - P_i)\beta X_i \qquad i = 1,....,J$$

Similarly, cross elasticity or change in P_j due to change in X_i can be derived as follows:

$$E_{X_i}^{P_j} = -P_i \beta X_i \qquad i, j = 1,.....,J; i \neq j$$

The assumption of the extreme value distribution of the error terms (and then the logistic distribution for the error differences) is nearly the same as assuming that the error terms are independently normally distributed. With its slightly fatter tails than a normal

distribution, the extreme value distribution allows for slightly more aberrant behavior than a normal distribution. However, the key assumption of the logit model lies in the independence of the error terms, not the shape of the distribution. The independence of error terms means that the unobserved utility of one alternative is uncorrelated to that of another alternative. The independence assumption then simultaneously imposes a restrictive and ideal condition on the logit model. It demands the researcher to specify the systematic part V_{nj} precisely enough that the remaining unobservable part ε_{nj} is independent and uncorrelated, essentially white noise. This is the ultimate goal of the researcher: to specify utility well enough that a logit model is appropriate. Seen in this way, the logit model is the ideal rather than a restriction. The independence assumption thus is not as restrictive as it might at first seem, but can be interpreted as a natural outcome of a well-specified model.

If the researcher thinks the unobservable part ε_{nj} is correlated across alternatives, she basically has three options. First, she can use different model that allows for correlation among error terms. Second, she can attempt to re-specify the systematic utility V_{nj} so that the source of the correlation is captured explicitly and thus the remaining errors are independent. Third, she can use the logit model as an approximation only. But the last option might lead to some errors, particularly if the researcher plans to examine substitution patterns.

The logit model is widely used because of its two main advantages. First, the model has mathematical simplicity. As derived previously, the choice probabilities take a closed form and are easy to calculate. Second, the model has a very large flexibility in the definition of the choice set. The choice set can vary from an individual to the next individual and only a subset of the alternatives can be included in a decision maker particular choice set. In addition, the standard logit estimation procedure by likelihood maximization still remains valid if only a subset of alternatives is included in the choice set, if all alternatives have the same chance of being chosen into each decision maker choice set.

Nevertheless, the logit model also contains three main weaknesses: it cannot represent random taste variation in the population, it implies a very specific substitution pattern, and it is not appropriate to deal with panel data. We first examine the issue of random taste variation. Random taste variation occurs when there is heterogeneity in the population response to an alternative's attribute. A good example is the impact of a Saturday night stay restriction associated with a discount fare. Indeed the impact may vary from traveler to traveler and this variation might be unobserved by the researcher. Some travelers, especially those with family commitments, may prefer to return home as soon as their business done rather than staying at their destination over the weekend. This type of passenger then may consider a Saturday night restriction as a serious disadvantage and also a negative impact on their utility. This will result in a high value to the Saturday night stay coefficient.

On the other hand, for some travelers like young unmarried students, having to stay over the weekend at their destination could be seen as an opportunity. The restriction may not make any hassle for them. These travelers will thus give a very low value to the Saturday night stay coefficient. Therefore, the coefficient of the Saturday night stay in the utility function of the discount fare alternative varies following an unknown distribution. This variation in the population response is called random taste variation. When tastes vary with unobserved parts of the utility, the error terms will necessarily be correlated across alternatives. The logit model is then not appropriate and it becomes a misspecification.

The second limitation of the logit model is a very specific substitution pattern among alternatives. Because of the assumption of independence between error terms, the ratio of choice probabilities of two alternatives remain constant. This is called the independence of irrelevant alternatives property or IIA property. In addition, the independence assumption of error terms results in a proportional substitution between alternatives. Any increase in the choice probability of one alternative leads to a decrease in choice probabilities of all other alternatives by the same percent. This very specific substitution pattern could be unrealistic in some circumstances.

The famous blue bus/red bus paradox is an extreme example of non IIA cases (Ben-Akira and Lerman, 1985). Suppose that a commuter has a choice of going to work by his

private car or taking the blue bus. For simplicity, assume that each alternative has a 50% choice probability: $P_c = P_{bb} = 1/2$, where c is car and bb is blue bus. In this case, the ratio of probability is one: $P_c / P_{bb} = 1$. Now suppose that a new red bus is introduced. Except for the color of the bus, the new bus service has all the same attributes as those of the existing bus. The commuter considers the red bus to be exactly like the blue bus. Thus, the probability that the commuter will take the red bus is the same as for the blue bus, and then the ratio of their probabilities is one: $P_{rb} / P_{bb} = 1$.

Now all available alternatives are red and blue buses as well as driving a private car. Under the logit model, the new choice probability of each alternative is 33.33%. This is because the ratio P_c / P_{bb} is the same whether or not another alternative, in this case the red bus exists. This ratio thus remains at one. The only probabilities for which $P_c / P_{bb} = 1$ and $P_{rb} / P_{bb} = 1$ are $P_c = P_{bb} = P_{rb} = 1/3$, which are the probabilities that the logit model predicts.

However, this is unrealistic because the commuter will most likely consider the two bus modes as closely similar or even the same and then treat them as a single alternative. In this case the probability of the car alternative will remain 50% and each of the bus alternatives will obtain a 25% choice probability. That is, we would expect $Pc = 1/2$ and $P_{bb} = P_{rb} = 1/4$. In this case, because of the IIA property, the logit model overestimates the probability of taking either of the buses and underestimates the probability of taking a car. The ratio of probabilities of car and blue bus, P_c / P_{bb}, actually changes with the introduction of the red bus, rather than remaining constant as required by the logit model. In this case, proportional substitution between alternatives seems completely unrealistic. Logit specification is then not an appropriate approach to model such a choice situation.

Though the IIA property imposes some limitations on the logit model, it has a major strength. When each decision maker choice set is chosen randomly, the IIA property allows researchers to estimate model parameters consistently only on a subset of alternatives. This can be an important advantage when the number of alternatives is so

high that estimation would be otherwise too computer-intensive. In addition, the property allows great flexibility as the choice set can vary across decision makers.

We can test whether the IIA property holds. If the IIA property seems unrealistic, the coefficient estimators obtained on a subset of alternatives are not significantly different from those obtained on the full set of alternatives. A hypothesis test of the IIA property is called the McFadden-Hausman test (Hausman and McFadden,1984). The test can also be easily conducted because the logit model is often a generalization of more complex models.

The last weakness of the logit model is with panel data; data that represent repeated choice over time by the same decision makers are called panel data[5]. If the unobserved attributes that influence the choice of decision maker are independent over the repeated choice, then logit model can be used with panel data. However, in most cases, errors can be assumed to be correlated over time. In this case, the researcher then has two options. First, she re-specifies the model to bring the sources of correlation into the observed part of the utility. Second, she may use another model like mixed logit with panel data.

The air traveler choice problem, such as the choice by an individual air travel passenger of an airline, a flight schedule and a fare class, might involve all three main limitations of the logit model. For example, we can reasonably find some heterogeneity in the response of the air traveler population to some parameters like schedule convenience or disutility associated with low fare restrictions. Indeed, business passengers are known to place a high emphasis on schedule convenience and flexibility, whereas leisure passengers place high emphasis on price. As a result, there should be significant differences on how passengers value these elements of their utility function, even within the population of business and leisure passengers.

In addition, a large proportion of air traffic is in fact flown by a relatively small population of regular frequent fliers. Most legacy airlines have developed frequent flyer programs (FFPs) to induce customer loyalty by taking advantage of switching costs.

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5 Panel data is a combination of cross section and time series data.

Membership is open to all passengers. Nevertheless, FFPs are especially targeted to attract that regular frequent flyer population to make repeated choices of airlines, flight schedule and fare class. These repeated choices can be assumed to be correlated over time depending on the passenger preference and characteristics. To analyze air travel problem, a model which allows some correlation between repeated choices over time thus might be useful.

In the case of the air travel choice problem, the assumptions of the logit model are fairly restrictive. Another model specification that is able to accommodate random taste variation, complex substitution patterns and correlation between repeated choices over time is probably more appropriate. The next section will describe an alternative to the standard logit model: the generalized extreme value (GEV) family of model. A widely used model of GEV family, nested logit model which allows for more complex substitution patterns will be presented.

4.2.2 The GEV family of discrete choice models

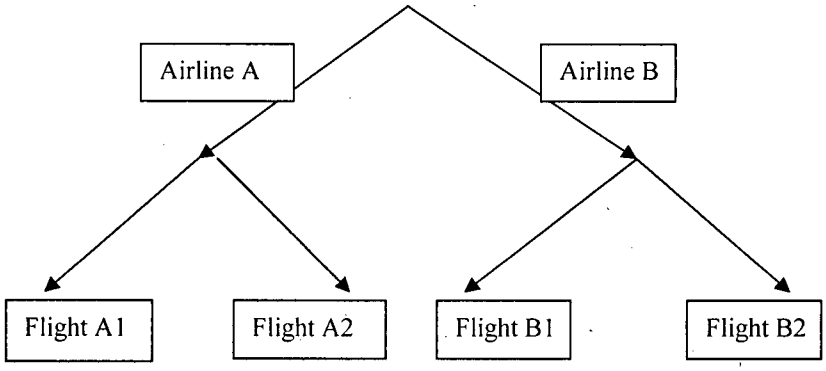
The development of other models has arisen largely to avoid the independence assumption within a logit specification. Generalized extreme-value (GEV) models are based on a generalization of the extreme value assumption. The generalization can take many forms but the unifying element is that it allows correlation in unobserved factors over alternatives and collapses to the standard logit model when this correlation is zero. Depending on the type of GEV models, the correlation can be more or less restrictive. GEV models consist of a large class of models that allows a variety of substitution patterns. In addition to being consistent with utility maximization, GEV models usually have close forms for choice probabilities that simulation is not required for their estimation (Hensher et al., 2005).

The most widely known member of the GEV family is nested or hierarchical logit (NL or HL) model. The nested logit model is appropriate when alternatives can be grouped into nests, and also exhibit the following properties. First, for any two alternatives that are in

the same nest[6], the ratio of probabilities is independent of the attributes or existence of all other alternatives. That is, IIA holds within each nest. Second, for any two alternatives in different nests, the ratio of probabilities can depend on the attributes of other alternatives in the two nests. That is, IIA does not hold for alternatives in different nests. The nested model has been applied by many researchers in a variety of situations, such as energy, transportation, housing, telecommunication because its functional form is simple compared to other types of GEV models, and it also provides a rich set of possible substitution patterns.

A convenient way to illustrate the substitution patterns of nested logit model is with a tree diagram. In such a tree, each branch denotes a subset of alternatives within which IIA holds. Every leaf on each branch denotes an alternative. For example, the tree diagram for air traveler's choice of airline and then flight schedule is given in
Figure **4.1**. The (upside down) tree consists of two branches, labeled "Airline A" and "Airline B", for the two subsets of alternatives, and each of the branches contains two twigs for the two alternatives within the subset (labeled flight A1, A2, B1, and B2 respectively). There is proportional substitution among various flights offered by the same airline but not across flights from different airlines. In this case, if airline B were to launch a third flight in the market, demand for flight B1 and B2 would decrease by the same proportion but the proportion would be different from the decrease in passenger demand for flights A1 and A2.

Figure 4.1: The nested logit tree structure[7]



[6] A nest is composed of a group of alternatives in which each alternative may possibly have information in the unobserved influences of each alternative that has a role to play in determining a choice outcome that is different across the alternative.

[7] Source: Carrier (2003)

The utility maximizing nested logit model is a special case of the GEV model. McFadden (1978) develops the model to ensure that it is consistent with utility maximization, provided that the log sum parameters are bounded appropriately. We first describe the process that McFadden (1978) develops to generate the GEV model. Then we show how generalized nested logit (GNL) model is derived. For notational simplicity, we will omit the subscript n denoting the decision maker. Since we will be using $\exp(V_j)$ repeatedly, we denote it more compactly by Y_j. That is, let $Y_j \equiv \exp(V_j)$ and note that Y_j is necessarily positive.

A GEV model can be derived from any G function that depends on $Y_j \ \forall j$. We denote this function as

$$G = G(Y_1,....,Y_J) \qquad\qquad Y_1,Y_2,....,Y_J \geq 0$$

Let G_i be the derivative of G with respect to $Y_i : G_i = \frac{\partial G}{\partial Y_i}$ .If this function satisfies certain conditions, then a discrete choice model can be based upon it. The properties that the function G must satisfy are the following:

1. $G \geq 0$ for all positive values of $Y_j \ \forall j$
2. G is a linear homogenous function.
3. $G \to \infty$ as $Y_j \to \infty$ for any j.
4. The cross partial derivatives of G change signs in a particular way. That is, $G_i \geq 0 \ \forall i$, $G_{ij} = \frac{\partial G_i}{\partial Y_j} \leq 0$ for all $j \neq i$, $G_{ijk} = \frac{\partial G_{ij}}{\partial Y_k} \geq 0$ for any distinct i, j and k, and so on for higher-order cross partials. It means G has j th cross partial derivatives which are non-negative for odd j and non-positive for even j.

If G meets the above conditions, then the choice probability of choosing alternative i is given by

$$P_i = \frac{Y_i G_i(Y_1,.....Y_J)}{G(Y_1,.....Y_J)}$$

Let the J alternatives are partitioned into K nests labels $B_1,.....,B_K$ .The generalized nested logit (GNL) probabilities are derived from:

$$G(Y_1,....Y_J) = \sum_{k=1}^{K}\left(\sum_{j\in B_k}(\alpha_{jk}Y_j)^{1/\lambda_k}\right)^{\lambda_k}$$

where B_k is the set of alternative in nest k, α_{jk} is an allocation parameter which reflects the extent to which alternative j is a member of nest k. This parameter must be non negative: $\alpha_{jk} \geq 0 \ \forall j,k$. A value of zero means that alternative is not in the nest at all. The additional condition $\sum_k \alpha_{jk} = 1 \ \forall j$ provides a useful interpretation with respect to allocation of each alternative to each nest. The logsum or parameter λ_k is defined to measure the degree of independence among alternatives within the nest k. The nested logit model is consistent with utility maximization if the condition $0 \leq \lambda_k \leq 1$ is satisfied for all λ_k; a higher value of λ_k means greater independence and less correlation. A value of λ_k=1 indicates complete independence within nest k, that is, no correlation.

The probability that a decision maker n chooses alternative i is

$$P_i = \frac{\sum_k (\alpha_{ik}e^{V_i})\left(\sum_{j\in B_k}(\alpha_{jk}e^{V_j})^{1/\lambda_k}\right)^{\lambda_k-1}}{\sum_{l=1}^{K}\left(\sum_{j\in B_l}(\alpha_{jl}e^{V_j})^{1/\lambda_l}\right)^{\lambda_l}}$$

If each alternative enters only one nest, with $\alpha_{jk} = 1$ for $j \in B_k$ and zero otherwise, the model become a nested logit model. In addition, if λ_k=1 for all nests, then the model becomes standard multinomial logit. Interpretation is facilitated by decomposing the generalized nested logit probability as follows:

$$P_i = \sum_k P_{i|B_k} P_k$$

where the probability of nest k is

$$P_k = \frac{\left(\sum_{j\in B_k}(\alpha_{jk}e^{V_i})^{1/\lambda_k}\right)^{\lambda_k}}{\sum_{l=1}^{K}\left(\sum_{j\in B_l}(\alpha_{jl}e^{V_j})^{1/\lambda_l}\right)^{\lambda_l}}$$

and the probability of alternative i given nest k is

$$P_{i|B_k} = \frac{(\alpha_{ik} e^{V_i})^{1/\lambda_k}}{\sum_{j \in B_k} (\alpha_{jk} e^{V_j})^{1/\lambda_k}}$$

Wen and Koppelman (2001) derive direct and cross elasticities of the GNL model. The direct elasticity of an alternative i which appears in one or more nests with logsum, λ_k, less than one, is

$$E_{X_i}^{P_i} = \frac{\sum_k P_k P_{i|B_k} \left[(1 - P_i) + (\frac{1}{\lambda_k} - 1)(1 - P_{i|B_k} \right]}{P_i} \beta X_i$$

The term in the summation collapses to zero for any nest which does not include alternative i. The elasticity reduces to the MNL elasticity, $(1 - P_i)\beta X_i$, if the alternative does not share a nest with any other alternative or is assigned only to nests for which the logsum value, λ_k, equals one.

The corresponding cross elasticity of a pair of alternative, i and j, which appear in one or more common nests, is

$$E_{X_i}^{P_j} = -\left[P_i + \frac{\sum_k (\frac{1}{\lambda_k} - 1) P_k P_{i|B_k} P_{j|B_k}}{P_j} \right] \beta X_i$$

In this case, the term in the summation becomes zero for any nest which does not include both alternative i and j, and reduces to the MNL cross elasticity, $-P_i \beta X_i$, if the alternatives do not share any common nest. Note that these elasticities are independent of the elasticities for any other alternative or pair of alternatives.

4.3 Some applications of discrete choice models in air transportation literature

Applications of discrete choice models in air transportation literature fall into two general categories: studies on airport choice and air travel demand. We first review the applications of discrete choice models on studies of airport choices. Since the deregulation of US domestic aviation market in the late 1970s, demand for air travel grew rapidly especially during 1990s.

Pressure exists to expand capacity at many of the world's busiest airports in term of runway and terminal. However, these capacity expansion decisions are complicated. The decision making process in the expansion scheme depends on the projected levels of passenger demand at the different airports. As a result, the modeling of traveler's choice of airport has become a key part of such studies. There have been a large number of studies of airport choice in multi-airport regions that are based on discrete choice models, particularly multinomial logit (MNL) and nested logit (NL) models.

Skinner (1976) uses an MNL model to conduct a study for airport choice in the Baltimore Washington DC area, accommodating 3 airports. His work is one of the first studies of airport choice. The results show significant impacts of flight frequency and ground accessibility, with travelers being more sensitive to the latter. A more recent study of airport choice in the same area has done by Windle and Dresner (1995). By using an MNL model, they find that there are significant effects associated with flight frequency and airport access time. Their study also gives an interesting conclusion that the more often a traveler uses a certain airport in a year, the more likely this traveler is to choose the same airport again.

The quality and availability of data sets for the San Francisco (SF)-Bay area result in a large number of studies on airport choice undertaken in this area. Kanafani (1983) uses an MNL model to study the choice of airport by air travelers flying between the Los Angeles metropolitan area and the SF-Bay area. His model predicts airport choice as a function of frequency of service at each airport and level of the fares. Harvey (1987) also uses an MNL model for airport choice and finds that airport access time and flight frequency are significant for both leisure and business travelers. However, leisure travelers place lower valuations of time.

More recently, Pels el al. (2001) uses a NL model for airport and airline choice in the SF-Bay area. Their work reveals that travelers are more likely to switch between airlines then between airports. Continuing to use a NL model, Pels et al. (2003) further analyze the joint choice of airport and access mode. The estimation results reveal that business travelers have a high value of time than leisure travelers. In the access mode choice, leisure travelers have higher access cost elasticity, while business travelers have higher

access time elasticity. As a result, the authors conclude that access time is of large importance in the competition between airports in region.

With a different approach from all earlier airport choice studies, Basar and Bhat (2004) use a probabilistic choice set multinomial logit (PCMNL) model for airport choice. The authors examine the airport choice of business travelers residing in the SF-Bay area. Their empirical analysis draws several important conclusions. First, as found in earlier studies, access time to the airport and flight frequency are the two primary determinants of airport choice. However, unlike earlier studies, their study shows variation in sensitivity to these two variables based on traveler demographics and trip characteristics. Interestingly, passengers traveling alone and women travelers are more sensitive to access time, while passengers traveling alone are also more sensitive to flight frequency.

Second, the access time parameter estimates of the MNL model and the choice stage of the PCMNL model are quite different. Basically the MNL model assumes that all airports are available to all individuals. However, the PCMNL model explicitly incorporates choice set formation in the model to acknowledging that not al airports are considered by every traveler. A comparison of the relative trade-off between access time and frequency from the two models suggests that flight frequency is the most important factor in the choice-set composition, surprisingly dominating the significant access time factor. Nevertheless in term of the actual choice of airport, access time is still the most important factor. Last, the substantive elasticity effects from both the MNL and PCMNL models indicate that access time is the most important factor in the choice of airport.

Following an analysis of Basar and Bhat's paper, Hess and Polak (2004a) show that there exist differences in choice behavior between population groups, and also within population groups, especially in the sensitivity to access-time increases. Their results suggest random taste variation indicating heterogeneity in the passenger population response to an airport attribute. Extending an analysis of the joint choice of airport, Hess and Polak (2004b) further find differences across population groups in the correlation structure in the choice set of alternatives. The results show that in general, the highest level of correlation exists between alternatives sharing the same access mode.

Acknowledging that random taste variation exists between and within population groups, Hess and Polak (2005) then use the mixed multinomial logit model, allowing for a random distribution of taste across decision makers, to analyze the choice of airport by air travelers departing from the SF-Bay area. Their results indicate that there is significant heterogeneity in taste, especially with respect to the sensitivity to access time, characterized by deterministic variations between groups of business and leisure travelers, and between groups of resident and visitor travelers. This analysis reinforces earlier findings that business passengers are far less price sensitive than leisure passengers. Moreover, they are willing to pay higher price for decreases in access time, and also for increases in flight frequency than leisure passengers. In addition, the results reveal that random taste variation between business passengers in term of sensitivity to access time is more apparent than that between leisure passengers. This similar pattern also occurs for visitor passengers when compared to resident passengers.

A number of studies of airport choices have been conducted in the UK. Using an MNL model, Ashford and Bencheman (1987) study air traveler's choice of 5 airports in England: Heathrow, Manchester, Birmingham, East Midlands, and Luton. They find that access time and flight frequency are significant attributes for all types of passengers. Their study concludes that fare is significant for all passengers except international business travelers. Ndoh et al. (1990) examine passenger route choice in Central England. After comparing MNL and NL models, they find that the latter model is superior to the former in their study.

Discrete choice model has also been used to predict market share of new alternative. This is one of the earliest applications, arose in mid 1970s and pioneered by McFadden on his ridership forecast for Bay Area Rapid Transit (BART), a new rail system in SF-Bay area. McFadden et al. (1977) apply MNL models to commuters' mode choice in the Bay area and then uses the models to predict BART ridership. Similar studies then have been done for a new airport alternative. Thomson and Caves (1993) use an MNL model to forecast the market share of a new airport in North England. The results reveal that access time, flight frequency, and the number of seats on the aircraft are significant factors for airport choices. In addition, access time is the most important for travelers living close to the airport, whereas flight frequency is more important for travelers living further away.

Outside the US and the UK, Ozoka and Ashford (1989) use an MNL model to predict the effect of building a third airport in a multi-airport region in Nigeria. The results show that access time is significant. Their study indicates that the choice of location plays a crucial role in the success of an airport, along with the provision of good ground access facilities. In Japan, Furuichi and Koppelman (1994) use a NL model for departure and destination airport choice. They find significant impacts of access time, access journey costs and flight frequency on airport choice.

However, airport choice studies do not give an airline's management enough planning information because they do not have detail on carrier service attributes in different markets. Understanding the needs and wants of individual travelers is essential for strategic planning in the airline industry. A better understanding of air traveler demand aids carriers in performing route schedule analysis, price elasticity studies, and equipment purchasing decision, and so on. Gaining insight on air travel demand thus improves carriers their revenue management, schedule efficiency, and profitability. As a result, an accurate air travel choice model is a robust and powerful tool for carrier planning and decision-making both at the operational and strategic level. A large number of studies then apply discrete choice models to focus on the allocation of city-pair airport travel demand.

Nason (1981) develops an MNL model for airline choice. He uses stated preference survey data obtained by giving respondents a series of questions and asking them to choose which airline has the best service to carrier service attributes. His model includes explanatory variables such as socioeconomic passenger characteristics and reported service attribute ratings. The model therefore predicts airline choice as a function of these explanatory variables. Nako (1992) examines business travelers' choice of airline as a function of the airlines' frequent flyer program. He uses disaggregate travel data from 1990 to 1991 to quantify the impacts of FFPs on the business travelers; choice of airline. His results reveal that FFP has a positive impact upon airline choice, and this impact also varies across airlines. In addition, the effectiveness of a program varies with the presence which the corresponding airline has in the city in which the participating member resides. Proussaloglou and Koppelman (1995) develop MNL models for city-pair carrier choice both pooled across purpose and partially segmented between business and leisure travel.

Previous studies on air travel demand have contributed much to the understanding of the relationship between carriers' city pair service attributes and their city-pair market share. Nevertheless, more disaggregate allocation of city-pair air travel demand to the flight, itinerary, and booking class level is required for accurate strategic planning. Proussaloglou and Koppelman (1999) develop MNL models of carrier, flight and fare class choice. The models measure traveler's tradeoffs among carrier market presence, quality of service, FFP membership, fare levels, travel restrictions and schedule convenience. Stated-preference data obtained from mail and telephone surveys are used to estimate the models so that the authors can assess the relative importance of factors that influence trader's choice behavior, and identify differences in the relative importance of those factors among segments of the air travel market.

The results reveal that carrier market presence has a strong effect on traveler's choice. This is an advantage of airline providing service to a range of destinations from a specific airport. In addition, there is positive impact of the quality service, indicating the importance of traveler's perceptions of a carrier's service quality on carrier choice. Unsurprisingly, frequent flyer program also has a positive impact on airline choice because it induces passenger loyalty. The authors also estimate the premiums that travelers are willing to pay to decrease scheduled delay or to travel on the carrier of their frequent flyer program membership. They report that business passengers are more time sensitive and less price sensitive than leisure passengers. Business passengers are willing to pay $60 per hour of reduced scheduled delay compared to only $17 for leisure passengers. Moreover, business passengers place more importance on frequent flyer programs. They are willing to pay a $21 premium to travel on airline which FFP they already belong to and $52 more to fly with the airline of their most preferred FFP, while for leisure passengers those values are only $7 and $18 respectively.

Last, Coldren et al. (2003) investigate the influence of various service attributes on itinerary choices. Their various itinerary service characteristics include level of service, connection quality, aircraft type and size, departure time, carrier market presence, fares. The authors estimate aggregate air travel share models at the city-pair level for all city-pairs in the US. The models determine the factors that influence airline ridership at the itinerary level and support carrier decisive making. By using aggregate MNL models, the

authors find that the provision of higher levels of service, such as more nonstop and direct itineraries is the most important among service attributes. This result suggests the potential market value of moving away from the dominant hub-and-spoke system of most legacy network carriers.

4.4 Summary

In this chapter, we have described the most widely used discrete choice models, logit and nested logit, with their respective strengths and weaknesses. Moreover, we have showed how these models have been used to study a variety of choice situations that air travelers may face including the choice of an airport, an airline, a flight schedule and a fare class. Next chapters will describe source of data and survey methodology. Basic descriptive statistic analyses based on surveyed data will be discussed.

Chapter 5 Data

In this chapter, we discuss our data methodology. Data used in this thesis were obtained using interview survey questionnaires applied to leisure and business passengers on short haul domestic trips in Thailand. Face-to-face interviews were conducted to obtain the passenger's socioeconomic profile and the chosen airline's attributes. Based on the survey data, descriptive statistics for both leisure and business passengers are reported. The survey data are used in empirical modeling to examine the degree of demand substitutability between network and low cost carriers, and to assess the risk of cannibalization between a major network carrier and its low cost offshoot.

5.1 Data methodology

Similar to a methodology adopted by Mason (2001), and O'Connell and Williams (2005), our data were obtained from two large groups of passengers: one flying with local low cost carriers, and the other flying with an incumbent flag carrier. Each group also consists of leisure and business passengers. The passengers surveyed chose airlines which included Thai Airways (TG), and three local low cost carriers (LCCs), Nok Air (NOK), Thai AirAsia (TAA), and One-Two-Go (OTG) which are operating in the recently liberalized Thai domestic market. The airport where permission was granted to undertake the passenger survey was Bangkok Int'l Airport in Thailand. Approval was granted by Airports of Thailand (AOT), the company that operates Bangkok Int'l Airport and other major international airports in Thailand. Bangkok Int'l Airport had a throughput approximately 45.11 million passengers in 2004. At the airport, face-to-face interviews were conducted at the departure gates for short haul service in domestic terminal. Passengers at the domestic terminal were customers of all four airlines surveyed.

The period of survey was from November 1 to December 9, 2005. During the first week, pilot studies were conducted to refine the questionnaire. It was found that the last page of the survey was often omitted by respondents and some questions were not fully understood because of a language barrier. The survey thus had to be revised and adjusted so that two types of questionnaire separately designed for leisure and business passengers could be self completed by short haul domestic passengers (copies of each questionnaire used are contained in the Appendix). It was important that all questions were understood

and fully answered. The author then assisted some respondents with language ambiguity and in answering any issues raised regarding the open-ended questions, in which each respondent could give a personal response in his or her own words.

Key pieces of data for modeling were fare and flight frequency. While the data on daily frequency of a chosen airline were obtained from an airline website, the data on fare of a chosen airline were collected through the questionnaires. Moreover, attitude statements regarding airline product attributes, various socioeconomic and behavioral data were collected. An attitude rating scale was used of each airline attribute on a nine point ranked continuum scale. Revealed preference (RP) data was collected to examine market shares of Thai domestic aviation market and to capture information on real choices. This is because our interest is in market share prediction and deriving own and cross price elasticities.

A total of 1067 responses were collected at the airport, 63% of which were leisure passengers and 37% of which were business passengers. After removing responses from individual passengers who were on award redeeming flights, airline employees and some further data cleaning, a final sample of 910 individual responses was obtained. These divided into 344 business passengers and 566 leisure passengers, with 320 (35%) of which comprised passengers using TG (see Table 5.1 for data breakdown). Out of total responses, 590 or 65% of which represent passengers of the low cost carriers: Nok Air (28%), Thai AirAsia (23%), and One-Two-Go (14%).

Table 5.1: Number of questionnaires for each carrier

Original data						
	Business	**Leisure**	**All**	**Business(%)**	**Leisure(%)**	**All(%)**
TG	196	277	473	18.37	25.96	44.33
Nok	86	166	252	8.06	15.56	23.62
TAA	74	141	215	6.94	13.21	20.15
OTG	46	81	127	4.31	7.59	11.90
Total	402	665	1067	37.68	62.32	100
Adjusted data						
TG	139	181	320	15.27	19.89	35.16
NOK	86	166	252	9.45	18.24	27.69
TAA	74	137	211	8.13	15.05	23.19
OTG	45	82	127	4.95	9.01	13.96
Total	344	566	910	37.80	62.20	100.00

Both groups of respondents using TG and LCCs were traveling from Bangkok to the following destinations: Chiang Mai, Chiang Rai, Phuket, Hat Yai, Surat Thani, Ubon Ratchathani, and Udon Thani. All domestic flights are less than 2 hour flying out of Bangkok, regarded as short haul services. Popular tourist destinations such as Chiang Mai, Hat Yai and Phuket are served by all carriers surveyed, whereas some routes have either two or three operators serving. (see Table 5.2 for routes used in modeling analysis).

Table 5.2: Destinations served by TG and LCCs in Thailand

Destination	Operator
Chiang Mai	TG, Nok Air, TAA, OTG
Chiang Rai	TG, TAA, OTG
Hat Yai	TG, Nok Air, TAA, OTG
Phuket	TG, Nok Air, TAA, OTG
Surat Thani	TG, OTG
Udon Thani	TG, Nok Air, TAA
Ubon Ratchathani	TG, TAA

5.2 Constructing non-chosen alternative choice data

The passenger survey dataset contains information on the actual choice of a given set of travelers including fare and flight information. However for a modeling analysis, this needs to be complemented by dataset describing attributes of the different alternatives contained in the travelers' choice set. In particular, important attributes such as daily flight frequency and fares of the non-chosen carrier on a given date of departure, period of booking and route are necessary for modeling.

To construct the data on the non-chosen alternative in revealed preference data, we took the average for the fare levels of each observed alternative and substitute these averages as the values for the attribute levels of the non-chosen alternatives for those who did not choose them. Therefore, for each respondent, while retain the information on the individuals' chosen carrier, we have generated data on the non-chosen carriers by using the averages of the non-chosen carrier's fare levels as chosen by the other respondents given a period of booking, date of departure and destination. From official airline websites, we obtained the number of daily flights of non-chosen airline operating on the selected routes for the time period of the survey.

It should be noted that our strategy of taking the averages of the fare level definitely reduces the variance of the fare level distribution in the sampled population. As a result,

these averages would provide a smoother set of fare levels than what would be the levels if we knew the actual levels available to the person who has the alternative as the non-chosen. Our constructed data then may not perfectly represent the carrier fares actually faced by respondents to the extent the traveler may have faced a somewhat different fare for non-chosen alternatives than is contained in the data set. This was controlled for to some degree by observing how far before the flight the reservation was made. Therefore, the procedure used will provide relatively accurate values for fares on non-chosen alternatives. An alternative way of capturing this information on the non-chosen alternative is to synthesize the data. However, this approach requires expert knowledge as to how the data are to be synthesized. The norm is to use known information such as travel distances or other socioeconomic characteristics and to condition the synthesized data on these (Hensher et al., 2005). But like our approach, synthesizing the data still leaves one open to the criticism that the created data may not represent the carrier information actually faced by respondents and as such the estimation process will be tainted. In the following sections descriptive statistics of survey data are provided for both business and leisure passengers.

5.3 Descriptive statistics of survey data

5.3.1 Business survey analysis

As expected, low cost carriers have attracted a large number of young and middle aged business people, with 5.9 % of passengers using LCCs being in the under 25 years age group, and 61.5% being in the 25-40 year age group compared to 5% and 57% of TG passengers respectively. However, older passengers (more than 40 year old) tend to prefer the incumbent flag carrier, accounting for 38% of TG passengers surveyed (see Table 5.3 for profile of business passengers surveyed). Unsurprisingly, a large proportion of high income business passengers are willing to pay higher fares to travel with Thai Airways. Nearly 65% of TG passengers surveyed earn more than 30,000 baht per month, while the majority of LCC passengers surveyed (42%) earn less than 30,000 baht of monthly income.

In addition, most business passengers whose companies paid for their tickets are likely to use Thai Airways compared to low cost carriers. 82% of TG passengers' trips were sponsored by their own companies, while the proportion of self paid passengers using

LCCs was double of those traveling TG. Moreover, the type of accommodation stayed at destination shows distinct difference between business passengers using Thai Airways and low cost carriers. Nearly 73% of TG passengers stayed in hotels, while approximately half of LCC passengers stayed at their parent, friend, company and own house. Business travelers usually tend to travel singularly. We found that about 70% of respondents using both types of carriers were traveling alone.

Table 5.3: Profile of business travelers of TG and LCCs

Nationality	**TG (%)**	**LCCs (%)**	**Nok (%)**	**TAA (%)**	**OTG (%)**
Non Thai	5.8	2.0	2.3	1.4	2.2
Thai	94.2	98.0	97.7	98.6	97.8
Age					
under25	5.0	5.9	5.8	8.1	2.2
25-40	56.8	61.5	60.5	67.6	53.3
40-60	38.1	32.2	32.6	24.3	44.4
above 60	0.0	0.5	1.2	0.0	0.0
Income					
less than 10K	4.3	2.9	3.5	2.7	2.2
10-30K	30.9	42.0	37.2	48.6	40.0
30-50K	31.7	27.8	25.6	27.0	33.3
50-70K	14.4	11.2	11.6	12.2	8.9
more than 70K	18.7	16.1	22.1	9.5	15.6
Ticket sponsor					
yourself	14.4	35.6	30.2	29.7	55.6
your company	82.0	62.4	67.4	67.6	44.4
your client	3.6	2.0	2.3	2.7	0.0
Accommodation					
your house	10.1	15.6	19.8	10.8	15.6
parent's house	1.4	9.8	7.0	9.5	15.6
friend's house	2.9	5.9	7.0	5.4	4.4
hotel	72.7	55.6	52.3	62.2	51.1
company's house	5.8	9.3	9.3	9.5	8.9
others	7.2	3.9	4.7	2.7	4.4
Number of company					
0	70.5	69.8	66.3	75.7	66.7
1	12.9	21.0	22.1	18.9	22.2
2-3	6.5	7.8	8.1	5.4	11.1
4 or more	10.1	1.5	3.5	0.0	0.0
Period of booking					
>2 months	3.6	1.0	0.0	2.7	0.0
1 month	2.9	5.9	4.7	5.4	8.9
2-3weeks	19.4	14.1	11.6	18.9	11.1
<1week	64.0	57.1	60.5	55.4	53.3
today	10.1	22.0	23.3	17.6	26.7

The price is an area where some low cost carriers have segmented leisure and business travelers. While TG and One-Two-Go have a simple flat fare per route policy, Thai AirAsia has used a number of different fare classes and ticket restrictions. It sells their lowest fares first and then increases fares as the departure date draws closer. Similar price discrimination is also practiced by Nok Air with their further introduction of business fares that are most suited to meet the ticket flexibility needs of business travelers. In this way, business travelers that can plan ahead can book a cheap one day return trip. The nearer the departure date, travelers will find the prices significantly higher than the lead in fare particularly on early morning departures. However, our investigation on the period of booking finds that Thai business passengers generally do not tend to seek lower fares through advance booking, with 74% of TG passengers booking tickets less than 1 week before departure, and 80% of LCC passengers doing the same.

The findings of earlier research (Mason, 2000; 2001) reveal that company size has an influence on the willingness-to-pay of business passengers, and on the value placed on in-flight service, flight frequency and frequent flyer programs. These results imply that the corporate profile of the sample drawn from travelers using network carriers would have a greater proportion of large companies than those travelers using low cost carriers. Table 5.5 illustrates corporate profile of business travelers using both Thai Airways and low cost carriers. There seems to show some evidence that the corporate profile of TG passengers surveyed is more heavily skewed towards larger companies (more than 100 employees) than the passengers using low cost carriers.

Mason (2001) also concludes that travelers particularly from small and medium sized companies are increasingly price sensitive. Low cost carriers are more likely to be successful in attracting business from small and medium sized companies. We thus investigate whether Thai business passengers using LCCs are increasingly price sensitive. Passengers were asked to select from a list the reasons for selecting the carrier they did. Reasons given included low fare offering, flight schedule, and in-flight service, pre-seat assignment, destination availability, FFP reward and business lounge. In this set of questions, passengers were allowed to choose more than one reason (see Table 5.4 for reasons why the carrier was selected).

The passengers using TG indicated that the airline was selected primarily because of flight schedule (70%), FFP award (37%), pre-seat assignment (33%) and in-flight service (25%), while low fare offering or promotion accounted for only 2.2%. In contrast, nearly 50% of passengers using TAA and OTG stated that low fare offering was the reason of selecting the airline. A slightly lower proportion (35%) of the passengers using Nok Air pointed out the same reason. This is possibly because Nok Air is positioning itself as a premium low cost carrier, charging 15-20% higher fares compared to other low cost competitors. Though these results shows that Thai business passengers using LCCs are fairly price sensitive, they are still time sensitive. Flight frequency is the most common reason (65%) the LCC passengers indicated why the carrier was selected.

Table 5.4: Reasons of business traveler why the carrier was selected

Was the carrier selected because of	TG (%)	LCCs(%)	Nok (%)	TAA (%)	OTG (%)
low fare offering	2.2	42.4	34.9	47.3	48.9
flight schedule	66.9	64.4	68.6	66.2	53.3
in-flight service	25.2	5.9	3.5	0.0	20.0
pre-seat assignment	33.1	30.2	44.2	8.1	40.0
destination availability	6.5	7.3	4.7	8.1	11.1
FFP reward	36.7	3.4	1.2	1.4	11.1
business lounge	6.5	0.5	0.0	1.4	0.0

The results from Table 5.4 also show the importance that Thai people place a pre-seat assignment in selecting the carrier. Except TAA, all carriers surveyed offer pre-assign seat at reservation to customers; some 33% of TG passengers and approximately 40% of Nok Air and of OTG passengers stated that this reason was taken into account in carrier selection. Table 5.4 further shows the influence of FFP reward on airline selection. Besides TG, only OTG has a simple "buy nine get one free" frequent flyer scheme. The importance of their frequent flyer programs resulted in 37% of TG passengers and 11% of OTG passengers selected the carrier because of the FFP reward.

Corporate purchasing infrastructure and behavior were also examined including whether a company employs a travel manager, a travel department, or have a travel policy. Mason (1999) shows the growing influence on traveler decision making behavior by the employer company. Table 5.5 indicates that TG travelers are more likely to be subject to travel policy prescriptions than those using the LCCs. Of the TG travelers surveyed, 22% worked for companies that had a corporate travel policy. Table 5.5 also reveals that TG

travelers were more likely to work for a company with a travel manager or travel department than those using the LCCs. The respondents were asked what their travel policies said about use of low cost carriers. Only 4.2% of those traveling Thai Airways indicated that their companies prevented the use of low cost carriers, with 23.4% of travelers stating that their companies encouraged the use of low cost carriers[8].

Table 5.5: Corporate profile of business travelers of TG and LCCs

Corporate travel policies	TG(%)	LCCs (%)	Nok (%)	TAA (%)	OTG (%)
Company size					
self employed	2.9	10.2	12.8	6.8	11.1
1-24	15.1	26.3	31.4	21.6	24.4
25-99	19.4	19.5	20.9	20.3	15.6
100-999	39.6	25.9	18.6	32.4	28.9
1000-5000	13.7	11.7	9.3	12.2	15.6
5000+	9.4	6.3	7.0	6.8	4.4
Corporate travel policy					
no	77.7	87.3	88.4	89.2	82.2
yes	22.3	12.7	11.6	10.8	17.8
Travel Manager /Department					
Has neither TM nor TD	74.8	83.9	82.6	85.1	84.4
Has either TM or TD	17.3	12.2	14.0	12.2	8.9
Has both TM and TD	7.9	3.9	3.5	2.7	6.7
Travel policy view of LCCs					
Prevent their use	4.3	2.9	3.5	1.4	4.4
Encourage their use	24.5	34.1	44.2	24.3	31.1
Holds no opinions on their use	71.2	62.9	52.3	74.3	64.4

Table 5.6 examines the flight selection and booking behavior, and shows that almost 85% of TG travelers and 93% of LCC travelers selected their own flight. After the decision has been made there seems to be clear differences in the method of booking between TG and LCC travelers. TG travelers had slightly higher proportion of using their secretary to book flights, 29% compared with 20% of those using LCCs. Clearly, a much greater proportion of the travelers using the LCCs booked their own flights, with 68% compared to only 48% of those using TG. The group of TG travelers also depends more highly on travel departments (15%) and travel agents (5%) to book travel.

Furthermore, Table 5.6 reveals distinct differences between the two groups in terms of booking channels. A large proportion of the TG travelers have their travel booked via a

[8] This finding will be of concern to the network carrier, Thai Airways.

travel agent (52.6%), while a much smaller proportion of LCC customers had their travel booked at a travel agent (14.1%). This small proportion of travel agent booking comes from a number of agents that will book travel for customers via low-cost airlines' websites for a service fee and this may be well incorporated in any management fee paid by a corporate planer to an agency. The vast majority of the sales for low cost carriers were through their three main channels; the internet website (32%), call center (27%), and counter service (25%). The results further show that Thai AirAsia has been successful in gaining a high proportion of their sales on the internet (about 42%), while Nok Air has successfully operated call center with 38% of ticket sales and One-Two-Go has strategically focused on sales through counter service (47%). For TG travelers, besides using the travel agent channel, direct sales through counter service was next most popular channel (19%) and other channels used in small amounts.

Table 5.6: Travel purpose and booking behavior of business travelers

Purpose of travel	TG (%)	LCCs (%)	Nok (%)	TAA (%)	OTG (%)
Sales/marketing	15.8	17.6	17.4	17.6	17.8
Internal meeting/visit	23.0	22.9	24.4	24.3	17.8
Training	7.9	7.3	4.7	9.5	8.9
Emergency/problem solving	3.6	6.8	12.8	0.0	6.7
Conference	33.1	20.5	18.6	24.3	17.8
Others	16.5	24.9	22.1	24.3	31.1
Booking behavior					
Traveler selected flights	86.3	92.7	94.2	91.9	91.1
Flight booking					
Traveler	46.0	68.3	64.0	67.6	77.8
Secretary	30.9	20.0	24.4	14.9	20.0
Travel agent	6.5	1.5	1.2	2.7	0.0
Travel department	13.7	8.3	9.3	10.8	2.2
Client	2.9	2.0	1.2	4.1	0.0
Booking channel					
Airline website	9.4	31.7	31.4	41.9	15.6
Airline call centre	15.1	27.3	38.4	13.5	28.9
Airline counter service	19.4	24.9	15.1	23.0	46.7
Travel agent site	53.2	14.1	14.0	17.6	8.9
Client	2.9	2.0	1.2	4.1	0.0

Investigation of the primary purpose of business travel is also provided in Table 5.6. Interestingly, both TG and LCCs had similar proportion of travelers making trips on sales/ marketing, internal meeting/visit, and training. However, the main difference between TG and LCCs is in a large proportion of TG travelers going to conferences relative to LCCs; 34% compared to 21% respectively.

Table 5.7presents a comparison in usage behavior toward network and low cost carriers. While almost all TG travelers had used TG for business trips before, a small number of LCC travelers (18%) had never used TG before. This small group may be business people who have begun traveling for business as the prices offered on low cost carriers make such travel worthwhile. It also provides some evidence of low cost carriers in generating new business travel. A large proportion of the LCC travelers had previously used a low cost carrier before, about 51% with leisure and 74% with business trips. These figures are some 20-30% higher than those traveling TG.

Table 5.7: Use of TG and low cost airlines for business travelers

Use of TG and LCCs	TG(%)	LCCs (%)	Nok (%)	TAA (%)	OTG (%)
Used TG before	96.4	82.0	88.4	81.1	71.1
Used a low cost airline for leisure	31.7	50.7	50.0	50.0	53.3
Used a low cost airline for business	42.4	73.7	79.1	71.6	66.7
Will use a low cost airline for business in the future					
no	12.9	1.5	1.2	1.4	2.2
yes	38.1	78.5	81.4	77.0	75.6
uncertain	48.9	20.0	17.4	21.6	22.2
Economy class of TG offers value for money					
no	47.5	52.2	51.2	48.6	60.0
yes	32.4	28.8	32.6	29.7	20.0
uncertain	20.1	19.0	16.3	21.6	20.0
In the event of a cut in travel budget, you would					
Reduce trip	15.1	9.8	12.8	8.1	6.7
Take fewer business class flights	2.9	3.4	5.8	1.4	2.2
Same no. of flights but on LCC	54.0	68.8	61.6	74.3	73.3
Not matter	28.1	18.0	19.8	16.2	17.8

When considering whether TG travelers have used a low cost carrier for making a business trip, 41% of those travelers had never used a low cost carrier for making such a trip. This result may be viewed as providing an opportunity for low cost airlines to make further move into the traditional market of Thai Airways. Alternatively, it may show that these travelers are brand loyal and happy with the service provided by TG, and then are unlikely to switch traveling behavior. To evaluate which view is more likely, we asked the respondents whether they believed Thai Airways offered value for money in economy class for short haul domestic travel. Nearly 50% of TG travelers surveyed thought that economy class service did not offer value for money for short haul domestic trips, while 20% of those were still uncertain. This result implies that low cost carriers are more likely to attract these travelers. This view can be further supported by the findings that almost

40% of the TG travelers would consider using low cost carriers for business travel in the future, though 50% of those were still uncertain.

We further asked business travelers to consider what behavior would be most likely if their travel budgets were decreased. While only 10% of LCC travelers would reduce the amount of travel, twice that proportion of those using TG (20%) said they would react in this manner. The result suggests that during any economic downturn, low cost carriers would not be affected as much as Thai Airways. Moreover, 50% of TG travelers indicated that they would take the same number of trips but switch to LCCs. Low cost carries thus could also rely on switching passengers during poor economic periods.

5.3.2 Leisure survey analysis

Table 5.8 presents that most LCC passengers surveyed were local people, with more than 92%, while international passengers composed of 20% TG passengers. Table 5.8 further shows that the LCCs attracted a high number of younger to early middle age leisure passengers (25- 40 years old), with more than 60% of LCC passengers surveyed. Looking at the range of monthly income of leisure passengers surveyed, we found that 50% of TG passengers earn more than BHT 30,000 per month, while nearly 65% of LCC passengers surveyed earn less than BHT 30,000 of monthly income. This result reveals that high-income leisure passengers were more likely to place more value on TG attributes such as in-flight comfort, flight frequency and frequent flyer program. Moreover, there is a high proportion of TG passengers whose parents or spouse paid for their trips. This group accounted for 28% of TG passengers while 83% of those using LCCs paid their own trips.

To further assess whether leisure passengers using TG are more price insensitive than those using LCCs, we asked passengers reasons for selecting the carrier they were taking. Table 5.9 shows the results of this set of questions. Clearly, leisure passengers using TG selected the airline mainly because of its flight schedule (67%), pre-seat assignment (38%), and FFP award (32%), while low fare offering accounted for only 14%. However, for the passengers using LCCs, the most common reason is low fare offering (33%) following by pre-seat assignment (26%). The influence of pre-seat assignment on airline selection making for both business and leisure passengers using TG and LCCs provides a conclusion that Thai people generally do prefer to take a carrier which offers this service.

Another interesting finding is the characteristics of Thai AirAsia leisure passengers. Among the LCCs surveyed, Thai AirAsia is the only low cost carrier that strictly adheres to low cost business model. It does not offer FFP, in-flight service, business lounge and pre-seat assignment. It also has the widest route network. In addition, the airline does not primarily operate yield management but maximizes seat capacity or load factor. As a result, it launches promotional discounts very often just to fill as many seats as possible. The answers from Thai AirAsia passengers show that short haul domestic passengers were willing to trade off low fare offering with any unnecessary airline attributes. Overall, the passengers surveyed took Thai AirAsia simply because of its low fare offering (55%) and flight schedule (62%).

We thus conclude that leisure passengers using LCCs are more price or cost conscious than leisure passengers using TG. This conclusion is further supported by the results of investigations on the type of accommodation and period of booking. Passengers were asked about the type of accommodations used at destination. This question reveals clear differences between passengers using TG and LCCs. A total of 47% of TG passengers stayed in hotels, while nearly 65% of LCC passengers stayed in places such as parents, friends, and their own houses. Nok Air and Thai AirAsia are the only two carriers using a pricing system based on supply and demand of a given flight in which prices increase as date of departure approaches. As a result, these two low cost carriers had larger proportions of passengers booking tickets at least 2-3 weeks in advance than that of One-Two-Go. Table 5.8 shows that 62% of TG passengers and 80% of OTG passengers booked tickets less than 1 week before departure. This result reflects the fact that both carriers use a fixed pricing strategy and allow passengers to change date and flight schedule without any surcharge, unlike Nok Air and Thai AirAsia.

Table 5.8: Profile of leisure travelers of TG and LCCs

Nationality	TG(%)	LCCs(%)	Nok(%)	TAA(%)	OTG(%)
Non Thai	19.6	6.2	6.0	8.0	3.6
Thai	80.4	93.8	94.0	92.0	96.4
Age					
under25	21.7	19.9	18.1	20.3	22.9
25-40	51.9	63.0	62.0	64.5	62.7
40-60	21.2	16.5	19.3	14.5	14.5
above 60	5.3	0.5	0.6	0.7	0.0
Income					
less than 10K	10.6	13.7	12.7	13.0	16.9
10-30K	38.6	50.6	45.8	55.1	53.0
30-50K	18.5	16.5	18.1	14.5	16.9
50-70K	11.1	8.8	10.8	8.7	4.8
more than 70K	21.2	10.3	12.7	8.7	8.4
Ticket sponsor					
your parent	14.3	9.6	10.2	6.5	13.3
yourself	69.3	83.2	82.5	86.2	79.5
your spouse	14.3	5.9	6.0	7.2	3.6
your friend	1.6	1.3	1.2	0.0	3.6
others	0.5	0.0	0.0	0.0	0.0
Accommodation					
your house	15.3	21.7	21.1	23.2	20.5
parent's house	24.9	27.4	24.1	28.3	32.5
friend's house	12.2	16.0	16.3	15.9	15.7
hotel	46.6	33.6	36.7	31.2	31.3
company's house	1.1	1.3	1.8	1.4	0.0
Number of company					
0	51.9	64.1	68.1	60.9	61.4
1	29.6	23.0	21.1	23.9	25.3
2-3	13.2	8.8	6.0	10.1	12.0
4 or more	5.3	4.1	4.8	5.1	1.2
Period of booking					
>2 months	12.7	4.1	2.4	8.7	0.0
1 month	13.8	5.2	3.6	8.0	3.6
2-3weeks	11.6	15.8	15.7	15.2	16.9
<1week	45.0	47.3	48.8	47.1	44.6
today	16.9	27.6	29.5	21.0	34.9

Table 5.9: Reasons of leisure traveler why the carrier was selected

Was the carrier selected because of	TG(%)	LCCs(%)	Nok(%)	TAA(%)	OTG(%)
low fare offering	14	33.1	46	55	27
flight schedule	66.7	66.1	70.5	62.3	63.9
in-flight service	26.5	5.2	3.0	0.0	18.1
pre-seat assignment	37.6	26.4	41.0	8.0	27.7
destination availability	4.2	2.3	2.4	2.9	1.2
FFP reward	31.7	2.3	0.0	0.0	10.8
business lounge	5.3	0.0	0	0	0

Table 5.10 reports journey propose, and as expected, the biggest leisure market segment comes from those passengers who regularly visit friends, family and relatives (VFR). Low cost carriers' VFR traffic accounted nearly 50% of its total respondents, while that of TG fewer than 5%. This segment represented the largest number of leisure passengers carried on every airlines surveyed. The growth of this segment is primarily due to a large number of non-Bangkok born people living and working in Bangkok, and for Thai people time spent with family and friends is culturally a very important leisure activity. Sightseeing travel accounted for the second largest leisure market, with almost the same proportion of passengers using TG and low cost carriers (33%). The growth of sightseeing market is driven by the notion that the likelihood of leisure travel will go up as the size of the middle income class increases.

Table 5.10: Travel purpose and booking behavior of leisure travelers

Purpose of travel	TG(%)	LCCs(%)	Nok(%)	TAA(%)	OTG(%)
VFR	44.4	48.8	46.4	50.7	50.6
sightseeing	34.4	32.0	30.7	33.3	32.5
education	4.8	6.2	7.2	5.1	6.0
religion	4.2	6.2	7.2	5.1	6.0
shopping	2.6	2.3	4.2	0.7	1.2
others	9.5	4.4	4.2	5.1	3.6
Booking channel					
airline website	10.1	25.3	26.5	35.5	6.0
call centre	12.2	26.9	34.3	23.2	18.1
counter service	31.7	37.0	30.7	33.3	55.4
travel agent	46.0	10.9	8.4	8.0	20.5

The distribution channels used by the leisure passengers surveyed are presented in Table 5.10. Investigation of the booking channels reveals clear differences between the two groups of passengers using TG and LCCs. Similar to an analysis of business passengers surveyed, a large proportion of TG travelers have their travel booked via a travel agent (46%), while a much smaller proportion of LCC customers had their travel booked at a travel agent (11%). This latter group of customers is required to pay a service fee to travel agent who book travel via low cost airline's website. The large majority of sales for the low cost carriers were through their three main channels; the internet (25%), call center (27%), and counter service (37%). For leisure traveler using TG besides using the travel agent channel, again direct sales through counter service was next most popular channel (32%). This pattern was found with leisure passengers using OTG as well.

Unlike its peer legacy carriers such as Singapore Airlines, Thai Airways has a limited functional e-commerce website. The contrast is more apparent between TG and Thai AirAsia with the latter's passengers predominantly using the Internet to book their tickets (36%) compared to 10% of those using TG. In addition, TG had a very small proportion of tickets sales through the Internet and call centre, when compared with 27% of online sales and 34% of telesales of Nok Air, its own low cost subsidiary. It should be noted that TG passengers are given 5% discount for tickets booked online. The discrepancy result reflects that TG has not run an aggressive marketing campaign in promoting online sales for domestic travel. In addition, TG has not seriously attempted to cut costs on travel agent commission

The results from booking behavior of the passengers show that Nok Air passengers are likely more accessible to call centre whereas TAA passengers prefer to use an Internet. Moreover, a high proportion of surveyed OTG passengers booking via its counter service (55%) reflect an emphasized booking channel of this airline. The results also support the findings of Gillen and Lall (2002), as the majority of low cost carrier's ticket sales were via travel agents and call centers.

Similar to their European and US counterparts, apparently Asian low cost carriers are taking advantage of online distribution and direct sales to generally avoid travel agent. AirAsia is the first airline in Asia to launch Internet booking with online payments and ticketless travel. Thomas (2003) reported that 45% of its bookings were made through the Internet by May 2003. Moreover, the carrier is pioneering, being the first airline worldwide to offer SMS booking, and is processing 2000-3000 messages per month (O'Connell and Williams, 2005). In Indonesia, Air Asia passengers can also book tickets at nation-wide post offices, another alternative distribution channel.

In Thailand, besides direct sales distribution channel, LCCs are competing to attract passengers with variety and convenience of payment methods. After booking ticket via call centers, LCCs enable passengers to pay ticket fares at convenient stores, 7-11 and supermarkets. Nok Air passengers are also able to pay for their tickets at bank's ATMs. The variety and convenience of ticket payment encourage more passengers without credit cards to travel and book tickets via their call centers.

Thus, a massive discrepancy between the booking profiles of TG passengers and those of LCC passengers reflects the legacy incumbent's inability to implement change particularly in technology and keep pace with its innovative LCC competitors. Though use of the Internet in Thailand is not widespread compared in Singapore, our results provide evidence that Thai passengers will seek out the available booking channels to access lower fares.

Table 5.11 provides a comparison in usage behavior towards TG and LCCs. While almost 85% of TG travelers had used TG for either business or leisure domestic trips before, a fairly large proportion of LCC travelers (30%) had never used TG before. This group may be local people who have begun traveling for leisure as the prices offered on low cost carriers make such travel affordable. This result provides some evidence that the LCCs generate new leisure traffic, passengers who had never flown before. Undeniably, the brand perception of lower fares, extensive network, high advertising campaigns, and 24 hour booking via the Internet is pushing the Thai low cost carrier's leisure market. Table 5.11 also shows that the majority of the LCC travelers for leisure travel had previously used a low cost carrier before. This figure is some 20% higher than those travelers using TG. A similar pattern is found when considering whether travelers have used a low cost carrier in the past for making a business trip. Of the leisure travelers using TG, 85% had never used a low cost carrier for making such a trip.

This statistic may show that these travelers are happy with services provided by TG, and are unwilling to switch traveling behavior. Alternatively, it may be viewed as an opportunity for LCCs to make further in-road into the leisure market of TG. Again, we assess which view is more likely by asking the TG travelers whether they believed TG offered value for money for short haul travel. Interestingly, nearly 30% of travelers thought that the ticket they paid did not offer value for money for short haul, while 20% of those were uncertain. If these proportions of TG travelers keep growing, LCCs are more likely to attract these travelers. This view can be further supported by the finding that 34% and 23% of TG travelers would consider using LCCs for leisure and business travels respectively in the future, whereas about 25% of TG travelers stated that they would not use LCCs for both types of travel.

Table 5.11: Use of TG and low cost airlines for leisure travelers

Use of TG and LCCs	TG(%)	LCCs(%)	Nok(%)	TAA(%)	OTG(%)
Used TG before	84.1	71.3	81.3	63.0	65.1
Used a low cost airline for leisure	40.2	64.1	69.9	57.2	63.9
Used a low cost airline for business	14.3	35.7	37.3	33.3	36.1
Will use a low cost airline for leisure in the future					
no	17.5	2.3	1.8	3.6	1.2
yes	33.9	72.6	74.1	73.9	67.5
uncertain	48.7	25.1	24.1	22.5	31.3
Will use a low cost airline for business in the future					
no	26.5	9.6	10.2	8.7	9.6
yes	23.3	54.8	54.2	56.5	53.0
uncertain	50.3	35.7	35.5	34.8	37.3
Ticket prices you paid offers value for money					
no	28.6	9.8	7.8	9.4	14.5
yes	51.3	72.4	75.9	71.7	66.3
uncertain	20.1	17.8	16.3	18.8	19.3
In the event of a cut in travel budget, you would					
reduce trip	29.6	24.5	24.1	21.7	30.1
same trip but cheaper destination	15.3	12.4	10.8	13.0	14.5
same trip but on LCCs	54.0	63.0	65.1	65.2	55.4
not matter	1.1	0.0	0.0	0.0	0.0

We also asked travelers to consider what behavior would be most likely if their travel budgets were reduced. While 30% of TG travelers would reduce the amount of travel, similar proportion of those using LCCs (25%) said they would react in the same manner. The result from this question reveals that during any economic downturn, low cost carriers would be able to rely on other sources of leisure passengers as 54% of TG travelers indicated that they would take as many trips like usual but switch to low cost carriers.

5.4 Summary

In this chapter we have described our survey methodology and source of data used to investigate our questions of interest. Short haul domestic business and leisure passenger surveys were conducted at the domestic terminal of Bangkok's Int'l Airport from November 1 to December 9, 2005. Descriptive statistics of the survey data were analyzed for both types of travelers. Based on business traveler survey, LCCs have attracted a larger number of young and middle aged travelers compared to TG. Unsurprisingly, older

and higher-income business travelers are likely to use TG. This group of passengers may represent management executives of corporate.

Interestingly, 50 percent of TG business travelers thought that economy class of TG did not offer value for money, while 20 percent of its travelers were still uncertain. Moreover, about 40 percent of TG travelers would consider using LCCs in the future. These findings should be of concern for TG to its business market presence.

From leisure traveler survey, we have found that high-income travelers place value on TG attributes. TG travelers selected the carrier mainly because of its flight frequency, FFP, and seat assignment at reservation. However, LCC travelers chose to use a particular LCC because of its low fare offerings and seat assignment. Leisure passenger profiles also reveal that LCC leisure passengers would seek the lowest fare through pre-advance booking, unlike LCC business passengers.

In the next chapter, we report estimated results of demand model. We will analyze derived elasticity to investigate the degree of LCC penetration to TG's core business, in term of demand substitutability. Further market share simulation will be conducted to examine cannibalization risk between TG and NOK.

Chapter 6 Modeling results

6.1 Introduction

In order to examine the factors or drivers influencing an air travelers' choice of carrier for short haul domestic trips, discrete choice models, multinomial and nested logit (MNL and NL) models were used. In this chapter, we describe the final estimated models used, and report the results produced. The basic MNL and NL models estimated are described in detail. In order to capture the variations in taste among travelers, we estimated separate models for different traveler types; two separate models were estimated, dividing business and leisure travelers.

Recall that our data set was obtained from passenger survey questionnaires from respondents using and having the choice of Thai Airways and low cost carriers and who were traveling from Bangkok to the following destinations: Chiang Mai, Chiang Rai, Phuket, Hat Yai, Surat Thani, Ubon Ratchathani, and Udon Thani. The final usable data set from the passenger survey were divided into 344 business passengers and 577 leisure passengers. Based on this data set, we estimated the MNL and NL models for business and leisure travelers. In each model, the influence of important airline attributes was explored. These attributes were fare and frequency because they were found to have a consistently significant impact, according to air transportation literature reviewed in Chapter 4. Table 6.1-Table 6.3 show average fare and flight frequency of airlines serving in each route. In addition to these attributes, a number of passenger socioeconomic and demographic characteristics (SDG) were included to better understand passenger's decision making process. These variables were age, income level, number of people traveling together, TG's FFP membership, type of accommodation at destination, sponsor of the ticket, and past flying experience on different low cost carriers (LCCs) in both business and leisure trips. Table 6.4 and Table 6.5 shows the definition and descriptions of explanatory variables included in the models.

Table 6.1: Average fare of airlines for leisure passengers surveyed (BHT)

Fare paid by leisure passenger	Thai Airways (TG)		Nok Air (NOK)		Thai AirAsia (TAA)		One-Two-Go (OTG)	
Route	Min	Max	Min	Max	Min	Max	Min	Max
	Average		Average		Average		Average	
Bangkok-Chiang Mai	2538	2775	1250	2750	500.4	2407.5	1350	1600
	2572.3		1750.47		1609.18		1570.74	
Bangkok-Phuket	2874.7	3230	1450	2650	587.4	2621.5	1300	1600
	3180.56		1994.3		1674.68		1520.25	
Bangkok-Hat Yai	3276	3595	1450	2050	690	2300.5	1750	1850
	3577.27		1835.55		1563.23		1835.55	
Bangkok-Chiang Rai	2961	3245			887.4	2033	1350	1850
	3214				1563.19		1806.52	
Bangkok-Ubon Ratchathani	2380.2	2600			681	1712		
	2548.9				1449.4			
Bangkok-Udon Thani	2281.5	3181.5	1250	2050	650.4	1872.5		
	2481.07		1550.1		1342.42			
Bangkok-Surat Thani	2649	3045					1650	1850
	2979.5						1826.54	

Table 6.2: Average fare of airlines for business passengers surveyed (BHT)

Fare paid by business passenger	Thai Airways (TG)		Nok Air (NOK)		Thai AirAsia (TAA)		One-Two-Go (OTG)	
Route	Min	Max	Min	Max	Min	Max	Min	Max
	Average		Average		Average		Average	
Bangkok-Chiang Mai	2538	2775	1350	2550	787.4	1979.5	1350	1600
	2742.78		1777.24		1507.09		1590.29	
Bangkok-Phuket	2947.5	3230	1450	2450	687.4	2835.5	1300	1600
	3214		1837.73		1755.89		1543.39	
Bangkok-Hat Yai	3276	3595	1650	2650	488.4	1872.5	1750	1850
	3562.63		2001.59		1472.74		1845.65	
Bangkok-Chiang Rai	2961	3245			1015.4	1550.4	1350	1850
	3184.92				1431.05		1811.53	
Bangkok-Ubon Ratchathani	2380.5	3280.5			466.4	1550.4		
					1391.58			
Bangkok-Udon Thani	2281.5	2790	1250	2450	136.4	1551.5		
	2475.16		1470.83		1236.39			
Bangkok-Surat Thani	2781	3377.2					1650	1850
	3002.89						1826.47	

Table 6.3: Daily flight frequency of airlines to destinations surveyed

Daily flight frequency	Thai Airways	Nok Air	Thai AirAsia	One-Two-Go
Bangkok-Chiang Mai	13	4	4	6-7
Bangkok-Phuket	11	2	4	2
Bangkok-Hat Yai	4	4	5	2
Bangkok-Chiang Rai	4		2	2
Bangkok-Ubon Ratchathani	3		2	
Bangkok-Udon Thani	3	3	1	
Bangkok-Surat Thani	2			1

Because it is impossible to capture all information that affects the choice of a given decision maker, the utility of a given alternative is not fully observed, and the unobserved part of utility or error term remains. By adding alternative specific constants (ASC) to the utility of alternatives, the mean of this random distributed error term is added into the observed utility function, such that the remaining error term has a mean of zero.

Therefore, these ASCs capture the mean effect of all unobserved variables, including general attitude toward an alternative, while the remaining error term captures the variation in this effect. For identification reasons, one of the ASCs has to be normalized. In the present analysis, the ASC of a low cost carrier, One-Two-Go (OTG) was set to zero in both the MNL and NL models.

In the next section, we present and comment on the model estimated results. We test two model structures (MNL and NL) to ascertain whether a correlation structure exits between the alternatives. The estimated models allow us not only to compute individual choice probabilities, which form the basis for demand forecasts, but also to derive own and cross elasticities with respect to fare and frequency for each model under analysis. We analyze the results from derived elasticity values in both leisure and business models. Our fundamental purpose is to investigate the degree of substitutability among carriers with respect to own and alternative fares and frequencies. With simulation, we further evaluate the effects of applying a 15 percent increase in fare prices and daily flight frequency to the market shares of each carrier in the choice set.

6.2 Model estimation and analysis of results

It should be noted that our sample domestic market shares of the alternatives does not match the actual known market shares. It was not possible to sample passengers in the same proportion as the actual carrier market shares. The sample we wanted was to be random. Table 6.6 presents the comparison between the sample and actual market shares of the alternatives. In order to allow our estimations to reflect the true market shares of

the alternatives, we applied endogenous weighting criteria[9] so that the actual market shares of the alternatives are represented by the choice variable within the data set.

After imposing endogenous weighting scale on the sample data, estimations proceed by maximizing the likelihood of the alternative choices made by the 344 business travelers and 566 leisure travelers in our sample. The MNL and NL models were estimated to derive cross elasticities across the alternatives to examine the degree of demand substitutability between network and LCCs and within LCCs in Thailand. The estimated models also allowed us to test how changes in attributes such as fare and frequency impact upon the market share for each of the alternatives. This simulation capability helped us to assess the risk of cannibalization between a major network carrier TG and its low cost offshoot Nok Air.

[9] The sample data is weighted by the ratio of actual and sample market share fractions so that the estimation process is adjusted to takes account of the weights in fitting the model. This approach provides us with more accurate models. After weighting the data, maximum likelihood estimator for our choice-based sample still yields consistent estimates for the parameters (see Ben Akiva and Lerman, 1985).

Table 6.4: Definition and Description of explanatory variables used in Leisure model

	Variable	Description and Definition	Mean	Min	Max
Attribute	FARE	One-way airplane ticket fare	2009.90	500.40	3595.00
	FREQUENC	Daily flight frequency	4.78	1.00	13.00
	FAREFREQ	Interaction between fare and frequency	10581.72	650.40	36075.00
	CHMAI	Destination chosen dummy-Chiang Mai	0.38	0	1
	PHUK	Destination chosen dummy-Phuket	0.15	0	1
	HYAI	Destination chosen dummy-Hat Yai	0.18	0	1
	CHRAI	Destination chosen dummy-Chiang Rai	0.07	0	1
	UBON	Destination chosen dummy-Ubon Ratchathani	0.06	0	1
	UDON	Destination chosen dummy-Udon Thani	0.15	0	1
	SURAT	Destination chosen dummy-Surat Thani	0.01	0	1
	FCHMAI	Interaction between frequency and CHMAI	2.67	0	13
	FPHUK	Interaction between frequency and PHUK	0.73	0	11
	FHYAI	Interaction between frequency and HYAI	0.68	0	5
	FCHRAI	Interaction between frequency and CHRAI	0.19	0	4
	FUBON	Interaction between frequency and UBON	0.15	0	3
	FUDON	Interaction between frequency and UDON	0.34	0	3
	FSURAT	Interaction between frequency and SURAT	0.02	0	2
SDGs	AGE	Average age of passenger	33.43	20	65
	INC	Average income of passenger	34636.91	5000	90000
	DLODGE	Dummy-1if stay at hotel;0 for otherwise	0.39	0	1
	SPSOR1	Dummy-1if someone paid for your trip	0.21	0	1
		;0 for otherwise			
	FFPTG	Dummy-1 if hold TG's FFP	0.38	0	1
		;0 for otherwise			
	DFWNOK	Dummy-1 if had domestic flight with NOK	0.40	0	1
		;0 for otherwise			
	DFWTAA	Dummy-1 if had domestic flight with TAA	0.36	0	1
		;0 for otherwise			
	DFWOTG	Dummy-1 if had domestic flight with OTG	0.33	0	1
		;0 for otherwise			
	LWLCC	Dummy-1 if had leisure trip with LCCs	0.58	0	1
		;0 for otherwise			
	BWLCC	Dummy-1 if had business trip with LCC	0.30	0	1
		;0 for otherwise			

Table 6.5: Definition and Description of explanatory variables used in Business model

	Variable	Description and Definition	Mean	Min	Max
Attribute	FARE	One-way airplane ticket fare	2029.37	136.4	3775
	FREQUENC	Daily flight frequency	4.67	1	13
	FAREFREQ	Interaction between fare and frequency	10425.48	136.4	49075
	CHMAI	Destination chosen dummy-Chiang Mai	0.34	0	1
	PHUK	Destination chosen dummy-Phuket	0.18	0	1
	HYAI	Destination chosen dummy-Hat Yai	0.23	0	1
	CHRAI	Destination chosen dummy-Chiang Rai	0.07	0	1
	UBON	Destination chosen dummy-Ubon Ratchathani	0.07	0	1
	UDON	Destination chosen dummy-Udon Thani	0.09	0	1
	SURAT	Destination chosen dummy-Surat Thani	0.03	0	1
	FCHMAI	Interaction between frequency and CHMAI	2.42	0	13
	FPHUK	Interaction between frequency and PHUK	0.79	0	11
	FHYAI	Interaction between frequency and HYAI	0.85	0	5
	FCHRAI	Interaction between frequency and CHRAI	0.18	0	8
	FUBON	Interaction between frequency and UBON	0.17	0	3
	FUDON	Interaction between frequency and UDON	0.20	0	3
	FSURAT	Interaction between frequency and SURAT	0.06	0	4
SDGs	AGE	Average age of passenger	38.21	20	65
	INC	Average income of passenger	42208.33	5000	90000
	DLODGE	Dummy-1if stay at hotel;0 for otherwise	0.6225	0	1
	SPSOR1	Dummy-1if someone paid for your trip	0.74	0	1
		;0 for otherwise			
	FFPTG	Dummy-1 if hold TG's FFP	0.55	0	1
		;0 for otherwise			
	DFWNOK	Dummy-1 if had domestic flight with NOK	0.50	0	1
		;0 for otherwise			
	DFWTAA	Dummy-1 if had domestic flight with TAA	0.48	0	1
		;0 for otherwise			
	DFWOTG	Dummy-1 if had domestic flight with OTG	0.40	0	1
		;0 for otherwise			
	LWLCC	Dummy-1 if had leisure trip with LCCs	0.46	0	1
		;0 for otherwise			
	BWLCC	Dummy-1 if had business trip with LCC	0.63	0	1
		;0 for otherwise			

Table 6.6: Comparison between sample and actual market share surveyed

#Passenger	Sample	Sample (%)	Actual	Actual (%)
TG	320	35.16	4,461,027	60.34
NOK	252	27.69	1,052,077	14.23
TAA	211	23.19	1,033,109	13.97
OTG	127	13.96	846,683	11.45
Total	910	100	7,392,896	100

Note: Actual number of passengers each carrier carried in 2005 to and from Bankok; actual and sample market shares for overlapping destinations including only Chiang Mai, Phuket, Hat Yai, Udon Thani, Chiang Rai, Surat Thani, and Ubon Ratchathani.

6.2.1 Multinomial logit models (MNL) and estimation results

We report some selected specifications with a reduced set of explanatory variables here, which are both satisfactorily fit and robust. Table 6.7 summarizes the separate estimated MNL results derived from leisure and business travelers. The selected specifications (Model 1A and Model 1B) shown provide the lowest estimated log likelihood (LL) functions closer to zero, compared to the value of the LL functions of other fitted models.

To determine the overall significance of leisure MNL Model 1A and business MNL Model 2B respectively, we compare the LL function of these fitted models with the LL function of a model fitted using only information of the market shares (base model) as they exist within the data set. If the fitted model does not improve the LL function then the additional attributes and SDGs do not improve the overall model it beyond the base model. A base model using the market shares within the data are equivalent to a model estimated with alternative specific constants only. The base model represents the average utility for each of the alternatives and also represents the market shares present within the data set. We thus conduct a likelihood ratio test with respect to the null hypothesis that the specified model is no better than the base model. The likelihood ratio test indicates that the fitted models possess explanatory variables that provide a significant explanation of the data in relation to the constants only (or market share) models. The likelihood ratio value with respect to this null model is far greater than the criteria value of Chi-square at the 95 per cent confidence level.

We further calculate a pseudo R-square of Model 1A and Model 1B to determine model fit. The MNL model is non-linear therefore R-square associated with choice model is not exactly analogous to the R-square statistic of the linear regression model. We obtain the pseudo R-square value of 0.374 and 0.435 for leisure and business MNL models respectively. Empirical relationship between R-square and pseudo R-square (Domencich and McFadden, 1975) justifies our Pseudo R-square values above 0.3 as a decent model fit for a discrete choice model.

To understand the variation in choice of alternatives, we include explanatory variables. If an explanatory variable does not add to our understanding of choice, statistically the weight attached to the variable will equal zero. In linear regression, this test is usually

performed via a t-or F-test. However, for choice analysis based upon MNL models, neither the t-nor F-statistic are available. The asymptotic equivalent test, the Wald statistic is calculated and interpreted in the same manner as the t-test associated with linear regression model. From Table 6.7, all the results presented show that all explanatory variables in both MNL models have expected signs and are statistically significant at the 95 percent level, except income variable (INC) in business Model 1B.

Table 6.7: Estimation results from MNL models

	Leisure model			Business model		
Variable	**Coefficient**	**Std. Er.**	**P-value**	**Coefficient**	**Std. Er.**	**P-value**
Attributes						
FARE	-0.0008	0.0002	0.0003	-0.0008	0.0004	0.0410
FREQ	0.0643	0.0265	0.0153	0.3219	0.1551	0.0379
FAREFREQ (TG)				-0.0001	0.0000	0.0056
FAREFREQ (LCCs)	0.0001	0.0000	0.0099			
FCHMAI (TG, OTG)				-0.2222	0.1203	0.0647
FPHUK (TG)				-0.4540	0.1318	0.0006
FHYAI (TG)				-0.4423	0.2621	0.0916
FUDON (TG)				-1.1321	0.4553	0.0129
FCHRAI (TG)				-0.6333	0.2977	0.0334
FUBON (TG)				-1.0057	0.4755	0.0344
FSURAT (TG)				-0.6834	0.2815	0.0152
SDCs						
INC	0.0000	0.0000	0.0206	0.0000	0.0000	0.5969
FFP (TG)	0.9844	0.2015	0.0000	1.2170	0.3073	0.0001
DLODGE (TG)	0.4948	0.2086	0.0177			
SPSOR1 (TG)	0.9013	0.2525	0.0004	1.4375	0.4104	0.0005
ENOK (NOK)	1.4305	0.2792	0.0000	0.9914	0.3687	0.0072
ETAA (TAA)	1.3493	0.2584	0.0000	1.2487	0.3846	0.0012
EOTG (OTG)	1.7492	0.3021	0.0000	1.6890	0.4442	0.0001
BWLCC (LCCs)				0.5406	0.3187	0.0899
ASCs						
ASCTG	1.9411	0.5415	0.0003	5.3980	1.6722	0.0012
ASCNOK	0.0772	0.3530	0.8269	0.3432	0.5131	0.5035
ASCTAA	-0.3855	0.3496	0.2701	-0.4231	0.4875	0.3855
LL fn	-486.4247			-269.2676		
Pseudo R	0.3743			0.4354		
Sample size	566			344		

Note:* not significantly different from zero at the 95 confidence level, Std. Er = standard error

Fare

In accordance with the law of demand, it is expected that each of the travel cost and travel time variables will have a negative sign. As can be seen from Table 6.7, fare variables in both Model 1A and 1B are of correct sign, being negative. The estimated fare coefficient in both models indicates that leisure and business travelers attach similar value to cost of

travel. However, this result does not necessarily imply that elasticity values with respect to fares for leisure travelers would the same as those for business travelers.

Frequency

Frequency variable characterizing less travel time also has expected positive sign and significant different from zero. The difference in frequency coefficients between the two models also reveals that business travelers attach much higher value to time through flight frequency. An interaction term between fare and frequency (FAREFREQ) was included in both models to capture interaction effects between fare and frequency upon choice. It is very possible that the level of fare charged by a carrier, particularly TG, will have a differential impact upon the choice of carrier when considered in concert with the number of flight frequency. Table 6.3 reveals that TG operates 13 and 11 daily flights for BKK-Chiang Mai and BKK-Phuket routes while most LCCs operates 2-4 flights a day for the same routes. However, TG average fares are about 30-40 percent higher than fares offered by LCCs on these routes. Table 6.7 shows that FAREFREQ is statistically significant in both models.

Business Model 1B is also inclusive of interaction effects between flight frequency and destinations surveyed carriers are operating. The dummy interaction terms, FCHMAI, FPHUK, FHYAI, FCHRAI, FUBON, FUDON, and FSURAT were included to capture interaction effects upon choice of TG. It is very likely that the number of flight frequency operated by TG will have a differential impact upon the choice of the carrier when considered in accord with popular tourist and business destinations such as Chiang Mai and Phuket. All of these interaction terms are significant supporting previous conclusion that business travelers attach higher value to time and flight frequency when making a carrier choice. High daily flight frequency to primary business destinations of TG is regarded as its core strategy to attract business travelers.

Income

Compared to ground and rail modes, air travel is regarded as an expensive transportation mode. Higher income passengers are likely to have a higher value on time and are willing to pay air fares relative to low income passengers. As a result, the income level of a passenger is expected to have a positive impact on carrier choice probabilities for both

leisure and business travel. Individual passenger's average income (INC) is included in both leisure and business models. From Table 6.7, we found that the income coefficient of leisure passengers (Model 1A) is statistically significant and of correct sign but its impact on carrier choice probabilities is minimal. This result could be accounted for by the fact that air travelers had chosen to fly at the beginning. When deciding to make a leisure trip, these passengers had not considered traveling by rail or coach bus because they could afford LCC fares which are marginally higher than rail and coach bus fares while air transport can reduce a tremendous amount of travel time.

For business travel, Model 1B unsurprisingly shows that income level has no significant impact on carrier choice probabilities at the 95 percent level. The result might straightforwardly be explained by several reasons. First, the majority of business travelers' trips surveyed were paid by their firms and clients. Second, business passengers using air transport as a business tool generally place an extra high value of time. They are willing to pay air fares to save time on short trip. Third, their business trips may involve the "must-go" short trips which are not easily planed and can be completed within a day. Because of these, income level possibly has an insignificant impact on business travel.

Thai Airways frequent flyer program

The impact of TG frequent flyer program is tested by including a dummy variable (FFP) whether passengers using TG are holding its FFP membership. The dummy variable is then added only on TG utility function on both business and leisure models. Rewards from the FFP are expected to have positive impact on TG passenger's utility. From Table 6.7, this dummy variable is of correct sign in both models. The difference in magnitude of FFP coefficients between leisure and business models reveals that this loyalty program is more powerful in attracting frequent flyer business travelers when making a choice to use TG, while unsurprisingly leisure travelers place less value on the FFP reward for short haul domestic trip.

Sponsorship

It is believed that business travelers whose firm pays for their trip are more price-insensitive than those who pay for their own trip. Similar notion can be applied with leisure travelers whose parents and spouse pay for their plane ticket. Both groups of

travelers are likely to use TG as a result; a dummy variable (SPSOR1) is included in both models. This dummy variable is equal one if someone paid for a passenger's trip, and zero otherwise. The results show that business travelers whose firm and clients pay for their plane ticket are more likely to use high fare TG, compared to leisure travelers. The sign of SPSOR1 shows that this variable has a positive effect upon the choice probabilities of TG.

Past experience on LCCs

To investigate the impact of past flying experience on usage behavior toward low cost carriers, we included several dummy variables in LCC utility functions whether a traveler had ever used a LCC he was taking before. The dummy variables for past experience on LCCs are ENOK, ETAA, and EOTG for NOK, TAA and OTG respectively. These past experience variables are expected to have positive impact on a carrier repeated choice. Table 6.7 shows that these coefficients in both business and leisure models are statistically significant and of correct signs. Past flying experience on a low cost carrier passengers were taking thus has positive impact on its passenger choice probabilities. Further, the larger magnitude of these coefficients in leisure Model 1A compared to business Model 1B indicates that past experience on any of LCCs is certainly taken into account when leisure passengers make a repeated choice of using LCCs. Past experience of using LCCs for making a business trip (BWLCC) is also positively significant and taken into account for only business travelers using LCCs (Model 1B).

Model preferences

The alternative specific constant terms, ASCTG, ASCNOK and ASCTAA for TG, NOK and TAA respectively (where OTG is the normalizing alternative) measure the relative "preference" of a reference group for the alternative whose indirect utility the constant term enters. Because TG is a full service carrier, we expect passengers to favor TG relative to LCCs, while there are no reasons to expect the alternative preference parameters to favor one or the other of the LCCs. As a result, ASCTG is expected to be significantly positive, whereas no hypothesis for the signs on ASCNOK and ASCTAA is identified. From Table 6.7, these estimated constant terms indicate that, all else constant, there is an equal preference for selecting NOK or OTG, TAA or OTG for leisure and business trips because the P-values for ASCNOK and ASCTAA are over than an alpha

level of 0.05. However, the positive and significant signs of ASCTG indicate that both types of travelers have a definite preference for TG relative to OTG, NOK and TAA. The relative preference for TG most likely reflects the convenience, seat comfort, ticket flexibility and in-flight services of full service carrier, TG, in comparison with low cost carriers, as well as the effect of other variables that are not included in the models. This is consistent with common public perception regarding the low cost, no frills services of low cost carriers.

6.2.2 Nested logit (NL) models and estimation results

MNL model has characteristics of computational ease and easy interpretation because of the assumption of Independence of Identically distributed (IID) error components and the behaviorally comparable assumption of Independence of Irrelevant Alternatives (IIA). The IIA property implies that the ratio of the choice probabilities of any pair of alternatives is independent of the presence or absence of any other alternative in a choice set. The IID assumption requires analysts to ensure the richness of information in specification of the utility expression associated with each alternative and the relationship between the choice alternatives such that unobserved component or error term is white noise. These two strong assumptions are potentially restrictive and violations both can and do occur.

When violations occur, the cross-substitution effects observed between pairs of alternatives are no longer equal given the presence or absence of other alternatives within the complete list of available alternatives within the model (Louviere et al., 2000). The nested logit (NL) model is the alternative choice model that is widely used to try and accommodate violations of IID/IIA assumptions. The NL model recognizes the possibility of different variances of error terms across the alternatives and some correlation among sub-set of alternatives. As a result, the NL model relaxes IID and IIA to some extent. It should be acknowledged that the entire purpose in creating a nested form is to try and accommodate any violation of IID/IIA. It has nothing to do with any behavioral belief in the way that alternatives are assessed in the process of making a choice (Hensher et al., 2005). Only once we are confident that the MNL model is deficient should we progress to more advanced NL models

To investigate whether our models are better fit with NL specification, we estimated two-level NL models based on three different tree structures for both leisure and business travels (see Figure 6.1-Figure 6.3). The first tree structure (Figure 6.1) is tested based on the assumption that unobserved attributes among LCCs are likely correlated. Since NOK is a TG's low cost offshoot, nested tree structure (Figure 6.2) is based on the assumption that these two airlines' unobserved attributes are correlated. The last nested tree structure (Figure 6.3) goes further (Figure 6.2) by assuming that unobserved attributes of TAA and OTG are correlated. We found that the values of Pseudo R-square and LL functions of all estimated NL models show that NL model is no better than the MNL model. Moreover, all IV (or logsum) parameters in every NL model are either greater than one or statistically equal to one, meaning that the all branches should collapse into a single branch, which is equivalent to a MNL model. The NL structures are rejected in favor of the MNL. Therefore, our preference would be to use the simpler MNL model rather than a NL model for further analysis.

Figure 6.1: Nested tree structure with an assumption that error terms of LCC attributes are correlated.

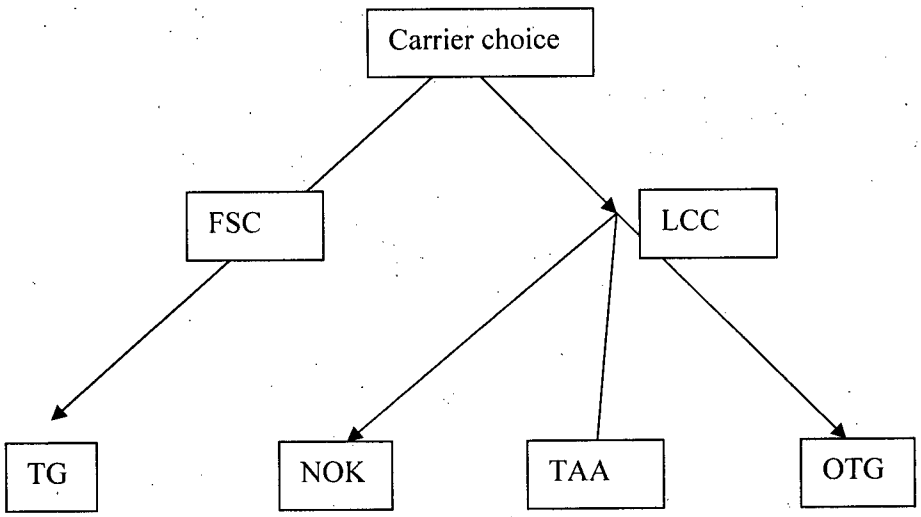


Figure 6.2: Nested tree structure with an assumption that error terms of carriers' attributes in the same mainline (TG and NOK) are correlated

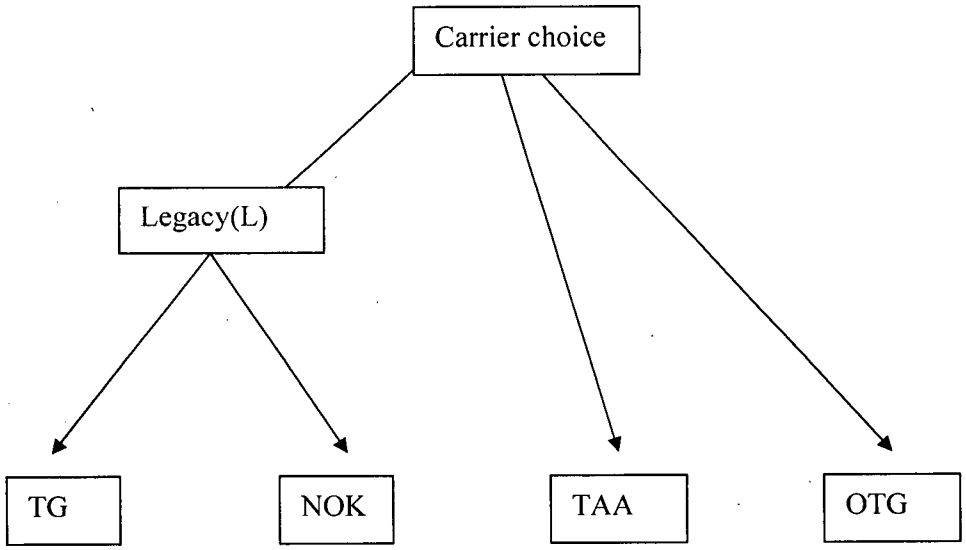
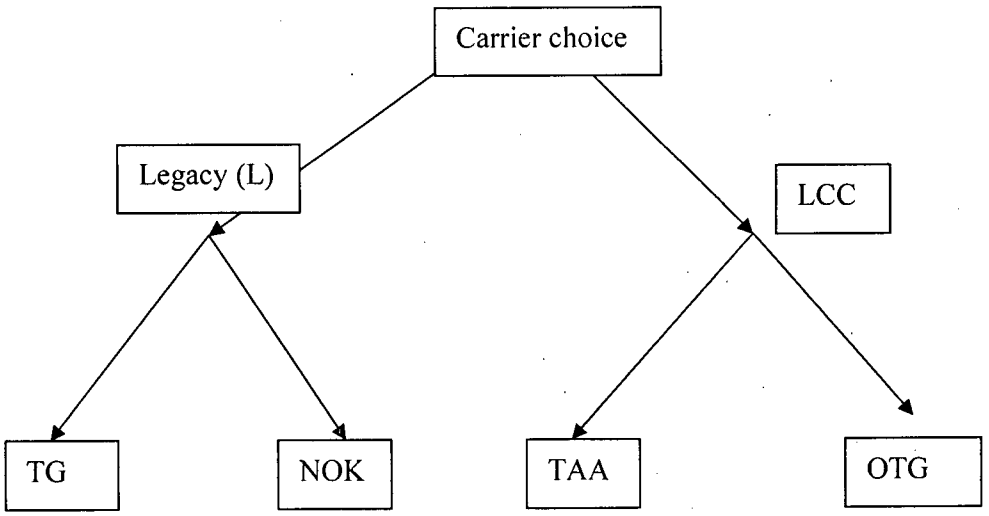


Figure 6.3: Nested tree structure with an assumption that there is correlation in error terms between legacy mainline and its offshoot, and between LCCs.



6.3 Elasticities and Demand forecasts

6.3.1 Demand elasticities

The coefficients obtained from MNL models do not provide direct behavioral interpretation of a parameter estimate of a choice model beyond the sign of the parameter which indicates whether the associated explanatory variable of interest has either a positive or negative impact upon the choice probabilities. In order to obtain a behaviorally meaningful interpretation, we calculated the elasticities of the choice probabilities with respect to fare and frequency attributes.

For direct elasticities, the calculated elasticity is interpreted as the percentage change of the choice probability for alternative i given a 1 percent change in attribute k of alternative i. For cross elasticities, the calculated elasticity is interpreted as the percentage change of the choice probability for alternative j given a 1 percent change in attribute k of alternative i. We follow Louviere et al. (2000) to use the probability weighted sample enumeration (PWSE) technique to calculate the aggregate elasticities. The use of PWSE avoids the pitfalls of the aggregation method or naïve pooling because it calculates the elasticity for each individual decision maker by weighting each individual elasticity by the decision maker's associated choice probability. The PWSE technique thus recognizes the contribution to the choice outcome of each alternative. It should be noted that the use of PWSE will produce non-uniform cross-elasticities; however, the individual level cross elasticities are strictly identical for the IID assumption.

We employed NLOGIT software to calculate the elasticity values and its calculation method is the point elasticity method. Table 6.8 and Table 6.9 present the own and cross point elasticities with respect to fare and frequency derived from leisure Model 1A and business Model 1B respectively. Using Table 6.9, we explain how to read our elasticity values. Taking the example of the business elasticity for the fare attribute on the Thai Airways (TG) alternative (the first left top column in Table 6.9), the direct effect is calculated as -0.69. This suggests that a 10 percent increase in TG air fare will decrease the probability of selecting the Thai Airways alternative by 6.9 percent, all else being equal. As would be expected, raising one's own price is likely to decrease demand for one's own good or service. The remaining point elasticities represent the cross-elasticity

effects in that column. Examining these effects, the business Model 1B suggests that a 10 percent increase in the fare for the Thai Airways alternative will result in a 7.47 percent increase in the choice probabilities for the Nok Air alternative and an increase of 8.18 percent and 6.82 percent in the choice probabilities of the Thai AirAsia, and One-Two-Go alternatives respectively, ceteris paribus. The findings conform to our expectations. An increase in a ticket price of Thai Airways is likely to increase the demand for competing low cost airlines, ceteris paribus and there is no reason why the increase in demand would be uniformly spread across these carriers.

Note that the elasticity here measures the percentage change in the probability of choosing a particular alternative in the choice set with respect to a given percentage change in an attribute of that same or in a competing alternative. To measure the volume change in demand for a particular alternative given a percentage change in an airline attribute, we conducted simulations in section 6.3.2. Simulations show how changes in fare and frequency impact upon the demand volume for each of the alternatives.

We summarize key findings from our elasticity analysis as follows. First, our estimated own price elasticities for both leisure and business travels fall in the range of short haul leisure and business elasticity values reported by Gillen et al. (2002). They report the findings of a review of the economics and business literature on empirically estimated own price elasticities of demand for air travel for Canada and other major developed countries. This provides ample evident that our demand study which segments distinct markets for business and leisure travel, and long haul and short haul travel is appropriate.

Second, our estimated own price elasticities for leisure travel are higher than those for business travel according with expectation that the demand for air transport for leisure reasons will be more elastic than business travel. Leisure travelers are more likely to postpone trips to specific locations and time in response to high fare, or to spend more time shop around for more affordable fares. Table 6.8 shows that for leisure travel the magnitude of own and cross price elasticity is far greater than the elasticity with respect to frequency. This result supports the literature reviewed in Chapter 4 and leisure data analysis in Chapter 5 that leisure travelers are more sensitive to price and less responsive

to time (via frequency). Leisure travelers will seek the lowest fares possible and thus LCCs will find it easier to capture and penetrate this market with low fare offerings.

Table 6.8: Own and cross elasticity derived from leisure Model 1A

Leisure	Own and Cross Elasticities			
Fare	TG	NOK	TAA	OTG
TG	**-0.853**	0.183	0.159	0.129
NOK	0.952	**-0.978**	0.196	0.167
TAA	1.057	0.252	**-0.918**	0.171
OTG	0.973	0.239	0.192	**-0.962**
Leisure	Own and Cross Elasticities			
Frequency	TG	NOK	TAA	OTG
TG	**0.181**	-0.029	-0.025	-0.028
NOK	-0.205	**0.154**	-0.038	-0.038
TAA	-0.189	-0.04	**0.159**	-0.029
OTG	-0.245	-0.039	-0.038	**0.202**

Note: own elasticity is highlighted

Table 6.9: Own and cross elasticity derived from business Model 1B

Business	Own and Cross Elasticities			
Fare	TG	NOK	TAA	OTG
TG	**-0.69**	0.151	0.121	0.1
NOK	0.747	**-0.985**	0.243	0.234
TAA	0.818	0.306	**-0.871**	0.223
OTG	0.682	0.332	0.257	**-0.941**
Business	Own and Cross Elasticities			
Frequency	TG	NOK	TAA	OTG
TG	**0.656**	-0.123	-0.113	-0.092
NOK	-0.791	**0.765**	-0.235	-0.231
TAA	-0.67	-0.223	**0.823**	-0.188
OTG	-0.673	-0.251	-0.241	**0.863**

Note: own elasticity is highlighted

The explanation why the short haul business elasticity is smaller in value than the short haul leisure elasticity is straightforward. Business people using air transport as a business tool, will place an extra high value of time. Therefore they are willing to pay high fares to save time on short haul trips. Moreover, there are a number of "must-go" short haul trips that occur in the course of business dealings. These short haul business trips are not easily planed and can be completed in the morning or afternoon without requiring scheduling meetings or packing or making family arrangements. The high airfare is low when factored into the overall value of the trip.

However, our elasticity results reveal that there are very small differences in the values of leisure and business own price elasticity. This finding points out that either business

elasticity is rising or leisure elasticity is falling. Rising business elasticity implies that business travelers are becoming more cost conscious or increasingly price sensitive particularly for short haul domestic trips. As can be seen for business travel, the minimal gap between the elasticity values with respect to fare and frequency implies that TG business passengers now attribute almost the same value to time and ticket fares for short haul domestic trip. Perhaps after a careful consideration of fare and flight frequency offered by TG, more and more cost-conscious business travelers will switch to fly with LCCs on domestic routes. This explanation will clearly be of concern to the network carrier, TG for its domestic market presence. The declining leisure elasticity can intuitively be accounted for the very low fare offered by LCCs. After LCCs entered Thai domestic market, domestic fares have fallen significantly and leisure travelers have increased their number of trips. The leisure market has possibly come to the point where further small drops in fare would have little impact on the market. A fare falling from 1800 baht to 1700 baht has trivial impact on the cost of a trip expense; as a result short haul leisure elasticity is reduced.

We could also investigate whether the own fare elasticity values for leisure travel are statistically significantly different from those values for business travel. The simplest way is to look at the values of fare variable's standard error in leisure Model 1A and business Model 1B. We observed the standard error values of 0.0002 and 0.0004 from fare variables in leisure and business models respectively. These values are very small; we then expect the ranges of own fare elasticity values (after adjusting fare coefficient by adding and subtracting its standard error) for both leisure and business travel to be minimal. It is then unlikely that the range of own fare elasticity values for leisure travel is overlapping with the range for business travel. Therefore, own fare elasticity values for leisure travel are likely to be statistically significantly different from those values for business travel. For a comprehensive investigation, it is beyond the scope of our study and the capability of the software we used to conduct the test.

Third, in business travel there is a distinct pattern in differences of cross price and frequency elasticity values between TG and LCCs, and between LCC and LCC. Cross elasticity between TG and LCC is about 50 percent lower than cross elasticity between the two low cost carriers. For business travel (Table 6.9), cross elasticity between TG and

LCCs are 0.15, 0.12 and 0.1 in response to change in percentage of fares of NOK, TAA and OTG respectively. However, cross elasticity between NOK and other LCCs (TAA and OTG) are 0.22 and 0.25, and cross elasticity between TAA and other LCCs (NOK and OTG) are 0.24 and 0.25. The pattern reveals that business travelers recognize the competitive distance between two different types of products offered by legacy carrier (TG) and LCCs. In simple words, business travelers recognize product and service differentiation offered between the two carriers. Note that competitive distance is the degree of comparability between different products. Sources of distance come from in-flight entertainment and comfort, service level, frequency, brand, frequent flyer program (FFP), ticket flexibility and physical product itself.

Unlike business travel, in Table 6.8cross fare and frequency elasticity values between TG and LCCs and between LCC and LCC are almost the same level for leisure travel. It thus reveals that leisure travelers do not perceive the competitive distance between the legacy and LCC products. In other words, for leisure short haul domestic trip, legacy's frills such as in-flight service and entertainment, FFP reward are not well appreciated. For leisure travelers, it is clear that LCCs offer a strong substitute to the full service airline product. Leisure travelers are willing to trade off frills with lower fares if possible (for short haul trip). As a result, LCCs would be able to successfully and easily attract leisure travelers with low fare no frills offerings, compared to business travelers.

6.3.2 Simulated forecasts and observed outcomes

This section presents aggregate demand forecasts from several simulations[10] to ascertain how specific change of fare and frequency would have affected the market shares of each alternative carrier available. The forecasts[11] here were obtained after imposing endogenous weighting scale in the model constants in order to reproduce the actual domestic market shares in 2005. As mentioned earlier, we applied endogenous weighting

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10 Simulations represent "what-if" scenarios, illustrating the impact upon individual choice probabilities, for example, given a one percent increase in the cost of travel. Since the sum of the choice probabilities for a given alternative across the sample defines in aggregate the number of times that alternatives was chosen across the entire data set, the sum of the probabilities for a given alternative is equal to the sample data choice or market share for that alternative (Hensher, et al. 2005).

11 It should be noted that the forecasts examined at a theoretical level are taken in ceteris paribus conditions.

criteria because our sample market share does not match the actual market share. With this approach, our forecasts in this section represent simulated changes in actual market shares of the alternative carriers as a result of a 15 percent change in fare or frequency.

From Table 6.10 in case 1A, a 15% decrease in fare from the average of Thai Airways will increase its market share by 6.85 percent, while Nok Air and Thai AirAsia will lose about 2.5 percent each of their market share. Moreover, 1.9 percent of One-Two-Go market share will switch to use Thai Airways. The number of passengers each low cost carrier loses to Thai Airways due to this change is represented in Appendix 1B.

Table 6.10: Simulation results derived from leisure Model 1A

Leisure MNL forecasts for a 15% decrease in fares					
Hypothesis (%)	**1A**	**2A**	**3A**	**4A**	**5A**
TG	6.85	-1.56	-1.36	-1.10	-3.82
NOK	-2.48	2.68	-0.54	-0.45	1.62
TAA	-2.47	-0.62	2.30	-0.43	1.17
OTG	-1.90	-0.50	-0.40	1.98	1.03
Leisure MNL forecasts for a 15% increase in frequency					
Hypothesis (%)	**6A**	**7A**	**8A**	**9A**	**10A**
TG	1.46	-0.23	-0.20	-0.23	-0.66
NOK	-0.53	0.41	-0.10	-0.10	0.20
TAA	-0.45	-0.10	0.38	-0.07	0.21
OTG	-0.48	-0.08	-0.08	0.40	0.25

Note: unit is in percent change

Table 6.11: Simulation results derived from business Model 1B

Business MNL forecasts for a 15% decrease in fares					
Hypothesis (%)	**1B**	**2B**	**3B**	**4B**	**5B**
TG	5.32	-1.25	-0.99	-0.84	-2.94
NOK	-1.97	2.75	-0.68	-0.65	1.38
TAA	-1.97	-0.78	2.23	-0.57	0.82
OTG	-1.39	-0.72	-0.56	2.05	0.74
Business MNL forecasts for a 15% increase in frequency					
Hypothesis (%)	**6B**	**7B**	**8B**	**9B**	**10B**
TG	5.13	-1.01	-0.93	-0.78	-2.59
NOK	-2.09	2.11	-0.65	-0.65	0.77
TAA	-1.64	-0.56	2.10	-0.48	1.01
OTG	-1.40	-0.54	-0.52	1.91	0.81

Note: unit is in percent change

We summarize the findings from simulated market share forecasts as follows. First, for both leisure and business markets, there is a distinct pattern in variation of market share

between TG and LCCs when any hypothesis is tested. When any change occurs, TG market share would change about two times higher than LCC market shares. And market shares of each LCC change by nearly the same amount. For leisure travel in Table 6.10, a 15 percent decrease in OTG fares (case 4A) bring about 1.1 percent reduction of TG market share, whereas 0.45 and 0.43 percent of reduction in NOK and TAA market shares respectively. Similar variations among LCC market shares are obtained when there is a 15 decrease in NOK or TAA fares (case 2A or 3A). This pattern emphasizes that LCCs offer close substitute products and both leisure and business travelers do not perceive the differences of LCC products.

Second, when TG fares drops by 15 percent, there is a big variation in its own market share. The sharp increase in leisure and business market shares (6.85 percent in case 1A and 5.32 percent in case 1B respectively) may be explained by the fact that the measure applied consists of lowering the ticket price of the most expensive but full frills services on the route, and as such it reduces the difference in relative prices between TG and LCCs.

6.3.2.1 Cannibalization in airline within an airline

Our third finding from simulations reveal some evidence of the cannibalization risk of airline within an airline between TG and its low cost offshoot, Nok Air. As can be seen in both leisure and business markets from Table 6.10 and Table 6.11, a 15 percent decrease in NOK fare (case 2A and 2B) and a 15 percent increase in NOK frequency (case 7A and 7B) result in the highest drop of TG market shares compared with the same amount of change in TAA/OTG fare and frequency. When NOK decreases fare by 15 percent, TG market share would fall by 1.56 percent in leisure travel (case 2A) and 1.25 percent in business travel (case 2B). However, if TAA (or OTG) reduces fare by15 percent, TG market share would fall by 1.36 percent (or 1.1 percent) in leisure market (case 3A or 4A), and only by 0.99 percent (or 0.84 percent) in business market (case 3B or 4B). Similar results are also found with a 15 percent increase in NOK frequency (case 7A and 7B). Apparently, TG would become more vulnerable with any change done by its own offshoot NOK, compared to other LCC competitors.

To further investigate the risk of cannibalization between TG and NOK, we allow all LCCs to simultaneously decrease their fares by 15% (case 5A and 5B), the simulated results show that while TG is severely hurt from this phenomenon in both markets, NOK is the low cost carrier that benefits most, obtaining the highest increase in market shares in both markets. Moreover, the result from case 2A/7A and 2B/7B reveal that NOK is the most vulnerable player among LCCs, losing the highest market shares in both markets, when TG lowers its fare by 15 percent or increase frequency by the same level. As a result, we conclude that the airline within an airline model is not a sustainable strategy for legacy carriers; NOK is growing at the expense of its parent mainline, TG.

6.4 Summary

In this chapter we present the final results of the most appropriate estimated MNL models for leisure and business travels separately. We also estimated the NL models with different tree structures. However, we reject the NL model in favor of a MNL model as all inclusive variable (IV) parameters indicate we should collapse the NL model into MNL model. Using MNL models, we derived own and cross price elasticity. Our elasticity analysis shows that the degree of substitutability among carriers in the leisure market is higher than in business markets. Leisure travelers do not distinguish product differentiation between legacy carriers and LCCs. Low cost carriers would be able to penetrate into this market easily with low fare offerings.

For the business market, LCCs may have to spend longer and provide more effort to attract business travelers. The cross elasticity results reveal that this group of travelers certainly perceives the competitive distance between the legacy and LCCs. Product and service differentiation between the two carriers are distinguishable. However, it should be of concern for TG that for short haul domestic trips, business travelers are likely becoming more price- sensitive. Interestingly, our simulation results provide some evidence of cannibalization between TG and its offshoot, NOK. The results reveal that having an airline within an airline may not be a sustainable strategy to respond LCC penetration.

The following chapter provides conclusions of the thesis. We will summarize the findings and contributions including final thoughts and future research direction.

Chapter 7 Conclusions and Contributions

7.1 Introduction

This thesis has investigated the following two questions: (1) on short haul routes, how serious a threat can low cost carriers pose to state-owned legacy carriers' core business in Southeast Asia? This was accomplished by examining the degree of demand substitutability between network and low cost carriers with respect to both fares and frequencies (2) what is the likelihood of cannibalization in airline within an airline in the region? This issue was examined by simulating market share forecasts. In the light of successful US and Europe low cost business models, we have analyzed business models of selective visible LCCs currently operating in Southeast Asia. We have witnessed some variations in Asian low cost business models to better suit the nature of their base countries and markets. Discrete choice models were estimated based on traveler data set obtained from passenger surveys conducted in Thailand where domestic market was recently liberalized. Multinomial logit (MNL) and nested logit (NL) models were employed to investigate two questions of our interest. Some conclusions and contributions could be drawn from this research.

7.2 Contributions of this thesis

This thesis adds to the literature in aviation economics in four ways. First, the thesis has analyzed various business models of Southeast Asian low cost carriers. Second, the thesis has provided a better understanding on air travel preferences and determinants of demands for air travel on LCCs and legacy carriers. Third, the thesis has empirically studied the impacts of low cost carriers on full service legacy carriers in term of demand substitutability across carriers. Fourth the thesis has empirically investigated the likelihood of cannibalization in the airline within an airline model.

7.2.1 Business models of Southeast Asian low cost carriers

In Asia, the low cost phenomenon is in its infancy, however, it is growing rapidly especially in Southeast Asia. These low cost carriers were modeled after prominent European and US low cost carriers. There are two types of low cost carriers operating in the region, independent operators and legacy incumbent's low cost offshoots.

According to our low cost business model analysis in Chapter 3, we have found that Southeast Asian LCCs can be segmented into 2 groups: low cost no frills and low fare low frills carriers. Low cost no frills carriers are AirAsia and Tiger Airways, because both strictly adhere to the low cost recipe; no free frills and unbundling every product and process. Low fare low frills carriers include Nok Air, One-Two-Go, Valuair and Jetstar Asia. A Thai Airways's offshoot, Nok Air is aimed to be a premium LCCs. The carrier charges fares 10-15 percent higher than other low cost competitors with a further introduction of business cabins. One-Two-Go provides free on-board drinks and snacks plus ticket flexibility. Valuair serves meals on board, while Jetstar Asia has pre-paid in-flight entertainment kits.

To this point, only the success of low cost no frills carriers can be observed. We have learned that AirAsia is the most successful LCC even though it is not the first mover in Asian market. Its solid LCC business model is to strictly adhere to easyJet and Ryanair models which are in turn were adapted from the Southwest model. Currently, AirAsia is the largest intra-Asian low cost carrier in terms of network, traffic and aircraft. The success of Tiger Airways in Singapore, a Ryanair clone, has become apparent after the recent merger of its low cost rivals, Valuair and Jetstar Asia.

Since European LCC models have deviated from the original Southwest model, the success of Tiger Airways and AirAsia, which clone Ryanair and easyJet's models, further indicates that some decent deviation from the Southwest model is feasible in the infancy of the LCC Asian market.

The triumph of AirAsia and Tiger Airways reveal a number of key principles for Asian LCC market survival as follows: (1) keep product and service simple and maintain cost advantage while offering a product that is well perceived by travelers and seen as value for money, (2) adhere to short haul routes, (3) use a single aircraft type, (4) maximize seating density, (5) avoid head-on competition with legacy and low cost carriers as much as possible, (6) on-time performance and high frequency, (7) emphasizes direct sales, (8), minimal on-board catering, with good quality but not free, (9) simple fare structure with simple, one-way and point-to-point, and (10) becoming the number one or two carriers on most routes operated (in term of market share).

Both Tiger Airways and AirAsia strictly adhere to above cost-cutting strategies to gain operational effectiveness. Besides good business plans containing the key principles above, an experienced management team, sufficient capital funding, and young aircraft have proven to be keys to success in low cost business in Asia as well. Both Tiger Airways and AirAsia are run by management teams who are well-experienced in low cost business in the US and EU. Both airlines can access capital and they are operating relatively new aircraft. Unlike AirAsia and Tiger Airways, low fare low frills carriers not only deviate from key cost cutting strategies, they also do not have a good business plan, nor a LCC experienced management team.

Therefore our prediction for low fare low frills carriers is that they would have a more difficult time to succeed and survive when an industry shakes out. Deep-pocket low cost offshoot such as Nok Air and Jetstar Asia are financially better off than independent low fare low frills carriers such as One-Two-Go. Our business model analysis further reveals that Thai Airways and its low cost subsidiary Nok Air are subject to cannibalization in the airline within an airline model. Besides their overlap in product offerings and customer target groups in short haul domestic routes, Nok Air is likely growing at the expense of Thai Airways for several reasons. First, by the nature of country's geography and demography, both can hardly avoid head-to-head competition. In Thailand, the longest domestic flights are less than 2 hours and there are only a few major cities. As a result, they both operate flights out of Bangkok to the same tourist and business destinations including Chiang Mai, Phuket, Hat Yai, Udon Thani. Second, Nok Air was given aircraft from Thai Airways. As a result, the logo of Thai Airways is overwhelmingly covered on seat cabins and accessories. This allows passengers to perceive that without free in-flight service and meal, Nok Air's product offering are very much the same as those of Thai Airways. It should be noted that in-flight service and meal would become less important in short haul domestic trips.

Apparently, the airline within an airline model seems to create the opportunity for cannibalization simply because the way Thai Airways and Nok Air have structured the business models and organized their short haul domestic route and service offerings. Unlike Nok Air, Jetstar Asia can refrain from cannibalizing Qantas's core business because they are offering distinctive products while also operating in different country

bases. In Australia, Jetstar is designed to avoid direct competition with Qantas by serving non-overlapping destinations. Singapore Airlines also clearly put distance between itself and Tiger Airways. Tiger is a real low cost carrier offering low cost no frills products while Singapore Airlines offers full service frills products. Their product differentiation is distinctive and customer target groups are different.

7.2.2 Air travel preference and determinants of air travel demand

Multinomial logit models were estimated and shown to be superior to nested logit models after all IV parameters of the various nested logit models implies that all branches should be collapsed into a single branch.

In the modeling we found several interesting findings as follows. First, for both leisure and business air travel, fare and frequency are statistically significant factors influencing a carrier's choice probabilities. While fare has negative impacts, frequency has positive impacts on choice probabilities following our expectation. Our estimated results also show that business travelers place a higher value on time via flight frequency. Moreover, fare has differential impacts on carrier choice probability in accordance with its flight frequency available. For business travel, travelers have to trade off between high fare with high flight frequency offered by Thai Airways. For leisure travel, traveler's utility on low cost carriers goes up when these carriers increase their daily frequency while offering low fares.

Second, income of an individual traveler is statistically significant for leisure travel but not significant for business travel. For business travel, the impact of non-self paid own trips are stronger than leisure travel. Business travelers whose firms and clients paid for their trip are more likely using high fare full service of Thai Airways, compared to low cost carriers. This possibly might be a principal reason why the income variable is insignificant for business travel. Third, Thai Airways frequency flyer program has positive impacts on the possibilities to travel by the carrier for both leisure and business travels. Unsurprisingly, frequent flyer business travelers attach higher value to this loyalty program, compared to leisure travel in short haul domestic trips.

Fourth, individual traveler's past experiences with low cost carriers create a significant positive impact on the probability of traveling by low cost carriers and hence lead to an increasing likelihood of choosing a low cost carrier. Interestingly, past experience with low cost carriers has more influence for leisure travel than for business travel. Moreover, past experiences on business trips by low cost carries positively affects the business travelers' intention and possibilities to travel by low cost carriers. Last, alternative specific constant terms of both models reveal that travelers do not perceive unobservable attributes across low cost carriers, but they do distinguish the differences in these attribute between Thai Airways and low cost carriers. In other word, both leisure and business travelers have equal preference for selecting among low cost carriers. However, they do have definite preference for selecting Thai Airway and low cost carriers.

7.2.3 Empirical impacts of low cost carriers on full service legacy carriers

We have derived own and cross elasticity values for fare and flight frequency based on business and leisure multinomial logit models. Our elasticity results provide interesting findings as follows.

For leisure travel, travelers do not differential to a significant degree of the differences in product offerings across low cost carriers. This finding is supported by the estimated results of alternative specific constant variables; that is there is an equal preference for selecting LCCs; perhaps this is reflecting the 'loyalty to price rather than carrier' talked about in trade publications. Furthermore, leisure travelers do not distinguish product and service offerings across Thai Airways and LCCs. Frills offered by Thai Airways are regarded as insignificant for short haul domestic leisure trips. Our elasticity results also support the findings in the air transportation literature that leisure travelers place a higher value on fare level than flight frequency. With low fare low/no frills offerings, LCCs will find it easier to penetrate fare sensitive, non-business market. Our results should be concern to Thai Airways for a potential loss of its leisure domestic market shares. It is thus unavoidable that in the near future Thai Airways will need to strategically focus on medium to long haul international routes, following its legacy peers such as Singapore Airlines and British Airways.

For business travel, passengers do perceive the differences in product offerings between Thai Airways and LCCs, unlike leisure travelers. Frills offered by Thai Airways such as frequency flyer program, ticket flexibility, brand and service level are taken into account for business travel. However, our results further reveal that the degree of demand substitutability is getting higher across Thai Airways and low cost carriers. It implies that business travelers are becoming more price sensitive for short haul domestic trips. Perhaps after a careful consideration of fare and quality of products, more and more cost conscious business travelers would choose to fly low cost carriers as travel budgets may deteriorate due to the economic downturn. This phenomenon needs more time to be visible in Asia. However, recent research has shown that business travelers now represents a sizable market for low cost carriers in the US and Europe.

7.2.4 Cannibalization in airline within an airline in Southeast Asia

Our business model analysis indicates that Thai Airways and its own low cost offshoot are likely subject to cannibalizing one another's core business for short haul domestic routes. This is because of the incompatibilities in their business models as well as inadequate level of uniqueness and distinction between the two carriers. Cannibalization in "airline within an airline" model is unlikely to happen with Singapore Airlines and Tiger Airways because both are having distinct business models and the parent mainline put distance between itself and Tiger Airways in particular they avoid overlapping routes. It seems Singapore Airline is successful in how to position two potentially different company brands. Low cost offshoot like Jetstar Asia can also refrain from head-on competition with Qantas as both are operating in very different regional bases.

We have empirically investigated the likelihood of cannibalization between Thai Airways and Nok Air by using market share simulations. Based on our appropriate discrete choice models, predicted change in domestic market shares were estimated with applications of a 15 percent decrease in fare and a 15 percent increase in flight frequency. Simulation results show that Thai Airways would be more vulnerable with a 15% drop in fare by Nok Air, compared to the same action done by other low cost competitors, Thai AirAsia and One-Two-Go.

On the other hand, among the LCC peers, Nok Air would be the most vulnerable low cost carrier with any change in fare or frequency by Thai Airways. Moreover, any change by its low cost competitors would generate smaller impacts on Nok's market share than a change by Thai Airways. We also found that when there is a simultaneous drop of LCC fares by 15 percent, Thai Airways is the only carrier losing market shares in both business and leisure market. Simulation results also show that among the LCCs, Nok Air would receive the highest market share increase taken away from Thai Airways. The results clearly show that Nok Air is likely growing at the expense of Thai Airways. Thus our prediction is that when Nok Air starts growing profitably and begins to eat into Thai Airways's domestic traffic, Thai Airways would find itself in the odd position of having to hold back the expansion of Nok Air, its low cost subsidiary. By doing so, Nok Air would not be able to successfully compete with other low cost rivals such as Thai AirAsia.

The evidence of cannibalization between Thai Airways and Nok Air does not imply that the airline within am airline model does not work well in Southeast Asia when looking at the success of Tiger Airways and Singapore Airlines. However, it does imply that the airline within an airline is not a sustainable strategy for legacy carrier to respond to low cost threat. Well-managed airline within an airline could be an efficient short-to-medium term strategy. But cannibalization is hardly avoidable in the long term. It is also true that the airline within an airline model has been successful only where the legacy carriers dominate the domestic routes. Examples include Jetstar by Qantas, Tiger Airways by Singapore Airlines and germanwings by Lufthansa.

7.3 Strategic decisions for network carriers in Southeast Asia

Southeast Asian network carriers are small and medium sized, state-owned and influenced carriers. These carriers tend to be overstaffed. They are dependent on high frequency short haul domestic services to feed its long haul flights. They thus cannot abandon the whole domestic network when low cost carriers aggressively penetrate their domestic market. For network carriers which are running low cost subsidiaries, they cannot simply give their domestic services away to their low cost subsidiaries. The reason is straightforward. Most network carriers are employing hub-and-spoke system and then they need domestic feeder traffic to feed their long haul flights at hubs.

If a network carrier fully withdraws its short haul domestic services, it would lose high yield business traffic. And its low cost offshoot would become its domestic feeder. However, the cost advantage obtained from the low cost business model would be reduced. Low cost offshoots have to change their baggage allowance, and allow baggage and passenger transfer. These extra activities would make their products and process more complex and then reducing cost advantage while increasing turnaround time. Network carriers thus can easily find themselves in dilemma.

Based on recommended strategy for US and EU network carriers by Doganis (2005), we provide two strategic decisions for network carriers in Southeast Asia to react adequately to the low cost threat. The first strategic decision is network carriers should consider cutting their domestic and short haul network where market share, load factors and yield are heavily undermined by low cost competitors or will be shortly. Network carriers should maintain their presence on domestic and short haul routes with a high business proportion and routes that provide a significant volume of feeder traffic to their long haul services, particularly where they can protect their local traffic by offering some competitive advantage such as much higher frequencies.

On some discontinued routes, network carriers should attempt to maintain feeder traffic using their low cost subsidiaries or lower cost partners. To survive with this downsized domestic short haul network decision, network carriers must achieve two goals. First,, they must aggressively attempt to cut their costs significantly so as to reduce the cost advantage of the low cost carriers. Second, since network carriers cannot match low cost carriers on costs, they must ensure that they are able to offer air travelers particular services that enable them to charge slightly higher fares and maintain travelers' loyalty.

The second strategic decision is network carriers should focus on their operations and growth on regional medium haul and long haul markets where are typically profitable. Regional medium haul to long haul intercontinental markets are routes where any operating and cost advantages of the low cost model are minimized. In order to survive and maintain sustainable profitability, Southeast Asian network carriers are strongly advised to take strategic decisions to adapt their business model to the challenge of low cost carriers.

7.4 Future research directions

In this thesis, we have studied the airline passenger choice based on data obtained from passenger surveys for leisure and business travel in Thailand. By discrete choice modeling, we also have investigated the degree of demand substitutability between Thai Airways and three local low cost carriers, as well as the likelihood of cannibalization in the airline within an airline model. The thesis has analyzed the degree of threat low cost carries could pose to network carrier' core business. It also has answered that launching a low cost offshoot is not a viable strategy for a network carrier to respond with the low cost challenge. This strategy is also subject to a self-cannibalization between parent mainline and a low cost subsidiary if their business models are not compatible.

For future research directions, another interesting issue that we could explore is to investigate if there is a significant distinction between the market segment of leisure and business travelers using the low cost carriers and those using the full service carrier, Thai Airways. There are three further analyses that we could carry on our study to examine this unexplored question.

First, we could adopt a methodology used by Mason (2001) and Evangelho et al. (2005) to examine the perception of travelers surveyed regarding the key attributes of the airline services offered. In our questionnaires, passengers' attitude statements regarding airline product attributes was collected. An attitude rating scale was used of each airline attribute on a nine ranked continuum scale. We then could calculate the average evaluation of attributes on the distinction between LCCs and Thai Airways.

The average value on attributes would reflect how travelers tend to give extra emphasis to each airline attribute such as punctuality, frequency, flexibility, and internet accessibility. To investigate if there is a distinction between travelers using LCCs and Thai Airways, we test whether or not the averages of the sub-samples of travelers in different type of carriers are statistically significant. As a result, the null hypothesis would state that the means of FSC and LCC attributes are equal, against the alternative hypothesis that they are different. However, this simple methodology is limited with a restricted assumption

that two sub-samples drawn from the same population are normally distributed, independent of each other, and have the same variance.

Second, based on our modeling we could further conduct an empirical evaluation of income effect. We could test the hypothesis that taste variations exists in the sample by examining the existence of behavioral difference in the valuation of the time and cost attributes by income strata. In simple words, we could test the hypothesis that both cost and time were income strata specific variable. For this future analysis, we may work with the three strata: low income, medium income and high income. The analysis would help us discover if individuals with different income level give different weights to the cost and time attributes on short haul domestic routes. Another benefit of this study is being able to capture the importance of Thai Airways' frequent flyer program for different passengers' level of income strata.

Last, we could further estimate the subjective value of time (SVT). The subjective value of time can be estimated for our models presented in this thesis. The SVT is defined as the marginal rate of substitution between the coefficients of travel time and cost and may be interpreted as the willingness-to-pay for reducing travel time in one unit. Since our fitted discrete choice models are linear, the SVT is easily computed as the ratio of the time and cost coefficients. We thus could derive the value of time for each LCCs and Thai Airways. This analysis would investigate the hypothesis that individuals using Thai Airways have the highest SVT values, while individuals traveling by LCCs have the lowest SVT values. The interpretation will differ somewhat in this case from the conventional literature since the time variable here is frequency of service.

All of these future analyses are aimed to determine whether there is a distinct market segment between travelers using LCCs and network carriers for leisure and business travel in Southeast Asia. By incorporating these future analyses we hope to better characterize correctly the short haul passenger demand. After the entry of low cost carriers, passengers are faced with an increased choice of airlines, fares and frequency. The behavior of the leisure and business travel market has become more difficult to predict. For Asian network carriers to survive in this new competitive environment, an airline will need to protect and build its market share. The author hopes that this thesis

would provide a sound understanding of the factors that affect the market which could be used to develop an airline's marketing strategy and adjust its business model.

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Appendices

Appendix 1A

Survey for Business Passenger

The survey is conducted as a part of Masters thesis for a student in Transportation Economics and Logistics, at the University of British Columbia, Canada. The thesis aims to study the impact of low cost carriers on network carrier in Thailand. In particular we are interested in passengers' perception as well as attitude on product differentiation of both kinds of carriers. The information obtained from the survey is regarded as confidential and purposely will be used for the study only. No individual identifying information is collected. Your kind cooperation will be highly appreciated.

Instruction: Please mark X on your best choice, and fill your answer in the gap provided. In this survey, low cost airlines are Nok Air, Thai Air Asia and One-To-Go.

Part1: Business Passenger profile

1: In which age group do you fit?

☐ under 25 ☐ 25-40 ☐ 41-60 ☐ above 60

2: In what category range is your monthly income (baht)?

☐ less than 10,000 ☐ 10,000-30,000 ☐ 30,000-50,000

☐ 50,000-70,000 ☐ more than 70,000

3: Which airline are you taking?

☐ Thai Airways ☐ Low cost airlines: ☐ Nok Air

☐ Thai AirAsia

☐ One-Two-Go

4: Which flight are you taking?

☐ TG..... Departure time:..... To.....

☐ FD..... Departure time:..... To.....

☐ OX..... Departure time:..... To.....

☐ DD..... Departure time:..... To.....

5: Who paid the trip for you?

☐ yourself ☐ your company ☐ your client

6: How many people will accompany you on this trip?

☐ 0 ☐ 1 ☐ 2-3 ☐ 4 or more

7: If possible, what is your most preferred departure time for this trip?

☐ 6:00-9:00 am ☐ 9:00-12:00 am ☐ 12:00-15:00 pm

☐ 15:00-18:00 pm ☐ 18:00-21:00pm ☐ 21:00-24:00 pm

8: How much did you pay for your airplane ticket?

_____baht

9: What type of accommodation will you be using?

☐ parents' house ☐ your house ☐ friend's house ☐ hotel

☐ company's house ☐ others

10: When did you book your ticket?

☐ 2 months ago or more ☐ 1 months ago ☐ 2-3 weeks ago

☐ 1 weeks ago ☐ purchased today at the airport

11: How many days will you stay at your destination?

_____days

12: Have you flown any domestic flight in Thailand before?

☐ yes, with ☐ Thai Airways

with low cost airline: ☐ Nok Air ☐ Thai Air Asia ☐ One-Two-Go

☐ no, previously traveled by ☐ coach bus ☐ rails ☐ personal automobile

☐ no, never been in Thailand

13: Are you a member of any frequent flyer programs?

☐ yes with ☐ Thai Airways (Royal Orchid Plus)

☐ Any airlines affiliated with Star Alliance (ex. SAS, ANA, Air Canada etc)

☐ other.....

☐ no

14: Is this trip being taken due to the low fare offering/promotions?

☐ yes ☐ no

15: Are you substituting the flying trip with another mode of transportation (ex: rail or bus)?

☐ yes ☐ no

16: Are you substituting this trip from other activities? (ex: spending time out of town instead of staying at home)

☐ yes ☐ no

17: Was the carrier selected because of its flight schedule?

☐ yes ☐ no

18: Was the carrier selected because of its in-flight service (ex: meals, snacks, magazines)?

☐ yes ☐ no

19: Was the carrier selected because it offers pre-seat assignment at reservation?

☐ yes ☐ no

20: Was the carrier selected because it is the only airline offering flight to your desire destination?

☐ yes ☐ no

21: Was the carrier selected because of its frequent flyer programs?

☐ yes ☐ no

22: Was the carrier selected because it offers access to business lounge?

☐ yes ☐ no

Part 2: Travel purpose and booking behavior

23: What is the primary purpose of your travel?

☐ sales/marketing ☐ internal meeting/visit ☐ training

☐ emergency/problem solving ☐ conference ☐ others

24: What is the size of your company (how many employees)?

☐ self employed ☐ 1-24 ☐ 25-99 ☐ 100-999 ☐ 1,000-5,00

☐ 5,000+

25: Does your company have travel policy?

☐ yes ☐ no

26: Does your company have travel manager(TM)/ travel department (TD)?

☐ has neither TM or TD

☐ company has either TM or TD

☐ has both TM and TD

27: What is your company's travel policy view of low cost airlines?

☐ prevent their use

☐ encourage their use

☐ holds no opinion on their use

28: Did you select the flight schedule yourself?

☐ yes ☐ no

29: Who booked the flight for you?

☐ yourself ☐ your secretary ☐ travel agent

☐ travel department at your company ☐ your client

30: What is your booking channel?

☐ airline website ☐ travel agency ☐ call centre

☐ airline's counter service ☐ your client

Part 3: Use of network and low cost airlines

31: How many times did you fly <u>domestic flight</u> during the last 12 months?

_____**time**

32: Have you used a low cost airline for leisure travel in Thailand?

☐ yes ☐ no

33: Have you used a low cost airline for business travel in Thailand?

☐ yes ☐ no

34: Will you use a low cost airline for business in the future?

☐ yes ☐ no

35: Do you think economy class of Thai Airways offers value for money?

☐ yes ☐ no

36: In the event of a cut in travel budget you would?

☐ reduce travel ☐ not matter

☐ take fewer business class flights

☐ same number of flights but on low cost airline

Part 4: Fares

37: For Thai Airways (TG) passenger only, please choose one.
"Assume both Thai Airways and a low cost airline fly to the same destination you want to go in the future, how much lower would your fares offered by TG have been if you had not taken a low cost airline?"

☐ same price ☐ 20% ☐ 30% ☐ 40% or more

38: For low cost airline passenger only, please choose one.
"Assume both Thai Airways and a low cost airline fly to the same destination you want to go in the future, how much higher would your fares offered by the low cost airline have been if you had not taken a low cost airline?"

☐ 20% ☐ 30% ☐ 40% ☐ 50% or more

Part 5: Principal reasons for carrier selection

39: Had you looked at other carriers' offering prior to booking your flights?

☐ yes ☐ no

40: What are the most important reasons for choosing this airline? Please rank from 1 (most important) to 10 (least important)

_____punctuality

_____seat assignment at reservation

_____fare

_____in flight service

_____flight schedule and frequency

_____business lounge

_____frequent flyer program

_____ticket flexibility

_____easy booking via internet and call center

Survey for Leisure Passenger

The survey is conducted as a part of Masters thesis for a student in Transportation Economics and Logistics, at the University of British Columbia, Canada. The thesis aims to study the impact of low cost carriers on network carrier in Thailand. In particular we are interested in passengers' perception as well as attitude on product differentiation of both kinds of carriers. The information obtained from the survey is regarded as confidential and purposely will be used for the study only. No individual identifying information is collected. Your kind cooperation will be highly appreciated.

Instruction: Please mark X on your best choice, and fill your answer in the gap provided. In this survey, low cost airlines are Nok Air, Thai Air Asia and One-To-Go.

Part1: Leisure Passenger profile

1: In which age group do you fit?

☐ under 25 ☐ 25-40 ☐ 41-60 ☐ above 60

2: In what category range is your monthly income (baht)?

☐ less than 10,000 ☐ 10,000-30,000 ☐ 30,000-50,000

☐ 50,000-70,000 ☐ more than 70,000

3: Which airline are you taking?

☐ Thai Airways ☐ Low cost airlines: ☐ Nok Air

☐ Thai AirAsia

☐ One-Two-Go

4: Which flight are you taking?

☐ TG..... Departure time:..... To.....

☐ FD..... Departure time:..... To.....

☐ OX..... Departure time:..... To.....

☐ DD..... Departure time:..... To.....

5: Who paid the trip for you?

☐ your parents ☐ yourself ☐ your spouse ☐ your friend

6: How many people will accompany you on this trip?

☐ 0 ☐ 1 ☐ 2-3 ☐ 4 or more

7: If possible, what is your most preferred departure time for this trip?

☐ 6:00-9:00 am ☐ 9:00-12:00 am ☐ 12:00-15:00 pm ☐ 15:00-18:00 pm

☐ 18:00-21:00pm ☐ 21:00-24:00 pm

8: How much did you pay for your airplane ticket?

_____baht

9: What type of accommodation will you be using?

☐ parents' house ☐ your house ☐ friend's house ☐ hotel

☐ company's house ☐ other

10: When did you book your ticket?

☐ 2 months ago or more ☐ 1 months ago ☐ 2-3 weeks ago

☐ 1 weeks ago ☐ purchased today at the airport

11: How many days will you stay at your destination?

_____**days**

12: Have you flown any domestic flight in Thailand before?

☐ yes, with ☐ Thai Airways

with low cost airline: ☐ Nok Air ☐ Thai Air Asia ☐ One-Two-Go

☐ no, previously traveled by ☐ coach bus ☐ rails ☐ personal automobile

☐ no, never been in Thailand

13: Are you a member of any frequent flyer programs?

☐ yes with ☐ Thai Airways (Royal Orchid Plus)

☐ Any airlines affiliated with Star Alliance (ex. SAS, ANA, Air Canada etc)

☐ other.....

☐ no

14: Is this trip being taken due to the low fare offering/promotions?

☐ yes ☐ no

15: Are you substituting the flying trip with another mode of transportation (ex: rail or bus)?

☐ yes ☐ no

16: Are you substituting this trip from other activities? (ex: spending time out of town instead of staying at home)

☐ yes ☐ no

17: Was the carrier selected because of its flight schedule?

☐ yes ☐ no

18: Was the carrier selected because of its in-flight service (ex: meals, snacks, magazines)?

☐ yes ☐ no

19: Was the carrier selected because it offers pre-seat assignment at reservation?

☐ yes ☐ no

20: Was the carrier selected because of its destination availability?

☐ yes ☐ no

21: Was the carrier selected because of its frequent flyer programs?

☐ yes ☐ no

22: Was the carrier selected because it offers access to business lounge?

☐ yes ☐ no

Part 2: Travel purpose and booking behavior

23: What is the primary purpose of your travel?

☐ visiting friends and family ☐ sightseeing ☐ education

☐ religion ☐ shopping ☐ others

24: What is your booking channel?

☐ airline website ☐ call centre ☐ airline's counter service ☐ travel agent

Part 3: Use of network and low cost airlines

25: How many times did you fly <u>domestic flight</u> during the last 12 months?

_____

26: Have you used a low cost airline for leisure travel in Thailand?

☐ yes ☐ no

27: Have you used a low cost airline for business travel in Thailand?

☐ yes ☐ no

28: Will you use a low cost airline for leisure travel in Thailand in the future?

☐ yes ☐ no

29: Will you use a low cost airline for business travel in Thailand in the future?

☐ yes ☐ no

30: Do you think the ticket prices you paid offers value for money?

☐ yes ☐ no

31: In the event of a cut in travel budget you would

☐ reduce the number of trips

☐ same number of trips but choosing a less expensive destination

☐ same number of travel frequency but on low cost airlines

Part 4: Fares

32: For Thai Airways (TG) passenger only, please choose one.
"Assume both Thai Airways and a low cost airline fly to the same destination you want to go in the future, how much lower would your fares offered by TG have been if you had not taken a low cost airline?"

☐ same price ☐ 20% ☐ 30% ☐ 40% or more

33: For low cost airline passenger only, please choose one.
"Assume both Thai Airways and a low cost airline fly to the same destination you want to go in the future, how much higher would your fares offered by the low cost airline have been if you had not taken a low cost airline?"

☐ 20% ☐ 30% ☐ 40% ☐ 50% or more

Part 5: Principal reasons for carrier selection

34: Had you looked at other carriers' offering prior to booking your flights?

☐ yes ☐ (b) no

35: What are the most important reasons for choosing this airline? Please rank from 1 (most important) to 10 (least important)

_____punctuality

_____seat assignment at reservation

_____fare

_____in flight service

_____flight schedule and frequency

_____business lounge

_____frequent flyer program

_____ticket flexibility

_____easy booking via internet and call center

Appendix 1B: Simulation Results

Case 1A: Thai Airways lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	60.666	343	6.846%	38
NOK	17.343	98	14.866	84	-2.477%	-14
TAA	15.782	89	13.317	75	-2.465%	-14
OTG	13.055	74	11.151	63	-1.904%	-11
Total	100.000	566	100.000	565	0.000%	-1
Case 2A: Nok Air lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	52.262	296	-1.558%	-9
NOK	17.343	98	20.019	113	2.676%	15
TAA	15.782	89	15.159	86	0.623%	-3
OTG	13.055	74	12.560	71	0.495%	-3
Total	100.000	566	100.000	566	0.000%	0
Case 3A: Thai AirAsia lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	52.459	297	-1.360%	-8
NOK	17.343	98	16.806	95	-537.000%	-3
TAA	15.782	89	18.077	102	2.295%	13
OTG	13.055	74	12.657	72	-0.398%	-2
Total	100.000	566	100.000	566	0.000%	0
Case 4A: One-Two-Go lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	52.722	298	-1.098%	-7
NOK	17.343	98	16.889	96	-0.454%	-2
TAA	15.782	89	15.356	87	-0.425%	-2
OTG	13.055	74	15.033	85	1.978%	11
Total	100.000	566	100.000	566		0
Case 5A: All LCCs simultaneously lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	49.996	283	-3.824%	-22
NOK	17.343	98	18.963	107	1.620%	9
TAA	15.782	89	16.955	96	1.173%	7
OTG	13.055	74	14.087	80	1.031%	6
Total	100.000	566	100.000	566	0.000%	0
Note: Column totals may be affected by rounding error						
The model used was simulated with 566 observations						

Case 6A: Thai Airways increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	55.276	313	1.456%	8
NOK	17.343	98	16.811	95	-0.532%	-3
TAA	15.782	89	15.336	87	-0.445%	-2
OTG	13.055	74	12.577	71	-0.479%	-3
Total	100.000	566	100.000	566	0.000%	0
Case 7A: Nok Air increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	53.587	303	-0.232%	-2
NOK	17.343	98	17.748	100	0.405%	2
TAA	15.782	89	15.687	89	-0.095%	0
OTG	13.055	74	12.978	73	-0.077%	-1
Total	100.000	566	100.000	565	0.000%	-1
Case 8A: Thai AirAsia increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	53.616	303	-0.204%	-2
NOK	17.343	98	17.242	98	-0.101%	0
TAA	15.782	89	16.161	91	0.380%	2
OTG	13.055	74	12.980	73	-0.075%	-1
Total	100.000	566	100.000	565	0.000%	-1
Case 9A: One-Two-Go increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	53.587	303	-0.233%	-2
NOK	17.343	98	17.244	98	-0.099%	0
TAA	15.782	89	15.713	89	-0.069%	0
OTG	13.055	74	13.456	76	0.401%	2
Total	100.000	566	100.000	566	0.000%	0
Case 10A: All LCCs simultaneously increases their frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	53.820	305	53.157	301	-0.663%	-4
NOK	17.343	98	17.546	99	0.203%	1
TAA	15.782	89	15.995	91	0.213%	2
OTG	13.055	74	13.302	75	0.247%	1
Total	100.000	566	100.000	566	0.000%	0
Note: Column totals may be affected by rounding error						
The model used was simulated with 566 observations						

Case 1B: Thai Airways lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	57.511	198	5.321%	18
NOK	17.708	61	15.743	54	-1.965%	-7
TAA	16.273	56	14.308	49	-1.965%	-7
OTG	13.829	48	12.438	43	-1.391%	-5
Total	100.000	345	100.000	344	0.000%	-1
Case 2B: Nok Air lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	50.936	175	-1.254%	-5
NOK	17.708	61	20.457	70	2.749%	9
TAA	16.273	56	15.493	53	-0.780%	-3
OTG	13.829	48	13.113	45	-0.716%	-3
Total	100.000	345	100.000	343	0.000%	-2
Case 3B: Thai AirAsia lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	51.196	176	-0.994%	-4
NOK	17.708	61	17.033	59	-0.675%	-2
TAA	16.273	56	18.502	64	2.229%	8
OTG	13.829	48	13.270	46	-0.559%	-2
Total	100.000	345	100.000	345	0.000%	0
Case 4B: One-Two-Go lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	51.351	177	-0.839%	-3
NOK	17.708	61	17.062	59	-0.646%	-2
TAA	16.273	56	15.708	54	-0.565%	-2
OTG	13.829	48	15.879	55	2.050%	7
Total	100.000	345	100.000	345	0.000%	0
Case 5B: All LCCs simultaneously lowers its fare by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	49.252	169	-2.938%	-11
NOK	17.708	61	19.083	66	1.375%	5
TAA	16.273	56	17.097	59	0.824%	3
OTG	13.829	48	14.568	50	0.739%	2
Total	100.000	345	100.000	344	0.000%	-1
Note: Column totals may be affected by rounding error						
The model used was simulated with 344 observations						

Case 6B: Thai Airways increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	57.316	197	5.126%	17
NOK	17.708	61	15.619	54	-2.089%	-7
TAA	16.273	56	14.636	50	-1.637%	-6
OTG	13.829	48	12.429	43	-1.400%	-5
Total	100.000	345	100.000	344	0.000%	-1
Case 7B: Nok Air increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	51.178	176	-1.012%	-4
NOK	17.708	61	19.817	68	2.110%	7
TAA	16.273	56	15.710	54	-0.562%	-2
OTG	13.829	48	13.294	46	-0.536%	-2
Total	100.000	345	100.000	344	0.000%	-1
Case 8B: Thai AirAsia increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	51.259	176	-0.931%	-4
NOK	17.708	61	17.057	59	-0.651%	-2
TAA	16.273	56	18.374	63	2.101%	7
OTG	13.829	48	13.309	46	-0.520%	-2
Total	100.000	345	100.000	344	0.000%	-1
Case 9B: One-Two-Go increases its frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	51.408	177	-0.782%	-3
NOK	17.708	61	17.057	59	-0.651%	-2
TAA	16.273	56	15.792	54	-0.481%	-2
OTG	13.829	48	15.743	54	1.914%	6
Total	100.000	345	100.000	344	0.000%	-1
Case 10B: All LCCs simultaneously increases their frequency by 15 percent						
Choice	Base		Scenario		Scenario	Base
	%Share	Number	%Share	Number	ChgShare	ChgNumber
TG	52.190	180	49.601	171	-2.589%	-9
NOK	17.708	61	18.478	64	0.770%	3
TAA	16.273	56	17.280	59	1.007%	3
OTG	13.829	48	14.640	50	0.811%	2
Total	100.000	345	100.000	344	0.000%	-1
Note: Column totals may be affected by rounding error						
The model used was simulated with 344 observations						