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The influence of firm age on the relationships of airline performance, economic situation and internal operation

Noor Azina Ismail *, Hashem Salarzadeh Jenatabadi 1

Department of Applied Statistics, Faculty of Economics and Administration, University of Malaya, Malaysia

ABSTRACT

The ways in which airline performance depends on the economic situation and internal operation are well established in the literature. One of the contextual factors that may change the nature of these relationships is firm age. As such, the aim of this study is to investigate the moderating influence of firm age on airline performance outcomes. Thirty airline companies from the Asia Pacific region were selected, and relevant data from 2006 to 2011 were collected. It can be deduced that company experience or firm age can help in taking control of the relationship between the constructs; thus, this measurement acts as a moderator in the research model.

1. Introduction

Airline companies face many different challenges, some of which may affect their performance and others that might result in their closure. For example, according to a report issued by the Airline Transport Association (ATA, 2008), since 1978, at least two hundred commercial airlines have had to merge with other airline companies, seek bankruptcy protection, and/or liquidate or terminate their operations. The report specifically highlights that 12 carriers filed for bankruptcy protection during a period of three years from 2005 to 2008. Due to the economic crises in the last decade, the period between 2000 and 2005 saw a 27% reduction in the number of employees at the six largest air carriers (Scovel, 2006). While the transport service index in terms of passengers and freight increased from 2000 to 2006, a clearly unstable trend can be observed since 2006 (see Fig. 1).

One of the most important results of globalisation has been the increasing performance and resources of airline companies, expansion of market areas, proliferation of destinations and business partners, and the consequent enhancement of conditions to increase competitiveness. Moreover, the survival of each company, especially in the current financial crisis, depends on whether its managers can identify useful policy to control and improve performance given such a situation. The current market environment, the question is therefore what type of policy should airlines adopt to stabilise or improve their performance. One strategic move is to form alliances through mergers or acquisitions of two or more companies. This step avoids bankruptcy and may form a strong coalition among companies. Examples of such coalitions are United Airlines with Continental and AirTran with Southwest.

According to Caves (1998), little attention has been paid to how aging affects firm performance. Investigating the relation between firm age and performance reveals whether firms are able to implement proper strategies to stay relevant and find
ways to constantly renew themselves. If performance declines as firm age increases, it indicates that older firms are not able to pursue entrepreneurial opportunities with greater congruence to market expectations. As a result, some of these aged firms are eventually taken over (Loderer et al., 2009). This paper highlights the potential influence of firm age on the indicators under control by airline managers given the current economic situation. The relationship between the economic situation and internal operation is well established in a way where managers will come up with survival and cost strategies to perform well under current market conditions. Here firm age plays a role in a way that it represents the experience of a company. Anderson and Eshima (2011) argued that older firms are not able to capture the value from entrepreneurial strategies as their younger counterparts are. This is supported by other researchers such as Hannan and Freeman (1984) who found that age can have adverse effects on performance because of the organisational rigidities and impaired firm’s ability to perceive valuable signals. However, it is also believed that firms learn about their abilities and about how to come up with strategies to survive better as they grow older (Baker and Kennedy, 2002).

In estimating organisational performance, age was used as an independent variable (Wang et al., 2011; Powell et al., 1999; Hmieleski et al., 2010), a control (Wang et al., 2010; Carmeli et al., 2011; Ling, 2012; LiPuma et al., 2011) and a moderator (Onyango et al., 2012; Anderson and Eshima, 2011; Jiménez-Jiménez and Sanz-Valle, 2010) variable. In particular, firm age has been used in airline performance modelling as an independent variable with route frequency, route length, passenger growth, and aircraft size (Malighetti et al., 2011). However, passenger growth and route frequency are both influenced by firm age and it cannot be considered as an independent variable. Although firm age is a variable that can be used to show a company’s experience, it cannot be used as the only independent variable that directly affects performance. This variable is only used to produce knowledge that can then be applied by managers in planning and performing flight strategies and programming.

Our study therefore aims to investigate the moderating influence of firm age on the nature of the relationship between the economic situation and internal operation and eventually its effect on performance of airline industry. To achieve this aim, the first step in our analysis is to investigate the relationship between the economic situation, internal operation and airline performance. This is followed by establishing the moderating effect of firm age on the relationship between the economic situation and internal operations. In the final step, the relationships between the three variables are investigated again, this time taking into account the moderating effect of the variable firm age. The contribution of the research is the use of firm age as a moderator, which has not been performed before in airline performance modelling.

2. Theoretical development

2.1. Previous studies on airline performance modelling

We divided the formation of airline performance estimation into 3 periods, including first generation (Early 1980s–Late 1980s), second generation (Late 1980s–Early 2000s), and third generation (Early 2000s–Present).
2.1.1. Early 1980s–Late 1980s

During this period, researchers concentrated on just internal variables, and they took into consideration other factors such as material and energy in addition to variables such as labour and capital. One of the pioneer academic studies was carried out by Caves et al. (1984). This study estimated total factor productivity as a measure of performance for 11 major airline companies. Four outputs (including Revenue Passenger Miles (RPMs) for charter and scheduled, revenue ton miles of mail, and revenue ton miles of other freight), which were mainly associated with airline performance with five inputs (including ground equipment, flight equipment, fuel, ground property, and labour), were used to estimate the Index of total factor productivity for each airline company. In another study, Sickles (1985) tested a nonlinear model and the growth of specific factors of productivity based on sixteen local American airline companies, which included cases from 1970 to 1978, to estimate performance. Sickles’ model included estimates of material, labour, capital, and energy inputs. He employed these variables to reach an estimated cost function that was able to describe a company’s production technology. In the following year, Sickles et al. (1986) used the same data between 1970 and 1981 and evaluated and assessed the deregulation in the sample airline companies. For this purpose, the researchers initiated an airline performance model, which contained 13 airlines with material, labour, energy, and capital, as the input variables to be able to forecast passenger and cargo incomes.

2.1.2. Late 1980s–Early 2000s

In the late 1970s, American Airlines and United Airlines launched their primary system invention based on computerised reservations. It was only in following years that innovations made through computerised reservation system technology created the opportunity to set up and enable revenue yield management systems for revenue-side productivity and ticket price recovery. Therefore, with the implementation of computerised reservation systems, new variables were taken into consideration to estimate the performance of airlines companies by researchers. In other words, variables in connection with ticket selling through agencies using reservation systems were also added to the companies’ other internal variables. The U.S. Transportation Department developed a model in 1988 in which data on an airline’s revenue shares were collected during the year from different airline agencies via their computerised reservation systems (Duliba et al., 2001). Therefore, with the implementation of computerised reservation systems in airlines and agencies, new indicators were taken into consideration to estimate the performance of airline companies by researchers. Most of these variables, such as the number of agencies, the number of systems for ticket sales and reservations, and even travel agent commissions have been effective in evaluating performance.

2.1.3. Early 2000s–Present

Since 2000, due to improvements in IT, most customers book their flights exclusively through the Internet, and the number of tickets sold by travel agencies has decreased. Consequently, variables relating to reservation and ticket sales have been discarded from subsequent research models. This industry change is a consequence of not only unexpected shock factors, such as September 11th, other terrorist attacks, or the SARS (Severe Acute Respiratory Syndrome) phenomenon in China 2003 but also the result of changes in macroeconomic indicators, such as Gross Domestic Products (GDP) growth in different countries and regions; fluctuations in exchange rates and oil price; and by the fact that the airline industry has experienced a general modification in its trends and structure. It can be concluded that the development of IT, on the one hand, by diminishing the importance of variables such as computer reservation systems, and the increasing significance of the effect of economic variables on the performance of organisations and companies, on the other, have brought about deep modifications in the methods that are used to estimate the performance of airline companies. Therefore, the studies conducted in recent years reveal the significance of the effects of the economic situation on the performance of the airline industry.

2.2. Airline performance and related factors

Based on the previous research discussed in Section 2 as well as a study by Duliba et al. (2001), four commonly used indicators that can be used to represent airline performance are load factor (Dai et al., 2005; Davila and Venkatachal, 2004), revenue passenger kilometre (RPK) (Youssef and Hansen, 1994; Guzha, 2008), market share (Ceha and Ohta, 2000; Adrangi et al., 1991; Kurtz and Rhoades, 1992; Contractor and Lorange, 1988; Clougherty, 2002) and operating profit (Bruning and Hu, 1988; Antoniou, 1992; Bailey, 1986). Duliba et al. (2001) argued that the use of market share and load factor is appropriate, although they are relative measures of performance because they are founded on an absolute measure of production. Both variables can also be viewed as indirect measures for maximising profit or as non-financial indicators. These studies considered each performance indicator as one measure, and performance indicators have been introduced separately in distinct models.

In explaining the variations in performance indicators, the most commonly used inputs or independent variables are number of departures (Duliba et al., 2001), average stage length (Doganis, 1991; Cornwell et al., 1990; Caves et al., 1981; Duliba et al., 2001), advertising expenses (Duliba et al., 2001; Squali, 2009) and aircraft kilometre (Aderamo, 2010; Jenatabadi, 2013b). The number of departures indicates the accessibility of an airline to its customers. Providing more departures normally results in better satisfaction and convenience for passengers. This, in turn, increases the attractiveness of the airline in the market. Average Stage Length (ASL) can simply be defined as the length flown divided by the number of departures (Doganis, 1991). This factor indicates the average length in miles, or kilometres, of an airline’s flight between the
departure point and destination, which can refer to two cities or routes, in the case of transit flights. The ASL measurement can result in better financial performance for a company. Advertising expenses can also be considered as a variable affecting the improvement of organisational performance, especially in the airline industry. This variable can contribute to improvement of market share among competitors. Aircraft kilometre is commonly used as a measure of air travel and is calculated by multiplying each weighted aircraft trip by the distance. High aircraft kilometre results in more market control and higher operating profits.

Other variables that should be considered are fleet size (Kim and Kuilman, 2013), and network size (Brueckner et al., 1992; Hansen et al., 2001). These variables are known as internal operation variables in this study, as they are under the control of airline managers. Another variable that was considered by Duliba et al. (2001) in their study is system location. System location has been defined as the number of agencies that have computerised services for ticket and seat reservations. However, this variable is excluded in this study as nearly all airline companies utilise a computer system for purchasing and reservation.

The most important economic indicator used in research is Gross Domestic Product (GDP). This indicator has been used in airline research by Ramanathan (2001) in investigating the performance of the airline industry. GDP is an indicator of changes in the microeconomic environment and it is believed that when GDP increases, the number of people who travel increases accordingly because the environment is attractive to entrepreneurs starting out in business. Therefore, demand for air travel is generally based on GDP, although demand growth is faster than GDP (Hanlon, 2006). The inflation rate is another economic indicator that is commonly used to assess organisational performance. Bachis and Piga, 2006 suggested that the inflation rate can be used to predict airline ticket prices. Another indicator that was never used before in investigating airline performance but is included in this study is the Human Development Index (HDI). According to Avakov (2010), HDI is defined as the average of the level of income per capita in purchasing power parity, level of education and level of health care. High HDI indicates that people have a higher purchasing power and would travel more, thus improving airline performance.

Because performance, internal operation and the economic situation are represented by more than one indicator, and these indicators are related, each of the measurements can be represented by a latent variable. The conceptual research model is shown in Fig. 2.

3. Methods

3.1. Sample and data collection

Based on an Air Transport World (ATW) report from 2011, there are 104 airlines listed in the Asia Pacific region. The companies involved in this study specialise in transfer of both passengers and cargo, which have short, medium, long, and ultra-long haul flights. However, 23 companies that are involved as trunk and low-cost carriers are excluded from the present research domain. In this study, 30 (37%) airline companies are selected over a 6-year period of 2006–2011. The data are reported on an annual basis and are gathered from an overall company level instead of city pair. Therefore, 180 records were considered, one of which was deleted due to missing information.

3.2. Structural equation modelling and research variables

In recent years, Structural Equation Modelling (SEM) has attracted the attention of many researchers as a commonly adopted method used in various transportation disciplines such as shipping (Lu, 2003; Lu et al., 2007; Yang et al., 2009; Farag et al., 2007), rail (Mohd Mahudin et al., 2012; Chou et al., 2011; Chou and Kim, 2009), aviation (Yoon et al., 2008; Kao et al., 2009; Chen, 2008; Jenatabadi, 2013a, 2013b), travel behaviour (Lu and Pas, 1999; Aditjandra et al., 2012;
Golob, 2003; de Abreu e Silva et al., 2012; Mokhtarian and Cao, 2008), and driver behaviour (Hassan and Abdel-Aty, 2011; Warner and Å.berg, 2006). The main feature of SEM distinguishing it from other available models is its ability to allow researchers to incorporate both observed and latent variables into the process of the same analysis. As a result, the created incorporation provides a stronger analysis of the suggested model as well as a better evaluation of the study (Chin, 1998; Gefen et al., 2000). Furthermore, SEM has the ability to assist researchers in two additional ways, i.e., handling complicated data (with non-normality and multi collinearity) and the use of graphical interface modelling (Garson, 2007). A path analysis utilises a measurement model to confirm model fitting and verifies the reliability of the measurement indicators employed in the latent constructs.

AMOS's 16 maximum likelihood programme was utilised to examine the proposed hypothetical model. One of the major characteristics of this SEM is its flexibility in interplaying between data and theory, and its capability of bridging the gap between empirical and theoretical knowledge to better understand the perception of the real world (Fornell and Larcker, 1981). This type of analysis enables researchers to design modelling that is based on both manifest and latent variables, a feature suitably fitting for the model that has been hypothesised in which the majority of constructs are made up of abstractions composed of unobservable phenomena. Moreover, in SEM, measurement errors are considered as multiple-group comparisons and variables with multiple indicators.

Table 1 lists the definition of the three constructs, namely performance, internal operation, and economic situation.

### 3.3. Moderation analysis

There are three main approaches that are commonly employed in the statistical path analysis. These approaches are to investigate (1) causal relationship; (2) difference in coefficients; and (3) product of coefficients (MacKinnon, 2000). Three regression equations involved are displayed below:

| Table 1 | Operational definition of research variable. |
|---------|---------------------------------------------|
| Construct | Definition of the variable |
| Performance | **Load Factor** is calculated by extracting the total number of transported passengers as a percentage of the available seats for one route and by extracting the total passenger kilometres travelled as a percentage of total available seat kilometres for mixed routes (Petrick, 2007) |
|          | **Revenue Passenger Kilometre**: “is a measure for passenger traffic, obtained by multiplying the number of paying passengers on a flight by the distance of the flight” (Petrick, 2007) |
|          | **Market Share**: Ceha and Ohta (2000) have presented a mathematical definition as follows: In the above formula, PAX, represents the number of passengers transported by ith airline and n refers to the number of airlines available in the market |
|          | **Revenue Tone Kilometre** is to determine the total amount of freight that is carried by the airline |
|          | **Operating Profit** refers to growth in business activities in favour of the business owners in a market. “Profit” is originally a Latin word that means “to make progress”. In this study, operating profit was based on the annual reports of airline companies in US dollars |
| Internal operation | **Number of Departure** indicates the accessibility of an airline to their customers |
|          | **Average Stage Length** can simply be defined as the length flown divided by the number of the departures (Doganis, 1991) |
|          | **Fleet size** is number of the companies’ aircraft |
|          | **Advertising expenses** that are measured in US dollars |
|          | **Available Seat Kilometres** is the result of the capacity of passengers on an aircraft multiplied by the route distance (Beaver, 2005) |
|          | **Network Size** is the number of route between two cities or airports |
|          | **Aircraft kilometre** is computing by multiply each weighted airplane trip by the distance. One vehicle kilometre is the movement of one airplane for one kilometre, regardless of the number of passengers in the airplane |
| Economic situation | **Inflation Rate** is “the year-on-year growth rate of the consumer price index” (Smith and Searle, 2010) |
|          | If \(\text{Price}_t\) represents the average price during year \(t\) and \(\text{Price}_{t-1}\) is the average price in year \(t-1\), the resulting inflation rate for year \(t\) will be obtained through: \[
\text{Inflation Rate} = \frac{\text{Price}_t - \text{Price}_{t-1}}{\text{Price}_{t-1}} \times 100\%
\]
|          | **Gross Domestic Products** is equal to the total expenditures for all final goods and services produced within a country during a given year (Bernold and AbouRizk, 2010). The following equation displays the components of the equation that results in GDP: GDP = government spending + gross investment + private consumption + (exports – imports) |
|          | **Human Development Index** is the “average of the level of income per capita in purchasing power parties, level of education, and level of the health care” (Avakov, 2010) |
|          | **GDP per capita** is equal GDP divided to the number of the people in the area |
|          | **Fuel Price** is the price of fuel per gallon |
|          | **Population** refers to the total population of the observed country (or area) |
\[
Y = \alpha_1 + \beta_1 X + \epsilon_1 \\
Y = \alpha_2 + \beta_2 X + \beta_M M + \epsilon_2 \\
M = \alpha_3 + \beta_M X + \epsilon_3.
\]

In the above equations, \(Y\) is considered as the dependent variable; \(\alpha_1, \alpha_2,\) and \(\alpha_3\) are intercepts; and \(M\) indicates the mediator; \(X\) represents the independent variable; \(\beta_1\) indicates the coefficient related to the dependent and independent variables; \(\beta_2\) shows the coefficient connecting the dependent variable to the independent one, and, ultimately, adjusting them for the mediator; \(\beta_M\) represents the coefficient linking the mediator indicator to the dependent variable adjusted for the independent one; \(\epsilon_1, \epsilon_2,\) and \(\epsilon_3\) indicate the residual terms. Nevertheless, the mediation functions can be modified to produce both nonlinear and linear effects as well as \(M\) and \(X\) interactions in Eq. (2).

Moderators can be tested as interaction effects (Aiken et al., 1991). A non-zero interaction of \(XM\) in Eq. (3) indicates a moderator effect, implicating that the effect of the \(\beta_M\) coefficient is different at a different level of \(X\). The existence of moderator effects shows the alterations that occur in the modelled function across various moderator variable levels, in which moderators are possibly either a natural variable such as gender or a manipulated factor in a setting of experiments. Testing these variables and their effects on models of mediation helps a study focus on the way the effects of an experiment can be achieved. Nevertheless, examining the moderator effects enables a researcher to see whether the effects of the experiment on individual subgroups are different (Donaldson, 2001; MacKinnon, 2001; Sandler et al., 1997).

4. Results

4.1. Reliability and validity

Reliability was assessed through a factor loading of each item on the underlying construct. According to Hair et al., 2006, a factor loading of at least 0.7 indicates that the validity of an item is acceptable. Using these criteria and the results shown in Fig. 3, fuel price, GDP per capita and population size are excluded from Economic Situation. Additionally, aircraft kilometre, ASK, fleet size and network size are excluded from Internal Operation. For the same reason, only load factor, RPK and operating profit are included in the next analysis for airline performance construct.

Composite reliability is utilised in this study instead of Cronbach’s alpha because the latter has a strong tendency to underestimate the level of the reliability (Hair et al., 2006). Nunally and Bernstein (1994) recommended a value of 0.7 or higher for the composite reliability to be considered as adequate. For the index of convergent validity, Fornell and Larcker (1981) suggested that the use of Average Variance Extract (AVE) because it “measures the overall amount of variance that is attributed to the construct in relation to the amount of variance attributable to measurement error”. According to Segars (1997), convergent validity is considered to be adequate if the AVE is 0.50 or higher. As illustrated in Table 2, all factor loadings were higher than the minimum and meet the guidelines recommended by related researchers.

Fornell et al. (1982) said “there is a discriminant validity when the variance shared between a construct, and any other construct in the model is less than the variance that constructs shares with its indicators”. The assessment of this relationship was performed based on the comparison between the AVE square root of a construct and the correlations between a construct to another. When the AVEs’ square roots for the off-diagonal elements in the columns and rows are larger than the correlations that relate a construct to other constructs in a given model, it can be strongly claimed that the correlation between a construct and its indicators is stronger than the correlations between the other constructs available in the model. Table 3 shows replacement of the diagonal elements in the matrix of correlation with the AVEs’ square roots. As the table confirms, discriminant validity seems to be quite satisfactory for all the constructs in the model.

4.2. Measurement model

As presented in Fig. 4, the measurement model in the graphically designed structure diagram shows the existence of relationships between the latent variables and their measurements. Fig. 4 also presents the association that exists between a pair of latent variables. This information in connection with the measurement model includes: an estimate of standardised regression weight, an estimate of squared multiple correlation, and an estimate of coefficients. The estimate of standardised regression weight is measurable between every latent variable and its measurement, for example, when the inflation rate increases by one standard deviation, the economic situation decreases by 0.77 of the standard deviation. The estimate of squared multiple correlation exists between the latent variables and their measurements, for instance, the predictors of RPK are estimated to explain 88% of its variance. Conversely, the RPK error variance is approximately 12% of the RPK variance itself.

4.3. Structural model

Nine variables with three constructs were taken into consideration in the confirmatory factor analysis. The goodness-of-fit indices and outcomes of direct effects between the constructs are displayed in Table 4. It can be claimed that this structure fits the data very well with CFI = 0.943, IFI = 0.946, NFI = 0.946, GFI = 0.902, and TLI = 0.918. It can be concluded...
that internal operation has a significant positive effect on economic situation, $\beta = 0.31$, $p < 0.01$. Moreover, it can be suggested that airline performance is significantly and positively related to economic situation, $\beta = 0.11$, $p < 0.05$. Airline performance is also significantly and positively related to internal operation, $\beta = 0.87$, $p < 0.01$.

Table 2
Results of convergent validity.

| Construct             | Measure          | Factor loading (>0.70) | AVE (>0.50) | Composite reliability (>0.70) |
|-----------------------|------------------|------------------------|-------------|-----------------------------|
| Airline performance   | Load factor      | 0.81                   | 0.71        |                             |
|                       | RPK               | 0.88                   |             |                             |
|                       | Operating profit | 0.74                   |             |                             |
| Internal operation    | Departure        | 0.89                   | 0.75        |                             |
|                       | Stage of length  | 0.92                   |             |                             |
|                       | Advertisement    | 0.91                   |             |                             |
| Economic situation    | Inflation rate   | 0.86                   | 0.85        |                             |
|                       | Ln(GDP)          | 0.85                   |             |                             |
|                       | HDI              | 0.78                   |             |                             |

The significance of '*' indicates acceptable values.
Table 3
Discriminant validity test.

| Factors            | AVE | r²_1 | r²_2 | r²_3 |
|--------------------|-----|------|------|------|
| Economic situation | 0.83| 1    |      |      |
| Internal operation | 0.82| 0.096| 1    |      |
| Airline performance| 0.81| 0.144| 0.81 | 1    |

Fig. 4. Estimated model.

Table 4
Parameter estimated and goodness of fit indices.

| Hypotheses       | Path                                      | Standardised coefficient | CR    | p      | Result     |
|------------------|-------------------------------------------|--------------------------|-------|--------|------------|
| H₁               | Economic situation → Internal operation   | 0.31                     | 3.544 | <0.01  | Supported  |
| H₂               | Economic situation → Airline Performance  | 0.11                     | 2.092 | 0.036  | Supported  |
| H₃               | Internal operation → Airline performance  | 0.87                     | 11.636| <0.01  | Supported  |
| χ² = 89.759      | RFI = 0.891                               | IIF = 0.946              |       |        |            |
| GFI = 0.902      | NFI = 0.946                               | TLI = 0.918              |       |        |            |
|                  |                                            |                          |       |        | RMSEA = 0.124|

Table 5
Direct, indirect, and total effect of the model.

| Outcome          | Input                        | Standardised estimates |
|------------------|------------------------------|------------------------|
|                  |                              | Direct     | Indirect | Total   |
| Internal operation| Economic situation           | 0.31       | –        | 0.31    |
| Performance      | Economic situation           | 0.11       | 0.27     | 0.38    |
| (R² = 0.83)      | Internal operation           | 0.87       | –        | 0.87    |
Table 5 shows the path analysis and provides the direct, indirect, and total effect of each construct. We find the value of $R^2$ is 0.83. In other words, 83% of the changes that occur in global airline performance depended on the economic situation and internal operation. In addition, indirect effect (0.27) is significant and bigger than the direct effect (0.11). Therefore, it can be confirmed that internal operation acts as a mediator in the relationship between economic situation and performance. This result provides support for the hypothesis in this research.

4.4. Moderating effect of firm age

To examine the moderating effect of firm age, we employed two procedures. The first procedure is testing firm age as a moderator using Smart-PLS. The second procedure is employed to compare two models, taking into account the firm age using AMOS.

We start by analysing the impact of firm age in a way where internal operation can be maximised by the airline managers. In this regard, we used firm age to examine age, i.e., the experience of the company, in the research model. Table 6 presents the relationship between firm age and airline performance indicators, which are also known as the dependents and internal operation indicators as mediators in this study. As we can see in Table 6, all the indicators in constructs have significant and positive relationships with firm age.

Because firm age is in a continuous form, Smart-PLS software is used to examine its moderating effect. The results are shown in Table 7, and it presents the interaction effect of age and economic situation on internal operation. It confirms our hypothesis that firm age is a moderator in the relationship between economic situation and internal operation, which means that as firm age increases, the effect of economic situation on internal operation will increase. In other words, the effect of the economic situation on internal operation with the company that has a higher age is larger than on companies with a lower age.

In investigating firm age as a moderator effect with AMOS, it cannot be treated as a continuous variable. Furthermore, we want to compare the effect of experienced firms with the younger ones. The most common approach in defining older and younger firms is by using the median as the cut-off points (Jiménez-Jiménez and Sanz-Valle, 2010; Anderson and Eshima, 2011). Because this study involved data from multiple years, the median is calculated based on the average median firm age over the six years. Hence, the median is 19 years and based on this value, firms are classified into two categories. Firms with fewer than 19 years are called younger companies and firms aged 19 years and older are known as higher age companies.

To test firm age differences, the Critical Ratio (CR) test (>±1.96, $p < .05$) is utilised to achieve the critical ratio statistics for the differences among regression weights of higher- and lower-age subjects (Ho, 2006). According to Arbuckle and Wothke,
the critical ratio of an estimate pair tests the hypothesis is used to confirm the equality of the two parameters. This method is repeated to investigate possible moderating effects in the three relationships. According to the results presented in Table 8, there seems to be a significant difference in the relationship between internal operation and economic situation in both lower and higher firm age. Thus, this finding supports the claim that firm age, represented in two groups, acts as a moderator in the research model.

Figs. 5 and 6 show the structural models for higher and younger companies in the airline industry. It can be concluded that there is no significant relationship between economic situation and internal operation in the younger companies. However, strong relationships between economic situation and internal operation with performance are observed for higher age companies. In other words, in higher age companies, the relationships among the three constructs of economic situation, internal operation and performance are significant, and internal operation acts as a mediator between the relationship of the economic situation and airline performance. As such, the model for younger companies is clearly different from higher age companies.

5. Discussion

Drawing from a sample of 30 airline companies in the Asia Pacific region, this study identified the moderating effect of firm age in the relationships between economic situation, internal operation and airline performance. Without taking firm
price for certain air travellers and has the potential to increase the load factor (Jenatabadi and Ismail, 2007). This indicator and performance are significant and internal operation acts as a mediator between the relationship of economic situation and internal operation. The findings of this study proved this phenomenon when the relationships among economic situation, internal operation and performance are significant and internal operation acts as a mediator between the relationship of economic situation and airline performance.

As with all research, this study does have its limitations. The first limitation is the exclusion of a few important factors such as subsidy, customer satisfaction and ticket price. A subsidy is financial support given to some airline companies by their governments (Bhadra, 2009). The subsidy given by the government allows companies to give discounts to the ticket price for certain air travellers and has the potential to increase the load factor (Jenatabadi and Ismail, 2007). This indicator was excluded due to the absence of such data in the annual report. Information on customer satisfaction and top management teams are also not available in the annual report and therefore are excluded from the study. Another important variable is ticket price, and it has been used in performance (Duliba et al., 2001), price (Mantin and Koo, 2009; Oliveira and Huse, 2009: Gaggero and Piga, 2010; Wan et al., 2009), and Choice modelling (Rose et al., 2012; Rose et al., 2005b; Rose et al., 2005a; Bliemer and Rose, 2011) of airline companies. For airline performance modelling, this indicator is suitable for the city pair level and not at the industrial level. For this reason, ticket price is also excluded from our research model. A further limitation is because data were only collected in the Asia Pacific region; therefore, the findings cannot be generalised to all airlines in the world.

The top management team is one of the most important topics that can be applied to the assessment of organisational (Pegels and Yang, 2000; Hambrick et al., 1996; Bowlin and Renner, 2008) and airline performance (Coll et al., 2008; Jones, 2006). It can be examined as a moderator in the relationship between the constructs of performance models.

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