TAXONOMY OF GLOBAL AIR TRANSPORT

M. Vaziri

Department of civil Engineering
Sharif University of Technology
Tehran, Iran

Abstract Data from the United Nations and the International Civil Aviation Organization Information Systems were used as a base for characterizing, classifying and comparing air transport demand and supply features of 156 countries. Relevant data from 1980 were chosen to reflect five sets of characteristics namely, air transport, socio-economic status, population demography, geographical and environmental features, and political features. The resulting 123 variables were assessed for accuracy and reliability and subjected to correlation and factor analysis to screen and identify key characteristics reflecting air tranport potentials. This led to a suitable basis for grouping countries to allow peer comparison based on composite indices. The resulting homogeneous clusters of countries provided a better than heretofore available framework for the evaluation of differences and similarities between national consumption and supply of air transport services. Regression models were developed for each peer group of countries to evaluate air transport potential, allowing a basis for more confidence in economy-of-scale decisions.

Key Words Air Transport, Peer Groups, Regression Analysis, Aviation System

چکیده دراین مقاله ۱۵۶ کشور مختلف جهان در ارتباط با خصوصیات عرضه و تقاضای حمل و نقل هوائی مورد تحلیل و گروه بندی قرار گرفته اند. اطلاعات لازم برای سال ۱۹۸۰ میلادی از بانک های اطلاعاتی سازمان ملل و سازمان بین المللی هوائی استخراج شده است. ۱۲۳ متغیر اطلاعات لازم را در ۵ گروه حمل و نقل هوائی، اقتصادی، اجتماعی جمعیتی و سیاسی منعکس ساخته اند. پس از تحلیل های آماری کورولیشن و فاکتور آنالیز کشورها به گروه های همگن تقسیم بندی شده و عرضه و مصرف حمل و نقل هوائی در هر گروه مورد مطالعه و ارزیابی قرار گرفته شده است. مدلهای رگراسیون برای هر گروه از کشورها برای عرضه و تقاضای حمل و نقل هوائی ساخته شده است.

INTRODUCTION

Aviation systems of the world have contributed immensely to trade, tourism, defense, communication and international understanding. Air transport activities have been rapidly escalating in the past three decades and have become the dominant form of long-haul passenger transport for many countries. As a consequence of this rapid growth, studies of air transport demand and supply have been intensified [4, 5, 8, 11].

Historically, demand analyses have been either univariate trend extrapolations or multivariate econometric studies. Univariate studies have varied from the mostly simple projections of historical air travel data to the more complex time-series analyses such as autoregressive integrated moving average, ARIMA, modeling [2 , 11]. A few studies have addressed air-transport demand at a global level by simple projection models [4 , 10]. Econometric models have related aviation activities to several economic, social and population factors. The objective has often been to forecast future air-transport demand for either short term or long term applications. These studies have covered local, regional and national demands in economically advanced markets such as the North Atlantic [7 , 8 , 10].

In the supply studies, variables describing different aspects of air transport cost and service level have been modeled and evaluated. Literature related to aircraft, air traffic, airport design and operation may be rich [5]. However, no study of either supply or demand has been carried out at the global level in consideration of economic, social, geographical and political differences and similarities among nations.

Although there is considerable discussion of air transport and service market uniqueness in various countries, deserving attention has not been paid to the development of a macroscopic global cross sectional study aimed at providing general air-transport development-potential comparisons between peer groups of nations to be used by decision makers as a guide in confronting the set of unique air transport development opportunities and constraints within any nation. Thus, the aim of study reported here is to present a good general comparison tool to be used as a guide in unique development efforts, allowing more confident "economy of scale" decisions during peer group and worldwide air transport growth.

The objectives of this research were primarily to:

1. Develop a useful methodology for evaluating and classifying countries of the world on the basis of air transport and relevant socio-economic, political and geographical characteristics, and
2. Apply that methodology to nations throughout the world as a means of evaluating air transport development potential.

STUDY APPROACH

The study was conducted in four major phases, namely collecting data, validating & reducing data, grouping of countries, and analyzing of peer groups. The first phase was to create a database from which air transport and other relevant national data could be extracted. For the chosen 156 countries, information on 123 variables was compiled. The second phase was to validate and screen the data. The resulting databank was scrutinized and validated by evaluating distributional characteristics using univariate statistical analysis. For data reduction, first pairwise correlation determined that, on the average, each of the 123 variables correlated significantly with more than half of the rest. Then by means of factor analysis, data were reduced to simpler and statistically less redundant set, consisting of almost one third of the original variables. In the third phase, the reduced data were subjected to another multivariate statistical procedure, namely, cluster analysis, to form homogeneous peer groups of countries. Comparative analysis of the resulting groups was carried out in the fourth phase. By means of analysis of variance, resultant peer groups were analyzed to determine similarities and differences. Simple econometric models were developed for each homogeneous group of countries. Inclusion of variables best describing the air transport of a country was achieved through stepwise regression analysis.

DATABASE

The global scope and limited resources of this study required the use of centralized data sources. United Nation's statistical year books and the published statistics by the International Civil Aviation Organization were used [6, 12]. Examination of the data sources revealed that the most complete and up-to-date information was reported for 1980. Consequently 1980 was chosen as the base year. From among more than

200 countries, 156 were selected for this study. The remainder were excluded only because data had not been adequately reported for the intended time period. Though the size of the list of variables was too long to be displayed here, a summary is as folows:

1. Air Transport (AT) variables: 35 variables reflecting national supply, demand and consumption of air transport such as seat mile, passenger mile, ton mile and operating expense.
2. Economic and social (ES) variables: 39 variables such as gross national product, housing condition and education.
3. Population demography (PD) variables: 21 variables such as total population, and its distribution by age and sex.
4. Geographical and environmental (GE) variables: 20 variables such as total surface area, type of climate and border perimeter.
5. Political structure and affiliation (PA) variables: 8 variables such as type of government and alliances.

These 123 variables encompassed all major national attributes relevant and amenable to investigation. They covered major characteristics within constraints of the database and appeared to be intelligible and potentially significant. Furthermore, they included most of the principles used by other researchers as revealed in the literature [10].

DATA VALIDATION AND SCREENING

Univariate statistical analysis determined distributional characteristics of the 123 variables [9]. The number of missing data entries for each variable was assessed and erroneous entries were corrected. Variables with more than half of observations missing were excluded from further analyses. Pairwise correlation analysis determined variables among economic and social, population demography, geographical and environmental and political characteristics that significantly correlated with air transport variables [9]. This was another screening exercise aimed at eliminating statistically less relevant variables, reducing the total to 100, including 35 air transport variables. To examine for statistical redundancy and develop and understanding of the basic interrelationship of the 100 variables, a 100 by 100 correlation matrix was developed. Not surprisingly, but, at the same time, of much significance, many pairs of the variables were found to highly correlate. Though the size of the matrix prevents its display here, it revealed, on the average, that each variable significantly correlated with about 60 percent of the others at the 0.05 level. Air transport variables, population demography variables, and economic and social variables were the most highly correlated among the different sets. The correlation analysis suggested that the 100 variables could be further reduced by eliminating statistically redundant variables. Factor analysis is a useful statistical procedure in such a case [9].

In factor analysis, variables having similar patterns of variance were grouped together into statistically independent factor dimensions. Results can be used in two ways. First, one or more variables within each factor goup, generally the most significant as indicated by a large factor loadings, are selected to represent the dimension of that group. The others are then discarded. In the second approach, a new variable is created to represent each of the factor groups, and a factor score is computed as a measure of that variable. Unfortunately, while the new variables may

represent the factor dimensions adequately, their meanings are not always instinctively obvious, and they sometimes bear little resemblance to the original variables. For this reason, the former approach to the task of variable reduction was adopted. A separate factor analysis, with a varimax rotation and minimum eigenvalue of one, was performed on each of the five sets of variables. For each of the five analyses, variable selection was based on the following criteria:

1. The more significant factor dimensions had to be represented,
2. selected variables has to statistically representative as indicated by large factor loadings, and
3. preference had to be given to variables used by other researchers and those deemed to be most logically representative.

This screening was useful in reducing the list of variables from 100 to 50. The 50 variables, together with their means and coefficients of variation are shown in Table 1. Air transport (AT) variables showed the largest variability with an average coefficient of 267.4 followed by economic and social (ES) variables with an average coefficient of 239.2. Average coefficients of population demography (PD) variables and geographical and environmental (GE) variables were 170.6 and 146.6, respectively. Since the mean and coefficients of variation for political structure and affiliation (PA) variables were measured in the nominal scale, they are not reported here.

GROUPING OF COUNTRIES

In order to select the most appropriate criteria for grouping countries based on similar air transport potentials, attention was paid to 35 selected exogenous variables. These variables included the economic and social (ES) variables, population demography (PD) variables, geographical and environmental (GE) variables, and the political structure and affiliation (PA) variables listed in Table 1. Factor analysis of the 35 variables was performed using the factor analysis program of the SPSS with varimax rotation and a minimum eigenvalue of one [9]. The purpose was to reduce the key variables further and to see if a pattern would emerge to suggest what the grouping criteria had to be. Although such a pattern was not very explicit, the ten resulting factors (F1 to F10) showed distinctive patterns as revealed by factor loadings. Factors 1 and 3 were dominated by population demography variables. Factors 2 and 5 reflected economic and social variables. In factors 4, 6, 7, 8 and 10, the geographical and environmental variables showed high loadings. Factor 9 (F9) was dominated by political structure and affiliation variables. While all the factors and combinations thereof were good bases for grouping the countries, the factors most correlated with air transport (AT) variables were considered to be more appropriate in terms of reflecting similar markets and environments for air transport activities. Among the 10 factors, F2, F9 and F4 correlated higher with the air transport variables than did other factors. Factor 9 (F9) was eliminated because it explained a little amount of the total variance among the 35 variables and was dominated by dichotomous variables. Factor 2 was labled an economic dimension with high positive loading from variables such as total export, foreign exchange, total import and gross national product. Factor 4 was labled a geographical dimension with high positive loading from variables such as country surface area and circumference. Groupings of the

countries were formed by using the Biomedical Computer Program cluster analysis with K-mean clustering [1]. In this algorithm the Euclidean distance was used as a measure of the deviation of each country from the group mean. Initially all countries were considered as one group. With each succeeding iteration, a new group was formed until the requested number of groups, K, had been reached. Three different schemes for grouping were subjected to detailed analysis based on F2 and F4 individually and in combination. The number of groups, K, varied from 2 to 10, thus developing nine groupings for each of the three schemes. These 27 groupings were investigated on the basis of criteria that peer groups have sufficient members and that peer countries are reasonably similar in air transport potentials. As a result, groupings based on economic dimension F2 and K=7 were finally selected. The resulting groups are presented in Table 2.

The first two groups consisted of 7 western economically advanced countries. Group 1 consisted of 3 countries: The United States, Japan and Germany. Group 2 consisted of 4 countries: France, Italy, The Netherlands and The United Kingdom. The third group consisted of 30 countries: dominated by developing countries that are very active in foreign trade. Group 4 consisted of 85 countries from all five continents. The fifth group consisted of 32 countries including most of the Eastern European nations. Groups 6 and 7 each consisted of one country, China and USSR, respectively. The groups are numbered according to the magnitude of the group mean for the composite economic index F2. Thus, group 1 has the highest mean, group 2 the second highest mean, etc. For each group, the mean and coefficient of variation of key economic and social variables reflecting F2 are shown in Table 3.

Table 3 also shows dispersion data for selected population demographic variables and geographical snd envrionmental variables. Variable descriptions are the same as these in Table 1. Coefficients of variation are written in parentheses below the mean values. In general, the economic and social variables are in descending order. The exception to this is most often with group 6 and 7 including the two unique nations of China and USSR. Comparison of coefficients of variation in Table 1 and Table 3 demonstrates that peer group values are much smaller than when all 156 countries are considered together. This is a reflection of homogeneity within the peer groups.

ANALYSIS OF PEER GROUPS

Data for peer groups were analyzed in two phases: comparative evaluation of peer group dispersion statistics and regression modeling. Dispersion data on air transport variables for the groups developed on the basis of the composite economic index i.e. F2, were compared to investigate within and between-group differences and similarities. Table 4 shows the mean and coefficient of variation for the selected 15 air transport variables. Since groups 6 and 7 each has only one member, the coefficient of variation is zero. Group averages and coefficients of variation are different from the world average and coefficient of variation, as demonstrated in Table 4. Variable descriptions are the same as Table 1. Coefficients of variation are written in parentheses below the mean value. A general relationship seems to exist between group mean and group number. As the composite economic index decreases and the group number increases, the supply of and demand for air transport decreases. The exceptions are groups 6 and 7 which contain "unique" countries, China and

USSR. Again, coefficients of variation are significantly lower for the peer groups, compared with that of the world coefficient of variation, reflecting homogeneity within groups.

Regardless of purpose, peer comparisons offer great promise in the quest for improved decision making and resource allocation. Air transport activities of a given nation can be compared with that of its peer group averages to the extent that F2 peer groups represent homogeneous groups of nations having equivalent potential for air transport. A realistic reference or target value for air transport supply or demand attributes is the average of the peer group. The suggestion is that a subject nation can achieve supply or demand levels demonstrated by the average of its peer group if the proper air transport policy decisions are made. The subject nation could even reach levels as good as the "best" demonstrated within the peer group.

The stepwise multiple regression analysis of SPSS was used to develop models for the 15 air transport (AT) variables listed in Table 1. The independent variables were selected from among the 35 economic and social (ES) variables, population demography (PD) variables, geographical and environmental (GE) variables, and political structure and affiliation (PA) variables listed in Table 1. The number of independent variables in each regression equation was limited to 3. This number seemed to be sufficient with regard to accuracy but not so large to distort the relationships. Two function forms were screened: the linear and the multiplicative. Because the linear form was simpler and seemed to be of comparable or superior accuracy, it was chosen for the detailed analysis. The sets of multiple linear regression models were developed. For the first set of models, the best 3 of the 35 candidate variables were selected by the stepwise routine. Three preselected variables of gross national product (ES7), total population (PD1) and total surface area (GE1) were used for the second set of models. The two sets involved the development of regression models for peer groups 1 to 5 and for all the 156 countries considered together. Groups 6 and 7 were eliminated because they included only the two nations, China and the USSR.

Results of modeling effort are too extensive to be presented here, but the complete set is available elsewhere [10]. For the first set containing 90 models developed by stepwise routine, economic and social (ES) variables showed the highest relative frequency of appearance, 39%, followed by geographical and environmental (GE) variables, 26%, Political structure and affiliation (PA) variables, 25%, and population demography (PD) variables, 11%. The coefficient of determination, R^2, for the first set had an average value of 0.78 and for the second set with 3 preselected variables had an average value of 0.67. The two sets containing 180 models can be used in decision making and prediction. The 15 air transport (AT) variables can be predicted once the known or predicted values of independent variables are placed in the models. Furthermore, the model predictions can be used as target or reference points for air transport supply and demand attributes. For the purposes of illustrative application, consider an air transport attribute such as international passenger kilometers (AT1) and a subject country such as Iran. The 1980 observed an peer group average values for Iran are 995 million passenger kilometers and 3471 million passenger kilometers, respectively. The relevant regression models based on peer group data are as follows:

$$AT1=2128+0.058\ (ES7)-1.240(GE8)-310.135(PA1) \quad (1)$$

AT1=486+0.083 (ES7)-0.041 (PD1)-0.001 (GE1) (2)

Variables are defined in Table 1. The coefficients of determination, R^2, for models 1 and 2 are 0.85 and 0.81, respectively. Model 1 belongs to the first set, developed by stepwise regression. Model 2 was developed on the basis of 3 preselected variables. Predictions from models 1 and 2 are 3430 million passenger kilometers and 4522 million passenger kilometers, respectively. It is imperative to note, however, that numerous additional factors must be incorporated into any decision such as boosting air transport activities in Iran. Decision makers might very appropriately decide that the resource commitments necessary to triple Iran's international passenger kilometers are not justified due to constraints outside the air transport sector.

CONCLUSIONS

The main study objective was achieved in the classification of countries of the world into seven homogeneous groups on the basis of relevant air transport characteristics. These peer groupings of countries are useful for comparative evaluation of air transport activities.

Procedures described here for meaningful comparisons of air transport development potentials within and between individual countries and peer groups of countries are considered viable. The developed models can be used as a basis for mode reliable predictions of the scale of needed infrastructure development to achieve levels of activity temporally suitable during continuing worldwide peer group and national growth of air transport. Overall planning of air transport activities in consideration of the constraints of predicted potentials will allow an economy of scale in development to help guard against "boom-and-bust" levels of resource over-commitments. Such readily derived mean of gaining and using a reliable view of the way things are at any given point in time need not infringe upon any other necessary consideration owing to unique aspects of air transport activities within any given country. Instead, they should be thought of as only a few of the presently essential tools for eyes-wide-open planning and management of air transport activities.

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TABLE 1. Distributional Characteristics of 50 Variables Selected from Factor Analysis

Variable Name	Variable Description	Mean	Coefficient of Variation
Air Transport (AT) Variables:			
AT1	International Passenger Kilometers in millions	3405.6	272.0
AT2	International Passengers in thousands	1194.6	249.5
AT3	International kilometers flown in millions	44.9	477.2
AT4	International freight ton kilometers in millions	147.9	277.0
AT5	Total international ton kilometers in millions	489.1	271.4
AT6	International aircraft departures in thousands	17.0	221.8
AT7	International passenger load factor	58.5	13.6
AT8	Total international ton kilometers available in millions	811.9	272.8
AT9	International non-schedule passenger kilometers in millions	500.7	363.6
AT10	Total freight ton kilometers in millions	204.5	386.5
AT11	Number of international scheduled air lines	1.6	177.7
AT12	Total operating revenue in millions of dollars	780.5	117.8
AT13	Total operating expense in million dollars	740.9	116.5
AT14	Number of usable air fields	188.8	229.4
AT15	Gasoline consumption in thousands of metric tons	25.9	564.4
Economic and Social (ES) Variables:			
ES1	Foreign exchange in millions of dollars	2867.1	212.0
ES2	Consumer price index	5678.1	755.5
ES3	Total import in millions of dollars	14137.7	243.1
ES4	Total export in millions of dollars	13776.7	236.3
ES5	Import growth rate in percent	17.5	51.8
ES6	Export growth rate in percent	17.0	63.3
ES7	Gross national product (GNP) in millions of dollars	73030.9	270.0
ES8	Energy production thousands of metric tons of coal equivalent	75505.8	368.1
ES9	Energy export in thousands of metric tons of coal equivalent	25338.8	301.9
ES10	Percent literacy	62.4	51.4
ES11	Total university enrollment in persons	266123.1	272.1
ES12	Educational expenditure as percent of GNP	4.6	45.3
Poplulation Demography (PD) Variables:			
PD1	Total population in thousands	28185.0	354.7
PD2	Annual rate of population increase	2.2	67.6
PD3	Cities with five hundred thousand or more population	3.1	300.6
PD4	Cities with one hundred thousand or more population	14.8	258.9
PD5	Life expectancy of males	56.3	20.7
PD6	Life expectancy of females	59.2	21.4
Geographic and Environmental (GE) Variables:			
GE1	Surface area in square kilometers	846449.1	282.3
GE2	Highest annual temperature, centigrade	37.6	10.4
GE3	Lowest annual temperature, centigrade	1.8	79.3
GE4	Latitude	17.5	135.5
GE5	Longitude	18.6	333.0
GE6	Circumference in kilometers	5131.8	157.4
GE7	Number of border countries	3.2	80.0
GE8	Average distance to capital of border countries in kilometers	892.6	94.6
GE9	Race (white = 1, white-yellow = 2, yellow = 3, yellow-black = 4, black = 5, black-white = 6)	N/A	N/A

TABLE 1. Continued

GE10	Region (North America = 1, Middle America = 2, Carribean = 3, Tropical South America = 4, Temperate South America=5, West Europe=6, Eastern Europe = 7, North Africa = 8, Africa = 9, USSR = 10, South West Asia = 11, Middle South Asia = 12, East Asia = 13, South East = 14, Oceania = 15)	N/A	N/A
Political Structure and Affiliation (PA) Variables:			
PA1	Type of government (Democracy = 1, Communist = 2, Socialist = 3, Others = 4)	N/A	N/A
PA2	NATO-WARSAW States (NATO = 1, WARSAW=2, Others = 3)	N/A	N/A
PA3	Commonmarket (Commonmarket=1, none=2)	N/A	N/A
PA4	OPEC Nations (OPEC Nation = 1, none = 2)	N/A	N/A
PA5	Alliance (Alliance = 1, Neutrality = 2)	N/A	N/A
PA6	Religion (Judeo-Christianity = 1, Hinduism = 2, Islam = 3, Buddhism, Confucianism, Taoism, Shinto = 4, Primitive religions = 5)	N/A	N/A

N/A = Not Applicable

TABLE 2. Recommended Peer Groups

Group	Countries in Group
1	United States, Japan, Federal Republic of Germany
2	France, Italy, The Netherlands, The United Kingdom
3	Algeria, Botswana, Congo, Lesotho, Libya, Nigeria, Seychelles, Sierra Leone, Swaziland, Canada, Brazil, Venezuela, Cyprus, Indonesia, Iran, Republic of Korea, Kuwait, Maldives, Oman, Saudi Arabia, Singapore, United Arab Emirates, Belgium, Luxemburg, Romania, Spain, Switzerland, Papua New Guinea, Ukrainia SSR, Byelorussia
4	Angola, Benin, Burundi, Chad, Djibouti, Egypt, Equatorial, Guinea, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Madagascar, Malawi, Mauritania, Mauritus, Morroco, Niger, Rwanda, Senegal, Soralia, Sudan, Togo, Tunisia, Upper Volta Zaire, Zambia, Zimbabwe, Antigua & Barbuda, Barabos, Costa Rica, Cuba, El Salvador, Grenada, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragus, Panama, Trinidad and Tobago, Argentina, Bolivia, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Afganistan, Bangladesh, Bhutan, Burma, Democratic Yemen, Israel, Malasia, Mongolia, Pakistan, Philipines, Sri Lanka, Syria Arab, Thailand, Turkey, Vietnam, Yemen, Albania, Austria, Denmark, Finland, Democratic Republic of Germany, Greece, Ireland, Malta, Monaco, Norway, Portugal, Sweden, Australia, Fiji, Nauru, New Zealand, Samoa
5	Cape Verde, Central African Republic, Comoros, Gambia, Guinea Bissau, Kenya, Liberia, Mali, Mozambique, Sao Tome and Principe, South Africa, Uganda, United Rep. Cameroun, United Rep. Tanzania, Bahamas, Dominican Republic, Bahrian, Democratic Kampuches, India, Iraq, Jordan, Lao People Dem. Republic, Lebanon, Nepal, Qatar, Bulgaria, Czechoslovakia, Hugary, Iceland, Poland, Yugoslavia, Solomon Island
6	China
7	USSR

TABLE 3. Dispersion Data of Selected Variables for the Developed Peer Groups

Variable Name	Mean and Coefficient of Variation						
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Selected Economic and Social (ES) Variables:							
ES1	25194.0	14689.3	5031.8	938.3	1313.2	2262.0	—
	(68.1)	(74.4)	(116.0)	(153.6)	(233.7)	(0.0)	—
ES3	195169.3	107816.0	18334.8	4481.3	4242.9	19447.0	68522.0
	(30.0)	(23.5)	(83.2)	(146.3)	(145.5)	(0.0)	(0.0)
ES4	181176.0	94459.8	23823.5	3737.5	3465.1	18179.0	76449.0
	(25.7)	(22.9)	(98.9)	(158.4)	(143.5)	(0.0)	(0.0)
ES7	728444.7	419912.2	55516.2	17996.1	27625.8	—	128100.0
	(61.6)	(48.6)	(126.1)	(184.9)	(190.2)	—	(0.0)
ES8	770051.3	116827.0	110147.3	11463.6	28896.4	614484.0	1937975.0
	(150.4)	(96.8)	(149.0)	(256.5)	(186.1)	(0.0)	(0.0)
ES9	45391.0	55121.0	79627.4	4931.6	12811.1	27207.0	338191.0
	(112.4)	(81.4)	(186.0)	(262.3)	(289.1)	(0.0)	(0.0)
ES10	99.2	98.5	65.1	60.9	54.1	65.5	99.8
	(0.3)	(0.6)	(46.2)	(54.5)	(54.7)	(0.0)	(0.0)
Selected Population Demography (PD) Variables:							
PD1	135346.7	45215.0	21368.5	11859.2	28141.7	994910.0	265540.0
	(62.5)	(45.9)	(167.1)	(150.1)	(413.3)	(0.0)	(0.0)
PD4	145.0	52.0	14.8	5.8	10.3	117.0	277.0
	(46.9)	(53.7)	(173.0)	(167.3)	(360.2)	(0.0)	(0.0)
Selected Geographical and Environmental (GE) Variables:							
GE1	3328004.0	283285.3	1129108.0	509063.6	368315.0	9596961.0	22402200.0
	(157.1)	(73.5)	(206.2)	(192.1)	(172.9)	(0.0)	(0.0)
GE6	9239.0	4195.3	4005.2	2822.4	2148.1	17445.0	49899.0
	(91.8)	(51.9)	(156.4)	(98.0)	(87.3)	(0.0)	(0.0)

TABLE 4. Dispersion Data of Air Transport Variables for the Developed Peer Groups

Variable Name	Mean and Coefficient of Variation						
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
AT1	41275.0 (86.9)	26442.3 (73.5)	3470.9 (137.8)	1351.6 (169.7)	1225.6 (139.8)	913.0 (0.0)	8982.0 (0.0)
AT2	12560.0 (91.5)	9316.3 (71.4)	1311.3 (129.2)	511.8 (121.9)	461.6 (93.0)	360.0 (0.0)	2503.0 (0.0)
AT3	287.2 (77.2)	196.5 (64.7)	120.8 (388.1)	13.0 (134.6)	12.2 (105.7)	10.0 (0.0)	— —
AT4	2156.7 (49.2)	1190.8 (50.3)	144.2 (150.8)	44.6 (167.1)	57.6 (213.2)	52.0 (0.0)	259.1 (0.0)
AT5	6131.0 (73.3)	3674.0 (60.4)	467.5 (138.4)	171.1 (166.0)	171.4 (148.7)	134.0 (0.0)	1135.0 (0.0)
AT6	137.0 (82.5)	140.8 (70.2)	18.4 (127.2)	8.3 (108.4)	7.8 (85.9)	6.0 (0.0)	— —
AT7	61.0 (1.6)	60.0 (4.0)	58.2 (14.4)	58.1 (13.9)	58.8 (14.3)	70.0 (0.0)	59.0 (0.0)
AT8	10645.7 (80.8)	6041.5 (61.1)	835.3 (127.9)	301.1 (155.8)	308.7 (144.8)	204.0 (0.0)	1766.0 (0.0)
AT9	4996.2 (154.8)	2548.8 (173.1)	429.1 (221.3)	191.3 (189.6)	137.8 (150.7)	— —	— —
AT10	3916.0 (98.6)	1220.7 (51.6)	162.0 (152.0)	43.2 (152.5)	56.9 (219.5)	120.0 (0.0)	2510.0 (0.0)
AT11	10.3 (148.5)	4.0 (85.0)	1.4 (57.1)	1.2 (41.7)	1.2 (41.7)	— —	1.0 (0.0)
AT12	3052.1 (59.0)	2753.6 (59.6)	1173.0 (53.2)	329.2 (93.3)	252.8 (85.2)	— —	— —
AT13	3032.6 (39.0)	2813.8 (55.8)	1110.1 (55.4)	313.4 (95.1)	521.7 (77.3)	— —	589.2 (0.0)
AT14	224.5 (130.7)	252.0 (79.3)	280.7 (280.5)	189.4 (200.1)	84.2 (152.5)	270.0 (0.0)	— —
AT15	617.0 (130.7)	67.8 (124.5)	13.7 (265.9)	7.3 (128.1)	3.8 (118.5)	— —	— —