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Price Discrimination in Aviation: The End of the Loyalty to the National Carrier

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**Price discrimination in aviation:
The end of the loyalty to the national carrier**

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Abstract:

In this study differences in airfares between city pairs will be analysed. We distinguish three types of city pairs: pairs within Western Europe, pairs within Eastern Europe, and pairs between Western and Eastern European cities. We distinguish two markets: economy and business class tickets. This study is focussed on the differences in airfares due to loyalty to the national (flag-)carriers and due to income differences.

1. Introduction

In this study differences in airfares between city pairs will be analysed. We distinguish three types of city pairs: pairs within Western Europe, pairs within Eastern Europe, and pairs between Western and Eastern European cities. In this study the differences in airfares of the national (flag-)carriers are analysed. For instance the fares of KLM and Lufthansa for the city pair Amsterdam - Berlin, in both directions. The fares are analysed for both economy and business class travellers.

In section 2 we will give the context of the study by describing the impact of the European deregulation in air transport on airfares. In section 3 we will raise our research questions and describe the data collection. In section 4 the - preliminary - results of our study will be presented. In section 5 some conclusions and ideas for further research will be presented.

2. European deregulation and air fares

The aviation sector has traditionally been a protected and regulated industry. Europe is subdivided into a large number of independent states, each with its own – in former days heavily subsidised - flag-carrier airline. The established system of scheduled airlines with their distribution of air traffic capacity, the double approval system and the strict regulation of routes, flight frequency and fare systems became increasingly criticised, in particular since it was not in the interests of the consumer (Nijkamp, 1996). To arrive at a smooth functioning of the Single European Market the European Union liberalised the European air transport market by the implementation of four policy packages, successively implemented from 1 January 1988, 1 November 1990, 1 January 1993, and 1 April 1997. The original two packages attacked restrictive practices on fares and permitted a considerable pricing freedom, especially for discount fares. Both packages permitted fifth-freedom traffic¹, albeit subject to capacity

¹ The eight freedoms of air of the Chicago Convention of 1944 are (Nijkamp, 1996):

1st freedom: the right to fly over the territory of a contracting state without landing;

2nd freedom: the right to land on the territory of a contracting state for non-commercial (technical) reasons;

3rd freedom: the right to transport passengers, cargo and mail from the state of registration of the aircraft to another contracting state;

4th freedom: the right to take on board passengers, cargo and mail in another contracting state, and to transport them to other countries of registration of the aircraft;

5th freedom: the right to transport passengers, cargo and mail between two other states as a continuation of, or a preliminary to, the operation of the 3rd and 4th freedom rights;

6th freedom: the right to take passengers, cargo and mail in one state, and transport them to a third state after a stop-over in the aircraft's state of registration and vice versa;

restraints and the requirements that such services had to originate in a carrier's home country. The third package concerns a nearly entire freedom of tariffs, only a technical permission is required for a new airline company to enter the market, and the free access of the market, except for cabotage (operation of domestic route in another country: 8th freedom, see footnote 1). Cabotage is dealt with in the fourth package as well as the extension of the European liberalisation to non-EU countries such as Norway and Switzerland (and in the medium term the 6 Central European countries).

The aim of European airline deregulation was to create a unified market in an integrating European network economy resulting in fair competition and sound economic growth, so that the European airline sector moves toward financial viability, reasonable stability and sufficient employment (Button & Banister, 1990; Button & Pitfield, 1990). However, the airline industry is operating in an imperfect market. There are barriers to market entry. Some European airports have a limited capacity. Most flag-carriers have grandfather rights on the main airport in the country of origin, so that it may be hard for newcomers to obtain landing rights. In addition, many airports appear to have a monopoly position for ground handling, which is often even controlled by the domestic airline.

3. Research questions and data collection

3.1 Research questions

Airlines offer services with a low marginal cost per passenger, but with high average costs. Marginal cost pricing would thus lead to losses, and this raises the issue of price discrimination in order to reduce the gap between the price and the consumer's willingness to pay. There are various ways to achieve this. Quite common is the distinction between business versus economy class where travellers with a high willingness to pay for comfort are induced to buy substantially higher priced tickets. Other ways of price discrimination concern the use of reduced fare tickets for children and students (or, interpreted differently: higher fares for other passengers) and cheaper tickets for passengers that reserve the seat long before the trip is actually made. In the

7th freedom: the right to transport passengers, cargo and mail between two other states on a service which does not touch the aircraft's state of registration;

present paper we address two aspects of price discrimination that are of particular relevance in the aviation literature:

1. The issue of charging a higher price to citizens of the country where the carrier has its seat. This is of particular relevance in the case of flag carriers. Here price discrimination is based on loyalty towards national carriers. When travellers have a high loyalty with respect to a certain carrier they will be less sensitive to price increases. This loyalty may have several underlying dimensions. First, airlines may have a symbolic value and may be a way to express the national proud. Second, there may be practical advantages with travelling with a national carrier: one does not need to speak foreign languages, and the meals may be rather close to one's taste. A third reason is that airlines usually have frequent flyer programmes. Since the national carrier will have more services for its own residents than other carriers will have, the probability that one participates in a frequent flyer programme of the national airline will be much higher than for other airlines. This membership of frequent flyer programmes may be an important consideration to choose the national airline, and this makes the traveller again less sensitive to price increases which would imply a tendency that citizens from the own country are charged higher prices. In the present paper this loyalty aspect will be addressed in two ways. First, the price of a return ticket a national carrier charges to travellers from its own country will be compared with what one charges in other countries. Second the price of a return ticket of a national carrier serving its home market will be compared with the price of a foreign competitor on the same market.
2. The second aspect of price discrimination concerns income levels. One would expect that ticket prices depend on income levels. Since income levels as such are unknown, one may use national income per capita as a proxy. Thus, travellers from countries with low average income may be expected to experience lower fares compared with travellers from countries with high average incomes.

On the basis of these considerations we formulate the following hypotheses:

8th freedom: the right to transport passengers, cargo and mail within another state, between the airports of that state (cabotage).

Loyalty 1:

The airfare of the flag-airline of the land of origin is higher than the airfare of the flag-airline in the country of destination.

We will use the following notation: price (ABA; FA) denotes the price of a return ticket from A to B to A carried out by the flag-carrier of A. Further, FB will denote the flag carrier of B.

Thus *Loyalty 1* means: **price (ABA; FA) > price (ABA; FB)**.

Loyalty 2:

The airfare is higher when leaving from the country of origin of the flag-airline, than leaving from the airport which is not the home airport of the flag-airline (for instance the airfare Amsterdam-Helsinki-Amsterdam flying by KLM is more expensive than Helsinki-Amsterdam-Helsinki flying by KLM).

Thus *Loyalty 2* means: **price (ABA; FA) > price (BAB; FA)**.

Income

Prices of airfares are higher in “rich” (Western European) countries than in “poor” (Eastern European) ones.

In the case of this hypothesis we have **price (WEW; FX) > price (EWE; FX)**, where W stands for Western city, E stands for Eastern city, and where FX is any airline.

Before testing these hypotheses, the connections for which data has to be collected have to be selected and the data itself has to be collected. After this we first try to find a relation between the different airfare prices by simply looking at the acquired data and comparing them for different airlines. After this first qualitative analysis it will be decided if it seems worthwhile to test the hypotheses in a more analytical way by using some econometric models in which the differences in airfares are explained by factors such as, differences in income levels, additional competing airlines on the connection, the distance between the cities, the loyalty to the own national flag-carrier, et cetera.

3.2 Data collection

The connections researched are selected in three steps.

First, we take the main national flag-carriers (such as BA for Great Britain leaving Easyjet and Ryan Air out of consideration) for a number of European countries or group of countries (SAS is representing, for instance, the Scandinavian countries Denmark, Norway, and Sweden).

Second, we select the main airport in these countries and add the remaining airports in the selected countries that are in the top 50 of biggest airports worldwide.

Third, we make random pairings between airlines and select in a random way one of the possible direct connections between airports lying in the home-countries of these airlines. We decided to take only the direct connections into account, because the extra distance and time of stopovers make the fares incomparable with direct connections.

We distinguish three types of connections and two types of passenger classes (see table 1). The three types of connections are; connections between two Western European cities; connections between a Western and an Eastern European city; and connections between two Eastern European cities². The two types of passenger classes are economy and business. The classes refer to different trip characteristics. Economy class refers to tourists who would like to make a trip of one week and book 1-2 months in advance. Business class refers to business men who would like to make a trip of just one day and book less than a week before the actual journey. Our goal is to include a minimum of 20 connections in each group, but preferably 25. This number of 25 proves to be easily to achieve for connections between Eastern and Western European cities and for connections between two Western European cities. Because of a lack of direct connections between the Eastern European countries, the collection of this type of connections is limited to 20.

Table 1: City pairs, airfare classes and number of researched connections

<i>City pair</i> / <i>Airfare class</i>	Business	Economy
Western-Western European city	26	26
Western-Eastern European city	25	25
Eastern-Eastern European city	20	20

For every connection we obtain four different airfares:

1. City A → City B → City A with flag-airline of country city A.
2. City B → City A → City B with flag- airline of country city A.
3. City B → City A → City B with flag-airline of country city B.
4. City A → City B → City A with flag-airline of country city B.

Every single group of data is collected on one day to avoid difference in prices over a period of time. The data for the tourist trips is acquired on Mondays (see table 2) by taking the prices for a trip with a duration of one week starting on the Thursday 5 weeks and three days after the date of data collection. In some situations the duration of the trip has to be extended to 8 days because of the impossibility of a direct outward or return flight on a Thursday. This only happens with connections between Eastern European cities.

The data for the groups containing prices for business trips is collected on Mondays for a business trip next Thursday (see table 2). If possible, the return flight is scheduled on the same day, otherwise the return flight is the first flight possible on Friday.

Table 2: Dates of data collection

<i>Group of passengers</i>	<i>Type of connection</i>	<i>Date data is collected on</i>
Tourist	Western-western	Monday, 28 th of January
Tourist	Western-eastern	3 rd and 4 th of January
Tourist	Eastern-eastern	Monday, 10 th of February
Business	Western-western	Monday, 24 th of February
Business	Western-eastern	Monday, 24 th of February
Business	Eastern-eastern	Monday, 3 rd of March

When the airfare prices that are needed can be found on the web sites of the airlines (for the exact address of the homepage, see table 3), these prices are used. If this isn't the case, the price that is given at the site www.vliegtickets.com was used³.

² We base the distinction between West and East on GDP/capita levels. This roughly coincides with the former distinction between European Union and Comecon countries

³ There appear to be large price differences in airfares on connections. We checked for those large differences in prices of airfares by collecting all the airfares from one source (www.vliegtickets.com) instead of collecting all the data from the web sites of all the carriers involved, but that did not change the price differences nor the patterns found.

Table 3: Data sources

Airline	Homepage	Prices found on website used?
KLM	www.klm.com	Yes
Air France	www.airfrance.com	Yes
British Airways	www.britishairways.com	Yes
Alitalia	www.alitalia.com	Yes
Iberia	www.iberia.com	Yes
Swissair	www.swiss.com	Yes
SAS	www.scandinavian.net	Yes
Austrian Airlines	www.aua.com	Yes
FinnAir	www.finnair.com	Yes
Lufthansa	www.lufthansa.com	Yes
TAP	www.tap-airportugal.pt	Yes
Olympic Airways	www.olympic-airways.gr	No
Turkish Airlines	www.turkishairlines.com	Yes
CSA	www.csa.cz/en/	Yes
Malev	www.malev.hu	No
LOT	www.lot.com	Yes
Aeroflot	www.aeroflot.com	No
UIA	www.ukraine-international.com/	No
JAT	Www.jat.com	No
Tarom	Www.tarom.ro	No

4. Asymmetric airfares: the results

4.1 Price discrimination according to national loyalty or income

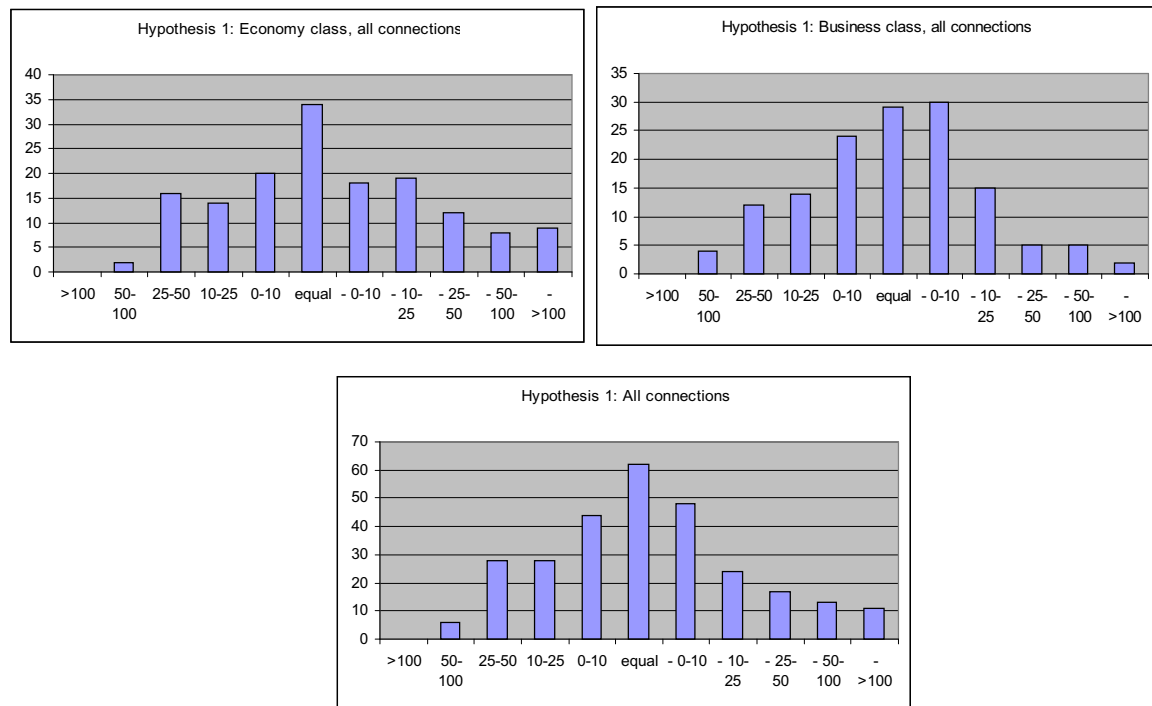
A first glance at the data collection shows that there are large differences in the airfares considered. Differences in airfares may be up to 250% - or down by 75% - depending on the airline one is flying with on the same connection (hypothesis 1)⁴. Depending on the direction one is flying with the same airline (hypothesis 2) these figures are 200% and nearly 65%, respectively. Considering the difference in airfares

⁴ In hypothesis 1 the airfare of the flag-carrier of the city of origin is set at 100 percent. The airfare of the flag-carrier of the city of destination (the competing airline) is expressed as a percentage of this first airfare. As a consequence, the reduction can never exceed 100 percent, whereas, on the other hand, the airfare can be more as double the prize of the airfare of the flag-carrier of the city of origin (see also the figures in appendix 1 and 2). The same holds for hypothesis 2, where the airfare departing from the city

depending on the departure from ‘rich’ or ‘poor’ countries (hypothesis 3) these figures are 170% and 60%, respectively. However, these observations are strong outliers.

Considering hypothesis 1, there is no clear indication found that the airfare of the flag-airline of the land of origin is higher than the airfare of the flag-airline from the country of destination. In other words it cannot be proven that, for instance, flying from Amsterdam to Berlin and back to Amsterdam is cheaper by Lufthansa then by the Dutch KLM. Hypothesis 1 holds for only 38% of the observations, whereas for even a larger share of observations (40%) a higher price is found for these connections.

Figure 1: Distribution of fare differences between carriers; national loyalty 1



of origin of the flag carrier is set at 100 percent, and the airfare departing from the city of destination (from the point of view of the flag-carrier) is expressed as a percentage of this first airfare.

Table 4: Price discrimination according to national loyalty 1

Price of ABA (FB) compared with ABA (FA) = 100	Number of observations (abs.)			Share of observations (%)		
	Eco.	Bus.*	Total	Eco.	Bus.	Total
50-100% lower	2	4	6	1.4	2.9	2.1
25-50%	16	12	28	11.3	8.6	10.0
10-25%	14	14	28	9.9	10.0	10.0
0-10%	20	24	44	14.1	17.1	15.7
Equal	34	29	62	23.9	20.7	22.1
0-10% higher	18	30	48	12.7	21.4	17.1
10-25%	9	15	24	6.3	10.7	8.5
25-50%	12	5	17	8.5	3.6	6.0
50-100%	8	5	13	5.6	3.6	4.6
> 100%	9	2	11	6.3	1.4	3.9
Total	142	140	281	100.0	100.0	100.0

* there is one missing fare (Moscow – Bucharest by Aeroflot) leading to two missing observations

Table 5: Price discrimination according to national loyalty 1; main results

Price of ABA (FB) compared with ABA (FA) = 100	Share of observations (%)		
	Economy	Business	Total
Lower	36.7	38.6	37.8
Equal	23.9	20.7	22.1
Higher	39.4	40.7	40.1
	100.0	100.0	100.0
<i>Within 10% range</i>	<i>50.7</i>	<i>59.0</i>	<i>54.9</i>
<i>Half or double the price</i>	<i>7.7</i>	<i>4.3</i>	<i>6.0</i>

Although it seems that there are large price differences, about 55 percent of the observations are in a range of 10% around the airfare of the flag-carrier of the city of origin (see table 5). Nevertheless, we found for 6% of the observations an airfare that is at most half or at least double compared with the airfare of the flag-carrier of the city of origin. A tendency exists that price differences in business class fares are smaller

(both from the perspective of the 10% range as well as from the perspective of the extreme price differences (half or double the price)) than in economy class.

Also *hypothesis 2* can not be confirmed (see figure 2 and table 6). In other words, it can not be proven that it is cheaper to fly Berlin-Amsterdam-Berlin than Amsterdam-Berlin-Amsterdam by the Dutch KLM. Hypothesis 2 holds for 47% of the observations.

In case of hypothesis 2 only 37% of the observations are within the 10% range (see table 7). In 4.3% of the observations the airlines half or double their airfare depending on the direction one is flying. Again, the price differences tend to be smaller for business traffic.

Figure 2: Distribution of fare differences per direction; national loyalty 2

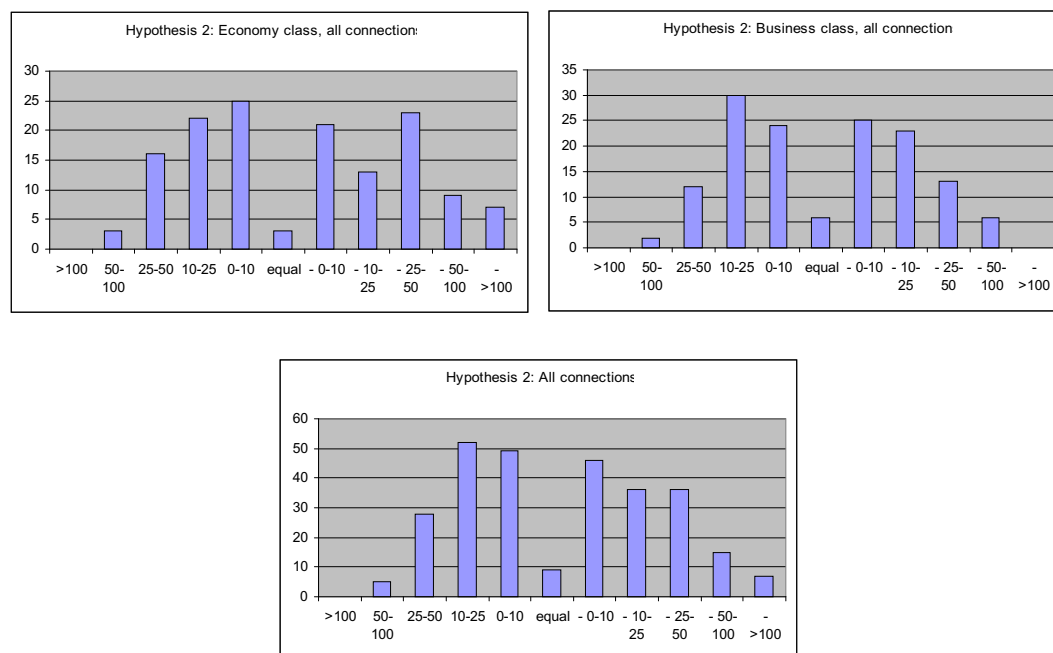


Table 6: Price discrimination according to national loyalty 2

Price of BAB (FA) compared with ABA (FA) = 100	Number of observations (abs.)			Share of observations (%)		
	Eco.	Bus.*	Total	Eco.	Bus.	Total
50-100% lower	3	2	5	2.1	1.4	1.8
25-50%	16	12	28	11.3	8.5	9.9
10-25%	22	30	52	15.5	21.3	18.4
0-10%	25	24	49	17.6	17.0	17.3
Equal	3	6	9	2.1	4.3	3.2
0-10% higher	21	25	46	14.8	17.7	16.3
10-25%	13	23	36	9.2	16.3	12.7
25-50%	23	13	36	16.2	9.2	12.7
50-100%	9	6	15	6.3	4.3	5.3
> 100%	7	0	7	4.9	0	2.5
Total	142	141	283	100.0	100.0	100.0

* there is one missing observation (Moscow – Bucharest by Aeroflot)

Table 7: Price discrimination according to national loyalty 2; main results

Price of BAB (FA) compared with ABA (FA) = 100	Share of observations (%)		
	Economy	Business	Total
Lower	46.5	48.2	47.4
Equal	2.1	4.3	3.2
Higher	51.4	47.5	49.4
	100.0	100.0	100.0
<i>Within 10% range</i>	<i>34.5</i>	<i>39.0</i>	<i>36.8</i>
<i>Half or double the price</i>	<i>7.0</i>	<i>1.4</i>	<i>4.3</i>

Comparing the result of hypothesis 1 and 2 there is one remarkable finding considering the pricing policies of airlines: the airlines seem to keep a close eye on the airfares of competing airlines on the researched connections. In 22% of the observations the airlines charge an equal airfare on a connection (for instance KLM and FinnAir charge identical airfares for the trip Amsterdam-Helsinki-Amsterdam), whereas only 2% of the observations indicate that an airline charges an equal airfare irrespective of

the direction of the flight (for instance Austrian Airlines charges the same airfare for a return flight Vienna-Amsterdam, irrespective of the city of departure).

Considering *hypothesis 3*, only in the case of business class airfares, our hypothesis seems to be confirmed that airfares are lower in - compared to ‘rich’ Western European countries - ‘poor’ Eastern European countries (see figure 3 and table 8). It is cheaper to fly from an Eastern European city to a Western European city and return on the same day than the opposite direction. This result holds for 74% of the observations (table 9). Both Western and Eastern European airlines charge passengers from the West higher airfares than passengers from the East. This pattern is not found for economy class fares. Remarkable is that none of the airlines charges an equal airfare for East-West and West-East connections.

Figure 3: Distribution of fare differences between ‘poor’ and ‘rich’ countries; hypothesis 3

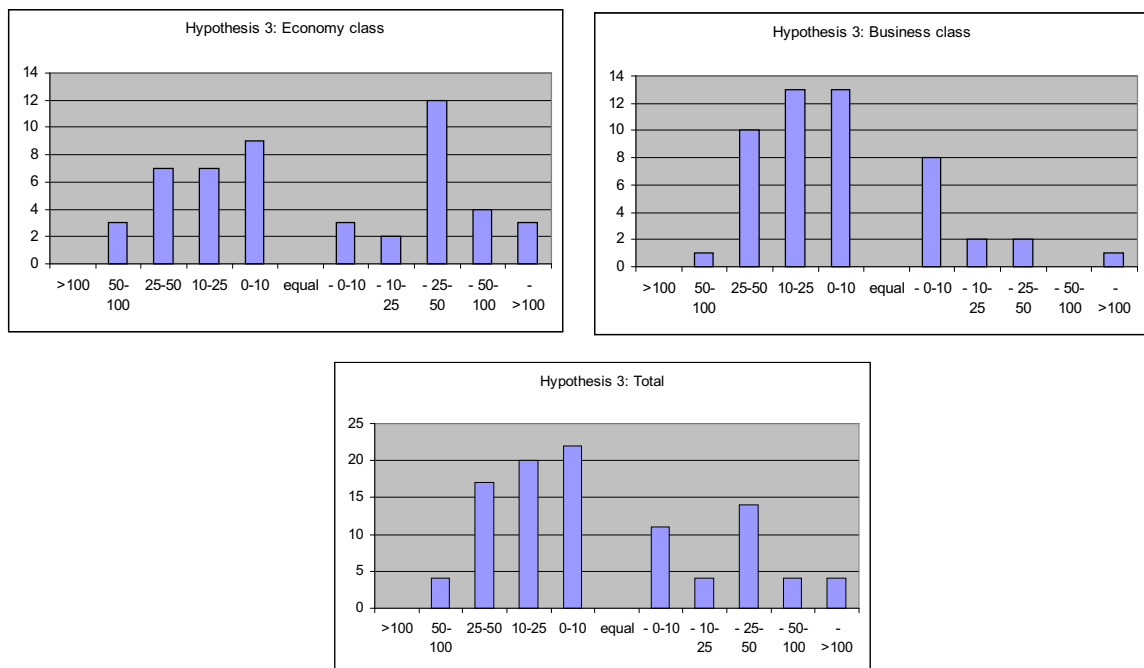


Table 8: Price discrimination according to income

Price of EWE (FX) compared with WEW (FX) = 100	Number of observations (abs.)			Share of observations (%)		
	Eco.	Bus.	Total	Eco.	Bus.	Total
50-100% lower	3	1	4	6	2	4
25-50%	7	10	17	14	20	17
10-25%	7	13	20	14	26	20
0-10%	9	13	22	18	26	22
Equal	0	0	0	0	0	0
0-10% higher	3	8	11	6	16	11
10-25%	2	2	4	4	4	4
25-50%	12	2	14	24	4	14
50-100%	4	0	4	8	0	4
> 100%	3	1	4	6	2	4
Total	50	50	100	100	100	100

Table 9: Price discrimination according to income; main results

Price of EWE (FX) compared with WEW (FX) = 100	Share of observations (%)		
	Economy	Business	Total
Lower	52	74	63
Equal	0	0	0
Higher	48	26	37
	100	100	100
<i>Within 10% range</i>	24	42	33
<i>Half or double the price</i>	12	4	8

Although we're not able to confirm our hypothesis, except of lower airfares in case of business class passengers travelling from the East to the West, it might be interesting to analyse the data more in detail to see if we can find interesting results for instance about the airfare policy of airlines on the distinguished markets. Therefore, we will analyse in the next sections the data for the West European air market, the East European air market, and the market for flights between the East and West. Note that these results are based on relatively few observations!

4.2 *The Western European market*

When looking at the figures, there is no clear indication that airlines charge more in their own country (hypothesis 1). This is the case in approximately 40% of the cases, but is no certainty at all. In about 46% of the observations, the airlines offer lower fares when departing from the city where the competing airline has its residence (hypothesis 2).

A number of remarks can be made for the distinguished airlines:

- FinnAir charges relatively high airfares for a business class tickets.
- Iberia, Alitalia and Lufthansa relatively often charge identical airfares to their competitors for business class tickets.
- Lufthansa charges relatively high airfares, regardless the class or the city of departure.
- British Air and Iberia charged relatively cheap airfares for economy class tickets.
- SAS and Swissair are relatively expensive considering economy class tickets. Furthermore, SAS show an opposite pattern as we formulated in hypothesis 1 considering business class fares: trips departing from Scandinavian cities are relatively cheap, whereas trips towards Scandinavian cities are relatively expensive.
- TAP uses airfares conform hypothesis 1 considering economy class tickets; these tickets are relatively cheap from competing cities and expensive from Lisbon.
- Austrian Airlines and Alitalia offer relatively cheap business class airfares. Austrian Airlines quite often charges the same prices as their competitors for the economy class tickets.

4.3 *The market between Western and Eastern European cities*

When looking at the figures without making a distinction between East-West and West-East connections, there is no clear indication that airlines charge more in their own country (hypothesis 1). This is the case in approximately 40% of the observations. In about 45% of the cases, the airlines offer lower fares when departing from the city where the competing airline has its residence (hypothesis 2). However, in this market it is important to make a distinction between East-West and West-East connections. In the case of business class airfares both Western and Eastern airlines charge lower airfares to citizens of Eastern European cities (including Turkey and

Greece). This finding is in line with hypothesis 3 and suggests that airlines adjust their prices for differences in income levels.

A number of remarks can be made for the distinguished airlines:

- Austrian Airlines is the sole airline that is more expensive than Eastern European airlines considering economy class tickets.
- Finnair, SAS and Alitalia charge relatively competitive airfares compared to Eastern European airlines, in particular in case of economy class tickets.
- Turkish Airlines charges relatively low airfares, both economy and business tickets, compared to Western European airlines.
- CSA and TAROM charge airfares comparable to Western European airlines, in particularly considering economy class tickets.
- MALEV and LOT charge higher airfares compared to Western European airlines in case of economy class tickets, however, they are cheaper considering business class tickets.

4.4 The Eastern European market

When looking at the figures, again there is no clear indication that airlines charge more in their own country (hypothesis 1). This is the case in approximately 31% of the cases, but is no certainty at all. In about 52% of the observations, the airlines offer lower fares when departing from the city where the competing airline has its residence (hypothesis 2). However, the majority is too small (41 observations in favour of hypothesis 2, 38 against) to accept this hypothesis.

A number of remarks can be made for the distinguished airlines:

- Aeroflot, LOT, TAROM and MALEV seem to be most eager to charge equal airfares considering economy class tickets. However, LOT and TAROM are also quite often a bit more expensive for those tickets.
- Olympic Airways and MALEV are relatively cheap considering both economy and business class tickets.
- Turkish Airways charge relatively high economy class airfares, however, relatively low business class airfares.
- Opposite to Turkish Airways, CSA charge relatively high business class airfares and low economy class airfares departing from Prague. However, economy class tickets towards Prague are relatively expensive.

Conclusion

In our study we analysed price discrimination in airfares. We focussed on two aspects: loyalty to the national carrier and income differences.

Considering income differences, only for business class airfares we found that 74% of the airfares departing from 'poor' Eastern European cities were lower than departing from 'rich' Western European cities. This pattern is not found for economy class tickets.

We could not confirm any relation between airfares and loyalty to the national carrier. We expected that due to aspects as symbolic value, language, familiar meals, and frequent flyer programmes the airfare of the own flag-carrier should be higher than the airfare of the competing airline. Further we expected, for the same reasons, that outward airfares (charged to the own population) are higher than inward airfares (charges to the population of the competing flag carrier) for given a certain airline. Neither of these hypotheses could be approved or disapproved.

Some interesting findings are that it seems that airlines keep a close eye on the airfares of competing airlines - they often charge the same airfare - and that they hardly charge the same airfare for an inward and an outward return ticket.

What are the implications of these results for frequent flyer programmes? It appears that airlines do not use their market power resulting from these programmes to charge higher prices. Elasticity of demand is apparently considered to be still high, irrespective of the frequent flyer element, so that carriers are reluctant to use the price instrument to improve receipts. This does not necessarily mean that these programmes are useless from the perspective of the airlines. They may also have an effect on the level of demand for a carrier's services: members of frequent flyer programmes will be more inclined to choose the carriers concerned. This volume effect on demand may be considered as important enough by the carrier to keep these loyalty programmes intact, even when they would not use to increase the fares.

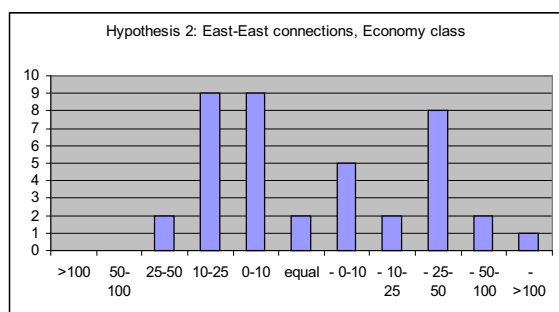
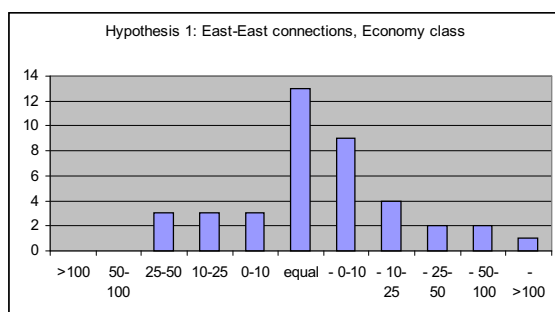
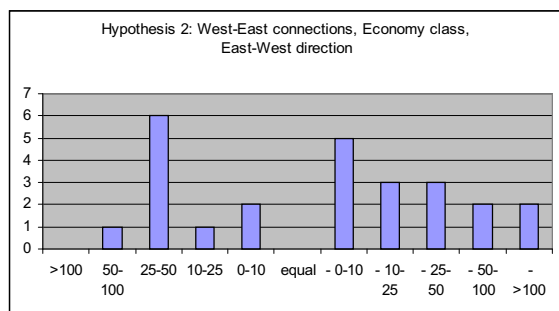
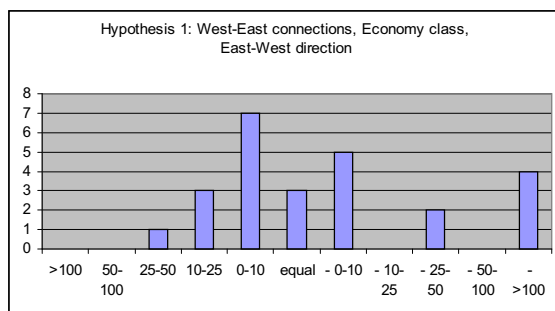
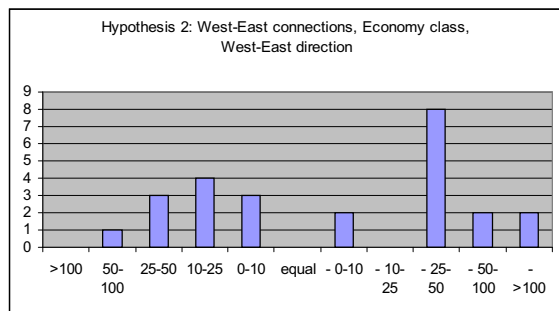
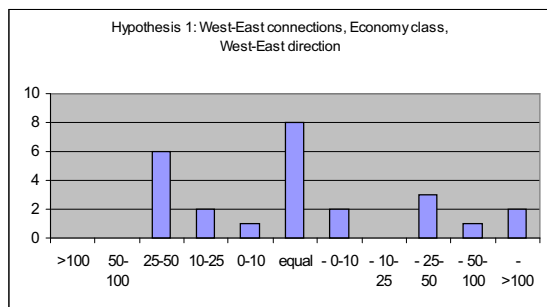
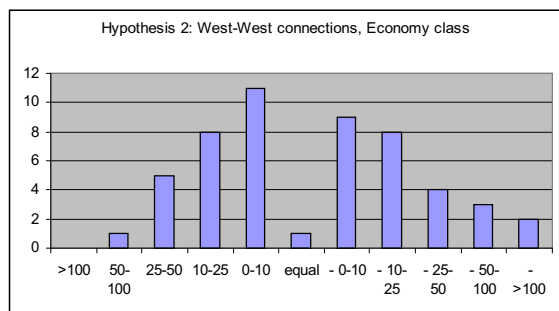
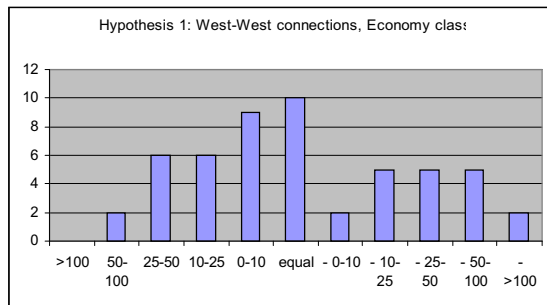
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Appendix 1: Distribution of observations, Economy class



Appendix 2: Distribution of observations, Business class

