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COMPETITION THROUGH FARES AND FARE ACCESSES ON THE AIR TRANSPORT MARKET

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ABSTRACT

Competition Through Fares and Fare Accesses on the Air Transport Market*

In the past four years, and under pressure from the EC authorities, most constraints on air transport prices in the European Community have been removed. This paper concentrates on the effects of increased competition on fare behaviour. It uses an unpublished 1990 dataset on eight fare categories adopted by Alitalia on medium-range international routes (Europe, North Africa, Middle East). Using an index of competitive pressure on Alitalia, we find that competition is stronger in the EC than elsewhere in the medium-range markets. Moreover, increases in the degree of competition cause average fares to fall, and fare variability to increase, as new lower fares are introduced, or passengers are allowed easier access to low fares which already exist. In non-EC medium-range (still regulated) markets, the determination of fares does not seem to depend on the number of carriers serving each route, as the presence of many 'competitors' – who in fact collude – may even suggest the existence of a market where prices can actually increase.

JEL classification: L9, L93
Keywords: fares, air transportation, deregulation

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NON-TECHNICAL SUMMARY

The European air transport market has undergone some important changes in the past four years. Under pressure from the EC authorities most constraints on prices have been removed (with the exception of routes totally within a single country) and some progress has been made towards improving market access. This has largely been achieved through the expansion of existing carriers into new routes, rather than new entrants challenging incumbents. Given the actual constraints on airport capacity, and on air traffic control ability to handle an ever increasing quantity of flights, market shares have changed very slowly. Prices reacted more swiftly. This paper concentrates, therefore, on examining the effects of increased competition on fare behaviour. It uses an unpublished 1990 dataset on eight fare categories adopted by Alitalia on medium-range international routes (Europe, North Africa, Middle East), which account for almost one-half of the traffic of the Italian flag carrier. Published data (mainly from the International Civil Aviation Organization) has also been used to obtain indexes of market shares, load factors, market concentration and competitive pressure in 1990.

Observed fare variability may vary in different ways, but essentially results from two fundamental policies (or any combination of the two): either the fare spectrum is altered by the addition or termination of selected fare classes, or the distribution of passengers across given fare classes is modified by changing access conditions to fares. The array of fares normally available to passengers (each with its own access condition) gives a carrier an effective tool to compete and to extract the maximum consumer surplus through market segmentation. A simple theoretical model is developed to show producers' and consumers' behaviour. For simplicity, two kinds of routes are examined: the first, a business route, has a low price elasticity of demand, as business travellers are willing to pay a high price to avoid the risk of not obtaining a seat; the second, a tourist route, exhibits more elastic demand. The carrier fare policy is different in the two markets: in the former, business travellers are served first and then lower fares with limited access are made available to additional passengers, to obtain a higher load factor; in the latter, tourists (in a limited number) are served first at low fares, but then, as excess demand arises, the air company uses market rationing devices to convince the less elastic segments of passenger demand to fly at prices higher than foreseen *ex ante*.

According to the theoretical model, routes are sub-divided by two criteria: the regulatory framework, under which only the EC routes have some price freedom relative to other European routes, or non-European medium-range routes, and the elasticity characteristics of the prevailing demand curve (predominantly business routes, tourist routes or mixed routes).

Within Europe (both in EC and non-EC countries), the average revenue per passenger-kilometre and the arithmetical fare average decrease from business routes to tourist routes, while fare variability increases by a few points. Extra-European routes, however, do not show such a clear pattern – both revenue per passenger-kilometre and fare variability are lower (partly because of their higher average distance, which is independent of the traffic type). In particular, on EC business routes a widening of the fare spectrum is obtained by introducing more expensive fares, while, to increase loads, Alitalia meets the demand of additional passengers at lower fares. On EC tourist routes a widening of the fare spectrum corresponds to the introduction of lower fares and therefore the revenue per passenger is reduced. But a higher variability of passenger distribution is associated with higher revenues per passenger, which is consistent with demand rationing. Similar results are also observed on mixed routes.

Using an index of competitive pressure on Alitalia, we find that competition is stronger and more effective in the EC, while market concentration is weaker than elsewhere in the medium-range routes. In general, rising competition causes average fares to fall and fare variability to rise as new lower fares are introduced or passengers are allowed easier access to low fares that already exist. This is more evident on EC business routes, probably because charter flights provide competition on tourist routes. In non-EC medium-range (still regulated) markets, the determination of fares does not appear to depend on the number of carriers serving each route, as the presence of many 'competitors' – who in fact collude – may indicate the presence of a market where prices can increase.

In conclusion, it seems that Alitalia fare behaviour is surprisingly similar to that described in the US after the 1978 airline deregulation: the expected difference in prices paid by two passengers selected at random is 35% of the mean in the US and 36% on Alitalia medium-range international routes. Alitalia fare variability is higher on more competitive routes, with patterns similar to the American experience.

The analysis also illustrates a widespread phenomenon which is not as evident in the US studies. Alitalia seems to react to changes in different demand segments not only by introducing fare modifications, but also by varying the access conditions to various fares. This is consistent with a more general framework where prices are not fully flexible and are slower in adjusting than quantities, according to schemes widely studied in theories of equilibrium with rationing.

1. Introduction

Starting in 1988, the European Community has introduced a number of changes in air transport legislation aiming at fostering a certain degree of price competition in a framework of a more general deregulation of this sector. By early 1993, the liberalization of fares and other relevant elements of air transport should be completed (with the partial exception of cabotage[1] rights within each EEC Member State).

Stimulated by this wide-range -albeit limited to the Europe of Twelve- novelty, we decided to examine the effects both present and future of air transport competition for Italy and for its flag carrier Alitalia.

Our analysis concerns 1990 and focuses on the medium-range market[2] (Europe, North Africa and the Middle East), in particular the European market which is singularly relevant for Alitalia, compared both to the domestic and the long-range market: indeed, 43.4% of Alitalia passengers in 1990 regards the European market, and 47.8% the medium-range market.

Five factors deserve being outlined in this particular context, i.e.:

1) fare dispersion;

2) passengers' conditions for the utilization of different fares;

3) market penetration, revealed by the presence or absence of the Italian flag carrier on certain routes, as a consequence of the airline's desired network and of the size of its fleet;

4) passengers' recourse to indirect routes (the so-called sixth freedom) to reach particular destinations, even though a direct flight or an alternative[3] routing are available;

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[1] Cabotage refers to domestic routes within an EEC country. For instance: Rome-Venice, Paris-Bordeaux.

[2] For a better comprehension of the technical words, of the data used and of the statystical indicators adopted, we suggest to refer to the Methodological Appendix.

[3] In Italy, most direct flights leave from Rome and Milan; if

5) airports and other relevant domestic infrastructures, which influence the competitiveness of the carrier depending prevalently on them. Indeed, unlike what happens in the U.S., in selecting a hub[4] for one's routes, a European carrier is limited to domestic airports and infrastructures.

The last three factors are not further developed here, but are being studied in depth in another part of our research[5].

The first two factors have an obvious relevance both for the air company and for its users. A higher fare dispersion and more favourable access conditions to different fares, while providing carriers with a better array of competitive tools, also offer a wider choice to consumers.

The subject analyzed here is theoretically difficult as it embraces macro and micro problems and complex issues such as indivisibility, joint production and rationing. Furthermore, data availability is often limited: on the one side, it is not always simple to recognize what empirical evidence is necessary to validate the theory; on the other side, Italian air transport authorities rarely favour information transparency.

Section 2 covers the theoretical framework used in the paper and focuses on a simple analytical model.

Section 3 describes the available 1990 data and the main variables that affect them.

Section 4 illustrates laws and regulations regarding fares in Europe and in the medium-range market in 1990.

Section 5 contains the main results of the analysis. They are presented by geographical markets and by the predominant

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one flies from other towns, a stop-over is normally inevitable and the choice lies between an Italian and a foreign hub.

[4] A hub is defined as a center of a star-shaped network where most points are connected to the center rather than to each other.

[5] Progetto Finalizzato "Organizzazione e Funzionamento della Pubblica Amministrazione" ("Public Administration Organization and Functioning"), sponsored by the Italian Research Council (CNR).

character of passengers in the market: business, tourist or a mix of the two (business-tourist).

Significant differences emerge in 1990; these are analyzed in Section 6 with respect to the degree of competition prevailing in different markets and strong correlations are observed in general between fare behaviour and competition.

Section 7 summarizes the conclusions and is followed by a list of references and a Methodological Appendix.

2. Theoretical aspects of the two factors considered

Fare variability may change in different ways, two of which are polar in nature: all the others are but a combination of these two extremes. The one variation lies in a change in the fare spectrum obtained by adding and/or subtracting some fare categories; the other consists of modifying passenger distribution across different -given- fare classes[6]. When observed fare categories are given, it is difficult to distinguish on empirical grounds the two sources of variability.

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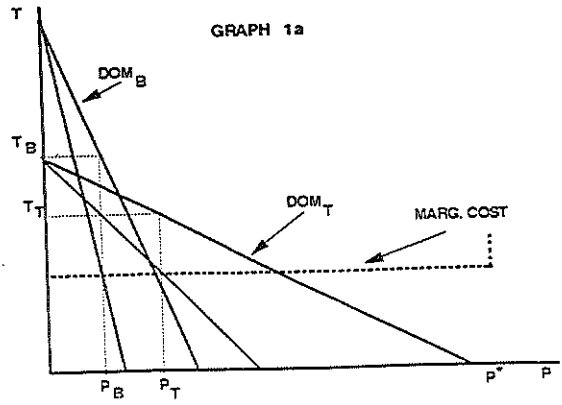
[6] For instance, let us start with three fare levels - fare 2, 3 and 4 - and a number N of equally distributed passengers (1/3, 1/3, 1/3). The average fare is 3, the variance is 2/3, the coefficient of variation is 0.272 and the skewness is 0, as the distribution is perfectly symmetrical. Faced with a competitive pressure, two policies are feasible (and any combination of the two): the first consists of introducing a new fare, for example fare 1, lower than the others, with the same, even, passenger distribution (now equalling 1/4, 1/4, 1/4, 1/4); the second policy allows access to a lower fare to passengers of a higher fare class (fare 3, for instance), thus modifying their distribution (2/3, 0, 1/3) but not the fare spectrum, still identified by classes 2, 3, 4. The number N might remain unaltered or change: as it also depends on competitors' policies, for simplicity we suppose that N is constant. The former policy, which is indeed a fare policy, has an impact on the arithmetical fare average (which is reduced to 2.5) and on the non-weighted coefficient of variation (now risen to 0.447), while skewness remains null; with the latter fare access policy, on the other hand, the arithmetical fare average and the non-weighted coefficient of variation remain unaltered, but the weighted average, called average fare, goes down to 2.66, the coefficient of variation rises to 0.699, and skewness becomes positive.

In practice we utilize the non-weighted coefficient of variation of fare classes to determine the spectrum, while the (weighted) coefficient of variation is assumed to proxy the fare variability induced by a modified distribution of passengers on different fares as well as by a modified fare spectrum. As a consequence, the comparison between the weighted and the unweighted coefficient of variation is attributed to the change in the passenger distribution on different fares.

Moreover, in the case of a modification in the passenger distribution, it is crucial -but certainly not easy without resorting to particular assumptions- to discriminate between two different situations: i) the case in which such a modification is determined by the passengers' ex ante (i.e. notional) demands, with different price elasticities; and ii) the one in which distribution reveals the producers' ability to induce a certain number of passengers, rationed in their notional demands, to accept seats at higher fares than those they had originally asked for. The notional demand being a latent variable, in practice we assume that rationing occurs only on certain (tourist) routes and for certain (low) fares.

Only when rationing arises, the carrier, enjoying a situation of excess demand, is able to shift some passengers to higher fares, by transferring the less elastic passengers. In both situations (i and ii), the carrier appropriates the maximum of consumer surplus, using a system of price discrimination aimed either at additional passengers with higher demand elasticity, or at passengers which would otherwise be rationed and are ready to pay higher ticket fares.

In a stylized way both cases are described in the following Graphs 1a, 1b and 1c, in which the problem is considered from the viewpoint of the Italian flag carrier, but an analysis of the situation from the users' side is immediately derivable. We assume that the choices made by Alitalia leave the behaviour of competitors unaltered. We further suppose that, in the short run, the marginal cost of a seat on a flight for any passenger at any fare, is positive and constant up to the point where the plane is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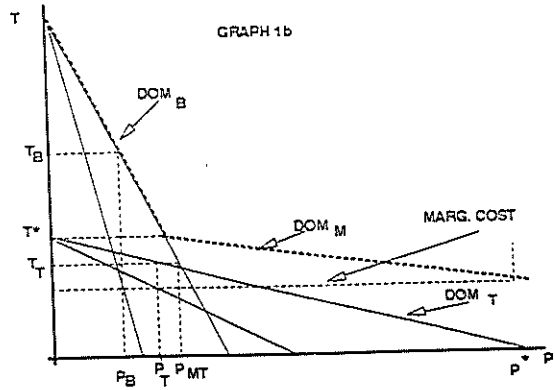
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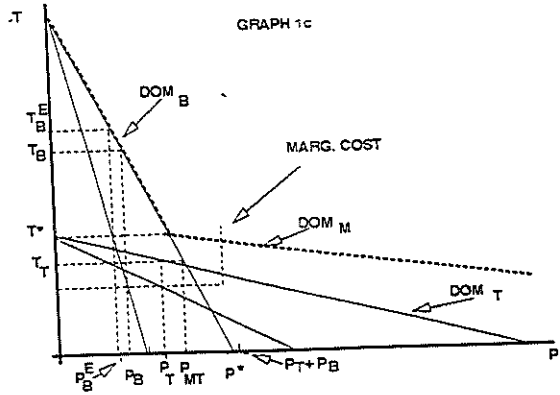
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completely full (load factor=1) and becomes infinite afterwards. This hypothesis depends on the fact that the plane's capacity is given and the service is indivisible, even though we do distinguish between different types of services (seats) on the plane, each identified by a different fare rather than by the different quality of the good (indeed, we assume that the marginal cost is identical for all passengers).

For simplicity, we shall also suppose that there are only two kinds of routes, the BB route, where the business component is dominant, and the TT route, where the tourist component is prevailing. The terms "dominant" or "prevailing" here take up specific meanings: on BB routes, business men (and women) are served first, which is in the very interest of the carrier, because those users (with low price elasticity) are ready to pay higher fares to avoid the risk of not finding a seat; on TT routes, tourists are served first, as flag carriers want to preserve their own credibility, supplying the service they have advertized, at least to a limited number of passengers. Advertizing a service at very low fares is a technique to launch a new route or to attract users, with high or low price elasticities, who have not made up their minds yet among different means of transportation or alternative uses of their leisure time. Even though, at the advertized conditions, the carrier only satisfies a small and selected - we shall see how- number of passengers, the company has to serve them first to safeguard its own reputation in its repeated market game.

Let us examine the problem with BB fares first. Graph 1a shows that the demand of the business component (DOM_B) has low elasticity and is relatively high also at high prices. The carrier, serving the less elastic business component first, maximizes its profit at fare T_B for a number of passengers P_B. Nevertheless, faced with an insufficient plane loading (equalling P_B/P^*) and knowing that it may attract another (separated) demand segment with high elasticity and low price level, the carrier decides to attract an additional number of passengers, P_T, at fare T_T, provided $P_T+P_B<P^*$, that is provided the maximum plane

load is not exceeded.

In Graph 1b, on the contrary, we show a similar case for TT routes, where the carrier implicitly committs itself to serve tourists with high elasticity and low price level first, even though it is aware that, on these routes too, there is a less elastic passenger component ready to pay higher fares to have a seat. Thus the carrier, while recognizing that market demand, at prices lower than T^*, is given by DOM_M (the horizontal sum of DOM_B plus DOM_T), chooses to carry passengers P_T at fare T_T -that is, those users who would not fly at prices higher than T^*-. Given that at fare T_T there is excess demand, equalling P_{MT}, the carrier, knowing that some passengers, originally attracted by cheap prices, are ready to pay higher fares in order to travel, succeeds in deflating the excess demand, offering a fare T_B to a further passenger segment, P_B. The market rationing at T_T is thus eliminated, partly because some passengers, $(P_{MT}-P_B)$, give up asking for the service, as fares are higher than expected, while others, the less elastic, (P_B), accept the offer at prices higher than foreseen ex ante. On the whole, the supply of the indivisible good -air transportation- is still in excess, because the load factor always remains lower than (or equal to) 1.

Graph 1c shows a situation which might emerge on TT routes, when the choice not to first serve the less elastic segment faces a capacity constraint. In this particular case, after satisfying the more elastic demand component through a combination of fare T_T and passenger volume P_T -which implies the equality between marginal cost and marginal revenue-, the residual plane capacity $(P^*-P_T$, identically equal to P_B^E and lower than the notional demand P_B, which would maximize the profit in the absence of capacity constraints) is sold at the highest fare the inelastic component is ready to pay (T_B^E). Limited capacity reduces the profit by a quantity equalling the triangle which in Figure 1c has $P_B-P_B^E$ as its base.

3. The data

Two different data-sets -published and unpublished- are available for 1990 relative to the medium-range market where Alitalia operates.

On the one hand, there is the empirical evidence gathered and published by official organizations, especially the International Civil Aviation Organization (ICAO)[7]. From this source we obtain the number of flights, seats offered and passengers carried by each airline on each route. They therefore enable us to identify market shares, load factors, market concentration and competitive pressure. No information is provided on charter flights. Besides, there are other, equally official and published data, contained in travel agents' manuals -see SAS and Swissair (eds.)-, relative to the different fares Alitalia offers on the medium-range market. The economy fare, or "economy normal", is considered the reference price and used to be approved by the EEC Member States up to the latter part of 1990 and is still in use outside the EEC.

On the other hand, we gratefully acknowledge the chance of being able to utilize unpublished data from Alitalia. They concern the revenues per passenger obtained by the Italian flag carrier on 98 medium-range routes, sub-divided into eight fare categories. For each category, we know also the number of passengers using that fare. The revenue per passenger does not exactly correspond to the fare because of three main factors: i) the mix of tickets sold in Italy and abroad (including those sold in places different from the flight departure or destination); ii) the impact of exchange rates; and iii) proratization.

In order to quantify the bias, we analyze four of the eight available[8] fare categories, as the first and the eighth classes

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[7] It is a body created under the aegis of the U.N. and formed by all national civil aviation authorities (for Italy it is the General Direction of Civil Aviation within the Ministry of Transport).

[8] The more representative fares within the eight categories are the following: 1) First Class, 2) Business Class, 3) "Economy Normal", 4) Excursion Class, 5) PEX and APEX, 6) Super PEX and Super APEX, 7) Inclusive Tour, 8) Fare for Travel Agency, called

do not concern the general public on European routes (either because they are sold by Alitalia only for non-European destinations or are reserved to tour operators), while the existing data on the sixth and the seventh classes of revenues per passenger are too few to constitute a representative sample. The comparison is therefore limited to categories 2, 3, 4, 5 regarding only flights from Rome or Milan, and those routes for which we have a complete set of information.

With respect to element i) mentioned above, observing the revenues per passenger on European routes from Rome and Milan in 1990, we note in Table 1a that they are generally higher for tickets sold in Italy than for those issued by Alitalia abroad, this being consistent with the relative price leadership a flag carrier holds in its own country. To assess the bias due to this factor and to the exchange rate impact, we consider in Tables 1b, 1c and 1d (and label as MIX) the difference in percentage points (relative to published fares) between Alitalia revenues per passenger deriving from tickets sold in Italy and Alitalia revenues per passenger, wherever they come from (Italy or abroad).

Proratization is defined as the rule followed in allocating to each single stage a multi-stage ticket[9]. Tables 1b, 1c and 1d, by comparing (in percentage points) published fares on travel agents' manuals and Alitalia revenues per passenger from tickets issued in Italy in 1990, show the presence of a bias mainly due to this phenomenon. It appears that proratization (labelled as PRZ) has no uniform impact on all categories, but is considerably higher on high fares offering passengers fewer constraints (or no constraint at all) on travel conditions, i.e. a greater freedom

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"Flat Fare". Most of these fares envisage discounts for particular groups (infants, children...), as shown in Tables 1b, 1c and 1d.

[9] For example, on a flight Tunis-Rome-London, passengers are charged a fare which is normally below the sum of two tickets Tunis-Rome and Rome-London. Therefore, the two stages receive a fraction (pro rata) of the revenue according to a rule agreed upon by the participating carriers.

TABLE 1a

ALITALIA PUBLISHED FARES AND REVENUES PER PASSENGER BY FARE CATEGORIES ON AIR TICKETS FROM ROME AND MILAN (1990; in thousands of It. lires) (1)

FARE:	BUSINESS (2)			ECONOMY			EXCURSION			PEX		
ROME	PUB (3)	T IT (4)	T TOT (5)	PUB (3)	T IT (4)	T TOT (5)	PUB (3)	T IT (4)	T TOT (5)	PUB (3)	T IT (4)	T TOT (5)
EUROPE OF 12:												
AMSTERDAM	579.0	557.7	522.4	579.0	412.9	406.4	357.5	329.6	252.0	294.8	274.0	233.1
ATHENS	482.0	489.3	419.6	482.0	431.8	295.3	327.3	291.3	193.5	256.9	230.1	182.1
BARCELONA	434.0	426.5	403.5	434.0	346.0	359.4	303.5	276.9	233.7	214.9	197.9	206.9
BERLIN	600.0	547.7	539.7	600.0	416.6	419.4	454.8	347.9	329.5	329.8	290.0	252.3
BRUSSELS	608.0	590.6	579.3	608.0	486.4	450.2	448.3	431.2	345.6	303.5	292.5	278.2
COPENHAGEN	765.0	647.5	603.8	765.0	495.5	485.6	631.3	483.2	297.3	406.5	342.6	303.8
FRANKFURT	489.5	458.0	434.4	489.5	370.6	317.5	370.3	279.4	211.2	268.3	225.8	217.9
LISBON	643.0	626.7	585.7	643.0	390.6	383.1	501.3	389.7	309.9	348.1	307.9	289.2
LONDON	639.5	580.4	499.0	639.5	463.1	355.1	430.0	400.7	275.6	264.6	265.3	231.4
MADRID	560.5	537.6	503.8	560.5	424.2	445.2	398.8	342.3	274.9	277.5	246.1	264.6
MALAGA	652.5	605.4	555.4	652.5	371.1	434.2	462.8	391.1	306.8	322.9	274.6	289.4
MARSEILLE	407.5	395.2	369.4	407.5	347.8	307.0	295.8	256.4	231.8	225.0	209.1	172.6
MUNICH	386.0	385.4	364.0	386.0	296.0	220.5	293.5	273.0	152.8	212.3	188.7	157.4
NICE	349.5	340.3	310.6	349.5	301.3	274.1	250.5	228.9	178.6	191.0	162.1	112.3
PARIS	597.5	563.2	521.7	597.5	447.4	440.1	436.5	384.8	279.8	322.5	237.4	200.3
TENERIFE	810.5	725.0	719.1	810.5	468.5	553.9	582.3	541.0	460.4	400.9	331.9	355.1
NON-EEC EUROPE:												
ANKARA	702.0	669.4	596.7	702.0	421.5	379.8	496.5	346.8	309.7	381.8	357.0	300.0
BUDAPEST	530.0	495.6	471.1	530.0	345.1	345.0	311.3	293.8	240.6	294.3	291.7	247.0
GENEVA	447.0	428.2	392.3	447.0	339.1	315.9	353.0	313.4	230.7	248.3	236.9	225.2
ISTANBUL	652.0	614.4	565.1	652.0	487.6	415.9	453.5	376.1	292.0	365.8	306.4	265.1
MALTA	304.0	310.1	293.5	304.0	262.2	238.7	220.0	181.5	154.7	140.6	122.6	123.8
PRAGUE	459.5	468.7	452.5	459.5	332.0	304.1	314.3	320.3	174.2	236.0	240.9	235.3
VIENNA	550.5	466.5	421.8	550.5	340.9	318.4	407.5	267.6	212.0	286.0	254.5	227.3
ZURICH	447.0	408.7	379.1	447.0	378.6	304.1	353.0	258.8	195.0	248.3	225.9	200.0
MILAN												
EUROPE OF 12:												
AMSTERDAM	462.5	441.3	418.2	462.5	370.1	358.7	279.8	252.1	233.9	235.3	218.7	217.7
ATHENS	657.5	620.0	575.4	657.5	561.7	469.2	351.8	359.8	277.0	324.9	301.3	263.1
BARCELONA	395.0	383.8	373.2	395.0	348.0	342.2	274.8	253.3	234.5	195.9	184.5	190.4
BRUSSELS	437.0	428.3	419.0	437.0	405.9	395.1	342.5	307.3	285.3	225.3	222.9	227.6
COPENHAGEN	648.5	564.9	544.1	648.5	472.3	436.0	556.5	400.3	341.4	344.6	306.1	270.5
LISBON	273.0	276.6	258.3	273.0	262.7	250.6	173.8	203.5	176.6	162.0	158.5	118.0
LONDON	626.5	600.7	584.9	626.5	445.1	455.9	491.3	413.3	346.0	327.5	310.2	285.0
LUXEMBURG	484.0	455.8	402.1	484.0	408.9	368.6	411.8	335.4	295.4	237.4	224.8	215.7
LYONS	437.0	429.4	414.3	437.0	442.5	426.8	342.5	336.2	297.6	225.3	223.6	228.1
MADRID	523.5	503.7	488.3	523.5	441.5	450.3	375.6	329.3	295.4	259.1	238.1	251.0
MALAGA	637.0	589.0	575.7	637.0	441.0	520.9	453.3	402.2	368.9	315.6	283.2	292.3
MANCHESTER	626.0	567.8	487.3	626.0	549.0	478.3	533.1	423.8	386.0	327.4	301.9	232.1
MARSEILLE	301.5	297.7	277.4	301.5	239.1	224.0	192.3	170.7	163.5	168.0	157.7	161.1
OPORTO	626.5	557.1	542.3	626.5	484.6	441.0	491.3	412.9	321.3	327.5	280.1	263.8
PARIS	414.5	390.2	368.9	414.5	353.2	352.7	322.5	272.9	238.2	232.0	166.8	164.4
NON-EEC EUROPE:												
BASEL	316.5	302.9	261.6	316.5	287.1	234.8	241.8	247.9	218.4	175.3	164.8	146.7
BUDAPEST	504.0	500.9	484.2	504.0	422.7	397.1	340.5	306.6	269.3	286.0	284.4	256.7
GENEVA	281.5	244.4	212.7	281.5	187.0	165.6	214.8	188.2	149.9	156.3	129.8	124.9
ISTANBUL	737.0	671.2	641.5	737.0	598.0	545.7	506.5	421.3	378.5	400.8	347.6	322.8
OSLO	794.5	707.4	669.7	794.5	547.5	521.8	665.8	519.4	440.5	422.3	383.3	332.6
PRAGUE	408.0	397.5	389.6	408.0	322.5	274.0	302.5	270.4	238.2	209.8	215.2	209.5
STOCKHOLM	816.0	756.7	717.2	816.0	635.0	542.1	703.8	589.8	434.5	433.1	403.9	336.0
VIENNA	478.0	412.4	397.3	478.0	299.1	317.9	354.5	223.6	209.9	249.0	234.2	222.8
ZURICH	281.5	223.7	198.8	281.5	176.7	167.8	214.8	169.8	139.8	156.3	106.6	110.2

NOTES: (1) Fares and revenues per passenger refer to a one-way ticket.
(2) Published business and "economy normal" fares are identical.
(3) PUB is the arithmetical mean computed on fares published in January and July for each of the four categories mentioned in the table: if a fare is not available in either of the two months, PUB corresponds to the only published fare in 1990.
(4) T IT stands for the revenue per passenger for tickets sold in Italy on each category.
(5) T TOT stands for the revenue per passenger for tickets sold in Italy and abroad on each category.

SOURCES: Unpublished Alitalia data; SAS and Swissair (eds.), 1990a and 1990b.

TABLE 1b

PERCENTAGE COMPARISON BETWEEN ALITALIA PUBLISHED FARES AND REVENUES PER PASSENGER BY FARE CATEGORIES ON AIR TICKETS FROM ROME (1990)

FARE:	BUSINESS (1)		ECONOMY		EXCURSION		PEX		AVERAGE 4 FARES (4)			NW COEFF. VAR.(6)			COEFF. VAR. (10)		
	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	DISC (5)	PRZ (2)	MIX (3)	PUB (7)	T IT (8)	T TOT (9)	PUB (7)	T IT (8)	T TOT (9)
EUROPE OF 12:																	
AMSTERDAM	0.0%	6.1%	25.0%	1.1%	4.1%	21.7%	3.4%	13.9%	3.7%	4.1%	14.4%	0.284	0.272	0.335	0.288	0.301	0.352
ATHENS	0.0%	14.5%	11.9%	28.3%	12.5%	29.9%	11.9%	18.7%	-1.5%	9.1%	27.2%	0.254	0.289	0.351	0.289	0.321	0.330
BARCELONA	0.0%	5.3%	18.5%	-3.1%	6.4%	14.9%	6.2%	-4.2%	1.7%	4.7%	10.8%	0.268	0.269	0.275	0.285	0.304	0.301
BERLIN	0.0%	1.3%	21.8%	-0.5%	14.8%	4.0%	3.3%	11.4%	8.7%	5.7%	13.4%	0.228	0.238	0.278	0.270	0.286	0.336
BRUSSELS	0.0%	1.9%	17.1%	6.0%	1.0%	19.1%	0.8%	4.7%	2.9%	1.7%	8.2%	0.258	0.240	0.275	0.256	0.258	0.294
COPENHAGEN	0.0%	5.7%	19.9%	1.3%	8.1%	29.4%	0.4%	9.6%	15.4%	3.3%	12.3%	0.228	0.219	0.305	0.289	0.285	0.303
FRANKFURT	0.0%	4.8%	17.9%	10.8%	18.1%	18.4%	9.4%	3.0%	6.4%	5.8%	12.9%	0.229	0.266	0.307	0.228	0.273	0.318
LISBON	0.0%	6.4%	36.7%	1.2%	19.7%	15.9%	9.0%	5.3%	2.5%	12.1%	7.7%	0.228	0.277	0.299	0.286	0.322	0.306
LONDON	0.0%	12.7%	18.4%	16.9%	-2.4%	29.1%	-9.5%	12.8%	9.2%	-0.7%	15.5%	0.319	0.266	0.299	0.392	0.347	0.340
MADRID	0.0%	6.0%	20.2%	-3.8%	10.1%	16.9%	7.3%	-6.7%	4.1%	5.3%	11.7%	0.265	0.277	0.281	0.274	0.302	0.292
MALAGA	0.0%	7.7%	35.9%	-9.7%	8.3%	18.2%	7.7%	-4.6%	7.2%	9.5%	6.1%	0.266	0.295	0.271	0.310	0.342	0.286
MARSEILLE	0.0%	6.3%	11.6%	10.0%	10.3%	8.3%	4.1%	16.2%	3.0%	7.1%	8.7%	0.233	0.243	0.276	0.174	0.205	0.215
MUNICH	0.0%	5.6%	23.2%	19.6%	6.9%	40.9%	10.9%	14.7%	0.1%	6.5%	24.5%	0.227	0.244	0.381	0.238	0.276	0.407
NICE	0.0%	8.5%	11.2%	7.8%	6.0%	20.1%	12.5%	26.1%	2.6%	3.9%	17.2%	0.238	0.265	0.357	0.151	0.173	0.290
PARIS	0.0%	7.1%	19.7%	1.2%	7.7%	24.1%	22.3%	11.5%	4.1%	6.8%	11.8%	0.231	0.268	0.352	0.147	0.198	0.252
TENERIFE	0.0%	0.8%	31.8%	-10.5%	-3.3%	13.8%	6.8%	-5.8%	10.4%	9.2%	5.6%	0.264	0.275	0.256	0.288	0.314	0.288
TOTAL (11)	0.0%	7.9%	17.1%	7.7%	6.5%	24.1%	2.9%	11.1%	4.9%	4.0%	16.3%	0.251	0.264	0.306	0.260	0.282	0.307
NON-EEC EUROPE:																	
ANKARA	0.0%	10.4%	35.3%	5.9%	24.1%	7.6%	1.8%	14.9%	4.6%	13.6%	14.8%	0.245	0.291	0.302	0.239	0.309	0.306
BUDAPEST	0.0%	5.1%	28.2%	0.2%	-2.1%	17.1%	-6.8%	15.2%	7.7%	1.4%	11.9%	0.282	0.236	0.287	0.289	0.259	0.297
GENEVA	0.0%	10.3%	19.9%	5.2%	7.0%	23.4%	0.4%	4.7%	4.2%	3.5%	11.9%	0.219	0.207	0.225	0.229	0.233	0.219
ISTANBUL	0.0%	7.6%	19.5%	11.0%	11.3%	18.6%	10.5%	11.3%	5.8%	7.0%	19.6%	0.236	0.262	0.309	0.223	0.266	0.330
MALTA	0.0%	5.5%	15.8%	7.7%	19.5%	12.2%	14.8%	-0.8%	-2.0%	11.0%	-1.1%	0.280	0.329	0.332	0.376	0.443	0.386
PRAGUE	0.0%	3.5%	29.8%	6.1%	0.1%	46.5%	-0.1%	2.4%	-2.0%	5.2%	14.7%	0.262	0.241	0.356	0.319	0.295	0.348
VIENNA	0.0%	8.1%	22.8%	4.1%	19.1%	13.6%	-4.2%	9.5%	15.3%	6.1%	11.5%	0.246	0.253	0.284	0.253	0.268	0.281
ZURICH	0.0%	6.6%	17.9%	5.5%	18.1%	18.1%	0.4%	10.5%	8.6%	4.4%	12.9%	0.219	0.230	0.285	0.221	0.235	0.270
TOTAL (11)	0.0%	8.4%	20.3%	8.4%	12.6%	18.9%	2.8%	1.1%	6.7%	5.2%	10.8%	0.249	0.256	0.298	0.268	0.288	0.305
GEOGR. EUROPE:																	
TOTAL (11)	0.0%	7.7%	17.8%	7.8%	8.1%	22.7%	3.0%	7.3%	5.2%	4.3%	14.6%	0.250	0.260	0.302	0.264	0.285	0.306

NOTES:

(1) Published business and "economy normal" fares are identical, but all tickets with no proratization are placed by Alitalia in the first class and all others in the second.

(2) PRZ stands for proratization.

(3) MIX indicates the distortion due to the mix of tickets sold in Italy and abroad.

(4) The average of published fares and of revenues on tickets sold in Italy is weighted by the number of passengers corresponding to the tickets issued in Italy; the average of the revenues on tickets sold everywhere is weighted by the total number of passengers (with tickets issued in Italy and abroad).

(5) DISC means discounts, i.e. fare reductions (e.g. for infants and children) constant in all classes. The percentage difference between the published fare and the corresponding revenue per passenger on tickets sold everywhere is sub-divided as follows: a share deriving from the fact that the ticket has not been sold in Italy (MIX equalling the percentage gap between the revenue on tickets issued in Italy and those on tickets issued abroad) and a share deriving from the fact that the revenue on that same ticket sold in Italy is different from the published fare owing to discounts plus proratization. Discounts are identified as the difference, for each route, between the business fare revenues on tickets sold in Italy and the corresponding published fare, given that the business class has no proratization.

(6) Non-weighted (=NW) coefficients of variation show the dispersion of the four fares described in the previous columns.

(7) PUB is the arithmetical mean computed in January and July for each of the four fares: if a fare is not available in either of the two periods, PUB corresponds to the only published fare in 1990.

(8) T IT stands for the revenue per passenger for tickets sold in Italy, computed on each of the four fares.

(9) T TOT stands for the revenue per passenger for tickets sold both in Italy and abroad, computed on each of the four fares.

(10) Coefficients of variation show the fare variability due to the fare spectrum and the passenger distribution on the four fares.

(11) The totals for the geographical areas, for each fare class, were obtained as averages of column values weighted by the percentage of passengers on each route, according to the criteria described in note (4).

SOURCES: Table 1a; unpublished Alitalia data; SAS and Swissair (eds.), 1990a and 1990b.

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TABLE 1c

PERCENTAGE COMPARISON BETWEEN ALITALIA PUBLISHED FARES AND REVENUES PER PASSENGER BY FARE CATEGORIES
ON AIR TICKETS FROM MILAN (1990)

FARE:	BUSINESS (1)		ECONOMY		EXCURSION		PEX		AVERAGE 4 FARES (4)			NW COEFF. VAR.(6)			COEFF. VAR. (10)		
	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	DISC (5)	PRZ (2)	MIX (3)	PUB (7)	T IT (8)	T TOT (9)	PUB (7)	T IT (8)	T TOT (9)
EUROPE OF 12:																	
AMSTERDAM	0.0%	5.0%	15.4%	2.5%	5.3%	6.5%	2.5%	0.4%	4.6%	2.2%	6.1%	0.288	0.279	0.274	0.262	0.272	0.258
ATHENS	0.0%	6.8%	8.9%	14.1%	-8.0%	23.5%	1.6%	11.8%	5.7%	2.3%	19.1%	0.306	0.290	0.332	0.302	0.295	0.346
BARCELONA	0.0%	2.7%	9.1%	1.5%	5.0%	6.8%	3.0%	-3.0%	2.8%	1.6%	8.6%	0.268	0.269	0.263	0.224	0.233	0.258
BRUSSELS	0.0%	2.1%	5.1%	2.5%	8.3%	6.4%	-0.9%	-2.1%	2.0%	0.7%	4.3%	0.242	0.236	0.237	0.218	0.218	0.225
COPENHAGEN	0.0%	3.2%	14.3%	5.6%	15.2%	10.6%	-1.7%	10.3%	12.9%	2.4%	11.0%	0.226	0.218	0.258	0.249	0.246	0.275
LISBON	0.0%	2.5%	24.8%	-1.7%	11.7%	13.7%	1.2%	7.7%	4.1%	5.0%	8.7%	0.238	0.236	0.273	0.274	0.281	0.306
LONDON	0.0%	11.1%	9.7%	8.3%	12.7%	9.7%	-0.5%	3.8%	5.8%	1.3%	6.4%	0.249	0.245	0.224	0.299	0.297	0.239
LUXEMBURG	0.0%	3.4%	-3.0%	3.6%	0.1%	11.3%	-1.0%	-2.0%	1.8%	-1.4%	3.8%	0.242	0.244	0.242	0.211	0.213	0.208
LYONS	0.0%	6.7%	5.1%	4.5%	-15.8%	15.5%	3.4%	25.0%	-1.3%	-0.7%	4.9%	0.239	0.211	0.286	0.179	0.139	0.139
MADRID	0.0%	2.9%	11.9%	-1.7%	8.6%	9.0%	4.3%	-5.0%	3.8%	2.5%	8.2%	0.264	0.271	0.270	0.240	0.259	0.271
MALAGA	0.0%	2.1%	23.2%	-12.5%	3.7%	7.3%	2.7%	-2.9%	7.5%	3.2%	1.9%	0.265	0.255	0.259	0.319	0.327	0.304
MANCHESTER	0.0%	12.8%	3.0%	11.3%	11.2%	7.1%	-1.5%	21.3%	9.3%	0.8%	16.1%	0.231	0.232	0.259	0.215	0.215	0.258
MARSEILLE	0.0%	6.7%	19.4%	5.0%	9.9%	3.8%	4.8%	-2.0%	1.3%	12.9%	4.6%	0.255	0.260	0.233	0.198	0.201	0.166
OPORTO	0.0%	2.4%	11.6%	7.0%	4.9%	18.6%	3.4%	5.0%	11.1%	2.8%	13.8%	0.238	0.236	0.275	0.220	0.232	0.287
PARIS	0.0%	5.1%	8.9%	0.1%	9.5%	10.8%	22.2%	1.0%	5.9%	3.7%	4.0%	0.243	0.289	0.299	0.120	0.160	0.147
TOTAL (11)	0.0%	6.0%	10.5%	4.6%	7.8%	8.5%	2.0%	2.4%	5.0%	2.3%	7.3%	0.253	0.251	0.266	0.235	0.239	0.246
NON-EEC EUROPE:																	
BASEL	0.0%	13.1%	5.0%	16.5%	-6.8%	12.2%	1.7%	10.3%	4.3%	-1.0%	13.9%	0.224	0.213	0.197	0.174	0.157	0.140
BUDAPEST	0.0%	3.3%	15.5%	5.1%	9.3%	10.9%	-0.1%	9.7%	0.6%	2.8%	7.7%	0.238	0.233	0.268	0.232	0.241	0.257
GENEVA	0.0%	11.3%	20.4%	7.6%	-0.8%	17.8%	3.8%	3.1%	13.2%	2.9%	14.4%	0.224	0.215	0.196	0.179	0.186	0.171
ISTANBUL	0.0%	4.0%	9.9%	7.1%	7.9%	8.5%	4.3%	6.2%	8.9%	3.3%	18.2%	0.246	0.256	0.270	0.216	0.239	0.295
OSLO	0.0%	4.7%	20.1%	3.2%	11.0%	11.8%	-1.7%	12.0%	11.0%	2.5%	13.3%	0.227	0.250	0.250	0.278	0.270	0.293
PRAGUE	0.0%	2.0%	18.4%	11.9%	8.0%	10.6%	-5.2%	2.7%	2.6%	0.9%	4.4%	0.249	0.224	0.246	0.321	0.286	0.267
STOCKHOLM	0.0%	4.8%	14.9%	11.4%	8.9%	22.1%	-0.5%	15.7%	7.3%	1.8%	22.8%	0.226	0.213	0.279	0.269	0.265	0.314
VIENNA	0.0%	3.2%	23.7%	-3.9%	23.2%	3.9%	-7.8%	4.6%	13.7%	5.8%	4.4%	0.245	0.256	0.265	0.190	0.229	0.223
ZURICH	0.0%	8.9%	16.7%	3.2%	0.4%	13.9%	11.2%	-2.3%	20.5%	4.0%	9.6%	0.224	0.246	0.213	0.176	0.202	0.183
TOTAL (11)	0.0%	10.2%	20.4%	-1.5%	7.8%	12.7%	-3.1%	-2.5%	12.5%	3.8%	9.9%	0.234	0.234	0.243	0.226	0.231	0.238
GEOGR. EUROPE:																	
TOTAL (11)	0.0%	6.4%	12.2%	4.1%	8.6%	8.6%	1.3%	1.6%	6.0%	2.6%	7.9%	0.243	0.243	0.254	0.231	0.235	0.242

NOTE: See notes of Table 1b.

SOURCES: See sources of Table 1b.

TABLE 1d

PERCENTAGE COMPARISON BETWEEN ALITALIA PUBLISHED FARES AND REVENUES PER PASSENGER BY FARE CATEGORIES
ON AIR TICKETS LEAVING BOTH FROM ROME AND MILAN (1990)

FARE:	BUSINESS (1)		ECONOMY		EXCURSION		PEX		AVERAGE 4 FARES (4)			NW COEFF. VAR.(6)			COEFF. VAR. (10)		
	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	PRZ (2)	MIX (3)	DISC (5)	PRZ (2)	MIX (3)	PUB (7)	T IT (8)	T TOT (9)	PUB (7)	T IT (8)	T TOT (9)
EUROPE OF 12:																	
TOTAL (11)	0.0%	6.3%	13.5%	6.1%	7.1%	17.0%	2.4%	6.6%	5.0%	3.0%	11.1%	0.252	0.258	0.286	0.248	0.260	0.276
NON-EEC EUROPE:																	
TOTAL (11)	0.0%	9.0%	20.2%	4.4%	10.3%	14.0%	-0.0%	-1.4%	9.5%	4.4%	10.4%	0.241	0.245	0.270	0.247	0.259	0.271
GEOGR. EUROPE:																	
TOTAL (11)	0.0%	6.6%	14.8%	6.0%	8.3%	15.7%	2.1%	4.8%	5.7%	3.3%	10.9%	0.247	0.251	0.278	0.248	0.260	0.274

NOTE: See notes of Table 1b.

SOURCES: See sources of Table 1b.

of choice between different routes; it is also higher on destinations which are deliberately used as intermediate stages in multi-stage flights. These are mainly large airports, hubs for business travellers (such as Zurich, Vienna, Copenhagen, Frankfurt), or medium-capacity tourist airports which are normally combined with other destinations in a multi-stage tourist itinerary (Malaga, Oporto, Istanbul, Ankara, etc.).

For these reasons, the phenomenon, as illustrated by Tables 1b and 1c, is more relevant on flights leaving from Rome rather than Milan. Indeed, Rome plays the role of a network centre, particularly in the Mediterranean area, and therefore offers a wider range of links which eventually create a web of connections with the main European centres. This favours an inflow of passengers from foreign markets and also fosters their outflow towards European airports.

In the case of Milan, which is not a hub owing to structural limitations of its airport, the timetable of Alitalia tends to avoid easy connections and instead attracts passengers who depart from the starting point and arrive to the end destination of the flight, thus minimizing, with few exceptions, proratization.

In spite of the discrepancy between published fares and revenues per passenger, as summarized by Tables 1a, 1b, 1c, and in spite of the corresponding bias evaluated on average at 19.9% in Table 1d, we consider that our data on revenues per passenger are good proxies of fares.

4. The legal framework and first results on fare variability

Thanks to a 1987 EEC Council Directive that entered into force in 1988 (EEC, 1987), a higher degree of competition has been developed among Europe-based airlines, according to a philosophy defined as "evolution rather than revolution. Deregulation will occur in stages" (Button and Swann, 1989, p.274).

With regard to ticket fares, two flexibility areas were introduced relative to the "economy normal". Further fare

liberalizations were approved by the Council in the summer of 1990 (EEC, 1990) and entered into force from November 1, 1990: in particular, the flexibility areas became three, thus widening the spectrum of "free" fares; moreover, double disapproval by Member States became necessary for fares exceeding 105% of the "economy normal", while double approval was required only for fares below 30% of the reference fare. Generally speaking, the procedures protecting national carriers became more cumbersome and therefore more unlikely[10].

We must refer to both the afore-mentioned legal frameworks in order to evaluate the actual degree of fare liberalization and competition prevailing in 1990 within the EEC air market. It was in fact during 1990 that the shift took place from the first to the second "package". Furthermore, fare behaviours prevailing in the EEC are to be compared to those of non-EEC European or non-European medium-range fares, characterized by rules and regulations which are not aimed at fostering market competition.

Against this background, a preliminary warning seems important: while fare dispersion in the U.S. is mostly a consequence of liberalization and price competition, in Europe and generally in the medium-range market, the situation is different, as fare dispersion also exists outside the EEC, being linked to more complex reasons.

Both "free" and regulated fares (all those in the medium-range market except in the EEC and the non-liberalized fares in the Europe of Twelve) are changed through time and are somewhat responsive to general market conditions, as brought out by the analysis of the "economy normal" fare in the period 1986-1990. Modifications in the reference fare are the same for all routes linking two countries -irrespective of the

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[10] In June 1992, a third "package" has been approved by the EEC Council so as to make complete and almost automatic the free definition of air fares on the Europe of Twelve, within what is known as "the completion of the EEC civil aviation policy in view of the internal market" (EEC, 1992): the EEC has abolished the reference fare and the double approval/disapproval system.

characteristics of each market- as they usually depend on average costs and on the more or less pro-competitive attitude of the administrations responsible for price changes. For instance, real fares have decreased by more than 20 percentage points on the Italy-Great Britain routes, while constantly rising on the Italy-Spain[11] ones. Similar fare movements appear for the routes for North Africa and the Middle East, where in the 1986-1990 period the "economy normal" fare registered increases well below inflation (a 20% reduction in real terms for Jordan, Siria, Irak, Saudi Arabia, Iran, Libia and Israel), probably due to the efforts made to promote air traffic to these countries.

With regard to different fares applied by travel agents, Tables 1b, 1c and 1d show that fare dispersion is higher within the EEC than outside, where it is still significant, as indicated by coefficients of variation computed on published fares. These coefficients are consistent with those evaluated on revenues per passenger-kilometre, that are the main object of our analysis.

5. Fares and fare variability

Irrespective of the legal framework of reference, which is different for the Europe of Twelve and for other medium-range routes, Table 2 shows that the arithmetical fare average per passenger-kilometre, PPK2, is not significantly different in the various parts of geographical Europe, but is definitely lower on non-European routes (due also to the average stage length which is almost double). At the same time, fare dispersion is approximately constant within geographical Europe, but is considerably higher than that for non-European medium-range routes. Similar features emerge in (weighted) average revenues per passenger-kilometre, PPK, and in their variability.

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[11] The sharp rise in the "economy normal" fare on all connections registered in the first half of 1990 is due to common efforts by all European airlines aimed at recovering the cost increases experienced before liberalization (Great Britain is the only country taking no part in this initiative).

TABLE 2

REFERENCE DATA ON ALITALIA REVENUE PER PASSENGER IN THE MEDIUM-RANGE MARKET (1990)

	EUROPE OF 12				NON-EEC EUROPE				GEOGRAPHICAL EUROPE				EXTRA-EUROPEAN MEDIUM-RANGE				TOTAL MEDIUM-RANGE			
	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL
Average revenue per passenger-kilometre: PPK (It. Liras)	427.36	253.75	184.86	267.38	518.60	259.99	184.50	270.62	436.17	254.72	184.81	267.85	189.94	190.43	127.48	153.11	383.90	251.89	166.99	250.80
Arithmetical fare average: PPK2 (It. Liras)	378.87	283.79	218.88	275.90	426.15	261.25	221.38	270.39	388.74	275.92	219.37	274.36	172.36	197.24	141.94	166.08	292.78	266.26	197.64	248.22
Average distance (km)	583	950	1382	959	384	1147	1587	992	526	1010	1418	968	2201	1379	2352	1978	794	1045	1596	1104
Traffic density (%)	19.69	42.73	14.30	76.72	3.83	8.57	2.01	14.41	23.52	51.30	16.31	91.13	2.25	2.53	4.09	8.87	25.77	53.83	20.40	100.00
Coefficient of variation of revenues per passenger	0.321	0.398	0.416	0.373	0.388	0.432	0.490	0.366	0.329	0.403	0.428	0.372	0.176	0.238	0.367	0.261	0.316	0.399	0.411	0.362
Non-weighted coefficient of variation of revenues per passenger	0.324	0.347	0.398	0.328	0.318	0.390	0.425	0.326	0.328	0.352	0.403	0.325	0.292	0.277	0.383	0.288	0.319	0.352	0.395	0.319
Skewness	-0.572	0.466	0.434	0.180	-0.235	0.438	0.467	0.250	-0.476	0.458	0.440	0.199	-0.025	0.088	0.403	0.155	-0.404	0.423	0.433	0.193
Load factor (%)	52.44	61.57	63.97	59.22	49.10	61.40	58.90	57.50	51.70	61.48	63.20	58.90	63.53	71.78	67.09	67.39	53.45	62.00	63.88	59.59

LEGENDA: For further explanations of the symbols, see the Methodological Appendix.

SOURCES: Unpublished Alitalia data; ICAO, 1989; ICAO, 1992.

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In order to pursue our analysis, it appears necessary to segment the medium-range network according to three prevailing types of traffic, on the basis of both legal-geographical and demand elasticity criteria, synthetically described in Figg. 1a, 1b and 1c. We distinguish between predominantly business routes (BB), predominantly tourist routes (TT) and mixed routes (BT). Routes are sub-divided into the three segments according to the divergence of passenger distribution in each single route from the passenger distribution on the network (routes with a distribution characterized by a large share of passengers using high fares are BB routes; those with a prevalence of passengers using low fares are TT routes: for further details please refer to the T/B index in the Methodological Appendix). This sub-division proves to be useful, as a significantly different behaviour emerges in different segments.

Indeed, Table 2 indicators, grouped by traffic type, appear to differ from one another, and from the network average, as well as for the same kind of traffic on different routes.

Within geographical Europe, without particular distinction between the Europe of Twelve and non-EEC Europe, the average revenue per passenger-kilometre and the arithmetical fare average per passenger-kilometre decrease orderly from BB to TT, while fare variability increases by a few points. On the contrary, extra-European routes, -partially due to their average length which is independent of the traffic type-, do not show such an orderly pattern, while both revenues per passenger-kilometre and fare variability are lower.

5.1. Predominantly business routes (BB)

5.1.1 EEC Europe

Table 3 indicates that on business routes a widening of the fare spectrum is obtained by introducing more expensive fares (positive relationship between the non-weighted coefficient of variation and the corresponding fare average per

TABLE 3

COEFFICIENTS OF CORRELATION OF ALITALIA REVENUES PER PASSENGER AND FARE VARIABILITY IN THE MEDIUM-RANGE MARKET (1990)

	EUROPE OF 12				NON-EEC EUROPE				GEOGRAPHICAL EUROPE				EXTRA-EUROPEAN MEDIUM-RANGE				TOTAL MEDIUM-RANGE			
COEFFICIENTS OF CORRELATION	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL
PPK / Distance	-0.730	-0.889	-0.931	-0.809	-0.885	-0.706	-0.908	-0.791	-0.788	-0.778	-0.922	-0.799	-0.480	-0.996	-0.335	-0.560	-0.735	-0.777	-0.931	-0.745
PPK / Coeff. of variation	-0.607	-0.460	0.242	-0.617	0.062	-0.576	0.381	-0.691	-0.348	-0.491	0.154	-0.677	-0.513	-0.791	0.654	-0.702	0.022	-0.105	0.348	-0.438
PPK / Non-weighted coeff. of variation	0.405	-0.344	-0.405	-0.335	0.606	-0.669	0.868	-0.557	0.340	-0.480	-0.281	-0.425	-0.094	-0.563	0.821	-0.386	0.292	-0.219	-0.028	-0.332
PPK2 / Coeff. of variation	-0.499	-0.427	0.279	-0.545	0.273	-0.572	0.866	-0.560	-0.178	-0.467	0.256	-0.593	-0.436	-0.779	0.017	-0.600	0.117	-0.087	0.464	-0.311
PPK2 / Non-weighted coeff. of variation	0.279	-0.318	-0.341	-0.333	0.657	-0.609	0.990	-0.506	0.240	-0.440	-0.236	-0.417	-0.005	-0.542	0.510	-0.392	0.262	-0.188	0.076	-0.259
PPK / Skewness	-0.373	-0.238	-0.085	-0.728	0.648	0.272	0.193	-0.647	-0.033	-0.104	-0.087	-0.675	-0.810	0.767	-0.278	-0.644	-0.392	0.096	-0.025	-0.610
PPK2 / Skewness	-0.353	-0.207	-0.188	-0.645	0.711	0.311	-0.447	-0.560	0.090	-0.058	-0.206	-0.570	-0.822	0.741	0.342	-0.493	-0.322	0.136	-0.044	-0.482
PPK / Market density	-0.428	-0.455	0.111	-0.222	0.003	0.035	0.820	0.032	-0.353	-0.298	0.191	-0.135	0.014	0.522	0.614	0.019	-0.099	-0.195	0.187	-0.099
PPK2 / Market density	-0.381	-0.491	-0.024	-0.218	0.219	0.126	0.299	0.109	-0.273	-0.315	0.013	-0.159	-0.077	0.636	0.925	0.122	-0.046	-0.207	0.057	-0.070
Coeff. of variation/Skewness	0.532	0.377	0.337	0.618	0.001	0.226	-0.833	0.611	0.260	0.342	0.265	0.259	0.121	-0.270	-0.475	0.361	0.035	0.451	0.237	0.553
Non-weighted coeff. of variation / Skewness	0.209	-0.003	0.012	0.229	0.018	-0.421	-0.400	0.419	-0.005	-0.125	-0.005	-0.005	-0.237	-0.003	-0.518	0.089	-0.162	0.066	-0.047	-0.152
Coeff. of variation / Market density	0.431	0.447	-0.103	0.177	0.684	0.637	-0.216	0.248	0.458	0.413	-0.174	0.458	-0.850	-0.015	0.339	0.095	0.340	0.391	-0.124	0.340
Non-weighted coeff. of variation / Market density	-0.012	0.356	0.083	0.071	0.024	-0.151	0.428	-0.031	0.069	0.140	0.093	0.069	-0.988	0.296	0.162	0.053	0.023	0.187	0.103	0.023
Market density / Skewness	-0.008	0.081	0.358	0.062	0.492	0.467	0.720	0.232	-0.008	0.123	0.348	-0.088	0.233	0.833	0.551	0.475	-0.133	0.185	0.368	-0.133

LEGENDA: For further explanations of the symbols, see the Methodological Appendix.

SOURCES: Unpublished Alitalia data; ICAO, 1989.

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passenger-kilometre, PPK2[12]). This does not in general happen in Europe, and is linked to the low elasticity of this type of traffic.

In order to better fill planes in a situation of excess supply -proved by load factors lower on average than those on other medium-range routes- air companies accept to meet the demand of additional passengers at lower fares: hence, the variability of passenger distribution on different fares is inversely correlated to PPK. As a situation of heavy excess supply for all fares remains, the afore-mentioned distribution is believed to correspond to notional demand. This phenomenon is common to the whole of Europe.

Passenger distribution shows a higher density at higher fares and skewness, which is negative[13], is inversely linked to PPK, and directly correlated to fare variability, indicating that an increasing asimmetry is associated to a rise in the revenue per passenger-kilometre and to a lower dispersion of fares and passengers.

5.1.2 Non-EEC Europe

Here too, a widening of the spectrum corresponds to the introduction of higher fares agreed upon by carriers. However, the excess supply on these routes apparently does not lead to a loading of the plane with passengers paying lower fares: indeed, there is a very weak correlation between PPK and the coefficient of variation. This is because distances are essentially short and/or routes mainly correspond to business trips (from Milan or Turin to cities such as Zurich, Basel, Geneva or from Rome to Tirane) or to connections with important hubs (for instance from Rome to Vienna or Zurich), where there is hardly any demand for

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12 The correlation between the non-weighted coefficient of variation and the average revenue per passenger-kilometre, PPK, is also positive and even higher.

13 The only BB route within the EEC with positive (indeed highly positive) skewness is Rome - Brussels.

low fares, and there are distortive effects due to proratization. As happens within the EEC, excess supply is a deliberate characteristic of BB routes.

5.1.3 Extra-European medium-range routes

On these routes, both weighted and non weighted (PPK and PPK2) average revenues per passenger-kilometre are scarcely correlated to fare dispersion, while, similar to what happens in the Europe of Twelve, a widening of passenger distribution takes place by granting the access to more favourable fares, which reduces the revenue per passenger-kilometre (see Table 3).

5.2. Predominantly tourist routes (TT)

5.2.1 EEC Europe

Table 3 shows that, on these routes with highly elastic traffic, a widening of the fare spectrum takes place by introducing lower fares which decrease PPK2 (and PPK). Tourist passengers would select only low fares; however, notional demand being in excess (as revealed by higher load factors than elsewhere in the medium-range market), Alitalia is able to transfer part of the traffic to higher fares, appropriating the consumer surplus and avoiding a rationing of demand through a de facto price increase. Therefore, a higher passenger variability on different fares implies a slightly higher PPK. To summarize, the exchange, in its components of quality and price, is determined here by notional supply rather than by notional demand. In keeping with this hypothesis, more skewed passenger distributions also imply a higher fare variability, because part of the users accepts to pay higher prices.

5.2.2 Non-EEC Europe

Generally speaking, the situation is partially different than in EEC-Europe. There is a direct correlation between fare variability and the revenue per passenger-kilometre, as shown by Table 3, but correlations are not really meaningful, because the

routes are only three and passenger distribution is concentrated on few fare categories for the Rome-Ankara and Milan-Oslo routes. The prevailing revenues per passenger-kilometre in these cases depend on the relations between carriers and intermediaries: if one wants to penetrate a market (Italy-Oslo, Italy-Ankara were opened in 1990), without running too many risks, one relies on tour operators to promote the market. The revenue split between carriers and intermediaries depends therefore on the respective bargaining powers. Furthermore, on new routes there is not necessarily an excess demand.

5.2.3 Extra-European medium-range routes

On these routes, a widening of the fare spectrum leads to an increase in PPK2 and in PPK, as in non-EEC Europe and in BB routes. Due to the high concentration of passengers on cheaper fares, the correlation between skewness and PPK is moderately negative, as shown in Table 3.

5.3. Mixed business-tourist routes (BT)

5.3.1 EEC Europe

BT routes in the EEC area represent the largest segment served by Alitalia (approximately 43% of the traffic density, as illustrated by Table 2). Here, both tourist and business passengers coexist: PPK is considerably lower than on business routes, and closer, though higher, to that of tourist routes. Consequently, we find features common to both BB and TT routes. In particular, in common with TT routes there exists a negative correlation between PPK2 and fare dispersion, but, like BB routes, a negative correlation emerges between PPK and passenger distribution on different fares.

5.3.2 Non-EEC Europe

Again BT routes are the most numerous group (12 routes out of 21). Revenues are strongly influenced by tourist flows, and on average are 50% lower than for the corresponding business routes.

The fare range is wider by more than 20% on average vis a vis the business segment and wider fare spectra are correlated with lower revenues and less concentrated passenger distributions. The flows being mainly tourist, skewness is positive and is associated to a lower fare dispersion, as passengers become more concentrated on few fare categories (see Table 3).

5.3.3 Extra-European medium-range routes

On these routes the correlations between fare variability, average revenues and asimmetry are similar to those already described with regard to geographical Europe, although the market is basically different. In fact, as indicated by Table 2, in this market PPK is equal to that of the BB routes (but PPK2 is lower) and the fare spectrum is even narrower.

6. Competition and its impact

Table 4 shows that, within the Europe of Twelve, competition is stronger and market concentration weaker than elsewhere on medium-range routes. In fact, the adopted indexes, LPS and H[14], illustrate that in the EEC the competitive pressure is higher and market concentration is lower on all single segments (BB, BT, TT).

The effects of competition appear to be in Table 4 particularly relevant and correctly signed within the EEC, where increased competition goes alongside with a reduction in average revenues per passenger-kilometre and a higher fare variability. Elsewhere in Europe, these correlations present the wrong sign or are absent, while the impact of market concentration appears almost insignificant. Surprisingly enough, there are non null correlations with the appropriate sign between the competive

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[14] As illustrated in the Methodological Appendix, LPS -an index of the degree of competition- increases when foreign competitors raise their competitive pressure on Alitalia; H -an indicator of the degree of market concentration- rises if the number of carriers, flights and seats on the market decreases.

TABLE 4

DEGREE OF COMPETITION AND MARKET CONCENTRATION ON THE MEDIUM-RANGE AIR TRANSPORT MARKET SERVED BY ALITALIA (1990)

	EUROPE OF 12				NON-EEC EUROPE				GEOGRAPHICAL EUROPE				EXTRA-EUROPEAN MEDIUM-RANGE				TOTAL MEDIUM-RANGE			
	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL	BB	BT	TT	TOTAL
LPS flights	1.497	1.748	1.688	1.666	1.360	1.520	1.199	1.429	1.458	1.678	1.602	1.601	1.459	1.560	1.598	1.539	1.458	1.667	1.601	1.593
H flights	0.546	0.578	0.643	0.586	0.670	0.649	0.839	0.682	0.581	0.600	0.678	0.612	0.513	0.654	0.565	0.544	0.571	0.596	0.656	0.603
COEFFICIENTS OF CORRELATION:																				
PPK / LPS flights	-0.727	-0.500	0.239	-0.277	0.153	0.204	0.775	0.052	-0.409	-0.331	0.314	-0.201	-0.942	-0.592	-0.266	-0.534	-0.294	-0.284	0.261	-0.179
PPK / H flights	0.619	0.322	-0.468	-0.041	-0.095	-0.181	-0.775	-0.162	0.321	0.118	-0.527	-0.071	0.934	-0.486	-0.004	-0.125	0.249	0.032	-0.136	-0.008
PPK2 / LPS flights	-0.674	-0.496	0.071	-0.318	0.160	0.247	0.227	0.078	-0.353	-0.308	0.107	-0.218	-0.950	-0.517	-0.699	-0.471	-0.254	-0.261	0.065	-0.180
PPK2 / H flights	0.547	0.326	-0.322	-0.012	-0.116	-0.213	-0.277	-0.169	0.282	0.103	-0.324	-0.048	0.937	-0.414	-0.439	-0.131	0.294	0.110	-0.088	0.009
Coeff. of variation / LPS flights	0.712	0.379	0.077	0.278	-0.009	0.473	-0.289	0.043	0.435	0.372	-0.068	0.212	0.477	0.438	-0.211	0.354	0.284	0.313	-0.063	0.190
Coeff. of variation / H flights	-0.622	-0.164	-0.404	-0.099	-0.078	-0.582	0.289	0.034	-0.373	-0.267	-0.157	-0.050	-0.516	0.184	-0.181	0.201	-0.264	-0.147	-0.059	-0.038
Non-weighted coeff. of variation / LPS flights	-0.135	0.475	-0.037	0.213	-0.243	0.075	0.359	0.014	-0.068	0.300	-0.032	0.165	0.062	0.352	0.250	0.316	0.024	0.278	-0.016	0.158
Non-weighted coeff. of variation / H flights	0.105	-0.264	-0.092	0.082	0.207	0.050	-0.359	-0.039	0.022	-0.080	-0.101	0.068	-0.110	0.063	0.530	0.235	0.047	-0.033	0.004	0.082

LEGENDA: For further explanations of the symbols, see the Methodological Appendix.

SOURCES: Unpublished Alitalia data; ICAO, 1989; ICAO, 1992.

index and PPK, PPK2 and fare variability in non-European medium-range routes.

Going into further detail, it is possible to observe that on EEC business and business-tourist routes, PPK decreases with rising competition, and increases when the market becomes more concentrated. A greater concentration means that the possibility of collusion is greater, unless there is a monopoly situation. Furthermore, competition favours fare dispersion and the introduction on the part of Alitalia of cheaper fares for passengers on the business-tourist routes, while the concomitant effects on business routes, albeit limited, are opposite in sign. Only in the EEC business-tourist segment one can see a strong impact of competition on fare spectrum, leading to decrease the average revenue per passenger-kilometre. Market concentration creates consistent but opposite consequences.

On EEC tourist routes, the effects of competition on fares are difficult to identify in our data, as charter carriers, who are the real competitors, are not considered here, the information being not available. Therefore, our indexes show the apparent absence of competitive effects among scheduled carriers.

In non-EEC Europe, irrespective of the tourist or business nature of the routes, the determination of fares underlines the typical framework of regulated markets. Indeed, the correlation between the competitive index, LPS, and weighted or unweighted average revenues per passenger-kilometre, when significantly different from zero, is unexpectedly positive. This is likely due to the fact that the presence of several "competitors" (who in reality collude) reveals the existence of a good market and therefore raises PPK, with the possibility of reducing passenger dispersion across fares; a higher market concentration, associated as it is to less important routes, has similar but downwards effects on PPK and PPK2.

7. Conclusions

In our 1990 data-set containing eight categories of Alitalia

average revenues per passenger on most medium-range routes, a wide variability in air fares emerges: in particular, the expected difference in fares paid by randomly chosen Alitalia passengers on a sample route is equal to 36% of the average prevailing fare paid on the same route.

Using various statistical indexes of dispersion and asimmetry in observed average revenues per passenger-kilometre, and showing their correlation to the route characteristics (routes serving predominantly tourist or business segments; routes with high or low traffic density; with large or small market share concentration; subject to strong or weak competition), our paper indicates that the fare preferences revealed by the Italian flag carrier are surprisingly similar to those described with reference to the American market after the 1978 airline deregulation (see Button, 1991). Indeed, the latest analysis devoted, to our knowledge, to this issue (Borenstein and Rose, 1991, p.2) states: "We find considerable dispersion in airline prices. The expected difference in prices paid by two passengers selected at random on a route is more than 35% of the mean ticket price on the route. We find that dispersion is higher on more competitive routes".

Unlike what happens in the U.S., where fare dispersion and competition are almost synonymous, a wide fare spectrum prevails in Europe, irrespective of the existing legal framework, which is aimed at fostering competition within the EEC, but not on other medium-range routes.

However, it is possible to observe on the data how an average fare reduction, under the pressure of competition, takes place through a downward widening of the fare spectrum, with a range that tends to be larger, the more elastic is demand. In fact, fare variability is higher on tourist routes and wherever competition is harsher.

On non-EEC medium-range routes, the impact of competition is strongly reduced or even non-existent. In Europe outside the EEC, typical signals of regulated markets emerge: a higher number of carriers on a route usually betrays the route attractiveness and

therefore leads not to a reduction but to a rise in fares, thanks to a de facto collusion between airlines.

On tourist routes, competition mainly comes not from scheduled carriers but from charter flights that our paper ignores, due to data insufficiencies.

Apparently, the Italian case shows an interesting feature which is not equally present in the American situation, and is probably common to other European countries. It seems to be part of a more general -European and Italian- framework, where prices are not fully flexible and are slower in adjusting than quantities, according to schemes widely studied in the theories of equilibrium with rationing (Malinvaud, 1978).

The Italian flag carrier seems to react to shifts in demand not only by introducing fare changes, but also by varying access conditions to more favourable fares (aimed at particularly elastic market segments) or to less favourable ones (wherever there is an excess demand for lower tariffs), modifying the terms offered to intermediaries[15] as well.

This widespread phenomenon emerges with different intensity in the various medium-range routes examined. Alitalia appears to vary the access conditions to different fare categories, with the aim to obtain an optimal passenger distribution. Such a practice, as it does not fall under EEC regulations, is constraint-free and finds its only limit in the carrier's capacity to assess the demand elasticity of various travellers' segments. In this case too, competition has a visible impact on passenger distribution on different fare categories and increases the distribution variability, particularly towards lower fares in the business segment and inversely in the intermediate segment.

All considered, it is possible to derive food for thought on the importance of the EEC interventions on the air transport market. Even though our analysis is limited to 1990 (due to the scarce significance of 1991 data, influenced by relevant and

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[15] There is no statistical evidence of this practice, which is nevertheless known to be widely adopted.

extraordinary events such as the Gulf War and to the lack of more recent empirical evidence), it nevertheless shows that the price liberalization is incomplete[16], to a certain extent effective, but not really decisive unless other policy-measures are introduced.

In our opinion, these conclusions partially depend on the EEC context, where conflicting forces lead to low and lagged adjustments, but they mainly derive from the limited area chosen by the EEC for its competition policy. Concentrating on fare liberalization and not paying enough attention to interventions aimed at freeing supply, via a better access to airports and routes for more competitive carriers (new entrants, charters), the EEC competition policy remains incomplete and not fully effective.

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16 The new rules introduced in 1992 actually achieve almost total price freedom.

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Methodological Appendix

The medium-range destinations include geographical Europe, North Africa and the Middle East (within a 2,500-mile distance). Geographical Europe comprises all destinations within the traditional European borders, that is the Mediterranean Sea Southwards and the Ural Mountains Eastwards; and it may be sub-divided in two destination areas: the 12 EEC Member States and non-EEC countries. This distinction is particularly useful for statistical elaborations, considering that many rules and regulations on fares are only applied outside the Europe of Twelve.

Of the data originally supplied by Alitalia concerning revenues per passenger on 98 medium-range routes, we have excluded those routes not satisfying two criteria, namely: i) routes with less than 1,000 passengers per year; and ii) routes with stop-overs, which are not comparable to quantitative ICAO data. According to criterium i), we have excluded Venice-Madrid and Bari-Tirane; according to ii), we have excluded Rome-Stockholm, Rome-Lyons, Rome-Moscow, Rome-Luxor, Rome-Dubai, Rome-Damascus, Rome-Bagdad. Consequently, our sample consists of 89 routes, 77 of which lie in geographical Europe (56 within the EEC) and 12 outside Europe.

The routes are grouped into 5 networks: the Europe of Twelve; non-EEC Europe; geographical Europe (sum of networks 1 and 2); extra-European countries; medium-range market (sum of networks 3 and 4). Each of these networks is further sub-divided into 3 sub-groups according to the kind of traffic - predominantly business, predominantly tourist or mixed - using the T/B index of each network (see below).

For analytical purposes, we have defined the following statistical indexes:

M = average revenue or average fare per passenger on each route. This is the average of the eight fare categories weighted by the frequency of passengers on the eight fares.

Source: Unpublished Alitalia data.

PPK = average revenue per passenger-kilometre carried on each route. This is equal to M divided by the distance in kilometres on each route. The network's PPK (geographical Europe, the Europe of Twelve, etc.) is obtained as the average of each route's PPK belonging to the network weighted by the ratio between the passenger-kilometres on each route and the total passenger-kilometres in the network.
Sources: Unpublished Alitalia data; International Civil Aviation Organization (ICAO), 1989.

M2 = arithmetical revenue average or fare average per passenger on each route.
Source: Unpublished Alitalia data.

PPK2= arithmetical fare average per passenger-kilometre on each route. The network's PPK2 is obtained summing the arithmetical fare averages, and then dividing by the sum of the distances of all the routes belonging to the network.
Sources: Unpublished Alitalia data; International Civil Aviation Organization (ICAO), 1989.

Coefficient of variation = index of variability depending on fare dispersion or fare spectrum and on passenger distribution on different fares. It equals the standard deviation divided by the average, both weighted, that is σ/M, where $\sigma = [\sum_i (T_i - M)^2 P_i / N]^{1/2}$: T_i is fare i, where i is one of the eight fare categories; P_i is the number of passengers using fare i; N is the total number of passengers.
Source: Unpublished Alitalia data.

Non-weighted coefficient of variation = fare dispersion or fare spectrum. It is computed as $[\sum_i (T_i - M2)^2 / 8]^{1/2} / M2$.
Source: Unpublished Alitalia data.

Skewness = asimmetry index. It is positive if passenger distribution is mainly concentrated on lower fare categories, negative otherwise. It is computed as $(M-Med)/\sigma$, where Med is the median value of fares.
Source: Unpublished Alitalia data.

LPS = competition index (Leporelli-Padoa Schioppa). It increases when Alitalia bears a higher competitive pressure from foreign flag carriers operating on its routes. It is constructed as $\sum_{i=1}^{n} i \ (v_i \ / \ V)$, where n is the number of carriers i operating on a route (including Alitalia), v_i is the number of flights made during the year by carrier i and V is the total number of flights on that route. The carriers are ordered according to a well defined criterium: Alitalia is first (with rank i=1), then the other air companies follow, in an order which increases with the number of offered flights (the last carrier has rank i=n). If Alitalia did not bear any competitive pressure, LPS would equal 1. The index may also be computed on the number of seats offered or on the number of passengers carried.
Source: International Civil Aviation Organization (ICAO), 1992.

H = market concentration index (Herfindahl-Hirschmann). It increases at rising concentration, being defined as the sum of the squares of the market shares of different carriers on the route (including Alitalia). If the market were a monopoly, with maximum concentration, H would equal 1. This index, too, may concern the number of flights, of seats offered or of passengers carried.
Sources: International Civil Aviation Organization (ICAO), 1992; Adelman, 1969.

Traffic density on a route = percentage of passengers carried on

a route by Alitalia relative to total passengers carried by Alitalia in the medium-range market.
Source: Unpublished Alitalia data.

Market density on a route = percentage of passengers carried on a route - whatever the carrier - as against total passengers on medium-range routes.
Source: International Civil Aviation Organization (ICAO), 1992.

T/B Index = index of the tourist quality of a route, being smaller than (or at maximum equal to) 1 the more business-oriented a route is. It is built as the ratio between the revenue per passenger-kilometre weighted by the network's weights (PPK3) on each route and the corresponding revenue per passenger-kilometre (PPK2). PPK3 is given by the average of the eight fare categories on each route, weighted by the weight passengers have in that category in the whole network, not in that route. For the Europe of Twelve and non-EEC Europe we assume as discriminants the values 0.935 and 1.14 of the T/B index, which become 1 and 1.14 in extra-European countries. This means that in geographical Europe a route belongs to the BB segment if the T/B index is smaller than (or equal to) 0.935, while it belongs to the TT segment if the T/B index is greater than (or equal to) 1.14. The BT segment in geographical Europe includes all routes whose T/B index falls within the threshold values of 0.935 and 1.14. Similarly, in extra-European countries the BB segment includes all routes whose T/B index is smaller than (or equal to) 1, the TT segment includes all routes having a T/B index greater than (or equal to) 1.14, and the BT segment comprises all routes whose T/B index falls within the values of 1 and 1.14. As a consequence, in the Europe of Twelve the business group includes 15 routes, the mixed group 27 routes and the tourist group 14 routes; in non-EEC Europe, the business group comprises 6 routes, the mixed

group 12 and the tourist group 3 routes; in the non-European medium-range market the sub-groups are formed each by 4 routes.

Source: Unpublished Alitalia data.

Coefficient of correlation = index of concordance -if positive- between two generical features labelled as X and Y; index of discordance -if negative-; or index of reciprocal independence -if null-. It is built as the Bravais-Pearson index (r), i.e. the mean of the product of the difference of X and Y from their corresponding means (covariance), divided by the product of the corresponding standard deviations. The index r may take up values between -1 and +1; when the index takes up values between -0.2 and +0.2 reciprocal indepence of the two variables is usually assumed.