SOCIAL AND COMMERCIAL FACTORS IN URBAN PUBLIC TRANSPORT TIMETABLES AND FARES

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The opinions expressed in this paper are those of the author and do not represent the official position of the European Commission.

1. INTRODUCTION

In Europe, urban public transport is not left to the market. Even in the British system of deregulated bus services, public authorities set fares for children and elderly people and fill gaps in the timetable. “Social” factors – a desire to offer some or all users services for which they would not be willing to pay the market price – always have an influence.

At the same time, all those who make decisions about urban public transport, whether operators or authorities, are subject to financial constraints. It follows that their decision-making must take into account “commercial” factors – the need to maximise profit or, at least, to keep profit above some minimum level (which can be negative).

This paper is part of an attempt to improve understanding of the behaviour of public transport decision-makers. It aims to propose quantifiable definitions of socially and commercially-orientated behaviour in public transport; to hypothesise how behaviour on one dimension might be correlated with behaviour on others; and to explore this hypothesis using data from 63 European cities.

Section 2 describes the scope of the paper and the variables examined. Section 3 sets out assumptions about what constitutes commercially orientated behaviour. Section 4 describes the data. Section 5 explores the occurrence of commercially and socially-orientated behaviour in the cities studied. Section 6 discusses the results and draws conclusions.

2. SCOPE AND VARIABLES EXAMINED

The units of analysis are the urban public transport networks of 63 cities from 11 European countries. [1] The cities have populations of at least 200 000.

These networks are buyers (deciding what quantity and mix of inputs to buy, negotiating the price paid) and sellers (deciding what quantity and mix of services to offer, at what price). This paper is confined to the decisions they make as sellers. It focuses, therefore, on decisions about timetables and fares.

Powers to fix timetables and fares can be divided between public transport operators and public authorities in different ways. The paper addresses the choices made by "urban public transport decision-makers" without taking these institutional differences into account.

The following variables were considered for use in the analysis:

fare variables

- fare level
- price discrimination
- tariff integration

timetable variables

- level of service provided
- distribution of service in time
- distribution of service in space

Data on tariff integration were set aside because there is no obvious theoretical reason to associate integration either with a commercial or with a social approach to public transport management. The other variables were retained.

The variables were given operational definition as shown in table 2.1.

<table>
<tr><th>Table 2.1</th><th>Operational definition of fare and timetable variables</th></tr>
<tr><td>i) Fare level</td><td>Price of the following basket of ordinary adult fares for a trip of 5 km -

• cheapest single (weight 1/3)
• price per trip of cheapest return, carnet or other journey count ticket (weight 1/3)
• price per trip [2] of cheapest weekly ticket (weight 1/9)
• price per trip of cheapest monthly ticket (weight 1/9)
• price per trip of cheapest annual ticket (weight 1/9)

- multiplied by 500 (to approximate a full year's travel) and divided by national GDP per capita</td></tr>
<tr><td>ii) Price discrimination</td><td>Indices were defined for the following aspects of price discrimination:

Price discrimination based on characteristics of the journey

• Variation of fare with time of day/week
• Variation of fare with journey distance
• Variation of fare between public transport modes</td></tr>
</table>

<table>
<tr><td></td><td>Price discrimination based on characteristics of the ticket

• Discounts for journey count tickets (e.g. returns, carnets)
• Discounts for time count tickets (e.g. season tickets)
• Miscellaneous discounts (e.g. for buying tickets off-vehicle)

Price discrimination based on passenger characteristics

• Discounts for students and young adults (over 18)
• Discounts for children (up to 18)
• Discounts for elderly people

These indices gave equal weight to the number of different ticket options and to the maximum discount available. Details of their calculation are in Hodson (2005).</td></tr>
<tr><td>iii) Service level</td><td>Public transport vehicle-km per year divided by city population</td></tr>
<tr><td>iv) Distribution of services in time</td><td>Index (Gini score) of inequality of distribution of vehicle-km across the hours of the week</td></tr>
<tr><td>v) Distribution of services in space</td><td>Public transport route-km divided by city area</td></tr>
</table>

3. HYPOTHESIS AND ASSUMPTIONS

It was assumed that some urban public transport decision-makers are more powerfully influenced by social factors, others by commercial ones. The former, for example, may be more directly subject to political influence in their decision-making; the latter may have less access to subsidy.

It was hypothesised that "commercial" and "social" decisions can be understood as lying at opposite ends of a single scale; that a city that adopts a commercial approach to one aspect of its timetable and fare planning will tend to adopt a commercial approach to all their aspects; and, similarly, that a city that adopts the opposite, social approach to one aspect of its timetable and fare planning will tend to adopt a social approach to all their aspects.

To explore this hypothesis it was necessary to make assumptions about the behaviour to be expected from commercially- and socially- orientated decision-makers. These assumptions were as follows:

i) Fare level

Assumption: High fares are associated with a commercial (profit-maximising) orientation.

Justification: Values higher than (closer to zero than) -1 are consistently reported for the elasticity of demand with respect to price. It is therefore likely that profit-increasing options for price increases are available.

ii) <u>Price discrimination</u>

Assumption 1: High levels of price discrimination based on journey characteristics (distance, mode or time) are associated with a commercial orientation.

Justification: Price discrimination based on journey characteristics is a way of making prices reflect cost differences. Cost-reflective pricing maximises profit.

Assumption 2: High levels of price discrimination based on ticket characteristics (such as discounts for multitrip tickets) are associated with a commercial orientation.

Justification: Price discrimination based on ticket characteristics is a means to segment the market according to willingness to pay. This is profit-maximising behaviour (available to operators with market power).

Assumption 3: High discounts for children and elderly people are associated with a social orientation.

Justification: Discounts for children and elderly people are a form of market segmentation. Up to an optimum level, they increase profits. However, they reduce profits when taken beyond this level. The discounts for children and elderly people observed in urban public transport are higher than those offered by commercially oriented service providers in other sectors (and reach 100% in Flanders and London among other places). They are assumed to be higher than the profit-maximising optimum and to result from the pressure of social rather than commercial forces.

Assumption 4: High discounts for students and young adults are associated with a commercial orientation.

Justification: While children and elderly people tend to be captive users of public transport, students and other young adults do not: they have more choice to drive, cycle or walk. Profit-maximisers with market power set higher prices for captive passengers than for those with a choice (Ramsey-Boiteaux pricing). This implies high discounts for students and young people.

In the light of these assumptions, two compound indices were constructed:

a) *“price discrimination”*, summing scores for journey-based discrimination (3 scores), ticket-based discrimination (3 scores) and discounts for students and young people (1 score);

b) *“social discounts”*, summing scores for discounts for children (1 score) and elderly people (1 score).

iii) <u>Service level</u>

Assumption: High levels of vehicle-km per capita (high service levels) are associated with a social orientation.

Justification: Values of less than 1 are consistently reported for the elasticity of demand with respect to service level. All urban public transport operators benefit from subsidies, implying that average costs are greater than average revenues. In combination, these two factors make it likely that profit-increasing service cuts are possible.

ii) <u>Distribution of services in time</u>

Assumption: A low disparity between peak and off-peak service levels (low Gini score) is associated with a social orientation.

Justification: Demand varies in time. It is usually profit maximising to match supply with demand.

iii) <u>Distribution of services in space</u>

Assumption: A high score for route-km per km^2 denotes the dispersal of services over a large number of routes or corridors, rather than concentration on a few routes. Such dispersal is associated with a social orientation.

Justification: Demand varies in space. It is usually profit maximising to match supply with demand.

4. DATA

There is no comprehensive data source for European urban public transport. Comparative research of the type attempted in this paper can only be done by putting together figures from different sources, referring to different dates and – without doubt – using different (non-explicit) definitions of variables.

Area and population data are particularly problematic because it is often difficult to know whether they relate to the same administrative unit and whether this unit is the same as that covered by data on public transport service provision. Some obvious cases of non-compatible boundaries were set aside, but it is likely that others remain in the data-set.

4.1 Data sources

The following sources were used:

Population

Population data were obtained from United Nations (1998). They were for years between 1990 and 1994. For French cities, United Nations (1998) reports the population of the commune at the centre of each agglomeration. These communes are disproportionately small. The figures were therefore replaced by data for the population served by the public transport operator, from UTP (2004) for Paris and UTP (2005) for other French cities.

Population data were available for all cities.

Area

Area data were obtained from ATM Milano (2004), Citizens' Network Benchmarking Initiative (2002), CRTM (1999), Geohive Global Statistics (2004), HUR (n.d.), Katowice (2004), Lodz (2004), Malmö stad (2003), Urban Audit (2000), UTP (2005) and VOR (2003). They were for dates between 1994 and 2004. Area data were available for 40 cities.

Vehicle-km and route-km

Data on vehicle-km (for buses and trolley buses), car-km (for trams, tram/trains and metro) and route-km were obtained from Jane's Information Group (2005). Equivalent data for French cities, expressed entirely in vehicle-km, were obtained from UTP (2005). These data were for dates between 1995 and 2004.

Vehicle-km are a measure of service frequency. Car-km are a measure of service capacity. It was assumed that under most circumstances, passengers care about frequency rather than capacity. Car-km were therefore converted to vehicle-km. To do this it was assumed that tram sets have 2 cars; tram/train sets have 3; and metro sets have 5.

Vehicle-km data were not available for commuter rail, which was therefore not taken into account. This means that vehicle-km for larger cities will tend to be understated.

GDP per capita

GDP data for 2002 were obtained from Eurostat.

Fares

Data for 2004 were obtained from the websites of public transport operators and authorities.

The timing of public transport services

Data for 2005 or 2006 were obtained from the websites of public transport operators and authorities. For each city and public transport mode, four routes were selected at random. For each route, an "inbound departure count" was made for each hour of the week between 0500-0559 and 2200-2259.

4.2 Calculation of indicators

In accordance with the operational definitions in table 2.1, data obtained from the sources listed in section 4.1 were used to calculate the fare and timetable indicators described below:

Fare level (defined as price of fare basket/GDP per capita)

This index could be calculated for all the 63 cities. Scores ranged from 1.6% (Prague) to 5.3% (London metro), with a mean of 2.8%. They were rescaled to run from 0 (low commercial orientation) to 1 (high commercial orientation).

Price discrimination (composite of indices of journey-based discrimination, ticket-based discrimination and discounts for students and young adults)

Price discrimination scores could be calculated for 54 cities. They ranged from 0.25 (Naples) to 1.00 (Gelsenkirchen), with a mean of 0.58. They were rescaled to run from 0 (low commercial orientation) to 1 (high commercial orientation).

Service level (defined as vehicle-km/population)

Data availability permitted this index to be calculated for 50 cities. Scores ranged from 21 vehicle-km/person/year (Duisburg and Seville) to 80 (Prague), with a mean of 41. They were rescaled to run from 0 (low social orientation) to 1 (high social orientation).

Distribution of services in time (defined as Gini score)

The "inbound departure counts" were weighted by an estimate of the average end-to-end trip time for each route and summed to give a distribution of estimated inbound vehicle-km for each mode across the hours of the week. A Gini score was calculated from this distribution as an indicator of the degree of inequality of service provision in time. A Gini score of 0 would indicate that each hour had the same volume of departures; a score of 1 would indicate that all the departures took place in a single hour. The lowest score was 0.10 for buses in Augsburg; the highest was 0.38 for buses in Rennes. These two distributions are illustrated in charts 4.1 and 4.2.

Chart 4.1: estimated distribution of bus-km across the hours of the week (Augsburg) (busiest hour = 1.00)

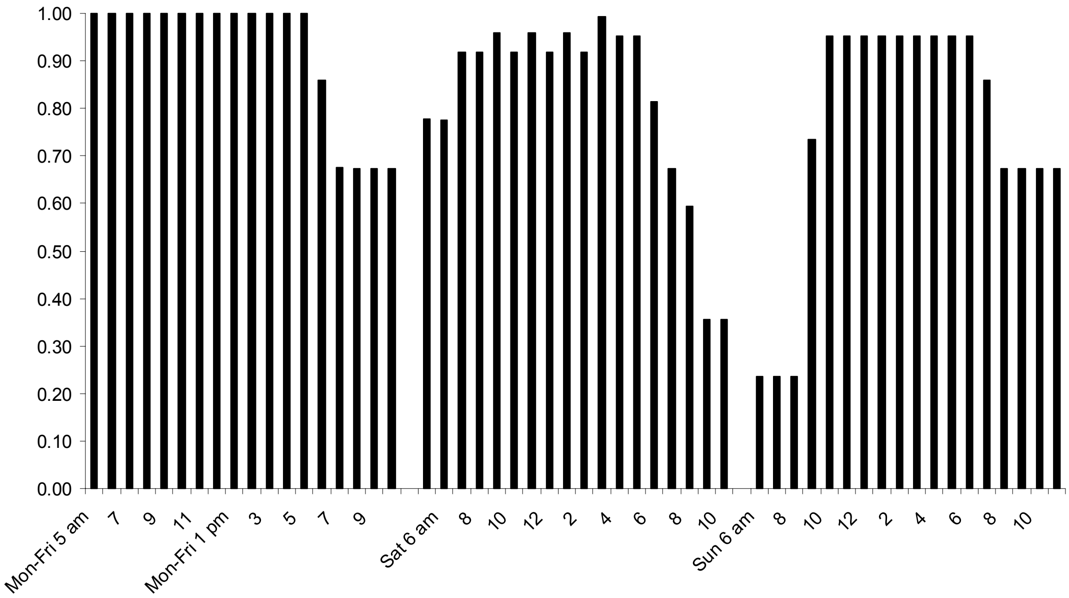
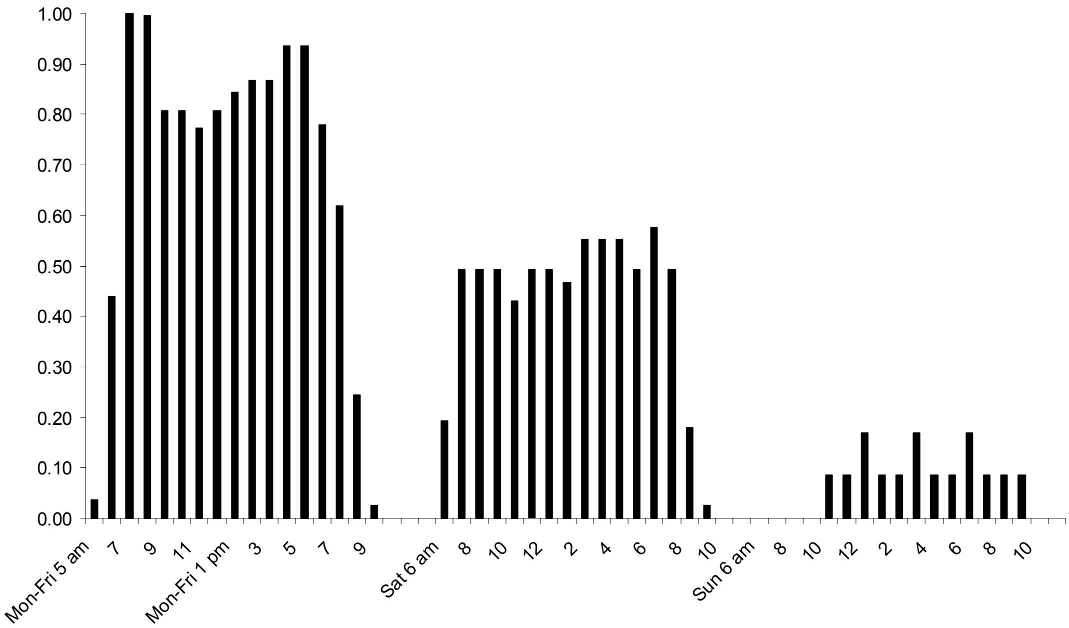


Chart 4.2: estimated distribution of bus-km across the hours of the week (Rennes)



These modal figures were weighted by vehicle-km to give a single Gini score for each city. Weighted indices of the distribution of services in time could be calculated for 33 cities. Scores ranged from 0.11 (Berlin) to 0.37 (Rennes), with a mean of 0.23. They were reversed (so that Berlin had a high score and Rennes a low one) and rescaled to run from 0 (low social orientation) to 1 (high social orientation).

Distribution of services in space (defined as route-km/area)

This index could be calculated for 31 cities. Scores ranged from 0.8 route-km/km^2 (Clermont-Ferrand) to 5.6 (Prague), with a mean of 2.2. They were rescaled to run from 0 (low social orientation) to 1 (high social orientation).

Social discounts (composite of indices of discounts for children and elderly people)

Social discount scores could be calculated for 57 cities. They ranged from 0.21 (Genoa) to 1.00 (Lodz), with a mean of 0.53.

Cities' scores on the six timetable and fare indices are shown in table 4.1.

Table 4.1

		COMMERCIAL PRICING		SOCIAL MEASURES			
city	**country**	**fare level**	**price discrim.**	**service level**	**dist. in time**	**dist. in space**	**social discounts**
Graz	AT	0.18	0.08	0.72	0.64	?	0.37
Linz	AT	0.25	0.23	0.15	0.65	?	0.58
Vienna	AT	0.24	0.51	0.35	0.70	0.21	0.62
Brno	CZ	0.12	0.36	?	0.71	0.41	0.59
Ostrava	CZ	0.11	0.54	0.89	0.67	?	0.66
Prague	CZ	0.00	0.12	1.00	0.44	1.00	0.82
Augsburg	DE	0.35	0.41	0.13	0.94	?	0.50
Berlin	DE	0.54	0.59	0.32	1.00	0.36	?
Bielefeld	DE	0.37	?	0.04	0.64	?	0.21
Bochum	DE	0.53	0.98	0.21	0.70	?	0.31
Bonn	DE	0.70	0.68	0.58	0.37	?	0.44
Braunschweig	DE	0.32	0.31	?	0.11	?	0.33
Bremen	DE	0.37	0.63	0.25	0.67	0.22	0.24
Chemnitz	DE	0.24	0.57	0.20	0.43	?	0.29
Dortmund	DE	0.37	0.85	0.14	0.52	?	0.23
Dresden	DE	0.48	?	0.36	0.60	0.20	?
Duisburg	DE	0.53	0.98	0.00	0.49	?	0.31
Düsseldorf	DE	0.53	0.98	0.77	0.46	?	0.31
Essen	DE	0.37	0.97	0.17	0.68	0.39	0.23
Gelsenkirchen	DE	0.69	1.00	0.21	0.67	?	0.36
Halle	DE	0.19	0.66	0.36	0.65	?	0.32
Hamburg	DE	0.33	0.71	0.24	0.61	?	0.45
Hannover	DE	0.45	0.54	0.45	0.84	?	0.41
Karlsruhe	DE	0.36	0.36	0.35	0.56	?	0.40
Copenhagen	DK	0.23	0.33	?	?	?	0.50
Madrid	ES	0.15	0.05	0.38	?	0.40	0.28
Murcia	ES	0.11	0.25	?	0.06	?	0.33
Sevilla	ES	0.03	0.21	0.00	?	0.42	0.32
Angers	FR	0.06	0.46	0.21	?	0.04	0.11
Bordeaux	FR	0.11	0.26	0.24	?	0.23	0.15
Clermont-F	FR	0.11	0.15	0.10	0.39	0.00	0.14
Grenoble	FR	0.07	0.35	0.33	0.13	0.20	0.61
Lille	FR	0.13	0.22	0.10	?	0.24	0.54
Lyon	FR	0.21	0.22	0.31	?	0.25	0.34
Marseille	FR	0.23	0.33	0.11	?	0.21	0.34
Montpellier	FR	0.09	0.40	0.18	?	0.20	0.09
Nantes	FR	0.12	0.25	0.28	?	0.13	0.67
Nice	FR	0.16	0.28	0.07	?	0.62	0.64
Orléans	FR	0.08	0.38	0.35	?	0.07	0.35
Paris	FR	0.19	?	?	?	?	0.31
Rennes	FR	0.16	0.32	0.33	0.00	0.04	0.38
Rouen	FR	0.11	0.28	0.20	?	0.17	0.48
Toulouse	FR	0.13	0.24	0.09	?	0.04	0.32
Genoa	IT	0.12	0.28	0.42	?	0.52	0.00
Milan	IT	0.09	0.24	0.66	?	?	0.27
Naples	IT	0.12	0.00	0.19	?	?	?
Palermo	IT	0.14	0.53	?	?	0.27	0.46
Rome	IT	0.12	0.22	?	?	0.25	0.17

Torino	IT	0.06	0.33	0.44	?	?	0.39
Utrecht	NL	0.74	0.53	0.38	0.66	?	0.45
Katowice	PL	0.75	?	?	?	?	0.80
Krakow	PL	0.71	0.57	?	?	0.82	0.45
Lodz	PL	0.65	0.38	0.52	?	0.41	1.00
Warsaw	PL	0.68	0.67	0.89	?	0.20	0.78
Wroclaw	PL	0.57	0.81	?	?	0.30	0.80
Gothenburg	SV	0.38	0.62	0.53	0.92	?	0.15
Malmö	SV	0.23	0.03	0.27	0.72	?	0.25
Stockholm	SV	0.56	?	?	?	?	0.76
Belfast	UK	0.26	?	0.29	?	?	?
Bristol	UK	0.53	0.56	?	0.32	?	0.42
Cardiff	UK	0.44	?	0.39	0.25	?	?
Leeds	UK	0.30	?	?	?	?	0.34
London (metro)	UK	1.00	?	0.65	?	?	?

5. EXPLORATORY ANALYSIS

As stated in section 3, it was hypothesised that the “commercial character” or “social character” of fare and timetable decisions in public transport can be understood as opposite ends of a single scale; and that cities tend to adopt the same position on this scale for all their fare and timetable decisions.

This hypothesis implies:

- a positive correlation between the two indicators of commercial pricing (high fares being associated with high levels of price discrimination);

- a positive correlation between the four indicators of social orientation (high service levels, distribution of services in time, distribution of services in space and high social discounts all being associated with each other);

- a negative correlation between the indicators of commercial pricing and the indicators of social orientation (commercial pricing being associated with a low incidence of these social measures and vice versa).

This section explores whether these implications appeared to hold true in this data-set. The correlations were investigated using XY plots and correlation coefficients *(R* scores).

5.1 Relationships between the two indicators of commercial pricing

The relationship between the two indicators of commercial pricing – fare level and price discrimination - is shown in chart 5.1.

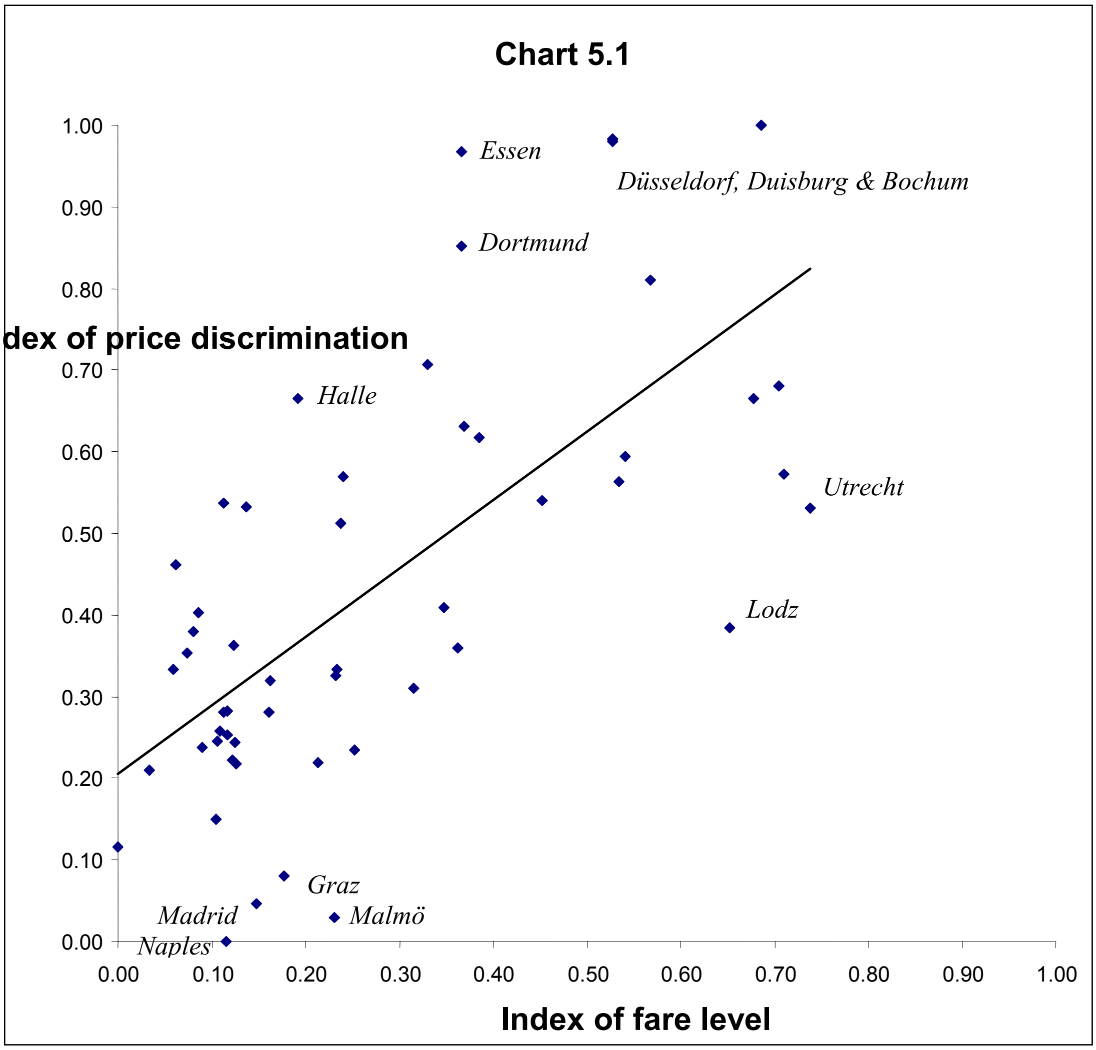


Chart 5.1
Index of price discrimination
Index of fare level
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00
Essen
Düsseldorf, Duisburg & Bochum
Dortmund
Halle
Utrecht
Lodz
Graz
Madrid
Malmö
Naples

As hypothesised, the relationship between the two indicators is positive (*R* = 0.67, *F* score 42.56, significant well above the 5% level). Thus, cities with high fares tend to have a high level of price discrimination; cities with low fares tend to have a low level of price discrimination. Most of the exceptions are found among cities with extreme scores, suggesting the possibility of finding a better functional form at the confirmatory stage of analysis. The cities whose scores differ most from that predicted include five (Bochum, Dortmund, Duisburg, Düsseldorf and Essen) from a single German fare scheme, the Verkehrsverbund Rhein-Ruhr (VRR). They have lower fare levels than their sophisticated system of price discrimination would imply. Otherwise, there is no clear national pattern to the cities with high deviations from the predicted score.

5.2 Relationships between the four indicators of social orientation

The social measures under investigation in this sub-section are high overall service levels, frequent off-peak services, dispersed route patterns and low fares for children and elderly people

Table 5.1 shows the *R* and *F* scores for the XY comparisons of cities' scores on these indicators.

Table 5.1 **Pair of variables**	**Correlation (*R* score)**	***F* score**
service level & distribution of services in time	-0.07	0.12
service level & distribution of services in space	0.46	6.30*
service level & social discounts	0.38	7.14*
distribution of services in time & in space	0.25	0.61
distribution of services in time & social discounts	-0.04	0.04
distribution of services in space & social discounts	0.31	2.93

** Significant at the 5% level*

Most of the correlations between these variables are positive, as expected. But they are not strong. It is true that two of the correlations in table 5.1 are apparently significant at the 5% level. But, as the XY plots in charts 5.2 and 5.3 make clear, these results are strongly influenced by extreme values from two Polish cities (Warsaw and Lodz) and two cities from the Czech Republic (Prague and Ostrava). Without them, the relationships would lose significance or even change sign.

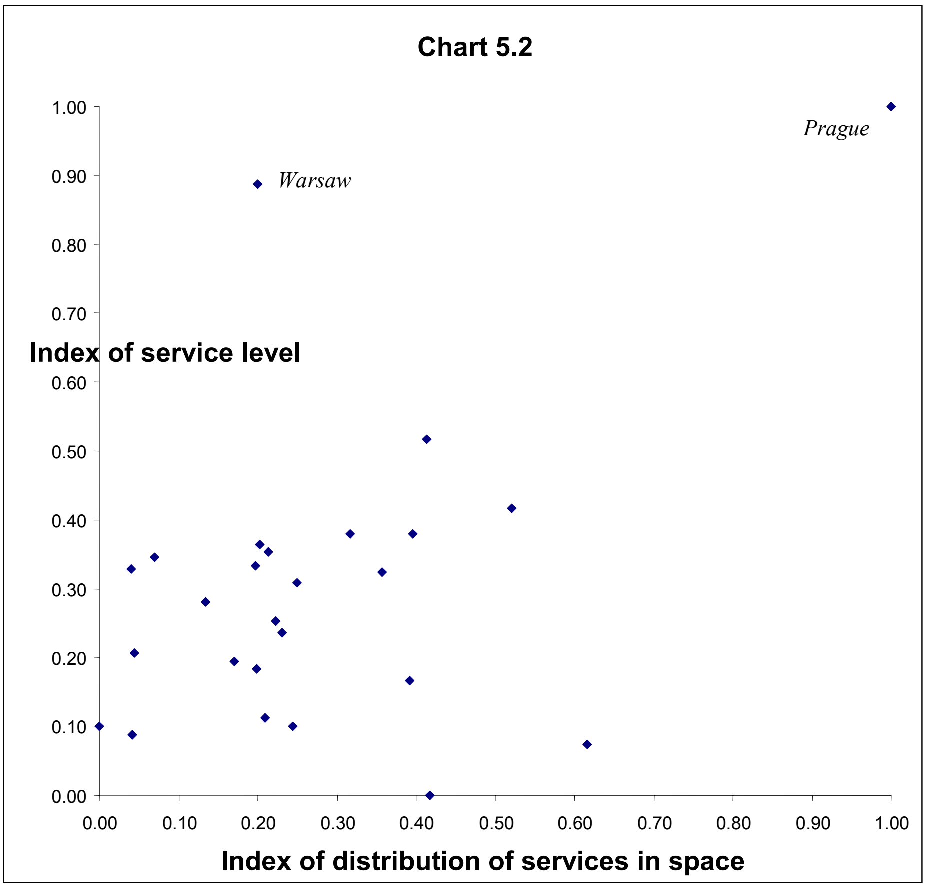


Chart 5.2
Prague
Warsaw
Index of service level
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00
Index of distribution of services in space

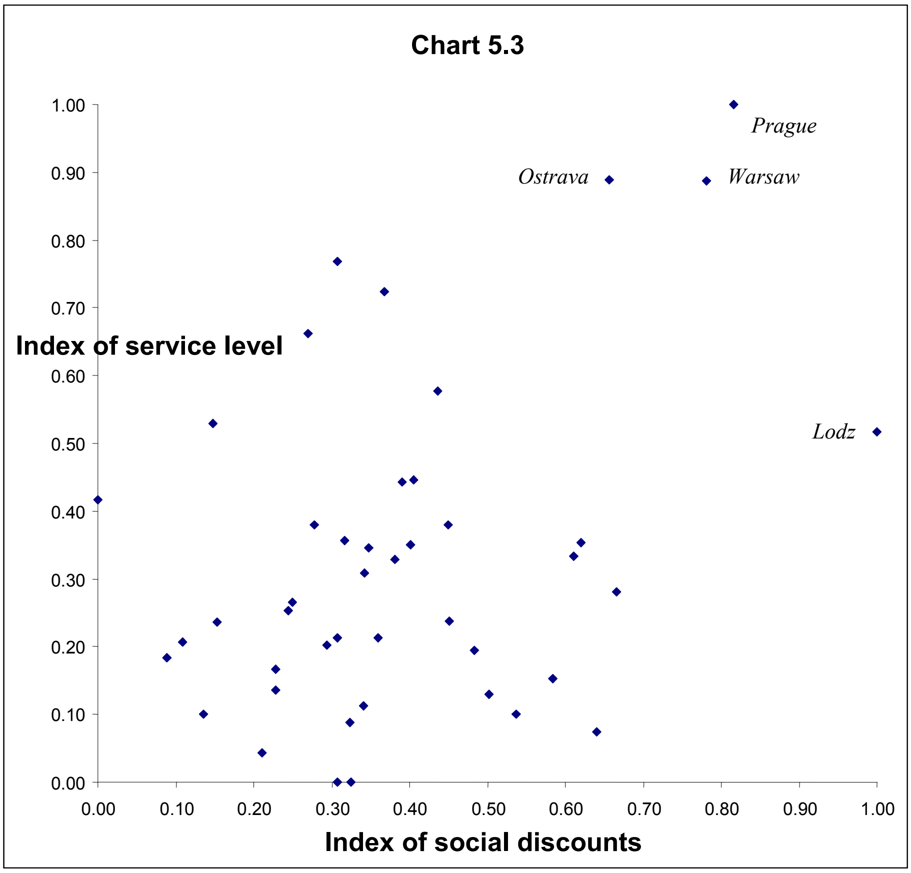
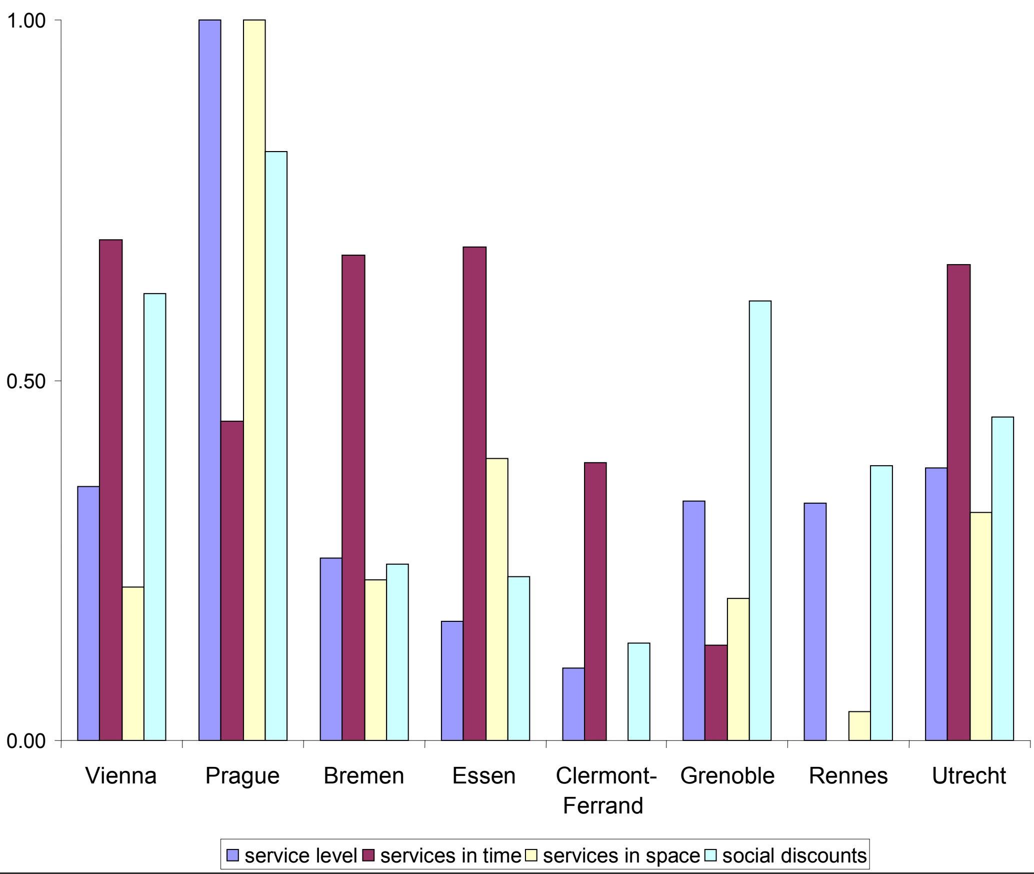


Chart 5.3
Prague
Ostrava
Warsaw
Lodz
Index of service level
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00
Index of social discounts

The data do not therefore seem to support the hypothesis that cities promoting one social measure in public transport tend to promote them all. Instead, it seems more common for cities to make trade-offs, choosing to give priority to one or two social measures while leaving others aside. This is illustrated by chart 5.4 for the 8 cities for which scores on all four indicators of social orientation were available. Most of the cities have one column that is noticeably higher than the rest. Rennes and Vienna have two; Prague, as in charts 5.2 and 5.3, is the most prominent exception with three.

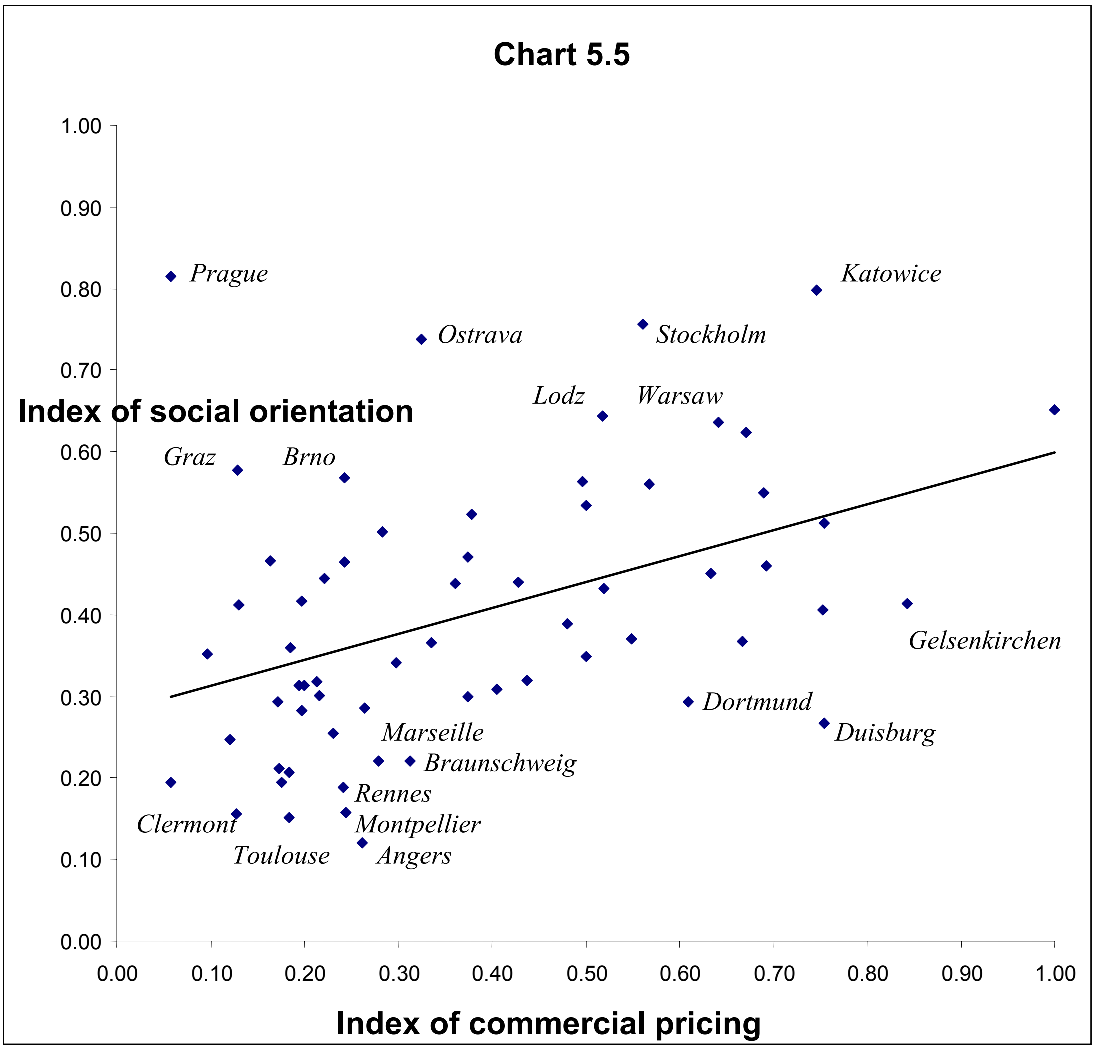
Chart 5.4 - Individual cities' scores on different social measures



5.3 Relationships between commercial pricing and the use of social measures

To explore the relationship between commercial pricing and social orientation, a single index was constructed for each. These indices aggregated cities' scores on the different fare and timetable dimensions. To overcome the problem of numerous missing observations, they were defined as the average of the observations that were available for the city in question, with a maximum of two components for the commercial pricing index (fare level and price discrimination) and four for the index of social orientation (service level, distribution in time, distribution in space and social discounts).

As chart 5.5 shows, cities' scores on the two indices are related (R = 0.43, F score 13.57, significant well above the 5% level) - although a great deal of variation remains unexplained.



This relationship is positive. According to the hypothesis in section 3, it should have been negative. Cities with a commercial approach to pricing were not expected to adopt a social approach to service provision and social discounts. However, this seems to be just what they tend to do.

An examination of the cities whose scores were furthest away from the fitted line suggests some clear national (or regional) patterns:

All three of the Czech Republic cities in the data-set (Prague, Ostrava and Brno) linked high levels of social orientation with non-commercial pricing. Three of the six German VRR cities (Dortmund, Gelsenkirchen and Duisburg) linked commercial pricing with low levels of social orientation. If these cities had been typical of the whole sample, the hypothesis that cities are either consistently commercial or consistently social in their orientation would have been confirmed.

Three of the five Polish cities in the data-set (Lodz, Warsaw and Katowice) displayed highly commercial pricing, but an even higher level of social orientation. Six of the fifteen French cities (Marseille, Rennes, Montpellier, Angers, Toulouse and Clermont-Ferrand) displayed non-commercial pricing, linked to an even lower level of social orientation than would have been expected. If these cities had been typical of the whole sample, the positive relationship between social orientation and commercial pricing would have been even more marked.

5.4 Effects of population, area and population density on the timetable and fare indicators

It seemed likely that the fare and timetable choices that are the subject of this paper vary with cities' population, area and population density. A check was therefore made of correlations between these variables (with population expressed both in absolute values and logged), the six fare and timetable variables, and the two compound indices (commercial pricing and social orientation). However, none of the correlation coefficients was significant at the 5% level. [3]

5.5 Country effects

Chart 5.6 shows that scores for commercial pricing and social orientation vary between countries. French, Italian and Spanish cities seem to have lower levels of both social orientation and commercial pricing. Austrian, Swedish and (especially) Polish cities seem to have higher levels of both. Cities from the Czech Republic stand out in combining high levels of social orientation and low levels of commercial pricing; those from the UK and Germany display the opposite characteristics, though to a lesser extent.

Chart 5.7 shows, however, that there is also a good deal of variation within countries.

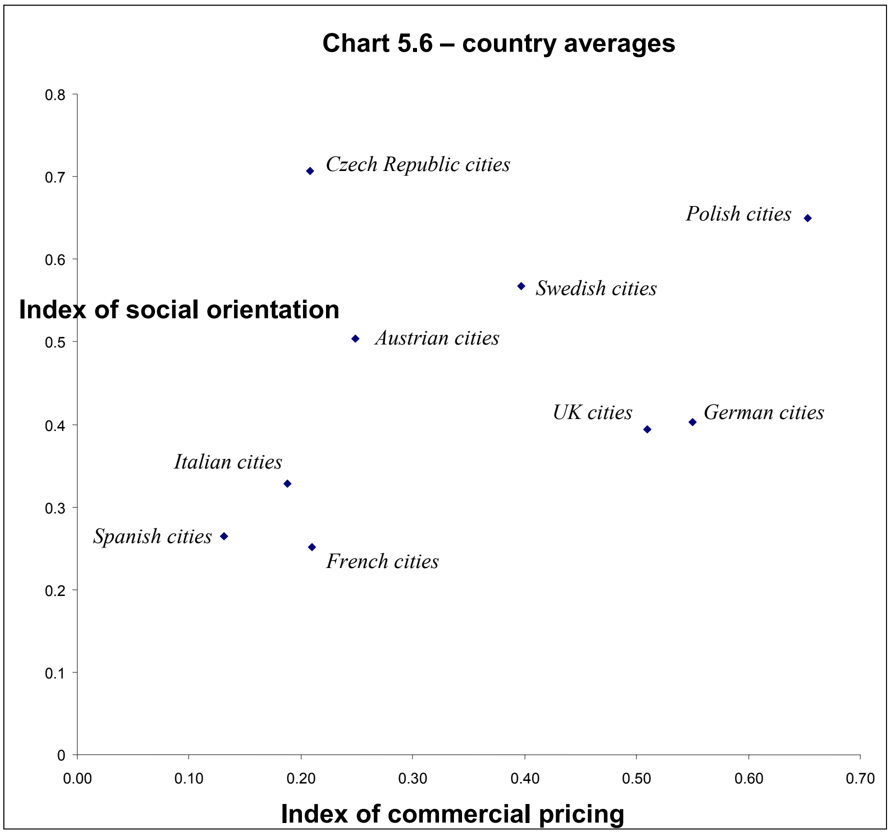


Chart 5.6 – country averages
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
Index of social orientation
Index of commercial pricing
Czech Republic cities
Polish cities
Swedish cities
Austrian cities
UK cities
German cities
Italian cities
Spanish cities
French cities

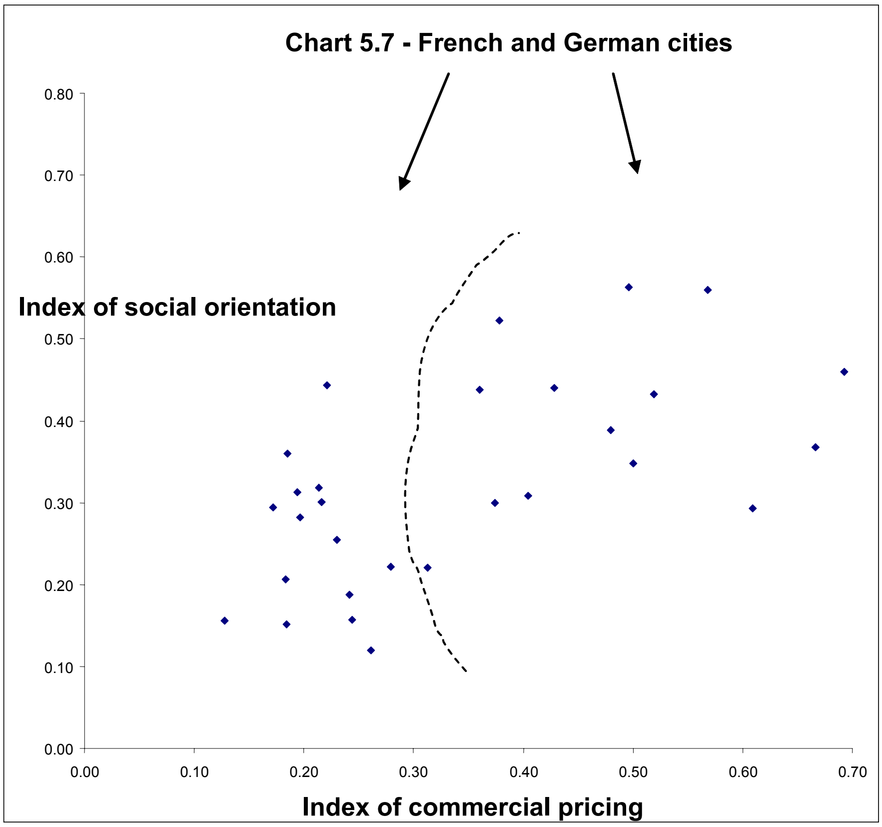


Chart 5.7 - French and German cities
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
Index of social orientation
Index of commercial pricing

Given the imperfections of the data-set and the fact that France and Germany are the only countries represented by more than 5 cities, no attempt was made at this stage to disentangle the separate impacts of national affiliation and city-level decision-making.

6. SUMMARY AND CONCLUSIONS

The concepts of “social” and “commercial” objectives, and the possible tension between them, play an important part in debate on public transport policy. The purpose of this paper has been to explore the relationship between these concepts in decisions on fares and timetables.

The paper’s first task was to propose quantitative measures. Two indicators of commercial pricing were defined – fare level and price discrimination. Four indicators of social orientation were defined – high service levels; distribution of services in time (high levels of off-peak service); distribution of services in space (provision of services on many routes); and social fare discounts for children and elderly people.

It was hypothesised that these two dimensions of behaviour (commercial pricing and social orientation) can be merged into a single scale, with high scores for commercial pricing lying at the opposite pole to high scores for social orientation. It was also hypothesised that cities make consistent choices across all these aspects of fare and timetable policy, opting either for the commercial or for the social end of the scale.

Exploratory analysis of data from 63 European cities did not fully bear out these hypotheses.

As expected, scores on the two indicators of commercial pricing were mutually correlated. Against expectation, however, there was no secure evidence of mutual correlation among scores on the four indicators of social orientation. Finally, when these individual indicators were combined into two compound indices (of commercial pricing and social orientation), a clear correlation could be seen between cities’ scores. Against expectation, this correlation was positive – meaning that commercially orientated pricing tends to be associated with a social orientation in service planning and social discounts.

In the light of this analysis, three tentative conclusions can be drawn about cities’ behaviour in setting fares and timetables for urban public transport.

First, it seems to make most sense to summarise cities’ fare and timetable choices not by a single scale but by two – one reflecting commercial orientation in price-setting for adults, the other reflecting social orientation in price-setting for children and elderly people and in service planning.

Second, cities display a good deal of variation in the social measures to which they choose to give priority: most focus their efforts on one or two of the four types of social measure defined in this paper. More work is needed to explore the reasons that may lie behind these choices.

Third, whatever their socially orientated decisions may be, most cities seem to adopt a similar approach to financing them. Thus, the further they go in adopting socially oriented policies, the higher their fares tend to be and the more aggressive their price discrimination.

There are country-based nuances in these patterns. For example, cities from the Czech Republic tended to place a strong emphasis on social measures while keeping low fares and low levels of price discrimination. German cities adopted higher levels of price discrimination than would be expected given their scores for social orientation. However, there was also a good deal of variation within countries. Confirming the effects suggested in this exploratory work, and disentangling the relative importance of national and local factors, will need better data and more rigorous analytical tools.

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Notes

[1] *Austria*: Graz, Linz, Vienna; *Czech Republic*: Brno, Ostrava, Prague; *Denmark:* Copenhagen; *France:* Angers, Bordeaux, Clermont-Ferrand, Grenoble, Lille, Lyon, Marseille, Montpellier, Nantes, Nice, Orléans, Paris, Rennes, Rouen, Toulouse; *Germany*: Augsburg, Berlin, Bielefeld, Bochum (member of Verkehrsverbund Rhein-Ruhr, VRR), Bonn, Braunschweig, Bremen, Chemnitz, Dortmund (VRR), Dresden, Duisburg (VRR), Düsseldorf (VRR), Essen (VRR), Gelsenkirchen (VRR and site of England's elimination from the 2006 football World Cup), Halle, Hamburg, Hannover, Karlsruhe; *Italy*: Genoa, Milan, Naples, Palermo, Rome, Turin; *Netherlands*: Utrecht; *Poland*: Katowice, Krakow, Lodz, Warsaw, Wroclaw; *Spain*: Madrid, Murcia, Seville; *Sweden*: Gothenburg, Malmö, Stockholm; *UK*: Belfast, Bristol, Cardiff, Leeds, London.

[2] Prices per trip for weekly, monthly and annual tickets were calculated on the assumption of 10 trips per week.

[3] This is not strictly true. There was a statistically significant positive correlation between population density (defined as population divided by area) and the distribution of services in space (defined as route-km divided by area). However, this correlation was an artefact of the use of "area" as a divider in the construction of both quantities.