

# Use of Urban Public Transportation for Multiperson Trips and the Market Chances of a Family Tariff

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This paper uses the Stuttgart Integrated Transportation System (VVS) as an example to show the use made of urban public transportation for multiperson trips and the market chances for family passes. In the first part of the paper, the number and structure of multiperson trips are depicted. Three user groups can be differentiated: (a) households that make most of their family trips with public transportation, (b) households that usually make family trips with individual modes of transportation, and (c) households that make no family trips. A situational model based on individual behavior is used to analyze these groups and to study the degree to which public relations work aimed at familiarizing the public with the family passes and the structure of the special family offer would generate ridership. This is followed by a discussion of a family tariff structure adapted to the needs of the users. Finally, the tariff offer that was actualized after the survey referred to in this paper was completed is discussed.

The use made of urban public transportation for group trips is a topic that, for the most part, has been neglected in transportation research. However, precisely for family trips, there is a reciprocal cost relation. Although the question of cost is usually an argument against using cars and for the use of public transportation, this is not so for family trips. Although the cost of using a car to transport only the driver is the same as the cost of transporting a whole family, the price of public transportation is the sum of the prices of each individual ticket. Thus, it seems that a special tariff for families would increase the attractiveness of public transportation for family trips.

This question was studied by using the Stuttgart Integrated Transportation System (VVS) as an example (1). When the VVS's citywide transportation network was introduced in Stuttgart on October 1, 1978, the discounts that had previously been offered by some of the individual transportation lines were discontinued; this resulted in negative public reactions. After the VVS had instituted two temporary special rates for families (Children-Travel-Free-Days and Family-Reduced-Rate-Cards), it planned to adapt a permanent family tariff. The market potential of this family tariff was to be studied in a survey.

The following data were needed to study this topic:

1. Number of family trips;
2. Possibility of using urban public transportation for these family trips; and
3. Willingness to use the family tariff.

In order to collect the necessary data, a three-step empirical approach was called for (2):

1. Selection of households that were a part of the study's target group--i.e., households with children;
2. Behavioral survey on number and type of family trips made in these households; and
3. Analysis of the transportation mode used in light of situational components influencing choice of mode, determining whether the households had the option of using public transportation for multiperson trips, and identifying potential users in an in-depth survey.

In the behavioral survey, 1052 households with children located in the area served by the VVS were questioned about the number of family trips made in a one-week period. When this had been done, a secondary sample of 200 representative households was selected for face-to-face intensive interviews. In these interviews, interactive measurement methods were used (3).

## NUMBER OF FAMILY TRIPS

The survey unit of the behavioral survey was multiperson trips--i.e., trips that at least two members of a household made together. The unit of analysis, on the other hand, was family trips--i.e., trips made by at least one adult (over 18 years of age) and one child (between 6 and 18 years of age) living within one household in the area served by the VVS.

## RESULTS

Almost one-quarter of the households with children made family trips on weekdays. On Saturdays, this figure increased to 35 percent and, on Sundays, jumped to 48 percent. More than 70 percent of these trips were made by car; about 20 percent were walking trips or bicycle trips; urban public transportation was used for only about 6 percent of the trips. Most family trips (including all modes) were made for recreational purposes.

In almost one-half of the family trips, the size of the group was two persons. However, differences in average group size could be noted for different modes of transportation. Family trips made with urban public transportation had the smallest average group size of any of the modes. The average time traveled with the different modes varied. This was probably caused by the fact that different modes were used for different purposes. However, toward the end of the week, the average travel time increased for all modes.

## SITUATIONAL ANALYSIS OF USER GROUPS

The goal of the survey was to determine if and how a family-oriented tariff offer would affect demand for public transportation. Changes in demand were interpreted to be the sum of individual households' reactions to changed framework conditions. The cumulative changes in the behavior of the individual households result in an altered transportation flow. Travel behavior is still understood to be the result of individual decisions made in situations that can generally be clearly defined. The individual situation explains the travel behavior realized under the given conditions and is the basis for forecasting future behavior in changed conditions.

The research concept in this study used the so-called situational approach (4), which had already been successfully used in a number of similar research projects (5). This approach assumes that the individual situation is a construct of several mutually dependent dimensions; in their entirety, these dimensions define situational

groups. In order to identify those households that had the option of using the public transportation system's family tariff, this study considered the following factors:

1. Objective option of using urban public transportation,
2. Constraints forcing persons to use other modes,
3. Information about the urban public transportation alternative,
4. Subjective option of using the urban public transportation alternative,
5. Evaluation of price of traveling with urban public transportation,
6. Perception of cost of using the chosen mode and using urban public transportation, and
7. Extent to which the current urban public transportation system's fare was known.

Analysis of these factors makes it possible to explain the behavior noted on the day of random sampling. However, these specific data cannot be used to explain general travel behavior. To collect data on general travel behavior, one must use the so-called sensitization method (6), which filters out temporary constraints applicable only on the day of random sampling. In the following, only general options were considered, since it is these options that are of primary importance in determining potential.

Our analysis differentiated between three user groups: (a) households that usually used urban public transportation to make their family trips, (b) households that generally made their family trips with individual modes of transportation, and (c) households in which no family trips were made.

#### Family-Reduced-Rate-Cards

While this study was being done, the VVS offered a special tariff for families. Due to the results of this study, these family passes, which offered discounts to children traveling in the company of adults, were to be improved and offered as a permanent feature of the VVS.

The following conditions applied to use of the family passes:

1. Age limit for children--the upper age limit for children in the company of adults was 12 years;
2. Number of children--when the family passes were used, no more than two children could travel for free;
3. Temporal restrictions--the special fare did not apply on weekday mornings between 6:00 and 8:30;
4. Adult fare--the accompanying adult had to pay the full fare;
5. Validity period--the cards were valid for one month; and
6. Price--the price for the ticket was 4 German marks.

#### Households Using Urban Public Transportation

The survey analyzed whether or not those households that regularly used public transportation to make their family trips had the option of using the special rates available at the time of the survey. The great majority of the households did not make use of the special offer; most of the households did not know that the Family-Reduced-Rate-Ticket existed (Figure 1).

Those households actually using the special offer represented the direct potential demand for the family tariff, while the large group of public transportation users who did not know that reduced

fares for families existed were a potential that could be comparatively easily mobilized.

#### Households Using Individual Modes of Transportation

Whether or not families that usually use individual modes of transportation for family trips have the option of using public transportation to make their trips is frequently influenced by external factors. More than 80 percent of these households do not have the objective option of using public transportation to make their family trips. If one takes various constraints into account, then 85 percent of the households do not have the alternative of using other modes of transportation due to external factors (Figure 2).

The percentage of households that do not use the urban public transportation system for reasons not cost-related increases to 96 percent if one takes subjective options and degree to which informed into consideration. Thus, only a fraction of a percentage (0.6 percent) of households using individual transportation had the subjective option of using the special family tariffs that were being offered.

#### Households with No Family Trips

The third target group was households that make no family trips. For this group, it was necessary to determine if the households were willing and able to so reorganize their individual activity patterns that family trips could be made. The great majority of the households (87.5 percent), however, was not in a position to do so. Of those households that were able to reorganize their activities in such a fashion, one-half of the households was not informed about the special family rates that were available (Figure 3).

#### Households with Potential for Use of Special Tariff

An analysis of the three different user groups shows the number of households that could potentially use the family tariff. Initially, 70 percent of the households did not have the objective option of using public transportation, while an additional 10 percent stated reasons other than cost in choosing the modes of transportation they used. One of the important reasons why options were limited was that the households were unaware of the public transportation options open to them.

Only 2 percent of the households thought that their options were limited due to price. Of the remaining households, an additional 11 percent could not be considered to be a potential for the special tariff because they did not know that it existed. Thus, only 7 percent of all households had the subjective option of using the Family-Reduced-Rate-Cards (Figure 4).

In fact, fewer households used the special tariff than were represented by the potential. The actual potential attained was only 1 percent of the households. As the survey results show, these households were willing to regularly use the special tariff in the future.

#### HOUSEHOLD SITUATION AND SUBJECTIVE WILLINGNESS TO USE SPECIAL OFFER

Not only the specific situation that determines whether or not households have the option of using public transportation for family trips is important, but also the subjective willingness of the households to use this family tariff.

Therefore, it is important to differentiate

Figure 1. Depiction of the observed use of family cards for family trips.

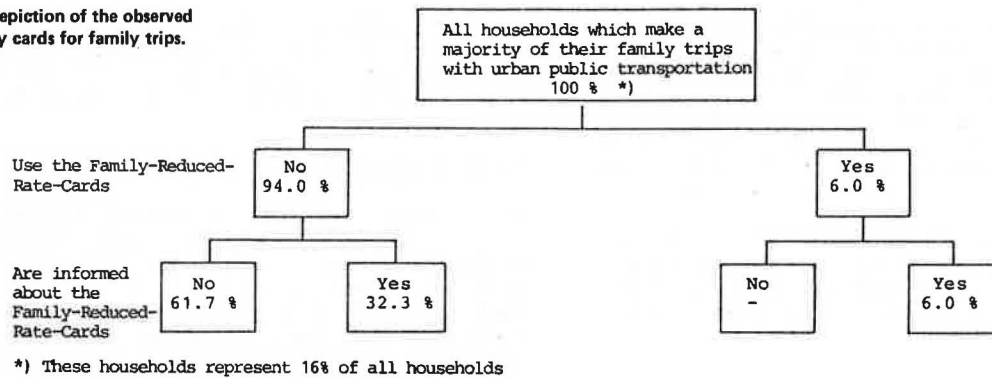
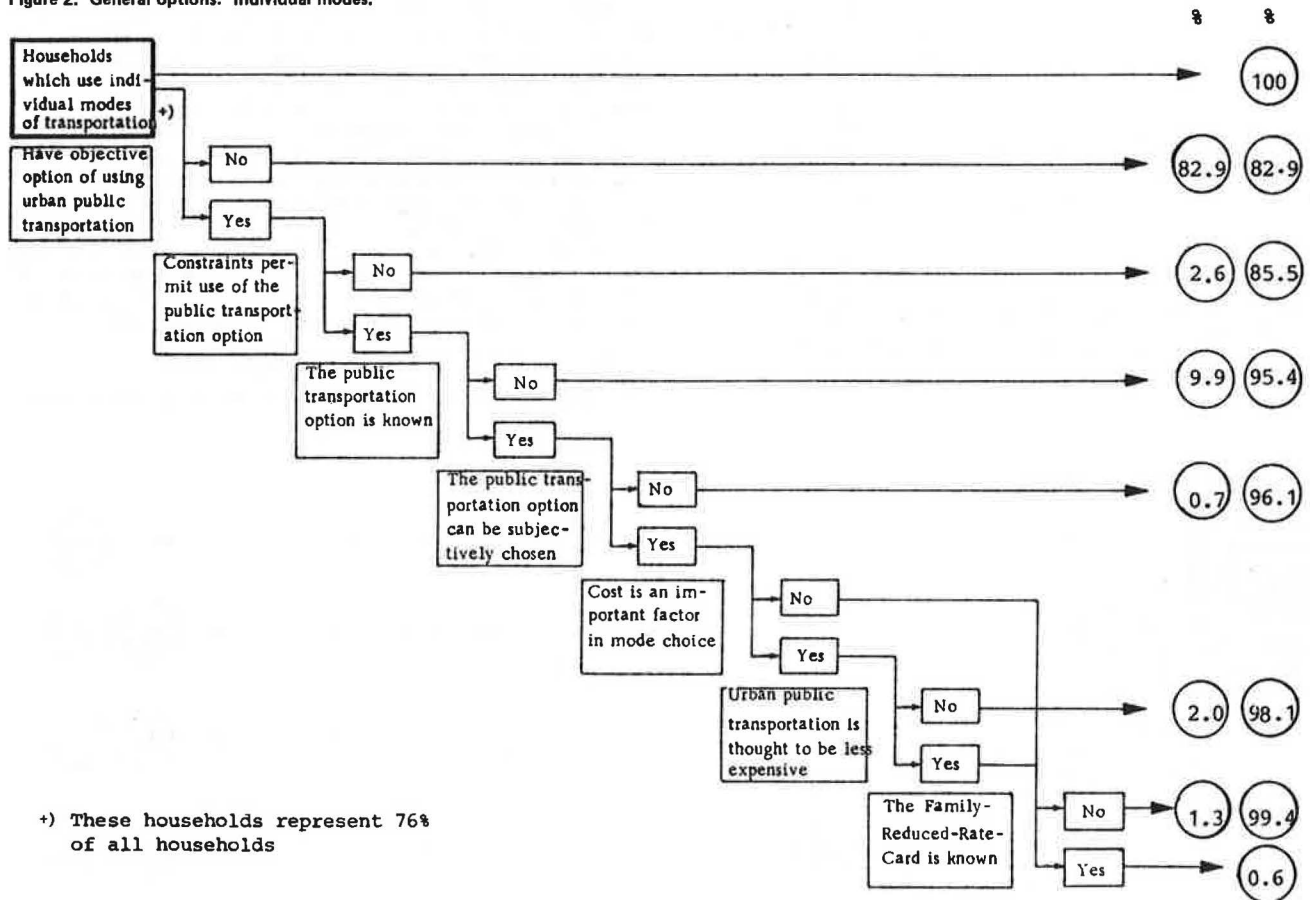


Figure 2. General options: individual modes.



between two groups: (a) persons willing to use the special offer regularly and (b) persons willing to use the special offer occasionally. Methods of increasing the number of users include improving information needs so that persons know enough about the special offer and improving the offer itself.

When one speaks of improving information needs, this means that all households that have the option of using the special offer be informed about the current family passes. When one refers to "improving the offer itself," this means that all those households that did not use the family tariff because they did not (subjectively) think that it suited their needs can be won as potential users.

Situational Group Model Versus Demoscopic Results

A model structure, such as that upon which this study is based, is different from a number of other attempts to forecast future behavior in changed framework conditions (7). Demoscopic approaches are frequently used to study similar topics. However, when these demoscopic approaches are used, persons are only questioned about whether they might be willing to change their behavior (8). The large variety of factors that influence actual behavior is ignored. In order to show the results attained by such demoscopic approaches, one can analyze the portions of our survey that deal with the household's willingness to use the special offer in

isolation--i.e., with no situational context.

If the offer were improved, 43 percent of all households with children in the tariff area would use the Family-Reduced-Rate-Cards. It is obvious that this does not correlate with actual behavior or with possible changes in behavior. It merely reflects the households' opinions of their own behavior, and this has nothing to do with their actual behavior (9).

Verbal opinions or the judgments of the persons involved cannot be used to determine if improving the special offer will generate increased demand for the offer. This can only be done by analyzing the

individual situations that define the options a person has to behave differently. Individual situations are frequently of such a nature that persons do not (cannot) transform their intentions into actions.

Potential Achieved Without Improving Offer

The potential that can be reached without making further improvements in the offer includes the households already making use of the special offer--i.e., the potential of 1 percent of the households with children, which has already been attained. The upper limit of the status quo condition is reached when those persons who have the option of occasionally using the offer are added to this figure. This upper limit of 2.5 percent shows the percentage of households that can be reached with the existing supply (Figure 5).

When public relations work is done to make the Family-Reduced-Rate-Cards more widely known, a further potential is exploited. The lower limit can be represented by the number of current users plus those persons who are not informed but are willing to use the offer regularly. The upper limit is represented by those persons who are not informed but willing to use the special offer occasionally. This results in a spectrum of 1.5-6.0 percent of the households with children.

These figures show how many persons might use the Family-Reduced-Rate-Cards available at the time of the survey. However, a precondition for this is that the public is informed about the special tariff.

Determination of an Offer Suited to Needs

In order to plan family tariffs so that they cover

Figure 3. General options: households with no family trips.

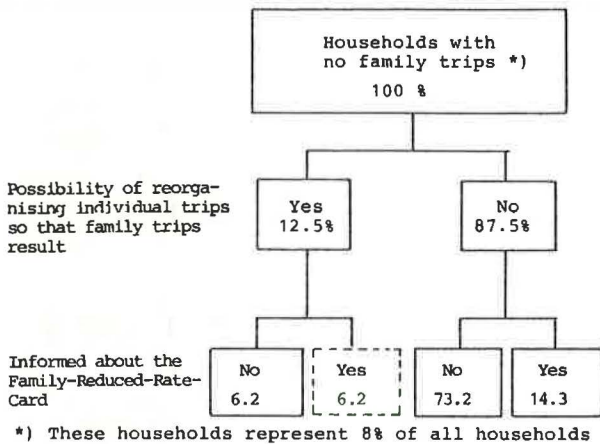


Figure 4. General options: all households.

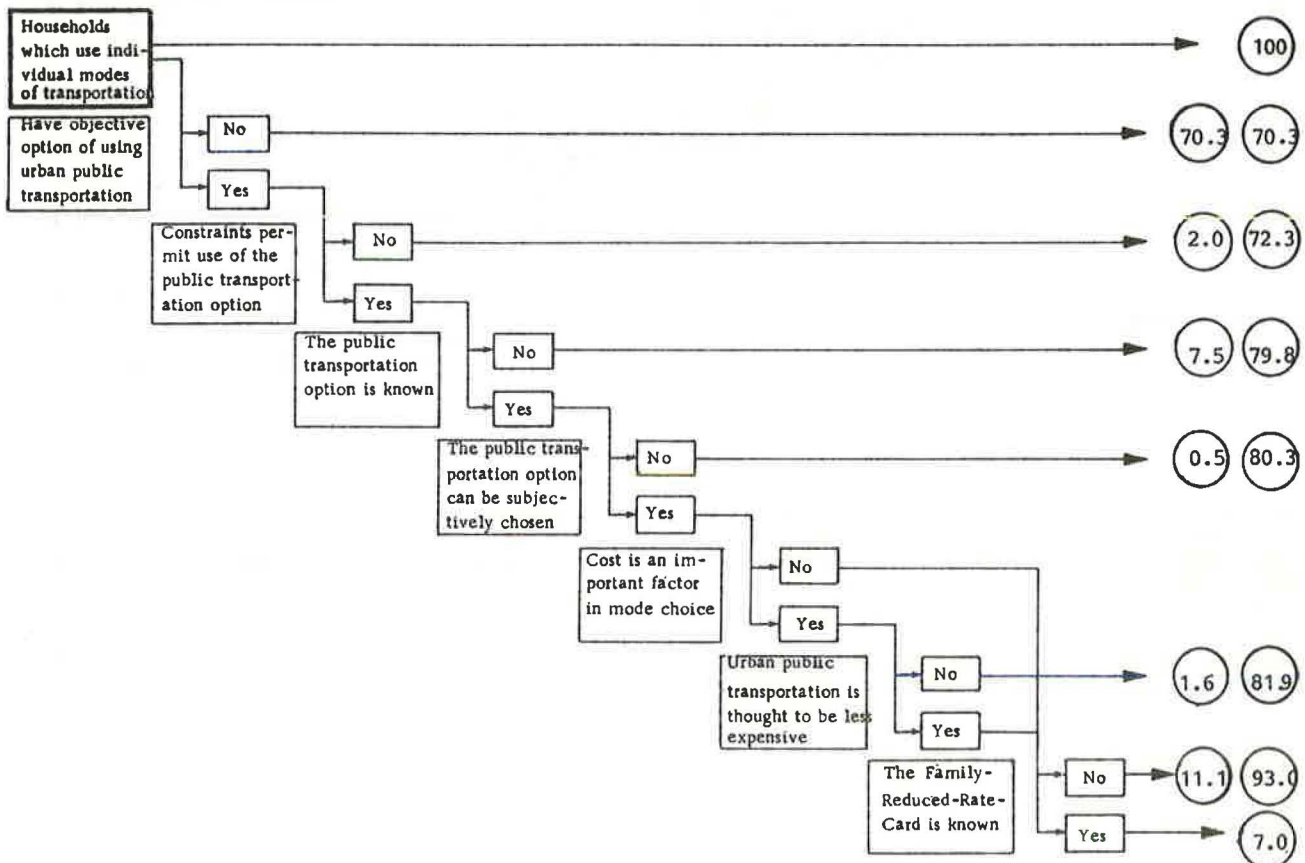
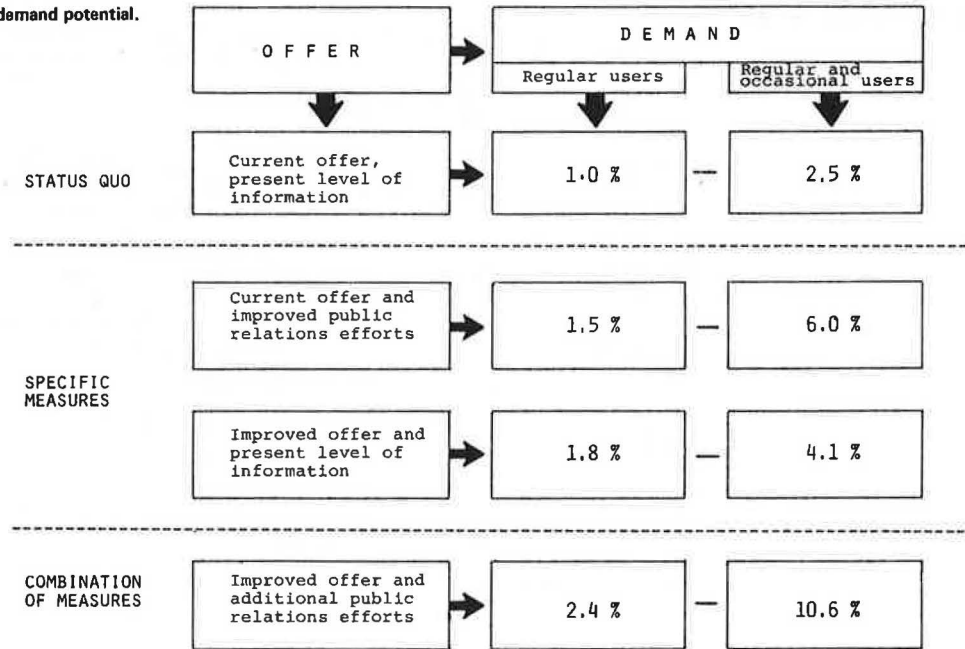


Figure 5. Depiction of the demand potential.



needs as adequately as possible, it does not suffice to use an approach in which the interviewees are simply asked for their opinions about a special offer optimally adapted to their wishes. For if this were done, it would result in suggestions for so radical an improvement of the offer that it would be unrealistic.

Rather, interactive measurement methods must be used (3) to analyze the interviewees' ideas. The following steps were taken to determine the family tariff design that the interviewees actually wished for:

1. The degree to which the households were informed about the family passes was determined;
2. When necessary, the interviewees were informed about the current family passes;
3. They were asked to evaluate these family passes; and
4. If they wished to improve the character of the family passes, they could change three of the following: (a) If the offer was changed, the price was changed; (b) If a higher price was accepted, additional improvements could be suggested; (c) When the price was no longer accepted at some point, the nature of an actually feasible offer should be identified; (d) Other suggestions pertaining to family-oriented fares could be made; and (e) Interviewees who intended to use the special family passes could list minimal changes necessary to ensure their use of the offer.

Analysis of Suggestions for Special Family Tariff

When one looks at the changes suggested by the households that claimed to be able to use the Family-Reduced-Rate-Cards, one gets an idea of the specific reasons that cause dissatisfactions with the special offer. The households that claimed to have a use for the special tariff (80 percent of the sample questioned) wanted considerable changes to be made in the individual parameters of the special offer. Almost all of these changes had to do with extending the current conditions. These households reflect public opinion such as it is sometimes depicted in the press.

However, if one wishes to collect data that are actually relevant to policymaking, one must use a differentiated approach:

1. As a first step, the special offer has to be adapted to the needs of those households identified as a further potential for the family tariff.
2. The interviewed household's wants and needs, which had been identified predominantly by demoscopic means, could not be used as the basis for possibly modifying the special tariff. For this purpose, the last stage of the interactive measurement process had to be used--the stage at which the interviewees formulated their actual suggestions with the additional corrective price of the Family-Reduced-Rate-Cards in relation to changes to be made in the special offer.

The individual wishes of these potential users concerning a family tariff will not be discussed in detail here. However, when interactive measurement is used, one can generally say that desired changes become more realistic and can identify the characteristics of the individual parameters for which they remain relatively constant (Figure 6).

Potential Attained by Making Changes in Special Offer

An analysis of the household-related responsiveness shows that a further potential can be attained if the offer is changed to correspond to the household's subjective notions of how the offer can be adapted to their needs. When the offer is thus changed, even if no public relations work is done, the minimal potential that can be reached consists of those persons who would then regularly or occasionally use the special offer and had not previously used it because they (subjectively) thought that it was inadequate. This group consists of 1.8-4.1 percent of households with children (Figure 5).

The maximum potential can be reached when improvements in the special offer are combined with policies aimed at informing the public about the offer. When suitable measures are taken to improve the special offer and increase familiarity with the

Figure 6. Family tariff: desired supply and public opinion.

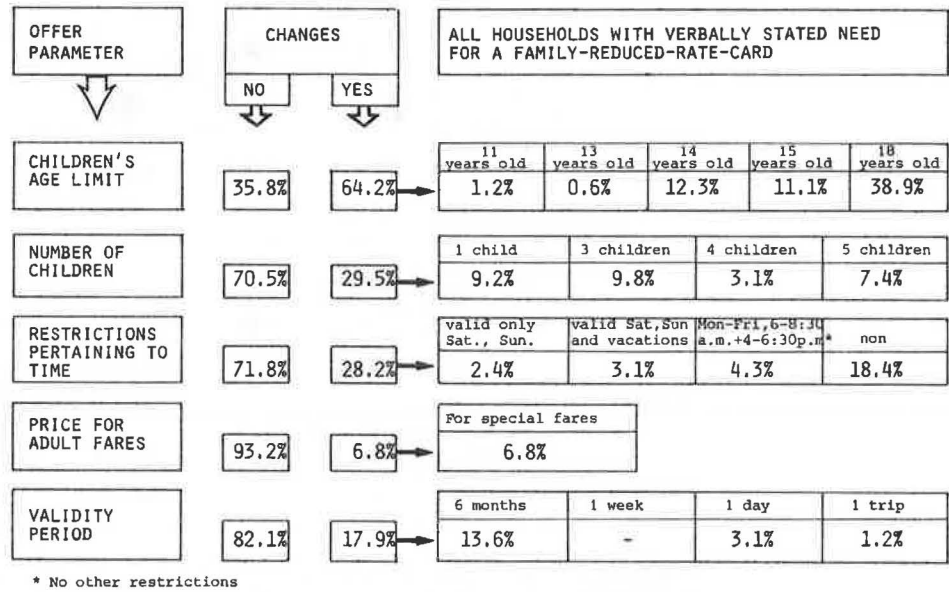
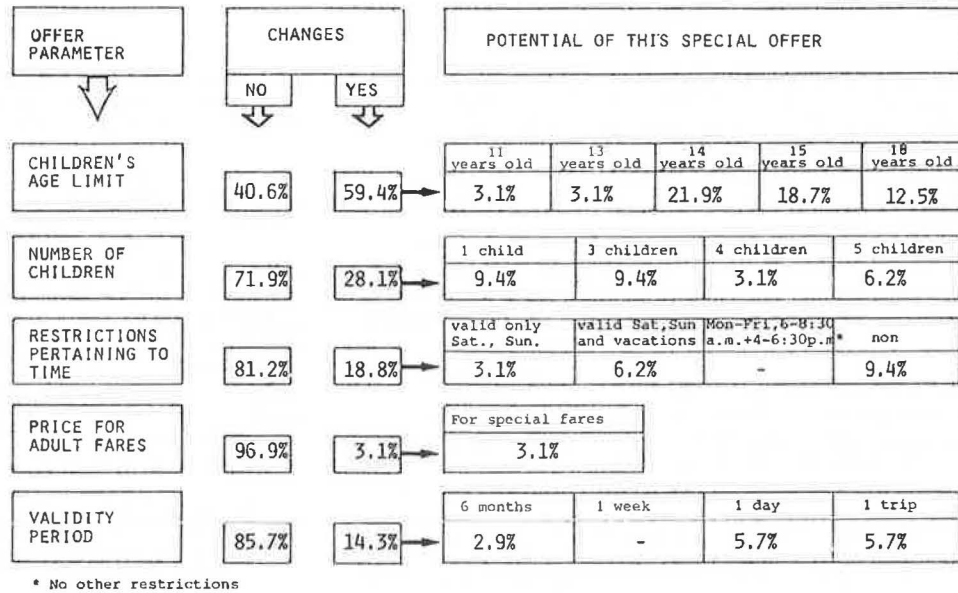


Figure 7. Family tariff: actual offer.



Family-Reduced-Rate-Card, 2.4 percent of all households with children in the tariff area of Stuttgart would regularly use the family tariff, while up to 10.6 percent of the households with children would occasionally buy a family card (Figure 5). However, these percentages are based on the assumption that the special offer is designed to conform to each individual's wishes and that the price for the tickets would not go up.

Summary of User Potential

Under status quo conditions, i.e., if the offer is not improved and no additional public relations work is done, demand will be limited to a small number of households. However, the number of potential users can be increased even if only a part of the possible measures are put into action. The number of households that regularly use the special tickets can more likely be increased by an improved offer than by improved information policies, while the number of households that occasionally use the

special offer can more likely be increased if better public relations work is done than by improving the offer (Figure 7).

When the offer itself is improved and information policies are improved, the percentage of potential demand can go up to 10.6 percent of all households with children. However, one should not forget that this percentage refers to an optimal situation in which the offer is perfectly suited to needs and wants and that the information strategies are successful in reaching all pertinent households. Realistically, this is not totally possible.

Actual Design of New Family Tariff

As of May 1, 1980, the VVS offered a new special tariff for families--the so-called Jumbo-Card. This Jumbo-Card took most of the insights of this research contract into consideration.

In a family, all children under 12 years of age can travel for free, and children from 12-18 years of age pay a child's fare if they are accompanied by

a parent (parents) possessing a family pass and paying full price. In order to simplify the processing of the tickets, the family card is valid for an entire year and costs 60 German marks. The time limits that were in effect (no reduced rates from Monday through Friday from 6:00-8:30 a.m.) remain in effect.

#### SUMMARY OF RESULTS

Public opinion, which represents the social point of view, and monetary considerations (increasing use of public transportation during slow hours) cause the family tariff to remain in the limelight. A social-scientific study oriented to individual behavior can be an important aid in forecasting the potential demand that might be reached. On the other hand, a market strategy that tries to deduce potential demand from secondary statistics cannot usually be used for forecasting. The situational analysis of the target group for a family tariff (i.e., households with children) shows that individual options are limited and that the introduction of different measures would have different effects on increased ridership. Since most of the households that use the family tariffs also previously used public transportation to make family trips, the increased number of family tariff users might actually represent a revenue loss. Only a small number of households can be expected to switch from private transportation to the use of public transportation. Thus, the ridership generated by the family passes is minimal.

Although the potential number of persons taking advantage of the family tariff can more likely be increased by public relations work aimed at improving the general image of public transportation than by optimally improving the special offer, the greatest number of persons can be induced to use the special family tariff if both information strategies and the family offer itself are improved.

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## Efficiency and Equity Impacts of Current Transit Fare Policies

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Over the past decade, most transit operators in this country have switched from graduated and zonal pricing to predominately flat fares. Many have hypothesized that flat-fare systems are both inefficient and regressive. This paper statistically tests several hypotheses related to the redistributive effects of three California transit operators' current fare structures. Disparities between users' fares and trip costs were found to be greatest as a function of trip distance. Those traveling less than 2 miles tended to pay inordinately high fares per unit of service. Trips beyond 6 miles were generally cross-subsidized by short-distance users. Moreover, off-peak patrons were found to return between one-quarter and one-half more of their costs through the

farebox than peak-hour riders. On the whole, redistributive effects of current pricing appeared to be only modestly regressive. Lower income, transit-dependent, and minority users tended to return a higher share of their costs than the average passenger, although equity impacts varied appreciably among study sites.

Virtually every U.S. bus system today charges most of its customers a single, flat fare. Since the mid-1960s, graduated and zonal fares have been