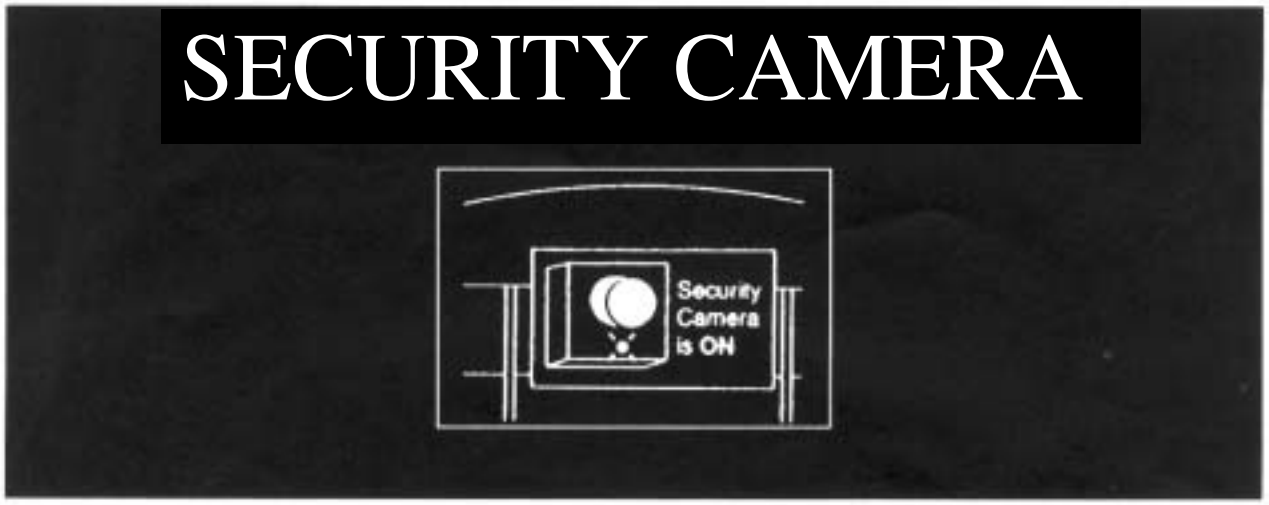


"There have been some problems recently, and I think the cameras give a greater sense of security."

"Now that I'm riding the bus again after many years of driving, I find the bus frightening. A security system would make you feel secure whether it did anything for you or not."

Impact on Transit Ridership

Although security cameras are of interest to specific user groups, in general, they are rather low on the list of features of passengers willing to forego a fare reduction and are even less of a priority when ranked according to their impact on transit ridership.

Potential Customer Preferences

Women

"Being an elderly woman, I think I'd feel more safe if there was a little more security on the buses. I've had bad experiences with people destroying my stuff and pushing me out of the way."

Women may prefer security cameras on buses more than men for reasons of personal safety.

Riders with Longer Trips

"I would want a security camera just as a precaution."

Riders who spend a longer time on a bus may have a higher interest in security cameras.

Off-peak Riders/Riders on Certain Lines

"At night on certain lines there is no security and I think that some of the drivers are afraid to enforce the rules."

Riders on lines through areas with security problems, or off-peak riders, may be interested in security cameras.

Potential Passenger Functional Concerns

Personal Privacy

"It means that I am going to be on camera every time I step on the bus."

Some customers may be discouraged from using a bus for this reason.

Illusion of Safety

"The security camera gives people the feeling that they're more safe than they are."

Security cameras do not necessarily improve real security, and therefore have to be balanced with other approaches to customer safety.

"I don't see why cameras are necessary; maybe we should look more to drivers to be more responsive and responsible."

$$$$$$$$$$$$$$$$$$
Approximate Price of Security Cameras
$$$$$$$$$$$$$$$$$$

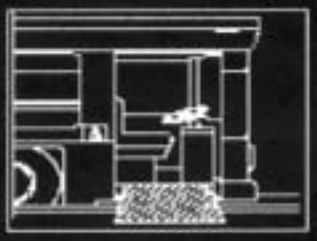
Level 1 - $1,000

$$$$$$$$$$$$$$$$$$
Ways to Offset Costs
$$$$$$$$$$$$$$$$$$
- Use "dummy" cameras, as well as real ones

Types of Information to Test with Transit Design Game

Level	Transit Feature	Estimated Points
No Frills	No Security Camera on Bus	0
1	Security Camera on the Bus	3

LOW FLOOR BUSES



"I picked the low floor bus so that it would be easier to get on. I find that's my biggest problem. I have to put down what I have in my hands to get on the bus and it's difficult."

Impact on Transit Ridership

Familiarity with low floor bus technology definitely had an effect on passenger selection of this feature. Despite its low cost, passengers from other cities with no prior experience of low floor technology did not often select it.

Potential Customer Preferences

Passengers With Disabilities

"I think accessibility is very important for handicapped individuals and senior citizens."

"I think a lot of disabled people will be using the system and they need to be able to get on and off the buses."

Passengers with disabilities — whether temporary or permanent — will have a strong preference for this feature.

Choice Riders

"My mother isn't mobile on stairs, so I'd like to see a low floor bus."

Choice riders may also prefer low floor buses over the conventional (usually three step) bus.

Women

Women may also prefer low floor buses. This could be due to the fact that low floor buses make boarding and lighting easier, and women are the ones most likely to be boarding buses with baby strollers and shopping bags.

Riders with Shorter Trips

"Low floor is great because the lifts take too long to load people on and off. It's much simpler."

"It gets people on and off the bus faster."

The fact that low floor buses speed board and alighting and reduce bus dwell time may make it appealing to riders with shorter trips.

Potential Passenger Functional Concerns

Impact on Amount of Seating

"With the seats being sideways like that [on a low-floor bus], there's hardly room for people to sit... With the older style bus, there was more seating."

One of the trade-offs with low floor buses is there may be less seating provided. Depending on their configuration, low floor buses often also provide more room for standees, but reduce the leg room of those seated. Others create a raised seating area in the back which is accessible only by steps.

"If I were confined to a wheelchair I'd prefer to get picked up at my door by trained people than sit on the street corner for 10 minutes in the snow being sprayed by cars."

Climate Issues

Riders are concerned that snow piled high on curbs can impede wheelchair access to the bus and make it difficult to lower the lift sufficiently to allow boarding.

$$$$$$$$$$$$$$$$$$
Approximate Price of Low Floor Buses
$$$$$$$$$$$$$$$$$$
Standard Bus
$185,000 in 1989
Level 1 - $198,000 in 1993

Note: See Ann Arbor Case Study 4-1
$$$$$$$$$$$$$$$$$$
Ways to Offset Costs
$$$$$$$$$$$$$$$$$$
- Low floor buses cost no more than conventional buses
-Testing a variety of low floor buses before purchasing large numbers is helpful to determine the best configuration for passengers in a given city

Types of Information to Test with Transit Design Game

Level	Transit Feature	Estimated Points
No Frills	Buses with Steps and Wheelchair Lifts	0
1	Low Floor Buses	1

APPENDIX

TRANSIT DESIGN GAME FINDINGS FROM FIVE CASE STUDY CITIES

Introduction

Much of the information gathered regarding the perceptions of transit riders about amenities comes from our use of the Transit Design Game, an innovative survey technique that we tested in five American cities: Rochester, NY; Aspen, CO; Portland, OR; San Francisco, CA; and Ann Arbor, MI. This section describes the Game, discusses the methods of analysis, and presents the findings from the survey.

Samples of the 12- and 18-point Transit Design Game questionnaires used in the five-city test were provided in Exhibit 3. (The versions are identical except that respondents can "spend" either 18 or 12 points.) The questionnaire forces respondents to make trade-offs among various amenities and between spending on amenities or getting a reduction in fare.

Administration of the Survey

Transit Design Game questionnaires were distributed in two ways. The majority of the sample was handed out on buses. We worked with the local transit agency to select a series of routes that reflected a city's demographic characteristics to ensure as representative a sample as possible. Members of the Research Team boarded the bus and generally asked every rider to fill out a survey. A concerted effort was made to help people fill out the survey correctly and to check results. The survey person rode the line for a complete run and repeated the trip or boarded a different line.

Surveys were also distributed during the two passenger focus groups held in each city, which consisted of 10-12 people. Approximately 10% of the total sample from each city are from focus groups. However, no focus group surveys from Rochester have been included, as they took place after the surveys had been tabulated.

Sample Size

The data for the analysis comes from the completed questionnaires of 568 respondents in the five survey cities. In fact, we distributed closer to 700 surveys, but had to reject many of the questionnaires because respondents answered only some of the questions or else answered key questions incorrectly. For example, some respondents spent 30 budget points or more to "buy" all the high-end options in each amenity category--despite our stipulation that they constrain their spending to the budget limit of 12 or 18 points. For the coded surveys, we defined the parameters for inclusion in the analysis as follows:

- acceptable bounds for 12 point surveys are 9 to 12 points
- acceptable bounds for 18 point surveys are 14 to 18 points

The high number of unusable surveys potentially undermines the representativeness of the sample. For example, if the people who did not fill out the form correctly tended to be those who were least educated or who biased the remaining sample in some other systematic way. We did not identify any instances of this type of bias, and there is no glaring evidence from the demographic characteristics of the completed surveys suggesting the over- or under-representation of particular groups. Moreover, our method of analysis takes some account of this potential by examining the results according to specific demographic factors. Readers of this report, however, should recognize that this issue could theoretically affect the conclusions pertaining to the cities as a whole.

Even if there is no bias in terms of who correctly completed the survey, the limited sample size affects the conclusiveness with which we are able to make assertions about the larger bus-riding community. For example, the 141 usable surveys from Ann Arbor provide more "degrees of freedom" on which to make statistical inferences than do the 69 usable surveys from Rochester. This means that we can generally be more confident about the results presented for Ann Arbor than for Rochester in Figures A1 through A6. Several surveys from each city were not coded because of some problem with the respondent's answers. Table A1 summarizes the number of surveys distributed and used for the analysis.

Finally, the high number of unusable surveys shows the limitations of using the Transit Design Game alone as a research method. It is not self-explanatory to many riders and surveyors must assist passengers in filling it out correctly. Other issues for future refinement include adding different features to the survey (such as easier to open or wider doors, buses that do not use diesel fuel, and different kinds of fare media).

Table A1. SURVEY SAMPLE

	Total surveys coded by PPS	Dropped--options	Dropped--total out of bounds	Total accepted
Rochester 12	43	4	7	32
Rochester 18	49	4	8	37
Portland 12	79	4	2	73
Portland 18	76	3	7	66
San Fran 12	71	4	5	62
San Fran 18	51	1	6	44
Ann Arbor 12	90	6	4	80
Ann Arbor 18	66	5	0	61
Aspen 12	63	2	2	59
Aspen 18	60	2	4	54
Total				568

Methods of Analysis

Each section in the statistical section of the report reflects a distinct method of analysis. The techniques used include cross-tabulations, correlation, and regression and logit analysis.

Survey Findings

Demographic and Ridership Characteristics

Average demographic and ridership characteristics of survey respondents in four of the five cities are comparable. As is evident in Table A2, Aspen is the exception, where the average respondent took fewer trips, had a considerably shorter wait time, had a longer trip length, were wealthier, and were less captive to transit compared with respondents elsewhere. Among the other cities, Rochester tends to be more transit dependent and female; San Francisco respondents tended to be older.

Table A2. RIDERSHIP CHARACTERISTICS

Variables	Rochester	Portland	San Francisco	Ann Arbor	Aspen
weekly one way trips (#)	9.07	9.35	9.40	8.55	7.97
wait time (min.)	11.82	11.1	13.83	9.5	6.6
trip length (min.)	21.22	26.87	24.46	21.17	33.16
choice riders (%)	18.9	38.6	29.7	37.7	72.6
Female (%)	64.8	50.4	48.1	51.4	56.3
income group (scale of 1 to 4)	1.75	1.97	2.21	1.89	2.51
income <$20,000 (%)	53.4	49.2	35.1	54.1	19.8
over age 65 (%)	0.0	5.1	5.7	3.6	0.9

Overall Amenity Choice

The following tables show the percent of respondents buying each level of the different amenities given budgets of 12 points (Table A3) and 18 points (Table A4). For example, under the storage space category, riders could choose a package rack for one point (level 1), a bike rack for three points (level 2), or both for four points (level 4).

Table A3. PERCENT BUYING EACH LEVEL OF AMENITY – 12-POINT BUDGET. BARS, RESPECTIVELY, ARE ROCHESTER, PORTLAND, SAN FRANCISCO, ANN ARBOR AND ASPEN

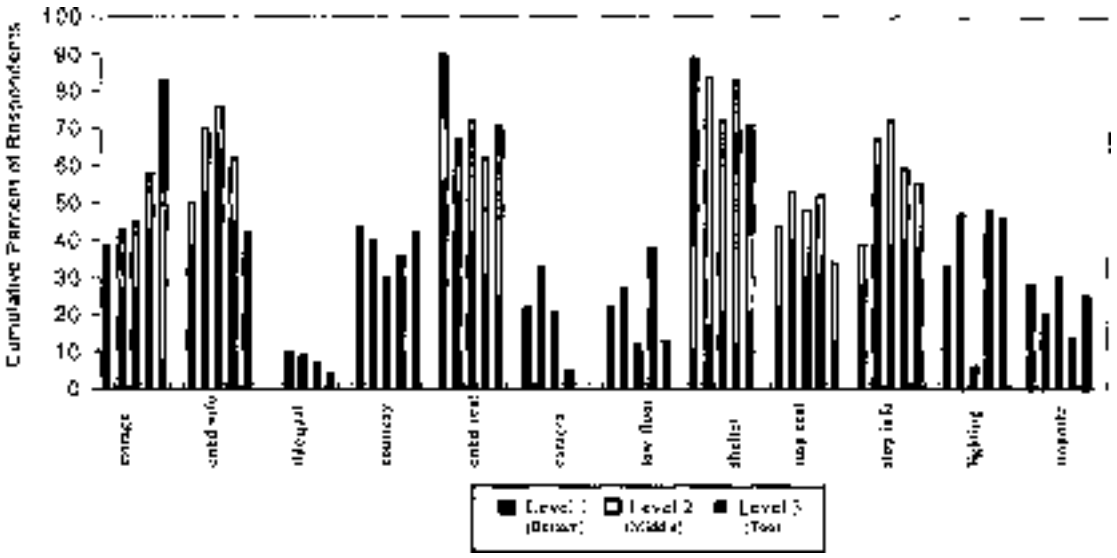
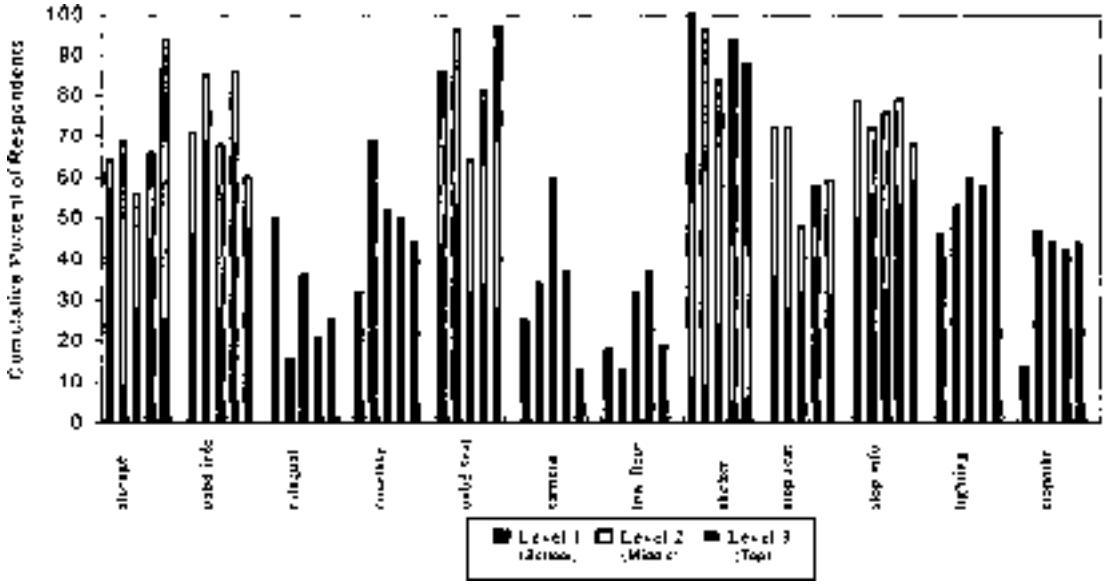


Table A4. PERCENT BUYING EACH LEVEL OF AMENITY – 18-POINT BUDGET. BARS, RESPECTIVELY, ARE ROCHESTER, PORTLAND, SAN FRANCISCO, ANN ARBOR AND ASPEN



How A Change In The Budget Affects The Choice Of Amenities

Increasing the budget from 12 to 18 points highlights those amenities that represent the next level of priority, *after* basic needs are met. These include ride quality, security camera, lighting at stops and courtesy training, for which the move from 12 to 18 points generates the greatest jump in the number of respondents choosing to buy the amenities. The survey also suggests that the 13th to 18th budget points spent on amenities are less valuable than the 1st through 12th. Table A5 presents the most significant of these differences.

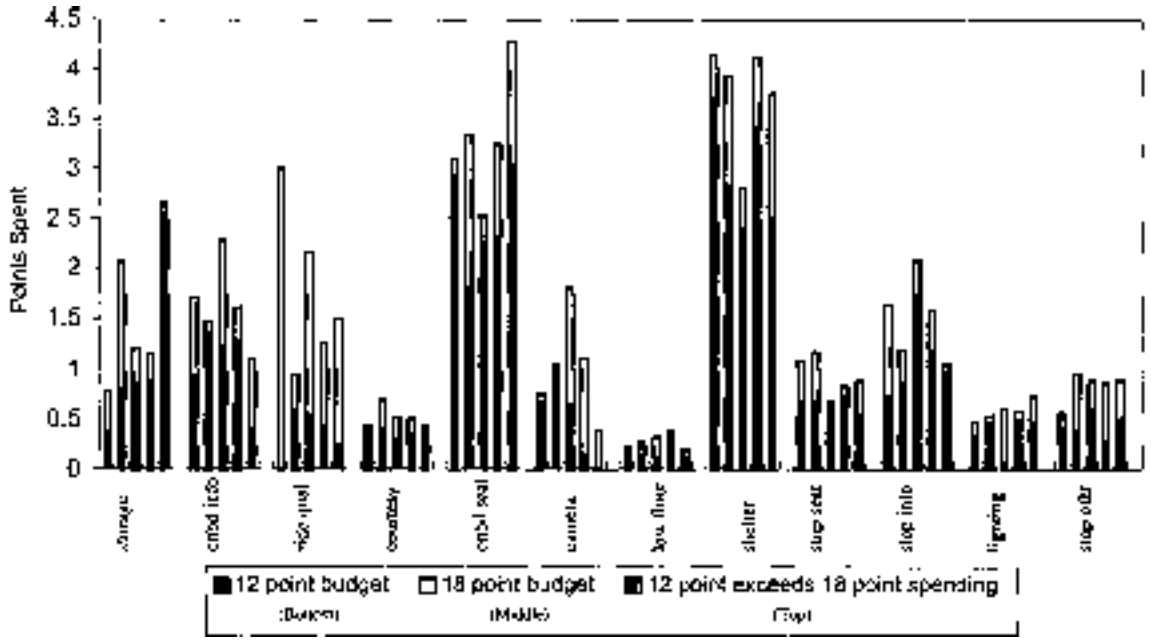
Table A5. BUDGET EFFECT ON AMENITY CHOICE

Amenity and City	Increase in the percent of respondents choosing this amenity between the 12 and 18 point budgets
Ride quality in Rochester	+49
Camera in San Francisco	+33
Lighting in San Francisco	+31
Lighting in Aspen	+30
Bus stop other in Ann Arbor	+30
Camera in Ann Arbor	+24
Electronic on-board info in San Francisco	+24
Courtesy training in San Francisco	+23
Courtesy training in Portland	+22
Shelter with heating in Aspen	+22
Lighting in Portland	+21
Ride quality in San Francisco	+20

Other Views of Overall Spending

The following charts provide other ways of looking at the overall selections by respondents in the five cities. Table A6 shows that a much higher share of the total points is spent on shelters compared with, for example, low-floor buses than is immediately evident in Tables A3 and A4. Table A6 also clearly shows the difference between respondents with a 12-point budget and those with an 18-point budget.

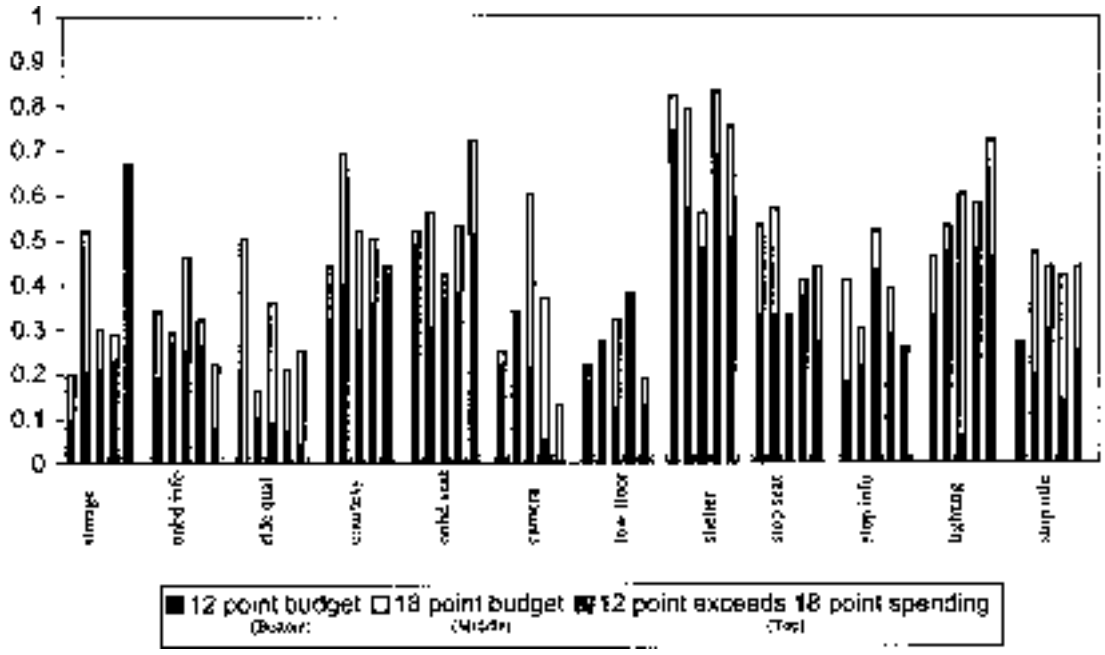
Table A6. AVERAGE POINTS SPENT PER CATEGORY. BARS, RESPECTIVELY, ARE ROCHESTER, PORTLAND, SAN FRANCISCO, ANN ARBOR AND ASPEN



As an example of how to read Table A6, consider the bars for the category labeled "onbd seat." The first bar in this series shows that the Rochester respondents to the surveys with a 12-point budget spent an average of about 3 points for on-board seating. Rochester respondents to the 18-point survey spent slightly more than this, about 3.1 points on average for the on-board seats. Typically, the respondents to the 18-point surveys spent more for each category than did those respondents with only 12 points to spend. However, the bigger budget for the respondents with the 18-point survey in some cases prompted respondents to divert resources to better ride quality or for other big-ticket items which they could not "afford" with the 12-point budget. Thus, respondents to the 18-point survey in San Francisco, for example, actually spent less on average (2.4 points) for on-board seating than did respondents in this city to the 12-point survey (2.6 points). These levels of spending are evident in the third bar in the on-board seating series.

Table A7 accounts for the fact that low-floor buses cost only 1 point and the heated shelters cost up to 5 points. Consequently, an average expenditure of .3 points for low-floor buses is 30 % of the possible expenditure in this category, and the bar would be about one-third of the way up the vertical axis. Viewed from this perspective, the interest in low-floor buses appears closer to the interest in bus shelters.

Table A7. SHARE OF MAXIMUM POINTS SPENT PER CATEGORY. BARS, RESPECTIVELY, ARE ROCHESTER, PORTLAND, SAN FRANCISCO, ANN ARBOR AND ASPEN



Preferences for Amenities Based on Demographic and Trip Characteristics

Figures A1 through A6 illustrate the preferences for different amenities based on selected characteristics of the traveler (i.e., sex, income, and age) and of the trip (i.e., trip length, wait time, etc.).

As an example of how to read the charts, consider the second set of bars (on-board information) in Figure A1, Trip Frequency.[1] The five bars in the set represent each of the five cities surveyed. The chart shows the degree and direction of preferences for each type of amenity by riders of different frequencies. The positive bars for on-board information indicate that, generally speaking, riders want more on-board information as their transit frequencies increase. This is particularly the case for riders in Aspen and Rochester. The long, negative bar for security cameras in Aspen (extending below the chart area to a value of -2.19) indicates that either low-frequency riders have a strong affinity for security cameras *or* that high-frequency riders have a strong dislike for the cameras. The short bars whether positive or negative (such as for storage or shelter) suggests that trip frequency has little impact on the demand for the amenities. The tables and figures also show how changes in the demographic characteristics affect the decision to take more rides (intent) and the willingness to forego a drop in fares in order to buy the amenities (trade). The trip frequency charts show that willingness to make the trade (in favor of more spending on amenities) goes up with increased trip frequency.

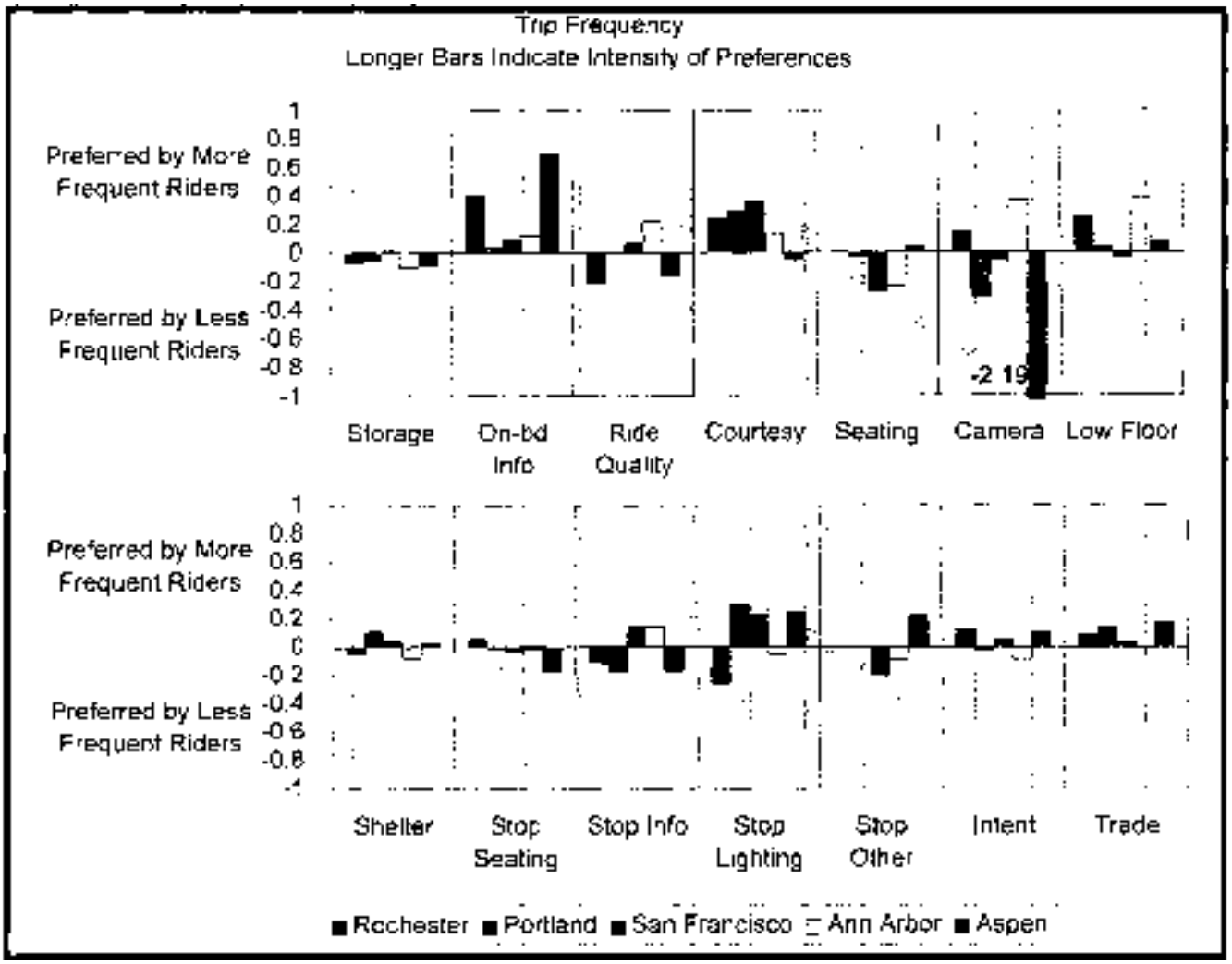
[1] More technically, the bars signify the log arc *elasticity with respect to trip frequency of points spent by transit users for each type of amenity.* For example, the .41 value for the first bar means that for transit riders in Rochester, the amount spent on on-board information would rise by about .41 percent for each 1- percent increase in trip frequency.

This information was derived from a series of multiple regression estimations in which the *dependent variable* is the points spent within each of the 12 amenity categories. The *independent variables* are the trip and traveler characteristics identifiable from the survey. By accounting for multiple traits within each regression equation, we assume that the changes attributable to a specific characteristic (e.g., income of the rider or length of the trip) are independent of the effects of all other characteristics. The graphs also show how the independent variable affects the stated willingness to take more transit rides (intent) and the willingness to trade off a fare reduction for increased spending on amenities (trade).

Trip Frequency

Increasing the frequency of trips leads to increases in the demand for on-board information, courtesy training, and bus stop lighting. Willingness to trade a fare reduction for increased amenities also tends to increase as the trip frequency rises. Interestingly, low-frequency riders tend to lack defining preferences for any of the amenities; they do show a slight preference for added investments in on-board seating or information at the bus stops. Low-frequency Aspen riders show a preference for a security camera on the bus, but the very high elasticity (-2.19, indicating that a one percent increase in transit frequency would yield an expected 2.19 percent drop in the points spent on security cameras) may primarily indicate that regular, high-frequency transit riders have a very strong dislike for the cameras.

Figure A1. TRIP FREQUENCY

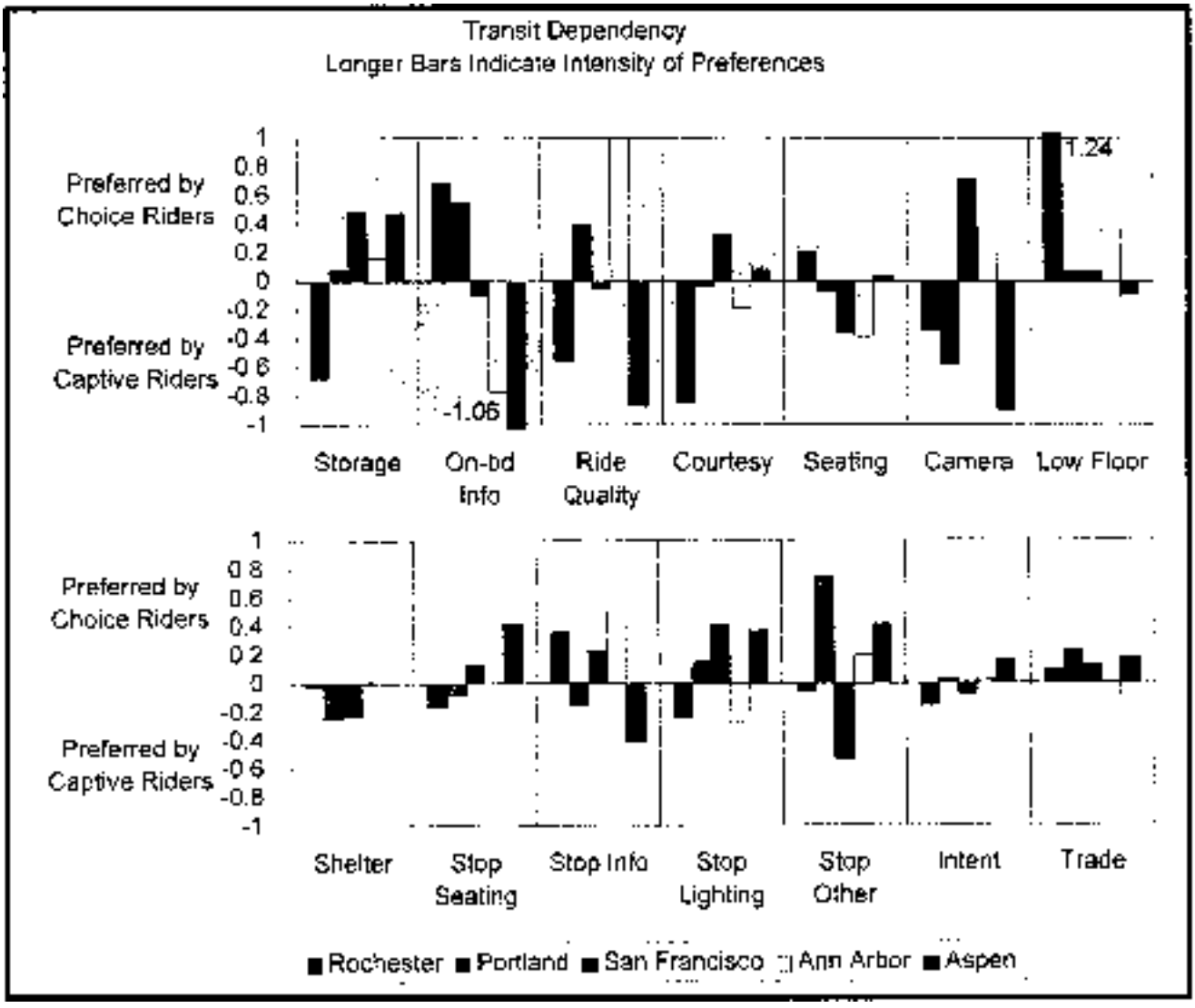


Transit Dependency

Note: These charts show the preferences of choice riders (i.e., those that could have used a car for their trip) compared with "captive" riders.

This is an important category because it highlights areas where transit agencies can best attract travelers who have alternatives to transit (rather than trying to entice captive transit riders to take more trips). There is little common pattern among the cities, but there seems to be some tendency for choice riders to prefer investments at the bus stops, while captive riders prefer investments on board the vehicle. Exceptions to this are storage and low-floor buses (generally preferred by choice riders), and shelters (somewhat preferred by captive riders). The greater interest in improved shelters among captive riders may indicate that in times of particularly bad weather, the choice rider does not head for the bus stop regardless of the quality of the shelter; the captive rider has no alternative to the bus and thus has a high demand for the improved shelters. Choice riders are also more willing than are captive riders to forego a fare decrease in favor of added spending on amenities.

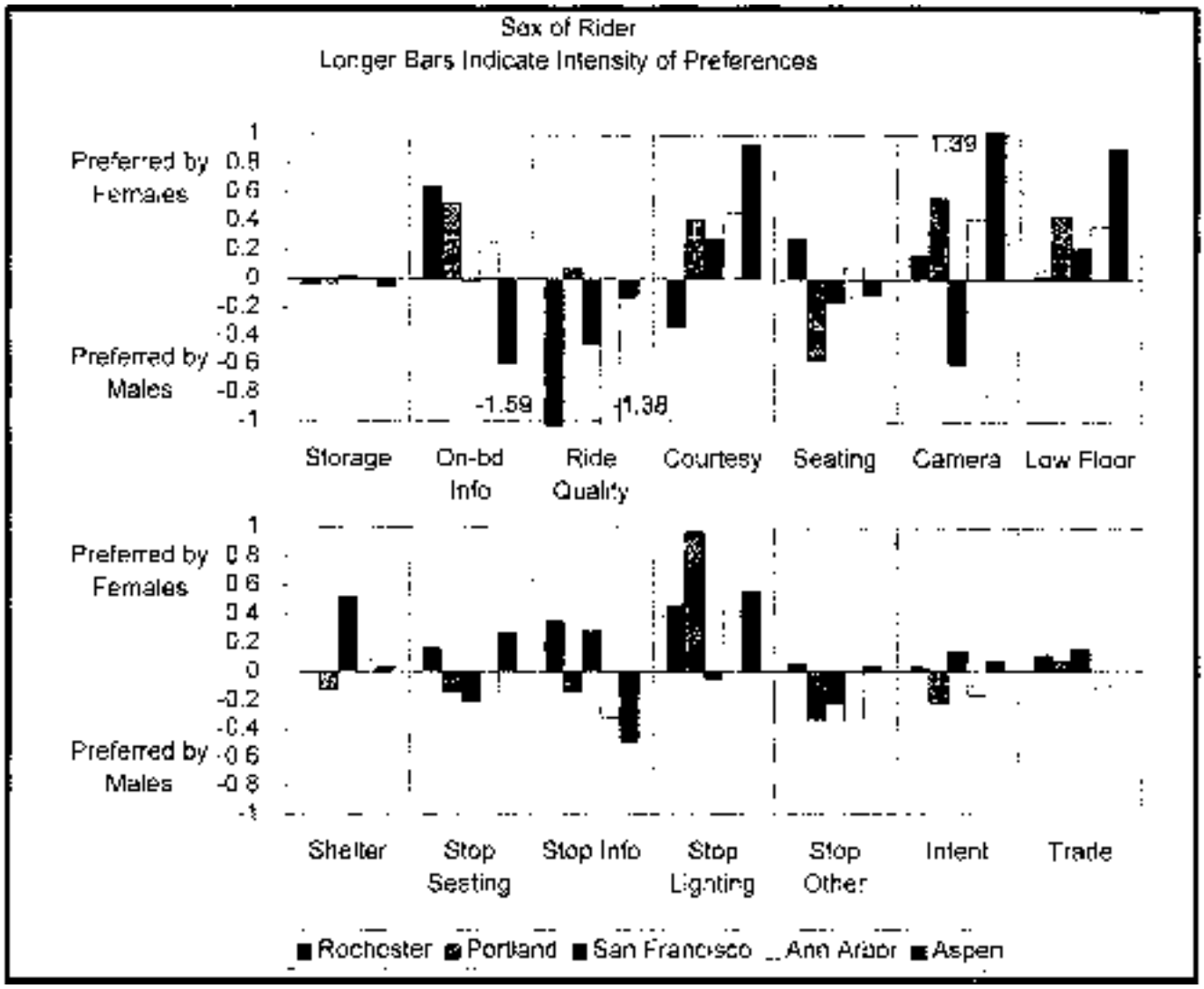
Figure A2. TRANSIT DEPENDENCY



Sex of Rider

There seem to be some clear differences in terms of preferences by sex. Women tend to prefer security-related amenities (such as the security cameras and enhanced lighting at the stop), men have a preference for higher levels of certain comforts (particularly the quieter and smoother ride in the ride quality category, but also for on-board seating). Driver courtesy training and low-floor buses are also more important to women than to men.

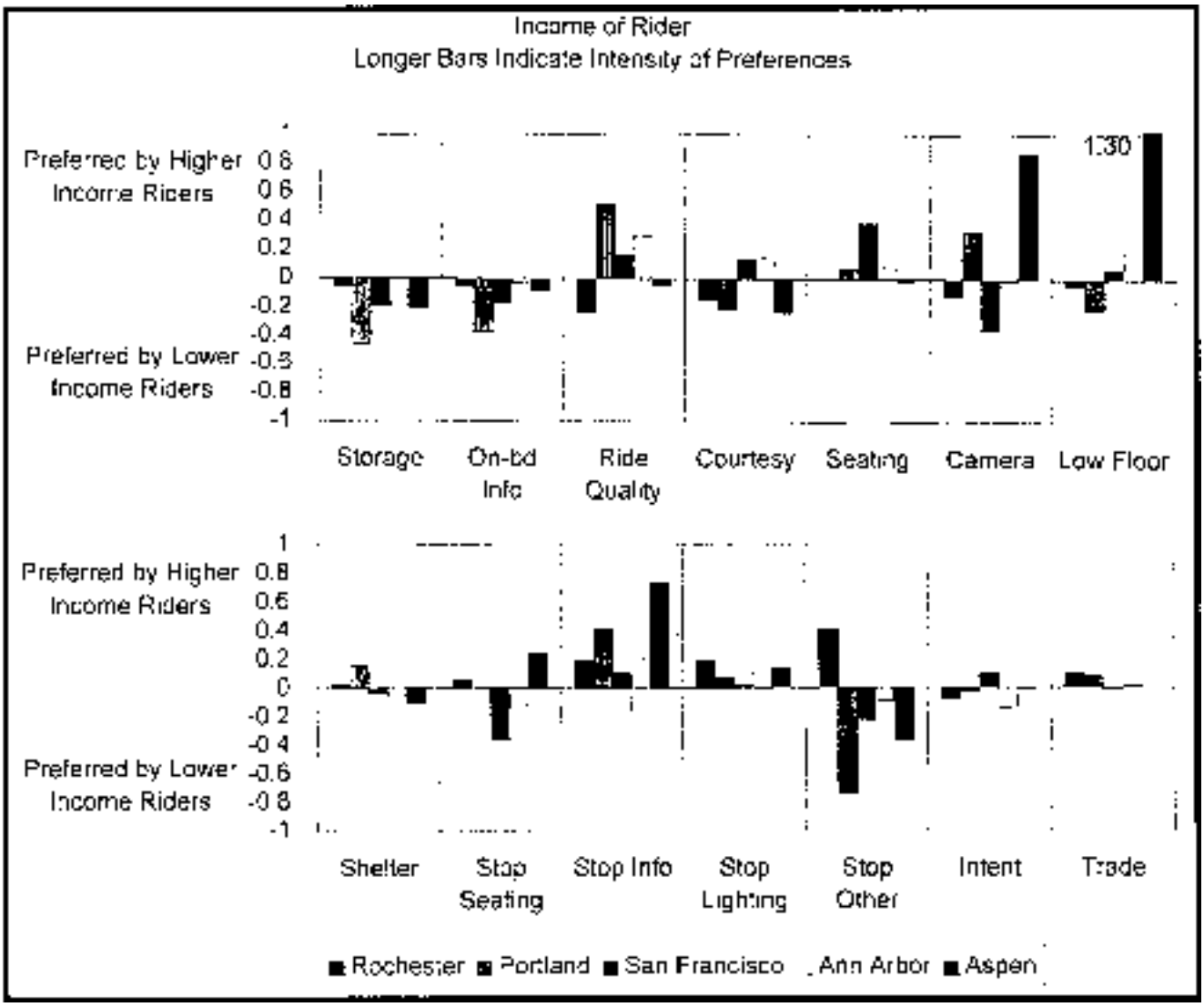
Figure A3. SEX OF RIDER



Income of Rider

The most surprising finding here is that higher income riders do not have an appreciably higher willingness to forego fare reduction as a tradeoff for more amenities. It also seems surprising that lower income riders tend to have the most interest in the "stop other" ancillary features of a phone, trash basket and newspaper vendor. Lower income riders also prefer the storage amenities and on-board information. Higher income riders show a preference for information at the stop, ride quality, and, to a lesser extent, for higher levels of on-board seating and enhanced lighting at the stops.

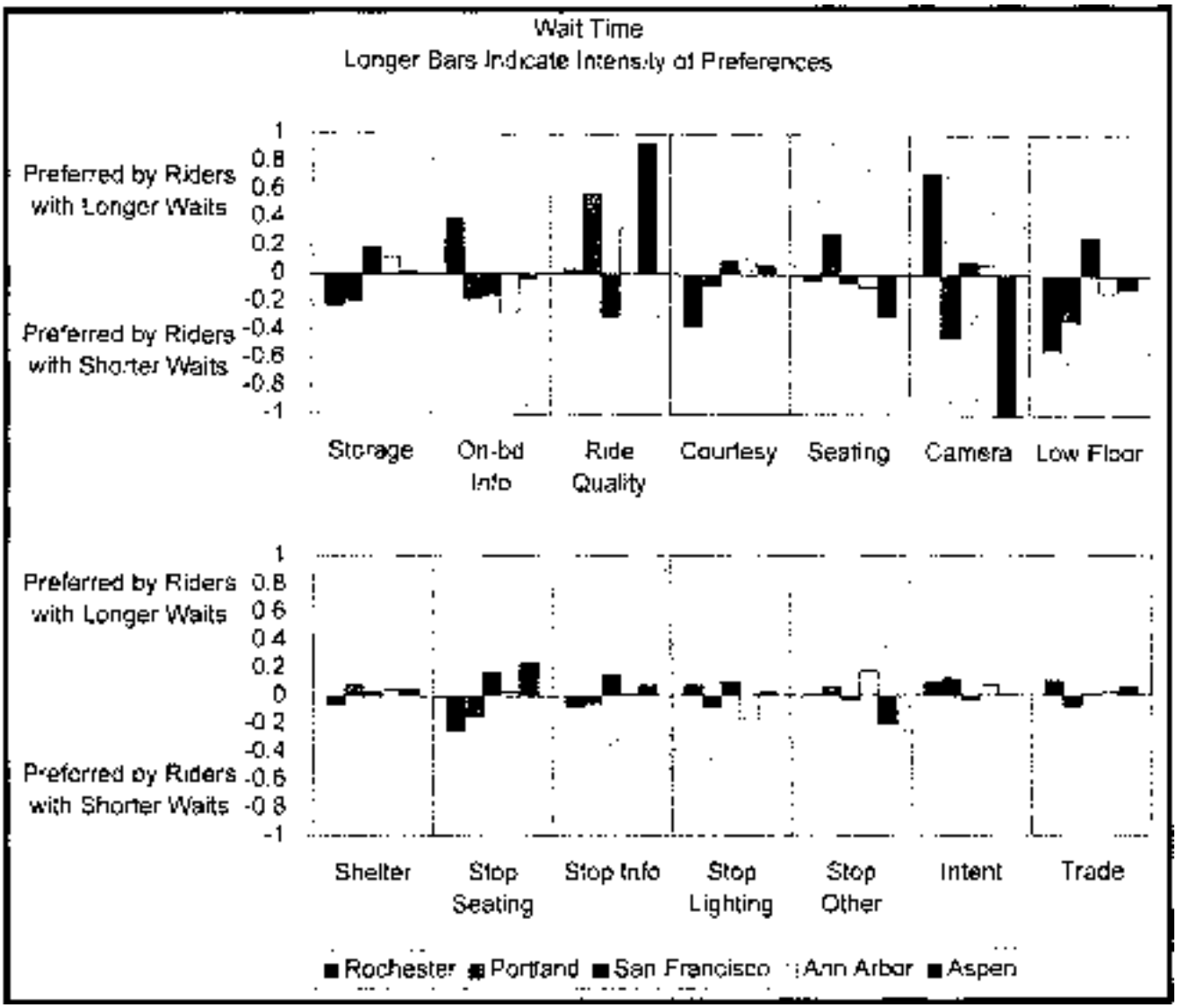
Figure A4. INCOME OF RIDER



Wait Time

Contrary to our expectations, longer wait time does not correspond with a particularly greater preference for added amenities at the stop. This is an interesting finding, although two contributing factors are evident from a detailed review of the survey data. First, there were relatively few people who had waits over 20 minutes, and thus the results may not apply to people with very long waits. Second, there are many people with very short waits who nonetheless are willing to spend large numbers of points for amenities at the stop. Keep in mind that these charts show the change in preferences as the independent quality increases; an amenity that is important to people with long wait times--but also important to many people with short wait times--would not register a high degree of change. Among the non-stop-related amenities, interest in smoother ride quality does increase with wait time, although the reason is unclear. (Transit users who have the longest waits are often those who take the longest trips, but we have accounted for this by including a separate variable for trip length.)

Figure A5. WAIT TIME

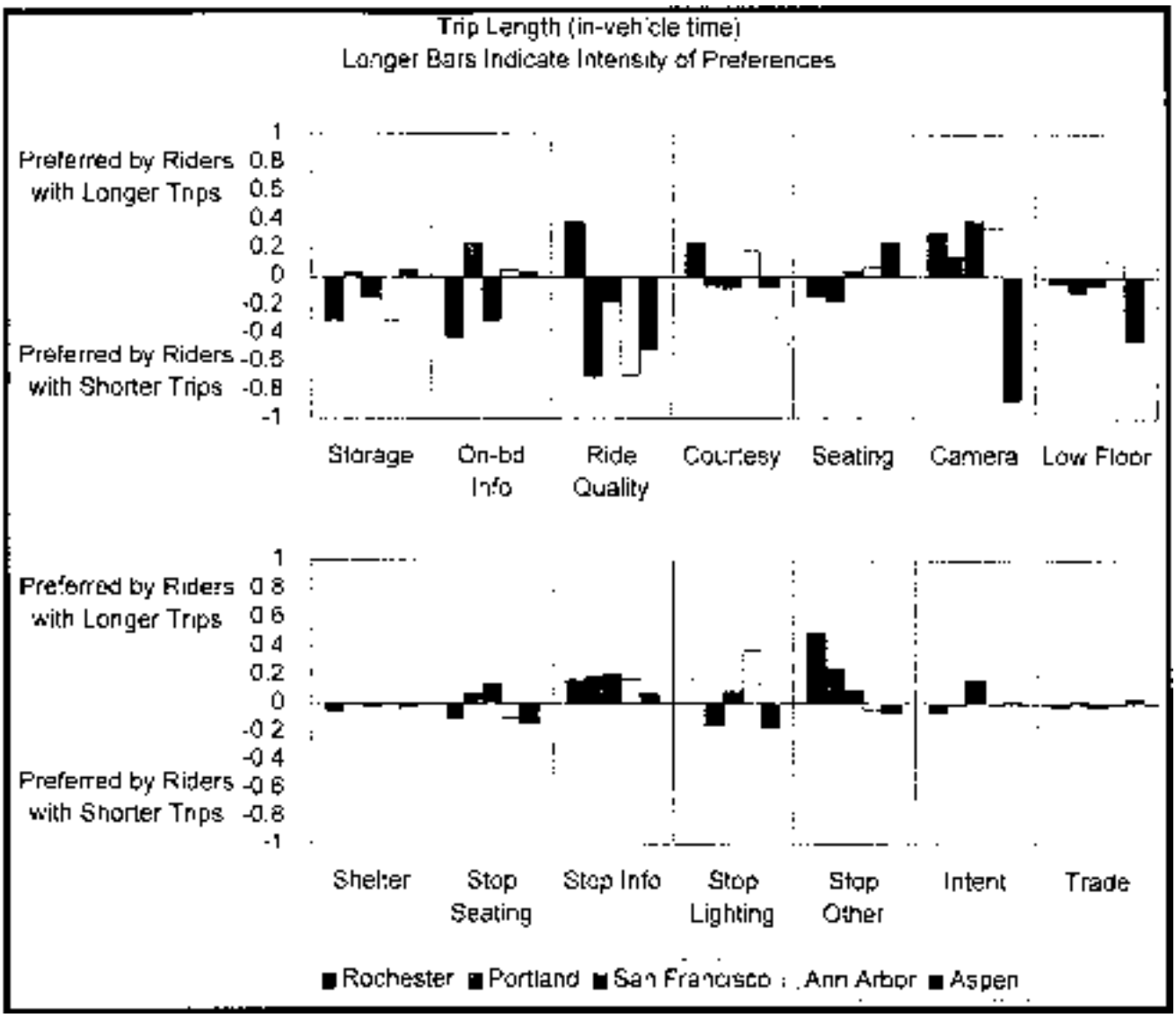


Trip Length

Note: The dependent variable here is time spent in the vehicle.

Increasing trip length reveals two patterns. First, four of the cities have a positive relationship between increasing trip length and interest in security cameras. Aspen is the exception. Second, the longer trips correlate with greater demand for bus stop information and other bus stop amenities. A possible explanation for this is that longer trips would likely have greater unreliability in the arrival time of buses. This could account for why this amenity has a clear positive relationship to trip length, but a statistically insignificant relationship to wait time. Riders with shorter trips show a clear preference for improved ride quality (except in Rochester). One possible explanation for this is that longer distance riders may already have higher quality buses compared to those on shorter distance routes. Other respondents may have spent their points primarily on items that their routes are lacking.

Figure A6. TRIP LENGTH



Which amenities are worth the cost?

First consider Table A8.

Table A8. PERCENTAGE OF RIDERS WILLING TO TRADE AMENITIES FOR FARE REDUCTION

	percent willing to trade at each level--12 point surveys				percent willing to trade at each level--18 point surveys			
	10¢* off fare, no amenity points	5¢*off fare, 6 amenity points	0 ¢* off fare, 12 amenity points		15¢* off fare, no amenity points	10¢* off fare, 6 amenity points	5¢* off fare, 12 amenity points	0¢* off fare, 18 amenity points
Rochester	22	22	56		38	23	13	26
Portland	14	23	63		17	20	17	46
San Francisco	16	26	58		24	17	12	48
Ann Arbor	13	25	61		5	12	20	63
Aspen	14	16	70		10	15	21	54

* Note: The high fare for commuters in Aspen ($3.00 one-way compared with about $1.00 at the other cities) required that we adjust the survey tradeoff questions. The savings were presented in terms of "percent" instead of "cents" off. Thus, Aspen respondents to the 12-point survey could choose to spend 6 points on amenities or receive a 5 percent fare reduction.

In the above table, you want to see higher numbers in the shaded columns. These columns show the riders who have the strongest preference for amenities instead of a fare reduction.

The highlights of this information are that Rochester has a lower willingness to trade than do other communities (i.e., they are more likely to prefer lower fares over more amenities as compared to other cities). Amenities prevail over low fares to a much higher extent in Ann Arbor and Aspen. The survey also suggests that the 13th to 18th budget points spent on amenities are of decreasing marginal utility; they are less valuable to riders than the 1st through 12th budget points. However, of those willing to forego all fare reductions to buy 12 points of amenities (with a 12-point budget), the data suggests that most would be willing to forego all fare reductions to buy 18 points of amenities (with an 18- point budget).

Now let's look at individual amenities. Table A9 shows which amenities are worth the cost. The "score" is the estimate of the percent of transit users who would forego a commensurate fare reduction in order to have the amenity (i.e., the amenity is worth the cost). "Pts" refers to the number of points needed to buy the items. Keep in mind when examining the information that the percentages are for those who would find the amenity worth *at least* the number of points charged for the item in the survey. It does not indicate the number of people who would be willing to pay much more than the item's cost. Likewise, the percent that do not feel it is worth the cost would include those who would pay nothing for the amenity and those who would pay 99 percent of the cost charged.

Table A9. AMENITIES RANKED BY PERCENTAGE OF RESPONDENTS WILLING TO FOREGO A COMMENSURATE FARE REDUCTION

Rochester	pts	score	Portland	pts	Score	SanFrancisco	pts	score	Ann Arbor	pts	score	Aspen	pts	score
Shelter 1	1	53	shelter 1	1	61	shelter 1	1	52	shelter 1	1	66	seating 1	2	63
seating 1	2	46	on-bd info 1	1	57	stop info 1	1	51	seating 1	2	61	shelter 1	1	62
shelter 2	4	42	seating 1	2	53	on-bd info 1	1	48	on-bd info 1	1	56	storage 2	3	52
Stop info 1	1	36	shelter 2	4	50	bench 1	1	41	stop info 1	1	56	shelter 2	4	50
On-bd info 1	1	31	stop info 1	1	48	seating 1	2	41	shelter 2	4	55	stop info 1	1	49
bench 1	1	31	bench 1	1	45	shelter 2	4	39	bench 1	1	46	stop lighting	1	42
storage 1	1	27	stop lighting	1	37	courtesy trng	1	30	stop lighting	1	40	seating 2	5	39
shelter 3	5	24	courtesy trng	1	34	stop other	2	26	low floor bus	1	31	bench 1	1	37
Courtesy trng	1	23	storage 2	3	27	stop lighting	1	25	courtesy trng	1	30	on-bd info 1	1	36
Stop lighting	1	23	see camera	3	23	stop info 2	4	23	storage 1	1	30	courtesy trng	1	33
stop other	2	19	stop other	2	23	storage 1	1	22	shelter 3	5	28	storage 1	1	31
bench 2	2	17	low floor bus	1	20	low floor bus	1	21	seating 2	5	27	stop other	2	24
see camera	3	16	storage 1	1	18	bench 2	2	17	see camera	3	23	shelter 3	5	21
stop info 2	4	15	bench 2	2	16	see camera	3	17	stop other	2	21	storage 3	4	20
seating 2	5	15	seating 2	5	14	on-bd info 2	5	15	bench 2	2	15	seating 3	6	19
Low floor bus	1	11	on-bd info 2	5	11	storage 2	3	14	on-bd info 2	5	13	bench 2	2	14
Ride quality	6	8	stop info 2	4	11	ride quality	6	14	stop info 2	4	13	ride quality	6	12
On-bd info 2	5	6	shelter 3	5	8	seating 2	5	13	ride quality	6	11	low floor bus	1	11
seating 3	6	5	ride quality	6	7	shelter 3	5	7	storage 2	3	10	stop info 2	4	7
storage 2	3	5	storage 3	4	6	seating 3	6	4	seating 3	6	8	on-bd info 2	5	4
storage 3	4	5	seating 3	6	3	storage 3	4	3	storage 3	4	2	see camera	3	2

Intent to Take More Rides

In the survey, we also asked passengers about their intent to take more rides. The specific question was: "If your transit system had the features you selected on the previous page, how would this affect your decision to use transit?" In Table A10, the shaded area represents the group with the strongest positive view toward the amenities.

Table A10. PERCENTAGE OF RIDERS STATING THAT THEY WOULD TAKE ADDED TRIPS

city	percent saying they would take added trip; 12 point surveys				percent saying they would take added trips; 18 point surveys		
	no	probably	definitely		no	probably	definitely
Roch-ester	44	28	28		24	41	35
Port-land	59	27	14		51	35	14
San Fran	47	35	18		40	45	14
Ann Arbor	46	35	19		38	38	25
Aspen	59	34	7		40	38	23

The information suggests that greater spending on amenities (with increased budget from 12 to 18 points) adds to the stated willingness to take more rides in some cities. The rate of change, however, is statistically significant for the full population of transit riders only in Rochester, Aspen and Ann Arbor. The chart also shows that Rochester riders are more heavily influenced by amenities than are riders in the other cities. In Portland, less than half the respondents expressed a willingness to ride more often given the added amenities. It is interesting to compare the intent to take more rides with the willingness to forego a drop in fares. Rochester respondents were the least likely of those surveyed to trade fare reductions for amenities, but they were the most likely to express an intent to take more rides. This suggests that the people who would be willing to pay for an amenity are not necessarily the same people who would increase their trip frequency.

Which Amenities Induce Added Transit Trips?

Table A11 ranks the amenities according to the degree to which they would contribute to increased transit ridership. The scores are a relative measure and do not reflect the actual percentage of respondents who would increase their ridership if this amenity were present. Rather, it is a score that says that, combined with other amenities, an amenity with a score of 60 is much more likely to induce transit rides than an amenity with a score of 30. Compared with the ranking in Table A9, the amenity categories are in roughly similar places (for example, shelter, seating, and on-board information are in the top spots on both lists). The key difference is in the ranking of the levels. For

example, respondents in each of the cities found the basic shelter ("shelter 1") to be most worth the money, whereas they ranked the most deluxe shelter ("shelter 3") as much more likely to induce added trips. This is as expected, and the automotive parallel would be someone who would really love to drive a Rolls Royce, but who--realistically--recognizes the Volkswagen to be a better value.

How many added rides will a group of amenities with a high score induce? A precise answer is impossible from the survey. Our expectation that we could use the willingness to trade amenities for a drop in fare in order to derive an elasticity of ridership with respect to amenities is not possible because it is clear from the survey results that the correlation between willingness to trade and stated intent is very weak. The dollar value and the affect on ridership are sufficiently different to preclude the deduction of one on the basis of the other. Consequently, we have relied on just the stated response of intent to take more rides to estimate how the amenities would affect transit ridership.

The survey results tell us that amenities do promote transit use, but we must still make a purely exogenous estimate of how much. A reasonable estimate might be that respondents expressing a "probable" increase in the number of rides would take 2.5 percent more rides and that those who would "definitely" take more rides would increase their transit usage by 5 percent. This corresponds to an added 1 or 2 trips each month for someone who is currently a twice-daily rider. At this rate, spending of 18 points on amenities would increase transit ridership of existing riders at the five cities by about 1.5 to 3 percent.

Table A11. AMENITIES RANKED ACCORDING TO THEIR ABILITY TO INDUCE TRANSIT RIDES

Rochester	Pts	score	Portland	pts	score	San Francisco	pts	Score	Ann Arbor	pts	score	Aspen	pts	score
shelter 3	5	90	shelter 3	5	79	shelter 3	5	67	shelter 3	5	82	storage 3	4	74
seating 3	6	84	seating 3	6	69	on-bd info 2	5	64	on-bd info 2	5	67	seating 3	6	70
seating 2	5	65	shelter 2	4	65	stop info 2	4	64	seating 3	6	64	shelter 3	5	65
on-bd info 2	5	56	on-bd info 2	5	64	seating 3	6	59	stop info 2	4	63	seating 2	5	47
stop info 2	4	53	seating 2	5	61	shelter 2	4	56	storage 3	4	53	stop info 2	4	46
bench 2	2	52	stop info 2	4	57	seating 2	5	53	bench 2	2	52	stop lighting	3	44
storage 3	4	46	bench 2	2	54	on-bd info 1	1	45	on-bd info 1	1	51	on-bd info 2	5	41
seating 1	2	45	storage 3	4	50	storage 3	4	43	stop lighting	1	49	stop info 1	1	36
storage 1	1	42	stop info 1	1	49	bench 2	2	43	seating 2	5	49	courtesy trng	1	36
courtesy trng	1	38	on-bd info 1	1	48	courtesy trng	1	37	stop info 1	1	42	on-bd info 1	1	36
on-bd info 1	1	37	courtesy trng	1	46	seating 1	2	35	storage 1	1	39	shelter 2	4	36
shelter 2	4	36	stop lighting	4	46	sec camera	3	32	shelter 2	4	38	storage 2	3	35
stop lighting	1	35	seating 1	2	45	stop info 1	1	30	courtesy trng	1	36	bench 2	2	34
stop info 1	1	32	bench 1	1	30	stop other	2	30	low floor bus	1	34	stop other	2	28
sec camera	3	22	sec camera	3	27	bench 1	1	26	seating 1	2	29	seating 1	2	21
bench 1	1	22	stop other	2	27	stop lighting	1	25	bench 1	1	26	bench 1	1	17
stop other	2	22	storage 2	3	22	storage 1	1	24	stop other	2	24	storage 1	1	14
low floor bus	1	21	storage 1	1	21	shelter 1	1	22	sec camera	3	16	shelter 1	1	13
ride quality	6	18	low floor bus	1	16	low floor bus	1	18	ride quality	6	11	ride quality	6	13
shelter 1	1	10	shelter 1	1	13	ride quality	6	18	storage 2	3	10	low floor bus	1	11
storage 2	3	3	ride quality	6	8	storage 2	3	15	shelter 1	1	9	sec camera	3	5

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The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Bruce M. Alberts is president of the National Academy of Sciences.

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Abbreviations used without definitions in TRB publications:

AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ITE	Institute of Transportation Engineers
NCHRP	National Cooperative Highway Research Program
NCTRP	National Cooperative Transit Research and Development Program
NHTSA	National Highway Traffic Safety Administration
SAE	Society of Automotive Engineers
TCRP	Transit Cooperative Research Program
TRB	Transportation Research Board
U.S.DOT	United States Department of Transportation