

Promotional Strategies for Ridesharing: Market Study for a Congested Major Urban Link

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The Port Authority of New York and New Jersey is developing programs to encourage ridesharing in the metropolitan New York region. Trans-Hudson vehicular commuter trips were analyzed to provide information for assessing the feasibility of such programs and to facilitating program development and promotion. The study analyzed strategies to induce single-occupant automobile drivers to switch to ridesharing. This paper reports on situational, sociodemographic, and attitudinal factors that may influence commuters' responses to ridesharing incentives and promotional strategies. A market segmentation approach is used to identify target groups in the study population that would be most likely to switch to ridesharing. The paper outlines the analytic procedures used to conduct the study and reports the major recommendations to the Port Authority.

The Port Authority of New York and New Jersey is developing programs to encourage ridesharing in the metropolitan New York region. Trans-Hudson vehicular commuter trips were analyzed in order to assess the feasibility of such programs and to facilitate their development and promotion. The study analyzed strategies to induce single-occupant automobile (SOA) drivers to switch to ridesharing.

The Port Authority operates numerous transportation facilities in the New York metropolitan area, including six highway crossings between New York and New Jersey [see Figure 1 (1)]. These bridges and tunnels carry approximately 600 000 automobile occupants on a typical weekday, or approximately 400 000 automobiles daily. At all three Manhattan crossings, capacity during the peak hour is rationed by queues at each of the eastbound toll facilities. Based on volumes, congestion, trip ends, and directional balance, each of the Hudson River crossings presents separate and distinct markets for ridesharing incentives. For instance, high-occupancy-vehicle (HOV) lanes would be more attractive at congested facilities that have long toll queues. It might be counterproductive to promote ridesharing at facilities that have high transit modal splits. Consequently, each facility group should be considered separately.

This paper focuses on the George Washington Bridge, which handles more daily work trips than all other trans-Hudson crossings combined. Trip ends for the bridge commuters are generally more dispersed than for users of the tunnels. Also, transit alternatives for most eastbound bridge commuters are less attractive than for commuters who use the tunnels to reach downtown Manhattan. These circumstances suggest that the George Washington Bridge may offer a large potential market for ridesharing promotion among current SOA commuters.

APPROACH

The approach used in this study relies on two basic assumptions:

1. Commuters' responses to ridesharing incentives and promotional strategies are preconditioned by observable situational, sociodemographic, and attitudinal factors. Consequently, a profile of the target market is useful in anticipating commuters' responses to ridesharing incentives.

2. The target market may not be homogeneous with respect to sociodemographic, situational, or attitudinal traits. Different market segments of the

target population may differ in ways that would influence their proclivity to rideshare and affect their responses to various ridesharing incentives.

Factors That Affect Responses to Ridesharing Incentives

Based on the first assumption, we identified a number of sociodemographic, situational, and attitudinal characteristics of commuters that could be measured and used to analyze response to ridesharing incentives. Situational factors may be considered carpool opportunities and constraints. Among other things, they include sociodemographic (e.g., age, income, education, occupation, household composition, and automobile availability), and work-based influences (e.g., job schedule, employer subsidies of commuting expenses, and matching program availability).

Attitudinal factors fall into several categories, including life-style considerations and transportation attitudes. Life-style considerations include mastery, personal planning, life pace, intellectualism, and home orientation. These factors are commonly used in sociological and psychological studies of attitudes and behavior. For example, persons who have a high need for mastery or a sense of control are less likely to enter an arrangement that ties their daily schedule to other persons' schedules. Transportation attitudes include attitudes and beliefs with respect to air pollution, job

Figure 1. New York-New Jersey Port Authority crossings.



Table 1. Sociodemographic characteristics.

Item	CBD SOA ^a (n = 47)		CBD Carpool ^a (n = 21)		CBD Transit ^a (n = 41)		Non-CBD SOA ^b (n = 171)		Non-CBD Carpool ^b (n = 33)		Reverse SOA ^c (n = 99)	
	No.	SD	No.	SD	No.	SD	No.	SD	No.	SD	No.	SD
Male (%)	85.1		85.7		70.7		72.9		69.7		84.7	
Licensed drivers (%)	100.0		100.0		100.0		97.1		100.0		97.9	
Avg age	43.9	10.8	43.3	11.2	43.2	12.7	42.4	11.9	37.7	11.0	40.7	12.2
Occupation (%)												
Professional or technical	47.7		36.8		46.4		50.1		53.2		44.9	
Manager, official, or proprietor	22.7		31.6		26.9		28.2		28.2		24.5	
Mean household income (\$000s)	43.2	18.5	46.4	16.5	36.0	15.0	40.3	16.5	36.7	16.6	35.2	16.6
Household composition (mean number in household)												
Adults	2.5	1.3	2.2	0.5	2.2	1.1	2.6	1.1	2.5	1.0	2.3	0.8
Full-time workers	1.4	0.9	1.4	0.7	1.6	0.7	1.8	0.8	1.7	0.8	1.6	0.6
Automobiles	2.2	0.9	2.0	0.7	1.6	0.9	2.4	1.0	2.2	0.8	1.8	0.7
Children	1.0	1.4	1.0	1.0	0.9	1.2	1.0	1.2	1.1	1.3	0.9	1.2
Licensed drivers	2.4	1.3	2.0	0.7	2.2	1.1	2.4	1.0	2.2	0.8	2.0	0.8
Automobiles per licensed driver (% less than 1)	20.0		16.7		56.4		18.5		9.7		30.0	
Avg no. of months at current residence	102.8	98.7	106.2	88.0	99.3	107.0	115.8	111.8	98.6	88.6	90.6	86.6

^aCBD = home location west of Hudson River and work location in central business district.

^bNon-CBD = home location west of Hudson River and work location outside of central business district.

^cReverse = home location east of Hudson River.

flexibility, noise in the car, commuter satisfaction, money, perceptions of carpools, and sociability. For example, attitudes about noise in a car, including the radio and conversation, may make individuals reluctant to share their ride to work.

Market Segmentation

The key to the market-segmentation approach is the identification of groups in the target market that are homogeneous with respect to important criteria that influence their travel choices. In this study, geography and current mode are important segmentation criteria. Geographically, the commuting environment, including personal requirements and constraints, varies by direction and destination. For instance, New Jersey residents bound for the Manhattan central business district (CBD) face different opportunities and constraints than their counterparts bound for the other boroughs. The principal market segments in these analyses were as follows:

1. CBD SOA--SOAs bound for downtown Manhattan,
2. CBD carpool--carpoolers bound for downtown Manhattan,
3. CBD transit--transit patrons bound for downtown Manhattan,
4. Non-CBD SOA--SOAs bound for elsewhere in New York,
5. Non-CBD carpool--carpoolers bound for elsewhere in New York, and
6. Reverse-commuting SOA--SOAs bound for New Jersey.

These six groups were best represented in the survey data. Other market segments are relatively less important at the George Washington Bridge.

A mailback survey instrument was designed to measure all the factors mentioned in the approach. The survey was distributed at all six Hudson crossing facilities; however, only the data from the George Washington Bridge were analyzed for this report.

The survey was administered to these independent samples:

1. SOAs,
2. Carpoolers, and
3. Transit patrons.

This sampling design ensured that each modal group was sufficiently represented for a market segmentation study. The total response rate (26.4 percent) did not vary significantly among samples [see Charles River Associates study (2) for more detail on data collection].

SEGMENT PROFILES

Sociodemographics

Most of the commuters on the George Washington Bridge are male, have driver's licenses, and own their own automobiles (see Table 1). On the average, they are about 40 years of age. In the CBD segment, commuters tend to come from households of fewer full-time workers than do commuters from the reverse-commuting segment. Nearly half of the respondents in the CBD segment are employed in professional or technical positions. Household incomes tend to be high--in the neighborhood of \$40 000/year. Reverse commuters tend to be somewhat younger and come from smaller, less-affluent households. Among SOAs, only the reverse commuters average less than \$40 000/year.

Levels of automobile ownership do not significantly discriminate among segments. There tends to be one car for every driver, although automobile ownership levels may be somewhat lower for reverse commuters. Length of residence at the current home was highly variable over all segments, and no significant differences were found among segments.

Since it is generally believed that commuters who have higher income are more sensitive to time than to cost, the finding that George Washington Bridge commuters tend to be well-paid professionals who have their own automobiles available for commuting suggests that they are likely to be more sensitive to time-savings incentives than to the cost-saving advantages that are already available to carpoolers.

Work-Based Influences

The majority of all SOAs reported that their work schedule varied from day to day (see Table 2). Carpoolers were somewhat less likely to work variable schedules. Transit patrons tended to work the most regular hours. Strictly enforced work hours are

Table 2. Situational factors—work-based influences.

Work-Based Influences	CBD SOA (%) (n = 47)	CBD Carpool (%) (n = 21)	CBD Transit (%) (n = 41)	Non-CBD SOA (%) (n = 171)	Non-CBD Carpool (%) (n = 33)	Reverse SOA (%) (n = 99)
Variable work hours	70.2	47.6	37.5	56.7	40.6	51.0
Strict work hours	27.7	38.1	43.9	43.3	48.5	38.8
Frequent and unpredictable overtime	46.8	38.1	22.0	39.2	45.5	34.7
Frequent out-of-town travel	31.9	33.3	9.8	14.6	9.1	30.6
Varying shifts	14.9	4.8	0.0	9.4	15.2	8.2
Staggered hours	4.3	4.8	2.4	8.2	0.0	6.1
Flexible hours	36.2	52.4	43.9	36.8	39.4	41.2
Same daily work location	75.6	85.7	97.5	88.3	90.9	78.5
Need car for business	44.7	14.3	2.4	42.7	9.1	52.6
Carpool matching service	2.1	0.0	7.7	8.4	6.1	13.3

Table 3. Situational factors—employer-paid commuting expenses.

Employer-Paid Commuting Expenses	CBD SOA (%) (n = 47)	CBD Carpool (%) (n = 21)	CBD Transit (%) (n = 41)	Non-CBD SOA (%) (n = 171)	Non-CBD Carpool (%) (n = 33)	Reverse SOA (%) (n = 99)
Parking	38.3	23.8	0.0	22.2	6.1	26.3
Gasoline	36.2	14.3	0.0	17.5	6.1	34.3
Tolls	27.7	9.5	0.0	16.4	9.1	37.4
Automobile maintenance and repairs	34.0	4.8	0.0	13.5	9.1	26.3
Mileage allowance	4.3	4.8	0.0	7.6	3.0	8.1
Transit fare	4.3	0.0	0.0	1.2	3.0	9.1
Automobile insurance	31.9	9.5	0.0	11.1	9.1	25.3
Automobile purchase price	23.4	0.0	0.0	8.2	6.1	15.2
Parking tickets	12.8	0.0	0.0	5.9	6.1	4.0
Any of the above	53.2	28.6	0.0	36.8	15.2	48.5
Company-owned car	23.9	4.8	0.0	10.0	9.4	26.5
Average number of months at current work location	100.8 ^a	147.4 ^b	103.7 ^c	106.0 ^d	91.5 ^e	66.3 ^f

^aSD = 104.6. ^bSD = 110.0. ^cSD = 112.1. ^dSD = 96.6. ^eSD = 74.8. ^fSD = 78.0.

most common in the non-CBD segment; approximately one-half of these respondents report strict hours. Frequent and unpredictable overtime characterizes the work hours of two-thirds of the CBD SOAs; only half the non-CBD SOAs often work late. About one-third of all CBD and reverse-commuter SOAs reported out-of-town travel. Out-of-town travel is much less common in the non-CBD segments. Only small proportions of any segment reported varying shifts or staggered hours. Stability of the work location was particularly high for non-CBD commuters; more than 90 percent work at the same site every day. Among CBD and reverse-commuting SOAs, only 75 percent work at the same place every day. Nearly one-half of these SOA groups need a car for work-related business on some days. Somewhat fewer of the non-CBD SOAs need cars for work-related business. These schedule considerations, particularly variability of the job site and job-related travel, suggest that the non-CBD SOAs would be least constrained in their responses to ridesharing promotional programs.

Only small proportions of any market segment's employers offer carpool matching services. This suggests that substantial early gains can be made by helping employers set up ridesharing services.

Subsidized Commuting Expenses

Employers currently subsidize a substantial portion of the George Washington Bridge market segment's commuting expenses (see Table 3). More than one-half of all CBD SOAs report that some or all of their expenses are paid by their firm: company car, 24 percent; free parking, 38 percent; free gasoline, 36 percent; free tolls, 28 percent; maintenance and repairs, 34 percent; and insurance, 32 percent. Less than one-third of the CBD carpoolers receive

similar benefits. No CBD transit patron reported a subsidy.

Among non-CBD commuters, employer subsidies are less common; still, more than one-third of all SOAs receive some commuting subsidy. However, only 10 percent drive a company car. The pattern of employer-paid expenses for reverse commuters is similar to that for CBD SOAs.

Since larger proportions of CBD and reverse-commuting SOAs are subsidized, a non-CBD focus for a ridesharing program may reach more commuters who feel the pinch of increased commuting costs and would be responsive to the cost-saving incentives to carpool.

The pattern of subsidized commuting expenses and generally high incomes of George Washington Bridge commuters suggests that company cars and other commuting subsidies may serve to shelter employees from federal, state, and local income taxes, which would be levied on cash income. A company car is not generally taxable as personal income. Possible tax reforms could help eliminate unintentional side effects on choice of mode for work trips.

Attitudinal Factors

The attitudinal data were analyzed by using factor analysis techniques to identify common themes in the commuter's response sets. The most salient attitudinal findings are summarized below. In the interest of brevity, no statistical information is presented on the attitudinal factors.

SOAs tend to score somewhat higher on mastery needs. This is consistent with a theory that some SOAs may drive alone to satisfy a need for power and control.

With respect to personal planning, CBD carpoolers

tend to be freer, but all respondents are generally conservative. Any carpool promotion campaign designed to appeal to SOAs should ensure potential ridesharers that the carpooling or vanpooling arrangement will not break down.

Under life pace, SOAs also appear to live more hectic lives than do carpoolers. They tend to be more often exhausted at the end of the day. SOAs tend to live more closely structured lives. This suggests that SOAs would not be attracted to join a ridesharing group that had slipshod aspects or the perceived potential to be unreliable.

All commuters tend to be home and family oriented. A ridesharing promotional campaign should emphasize benefits that accrue to the family and home from having the breadwinner carpool (e.g., home punctually and safely and the car is free for use at home). No group indicated that it particularly liked large social gatherings. A large work-based get together for potential carpoolers to meet one another may make commuters less comfortable with one another than would smaller, more personalized meetings. This supports the concept of carpool coordinators at the workplace who would help potential ridesharers meet one another on a more personal basis.

All groups feel that air pollution is a problem in New York. However, a simple media appeal to rideshare because it is good for the ecosystem is unlikely to shift many SOAs into carpools without added encouragement, incentives, and facilitation.

Ridesharing may be perceived as a sacrifice in job and schedule flexibility. Promotional campaigns should emphasize the flexibility of ridesharing relationships. Consistent with the professional and technical jobs they generally hold, most respondents indicated they could come and go as they pleased from their jobs. They tend to feel they need this flexibility.

In terms of satisfaction with their current commute mode, non-CBD carpoolers tended to be more satisfied than other groups. In the CBD, both SOAs and carpoolers report driving daily in bumper-to-bumper traffic, but it tends to bother SOAs more. Traffic is not as big a problem for non-CBD commuters, but it remains one of the biggest headaches for non-CBD SOAs and reverse commuters. Promotional appeals should indicate that carpooling is a good way to share the chores of driving in traffic, and that carpoolers have been shown to be more satisfied with their work trips than are SOAs. Heightened sensitivity to traffic snarls among SOAs also suggests that priority treatments, such as special lanes or toll booths for carpoolers, could shift disgruntled drive-alone motorists into the shared-ride mode.

RESPONSES TO RIDESHARING INCENTIVES

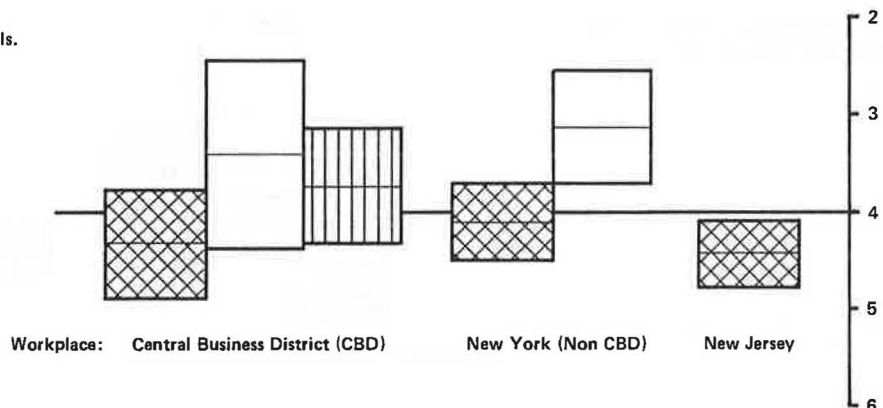
Respondents were asked to agree or disagree on their responses to seven specific transportation system management (TSM) incentives to encourage ridesharing. A seven-point scale was used; high values indicated disagreement and low values indicated agreement.

1. I would be more likely to carpool if I could travel in a special highway lane just for carpools,
2. I would be more likely to carpool if I could use toll booths just for carpools,
3. I would be more likely to carpool if I could go to the head of the line at toll booths,
4. I would be more likely to carpool if I were granted special parking privileges at work,
5. I would be more likely to carpool if carpoolers could go through toll booths free,
6. If I were rationed to 10 gal of gasoline a week I would be more likely to carpool, and
7. I would be more likely to carpool if we could use a van provided for the exclusive use of the carpool.

Reactions, in the form of agreement or disagreement, should be interpreted as the extent to which the respondent believed he or she would be persuaded to carpool by the relevant change in the commuting environment. Negative responses should not be interpreted as a rejection of the concept but rather as evidence that the respondent viewed it unlikely that a given incentive would influence him or her to carpool more often. Similarly, positive reactions should not be viewed as an endorsement of a particular policy option but rather as recognition that the policy would influence the respondent to carpool.

Analysis of the results of this portion of the questionnaire showed that different promotional strategies have different appeals for different market segments. Among SOAs, special highway lanes for carpools yielded the most positive response from non-CBD SOAs [see Figure 2 (2)]. (In Figures 2-9, the 95 percent confidence interval was for the George Washington Bridge market segment only. On a 1-7 scale, values less than 4 indicate agreement, and values greater than 4 indicate disagreement.) Priority treatments at toll booths, on the other hand, elicited few positive responses from SOAs [see Figures 3-5 (2)]. Special parking privileges for carpoolers were not perceived as a benefit for non-CBD and reverse SOAs, who already generally enjoy free parking [see Figure 6 (2)]. Gasoline rationing would probably have a dramatic positive effect on carpooling to job sites outside the CBD because commuters would tend to try to maximize

Figure 2. Confidence intervals for commuter responses to a special highway lane just for carpools.



their fuel allotment for discretionary trips by reducing their fuel use on nondiscretionary commuting travel [see Figure 7 (2)]. Vanpooling had a significant appeal for transit patrons [see Figure 8 (2)]. This may be due to the similarity of the modes; however, the vanpool is perceived as a more personalized mode. It may also be that the lower-income transit patrons would enjoy the use of a van. The Golden Gate Bridge Highway and Transportation District has experienced considerable success in filling vanpools by direct promotion at bridge toll plazas (3). Such a program would probably be successful at the George Washington Bridge but might have an adverse impact on peak-period transit rider-

ship. The Port Authority wishes to minimize adverse effects on transit ridership that result from ride-sharing promotion.

Work-Based Versus Community-Based Ridesharing

A separate question tested the appeal of carpooling with a neighbor rather than a coworker. The results are noteworthy [see Figure 9 (2)]. Among current carpoolers to the CBD, sharing the ride with a neighbor was seen as more likely than carpooling with a coworker. Non-CBD carpoolers stated they were more likely to carpool with a coworker.

This finding suggests that a work-based approach

Figure 3. Confidence intervals for commuter responses to toll booths just for carpools.

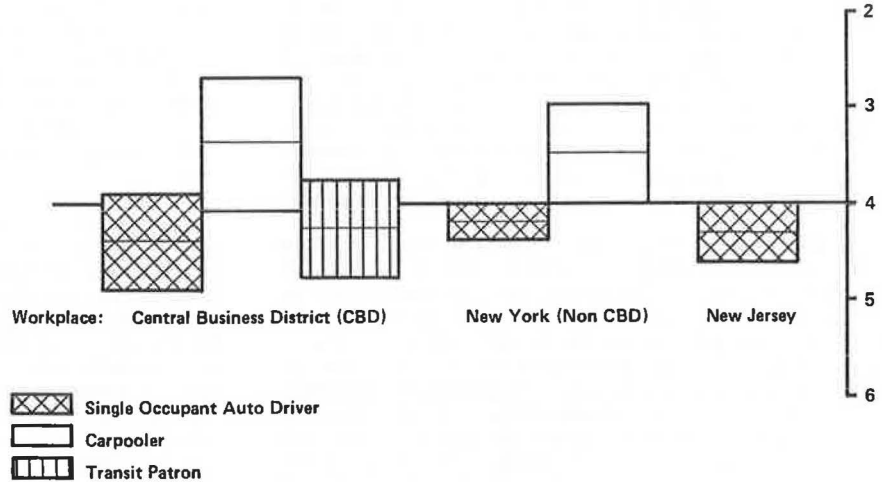


Figure 4. Confidence intervals for commuter responses to carpools going to the head of the line at toll booths.

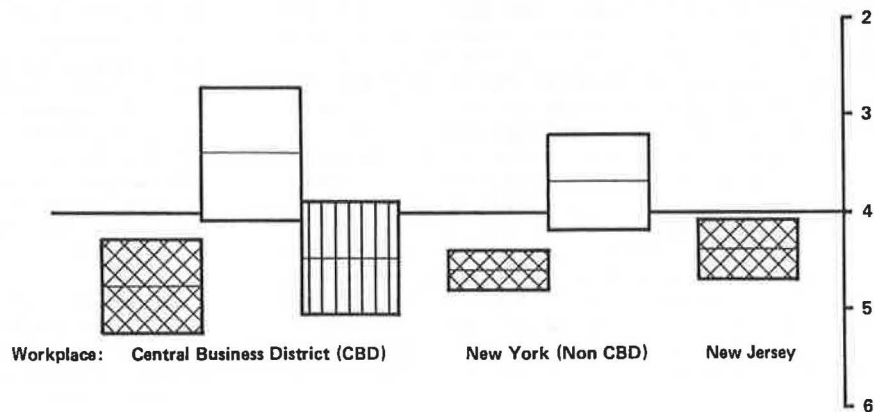
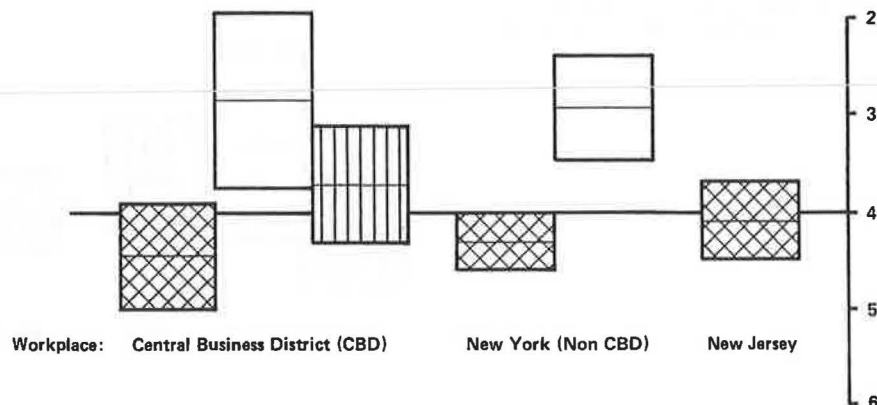


Figure 5. Confidence intervals for commuter responses to free tolls for carpools.



to ridesharing promotion would be a more effective strategy in recruiting non-CBD and reverse commuters. In contrast to CBD work trips, non-CBD work sites are geographically more dispersed. This reduces the chances that a commuter would find a neighbor working at his or her work place. There is a greater chance for successful matching with a work-based approach because potential ridersharers are known to have one trip end in common as well as common start and end times for work. With some cre-

ativity, matches could be made between coworkers who may not be neighbors but share a substantial portion of the route to work because they live in the same corridor. Each ridesharer would drive to a node on the highway system where he or she would park and ride with a coworker over the line-haul portion of the trip. Connecticut has experienced considerable success with roadside park-and-pool lots near major highway interchanges.

A neighborhood-based approach to ridesharing pro-

Figure 6. Confidence intervals for commuter responses to special parking privileges for carpools.

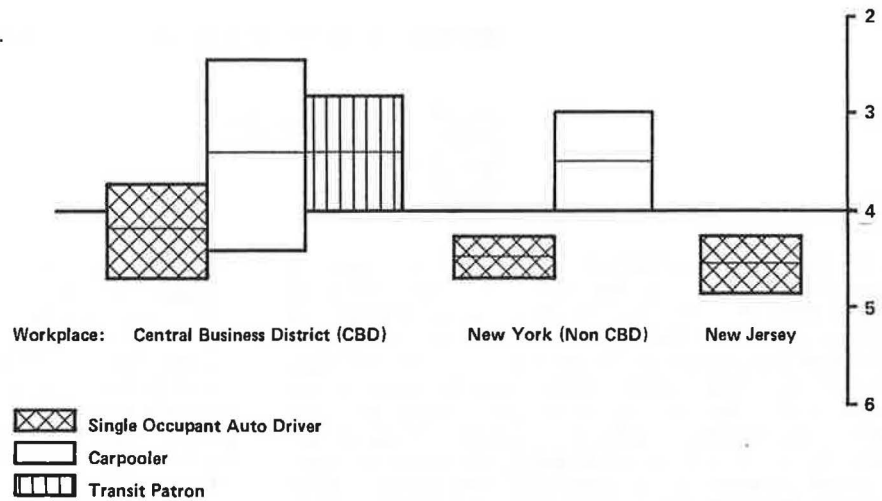


Figure 7. Confidence intervals for commuter response to carpooling if gasoline were rationed.

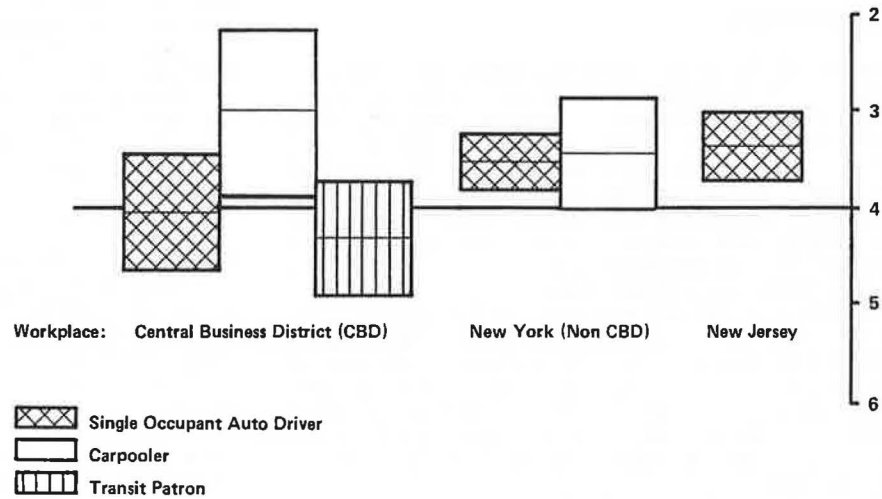


Figure 8. Confidence intervals for commuter responses to vanpooling.

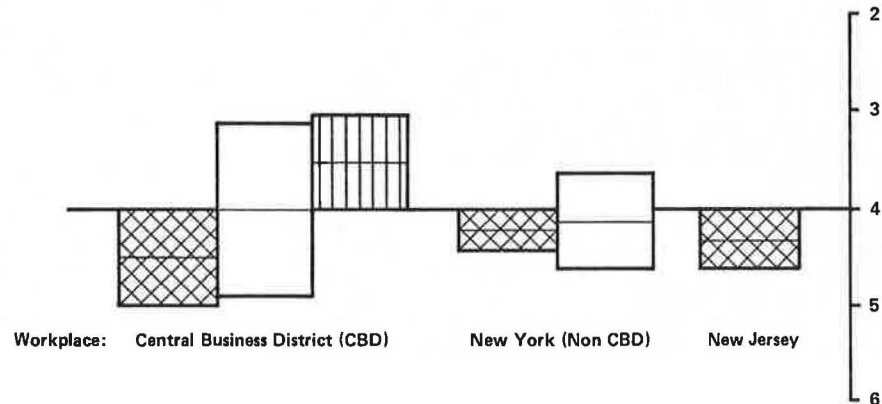
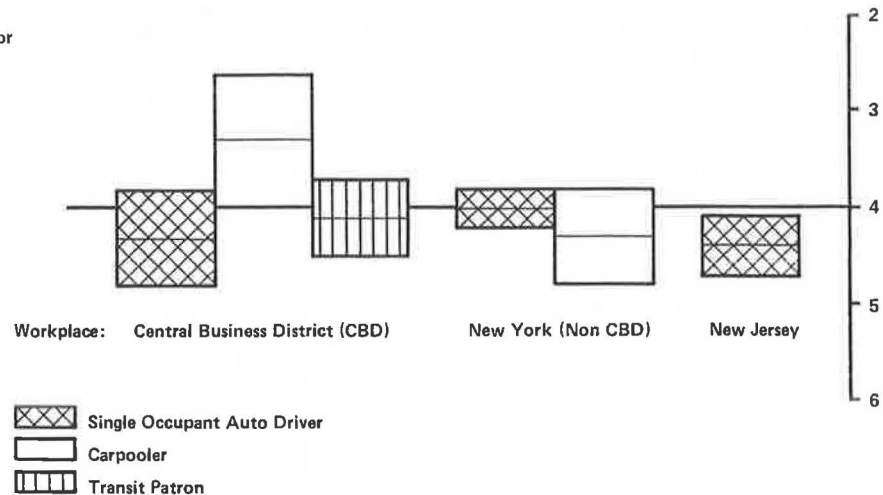


Figure 9. Confidence intervals for commuter responses to likelihood of carpooling with a neighbor versus a coworker.



motion could be particularly effective in creating successful matches for CBD commuters, many of whom now use transit. The CBD has the highest employment concentrations in the region; therefore, neighborhood-based matches would be most easily made to that destination. This could have adverse effects on transit ridership because most CBD commuters currently ride transit. With a neighborhood-based approach it would not be politically feasible to deny CBD-bound commuters ridesharing services. Consequently a work-based approach to ridesharing promotion, targeted to the non-CBD market, is favored for this project.

RECOMMENDATIONS

Analysis of the ridesharing opportunities and constraints that face SOAs in each of the George Washington Bridge directional segments suggests that non-CBD SOAs would be least constrained and most responsive in reacting to ridesharing incentives and promotions. A much smaller proportion of these SOAs are heavily subsidized with company cars, free gasoline, tolls, and parking. They also have greater stability of work location, more regular work hours, and make fewer out-of-town trips.

For the non-CBD and reverse-commuter market segments, a work-based approach is favored over a community-based approach to ridesharing. A system of park-and-pool lots along major corridors in New Jersey would facilitate carpool formation among groups of commuters who have a common schedule and work destination but disparate home origins in the same corridor.

The work-based approach could work through the employer to promote carpooling at individual employment sites. Once an employer is committed to ridesharing, he or she should be informed about ways in which schedule and work travel policies could be changed to facilitate carpool formation. Changes in the work environment might include a motor pool of employer-owned vehicles for occasional employee use in place of company cars that carry so many SOAs in this corridor.

Notwithstanding the emphasis on a work-based approach, the Port Authority should also avail itself of opportunities for ridesharing promotion at the bridge itself. Signs that give a telephone number to call for carpool information are a low-cost channel to reach first-acceptors for ridesharing services. This assumes that the Port Authority

would establish some telephone information system capability for the work-based approach. The phone-line signs would probably be most effective at the new HOV lane proposed for the bridge. Commuters would have an opportunity for first-hand observation of a timesaving incentive to rideshare. Similarly, vanpool promotion at the toll plazas could capture substantial ridership. However, vanpool marketing at toll plazas would not screen out potential diversion from transit.

Analysis of TSM incentives to encourage ridesharing suggests that techniques that save time or make carpools more reliable would more effectively induce carpool formation in this relatively affluent market than would techniques that save commuters money.

Analysis of attitudinal factors suggests that they are not an overriding influence in responding to ridesharing incentives. Nonetheless, a ridesharing promotional campaign should be sensitive to the attitudinal complexes that characterize the different target market segments.

ACKNOWLEDGMENT

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