ARIZONA DEPARTMENT OF TRANSPORTATION

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AN EVALUATION OF ALTERNATIVE ECONOMIC INDUCEMENTS TO RIDESHARING FOR THE ARIZONA COMMUTER

Volume I: Project Overview and Findings

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16. Abstract

A report is offered on a study of the relative effectiveness of alternative inducements to ridesharing in the Phoenix and Tucson metropolitan areas. The objectives are to provide evidence on the efficacy of a broad range of incentives and to establish a clearly defined methodology for such assessment.

The study was conducted in three phases:

I. Comprehensive inventory of ridesharing incentives currently employed in metropolitan areas across the country, from which a group of incentives appropriate to the Arizona study areas were selected for further analysis.

II. Surveys of both commuters and their employers were conducted. For commuters, information on present commuting arrangements, demographic and economic characteristics and general attitudes and perceptions of ridesharing, along with the conjoint analysis procedure designed to determine the effect of incentives upon ridesharing lieklihood was gathered. Employer opinions about ridesharing, the acceptability or feasibility of each incentive, and the perceived effect on their employees were also gathered.

III. A market segmentation methodology was first developed to categorize commuters based on behavioral indicators. Statistical estimation of each incentive's effect by segment was then performed. Finally, comparison of segments both within and between study areas was performed.
Volume II, 54 pages, contains Research Methodology.
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EXECUTIVE SUMMARY

This study was undertaken to provide preliminary evidence on the efficacy of a broad range of incentives to encourage increased commuter ridesharing in Arizona. Closely allied to this objective was the attempt to establish a clearly-defined methodology which could be employed by urbanized Arizona communities or communities elsewhere to obtain conclusive evidence on the effectiveness of any set of ridesharing incentives under consideration. Interest in the project is stimulated by the considerable potential that ridesharing promotional programs have to reduce peak hour traffic congestion. Such demand management approaches are seen as key elements aiding the efforts of transportation system planners in the high growth Phoenix and Tucson urban areas to meet rapidly increasing needs for additional system capacity.

The research plan was designed to improve upon previous ridesharing research in three major ways. First, it was seen as desirable to evaluate ridesharing incentives from the dual perspectives of behavioral efficacy--the ability of specific incentives to induce additional commuters to rideshare--and institutional acceptance--the likely organizational response of employers to aid in the institution of specific incentives. Second, it was deemed appropriate to adopt a market segmentation approach in order to differentiate specific "target segments" of commuters who are most likely to be potential adopters of ridesharing journey-to-work arrangements. Third, it was considered essential to employ the most powerful methodological tools available to evaluate potential incentives, known broadly as the method of

conjoint measurement/analysis. In brief, this procedure requires prospective ridesharers to evaluate their likelihood of ridesharing under a variety of different scenarios reflecting differing combinations of ridesharing incentives. The result is more accurate, more realistic, and hence more usable appraisals of the effectiveness of ridesharing incentives. This approach improves upon prior studies, where respondents have typically been asked in a simplistic fashion for their direct opinion of isolated incentives and where differential responses of segments of the commuter pool have not been anticipated or the institutional barriers to adoption considered.

The study involved three major phases. In Phase I, a comprehensive inventory of commuter ridesharing inducements was compiled for metropolitan areas across the nation. The purpose of Phase I was to identify a set of feasible and potentially effective inducements for further evaluation by Arizona metropolitan area commuters and employers. A mail survey of city, regional and statewide ridesharing coordinators was undertaken. Returned questionnaires were tabulated and the results stratified by characteristics of the responding metropolitan areas so as to correspond closely with the attributes of the Phoenix and Tucson situational contexts.

The principal findings from Phase I were twofold. First, tabulations were prepared of the national survey of ridesharing professionals, showing the frequency with which specific incentives have been applied in U.S. metropolitan areas. In addition, the level of potential effectiveness of each incentive, as perceived by the responding ridesharing professionals, was determined. These tabulations included both those incentives discussed in the ridesharing literature, as well as innovative, often unique, incentives reported by individual ridesharing administrators.

The second and more important output of Phase I, however, was the determination of a set of seven types of ridesharing incentives specifically identified for possible adoption in the two major Arizona markets. These incentives were decided upon by the research team in conjunction with the Arizona Department of Transportation Supervisory Committee. In broad terms, the sets of incentives correspond to the principal aspects of the commuter's home-to-work journey: (1) method of establishment of the car/vanpool (self-arranged, computer generated lists or arranged by on-site coordinators), (2) nature of vehicles and drivers (shared vehicles and driving, reimbursement for driving and use of vehicle, or driven in employer-owned vehicle), (3) extent of composition of ridesharing pool (co-workers, other employees of same employer, or anybody), (4) extent of reimbursement for ridesharing (shared expenses by poolers, half or full subsidy for ridesharing expenses), (5) location of pick up point (park-and-ride lot, home or public parking), (6) arrangements for highway travel (no special treatment of ridesharing vehicles, preferential freeway access, or special high occupancy vehicle lanes), and (7) work place parking (free for pool vehicles, reserved preferential parking or covered preferential parking).

In Phase II, research designs were developed to collect both commuter and employer preference data regarding the seven sets of incentives, and the specific incentives (or "levels") within each set. A judgmental sampling plan was devised to select employers for inclusion in the study in both the Phoenix and the Tucson study areas. A wide variety of public and private sector organizations were represented in the samples of employers. Employee respondents were randomly selected by the organizational contacts (ridesharing coordinators or personnel managers) using procedures specified by the research team. Designated employees completed a lengthy questionnaire designed to elicit information about the respondents' present commuting arrangements,

demographic and economic characteristics, and their general attitudes and perceptions of ridesharing. In addition, the conjoint analysis task was administered. The latter required respondents to "trade off" the desirability of the specific incentives contained in the seven incentive groups in reaching judgments about their likelihood of starting to rideshare. In parallel to the commuter survey, Phase II also comprised a key informant survey of management opinions about ridesharing at the employer oganizations from which the commuter respondents had been selected. The rideshare coordinator/personnel manager contact at each participating organization served as a "key informant," providing reports of (a) their organization's attitudes toward ridesharing, (b) the acceptability or feasibility of each incentive from the standpoint of their organizations's participation, and (c) the perceived likely commuter response to each incentive.

Phase III consisted of the statistical analysis of the data obtained in Phase II, and of a distillation of the results. Responses to the surveys of commuters and employers were examined. Separate detailed tabulations were carried out for the Phoenix and Tucson samples and a volume of tables prepared for use by those interested in ridesharing patterns and opinions in these two metropolitan areas. The next major step of Phase III was a comprehensive market segmentation analysis to identify subgroups of commuters, varying in terms of their responsiveness to ridesharing incentives, so that maximally cost-effective ridesharing promotional packages might be offered in pursuit of each subgroup. The segmentation scheme recognized that "situational constraints," such as the need to deliver and pick up children on the way to and from work, the use of personal vehicles during work hours, or irregular schedules, would make some commuters much less able to adopt ridesharing than others.

Since the absence of constraints alone does not motivate ridesharing, the segmentation scheme also considered commuters' willingness or desires to rideshare, in the form of psychological attitudes toward the act of ridesharing. By combining each commuter's responses to questions about his or her intention to rideshare in the coming year (none, low, or high) along with his/her attitudes toward ridesharing (unfavorable, neutral, or favorable), four segments of non-ridesharing commuters of interest were identified, meeting at least the criteria of low stated likelihoods of ridesharing and neutral or better attitudes toward ridesharing. These individuals represent the group of commuters for whom ridesharing incentives have some chance of working. The remaining commuters either consider it impossible or highly unacceptable to rideshare, or else plan to begin ridesharing anyway. Using similar logic, persons currently ridesharing were divided into two groups--those planning to continue and those not. Only the latter are of interest for the development of ridesharing incentives, since preclusion of their intentions to cease ridesharing will increase the size of the total ridesharing population. A potentially significant finding of the segmentation analysis was that the relevant ridesharing target groups appear to cut across more traditional groupings based on demographic or economic characteristics. This socio-economic heterogeneity of the groups reaffirms the importance of such a market segmentation approach to designing effective ridesharing incentive programs.

Following the identification of commuter target market segments, conjoint analysis was performed for each group. The results consist of a series of "impact profiles" showing the unique contribution to increased ridesharing likelihood which are produced by each incentive considered in the analysis. The most striking feature of the profiles is the large variation between target segments, even within a metropolitan area, with regard to the

effectiveness of the various incentives studied. In addition to the variation in incentive impacts between the target segments within a metropolitan area, substantial differences in impact also exist if the same segment is compared between the two metropolitan areas. This reflects the effect of different situational constraints. For example, for segment C (relatively low likelihood, generally favorable attitude) workplace parking incentives have a substantial effect in Tucson and minimal impact in Phoenix. The difference may reflect variations in the structure of current commuting arrangements in the two metropolitan areas, particularly workplace parking availability. The only incentive found to have strong and widespread impact on ridesharing intentions across all target segments is the provision of employer-based vanpools. Other incentives were found to appeal only to specific groups, thus suggesting the need to design appropriate incentive packages to attract specified population targets. Analysis of the employer survey results was also completed, yielding among other findings the interesting observation that vanpool programs are not viewed by the organizational respondents as being particularly effective, nor especially likely to be adopted--at least not in the absence of considerable governmental assistance.

The detailed procedures and findings of the study are presented in three volumes. Volume 1 contains an overview of the project and major findings. It was written for a general readership. Volume 2 contains a more technical discussion of the study's methods and information about the exact procedures utilized to obtain the results described in Volume 1. It is anticipated that this volume will be primarily of use to researchers wishing to replicate or borrow various aspects from the project's methodology. Finally, Volume 3 consists of three Appendices containing the detailed statistical tabulations of Phase II commuter and employer surveys. Results for Phoenix and Tucson are separately presented therein.

In summary:

(1) Transportation planners can benefit from the use of market segmentation techniques based on behavioral indicators to develop ridesharing incentive packages. In particular, attitudes toward ridesharing and likelihood of ridesharing have been demonstrated to be effective segmentation criteria. Moreover, traditional socioeconomic characteristics have not been found to correspond with these behavioral indicators, thus casting doubt on their usefulness as segmentation criteria.

(2) An easily implemented and powerful methodology designed in this study can be employed by local ridesharing agencies to assess the impact of any set of potential incentives on ridesharing. The method improves on past approaches by more realistically representing the commuter's choice process thereby giving more accurate estimates of impacts while being easily administered and analyzed.

(3) The results indicate the need to formulate unique ridesharing programs to be directed at each target market segment in each metropolitan area. The lack of the emergence of a single program appropriate for all segments within an area or for a single segment in both metropolitan areas confirms the need for transportation planners to employ a wider range of ridesharing incentives to appeal to diverse sets of potential ridesharers.

AN EVALUATION OF ALTERNATIVE ECONOMIC INDUCEMENTS TO RIDESHARING FOR THE ARIZONA COMMUTER

INTRODUCTION

One of the most pressing problems facing transportation systems in rapidly growing metropolitan areas is excessive demand in relation to available capacity, resulting in high levels of peak period congestion. Increasing transportation system capacity by building new roadways or mass-transit systems, however, requires enormous capital expenditure programs, prompting transportation planners to seek alternative solutions to the problem. Among the most attractive has been the approach of demand management, in which usage of transportation systems is altered to bring effective demand into balance with available capacity. Not only is demand management appreciably less costly in economic terms, it also requires less time to produce its intended effects than the alternative of structural changes in the capacity of system.

In this context, the encouragement of commuter ridesharing represents a most promising strategy of transportation demand management. Ridesharing has been broadly defined as follows:

> "...Two or more persons traveling by any mode of transportation, including, but not limited to: carpooling, vanpooling, buspooling, shared-ride taxis and jitneys and public transit. In its most familiar form ridesharing refers to the commuter work trip."
> (National Task Force on Ridesharing, 1980)

From a transportation planning perspective, it is preferable to restrict the scope of ridesharing to the form most commonly observed, the commuter home-to-work trip among unrelated persons who travel together on a more or less regular basis to particular employment sites. Conceptualized in this manner, ridesharing represents a stable, definable class of travel behavior amenable to planning and to a degree of central control by transportation policy makers. It has been estimated that work-related travel accounts for almost 40 percent of

all automobiles trips. Moreover, vehicle occupancy studies in Arizona have shown that 75 to 80 percent of the vehicles are on the road during peak travel hours. Thus implementation of large-scale commuter ridesharing programs offers significant opportunities to reduce total demand on the transportation system, especially during periods of peak congestion.

While a growing literature on ridesharing has accumulated in recent years, too little is known about the most effective incentives at the disposal of transportation system managers for encouraging the adoption of commuter ridesharing. Numerous studies have sought to ascertain the effects of alternative inducements on commuters. Alternately, a number of efforts have examined incentives to induce organizations to encourage ridesharing by their employees, or perceptions of employers of their employee's attitudes toward ridesharing. While offering useful insights, neither these studies nor others in the literature have evaluated commuter ridesharing incentives from the dual perspectives of behavioral efficacy and institutional acceptance by employers. Employers play a central role in commuter ridesharing inducement programs, and the role of their input in overall traffic system management has long been recognized.

A second major limitation of prior studies of commuter ridesharing incentives is the absence of a market segmentation approach to judge the effectiveness of alternative inducements. Typically, commuters have been viewed as an undifferentiated "mass market" rather than as comprising segments of the total market whose responsiveness to alternative incentives might well vary. Market segmentation has gained widespread acceptance in commercial marketing efforts, where its use has enabled organizations to efficiently target their selling resources on the prospective customers most likely to respond favorably.

This concept would appear particularly appropriate for the "marketing" of ridesharing, since only a relatively small fraction of the work force is likely to be encouraged to participate. The restricted size of the potential adopter population would appear to be due to two major factors. First, only certain segments of the population are attitudinally predisposed. Second, other segments are precluded from participation due to situational constraints. Thus, a market segmentation approach that is based upon these factors would lead to better program design.

A third shortcoming of prior studies of ridesharing incentive effectiveness is methodological. Virtually all research has examined the effectiveness of alternative incentives individually; each incentive is studied alone. In this context, direct commuter appraisals of their importance of particular incentives may tend to overstate considerably the effectiveness of those incentives. Such measurement deficiencies may be overcome through the use of questioning procedures involving forced trade-offs between alternative incentives. Formally known as conjoint measurement and analysis, these methods provide more accurate assessments of the actual contributions of alternative inducements to increasing the adoption of ridesharing by commuters.

In view of the limitations noted above, transportation system planners lack both direct knowledge and usable methods with which to provide such knowledge of the alternative incentives for stimulating commuter ridesharing. Moreover, no mention is generally made of the effect of employer acceptance and support. It is these needs to which this study was directed.

Study Scope and Objectives

The principal purpose of this study was to develop a method for identifying effective alternative incentives for increasing ridesharing by commuters, while

at the same time simultaneously appraising the acceptability of these incentives to private and public sector organizations. In addition, the study sought to provide preliminary evidence on the question of which specific incentives offered the most potential for inducing ridesharing among Arizona commuters and gaining the support of their employers.

Central to the accomplishment of these purposes were a number of more specific research objectives:

1) To develop a comprehensive taxonomy of current and potential commuter ridesharing incentives from a national taxonomy,

2) To identify commuter ridesharing incentives of particular applicability to Arizona metropolitan areas,

3) To segment the commuting public into groups of individuals of varying potential for personally adopting ridesharing in their commuting to work,

4) To accurately appraise the efficacy of selected ridesharing incentives on increasing commuter's attraction to and personally engaging in ridesharing within identified market segments,

5) To assess the acceptability of effective ridesharing incentives to the organizations employing commuters,

6) To identify the congruence of employer's perceptions of ridesharing incentive effectiveness to the efficacy of these incentives as determined in 4) above.

Thus, the research report that follows serves to provide transportation system planners with not only preliminary evidence of the potential effectiveness of various commuter ridesharing incentives in Arizona, but more importantly it sets forth a clear-cut methodology from which conclusive evidence may be generated as appropriate to circumstance.

METHOD OF STUDY

To accomplish the foregoing objectives, a three-phase research program was undertaken. Phase I involved both primary and secondary research to compile a comprehensive inventory of commuter ridesharing incentives and assess their applicability for further evaluative study in metropolitan Arizona transportation systems. Phase II comprised the fieldwork for a survey of over three hundred Arizona commuters and their respective employers, to gather detailed data on reactions to selected ridesharing incentives identified in Phase I as suitable for Arizona. Phase III involved statistical analysis of the detailed information obtained from the surveys in Phase II.

Phase I

Phase I began with a review of published ridesharing studies to identify specific commuter ridesharing incentives discussed in the literature. Next, a census of all traceable ridsharing programs in the United States was conducted to determine specific forms of ridesharing incentives presently in use, used in the past, and contemplated in the future. A total of 287 metropolitan and statewide ridesharing coordinators listed by two national ridesharing organizations (The Association of Ridesharing Professionals and The National Ridesharing Information Center) were identified as appropriate respondents for survey purposes. Each individual was sent an introductory letter of explanation and an 8-page questionnaire requesting information on (1) the ridesharing inducements presently in use, used in the past, and contemplated in the future; (2) the perceived effectiveness of each inducement actually used; (3) the major situational (or area-specific) characteristics of each respondent's ridesharing area (e.g. population density, traffic congestion, duration of typical

home-to-work trip, downtown parking facilities, etc.) which could affect the success of ridesharing inducements. The actual questions asked are discussed in more detail and are shown in Volume 2.

The initial mailing was followed by two separate post card reminders at two-week intervals, resulting in an overall response rate of close to 40%, representing a total of 105 ridesharing agencies. Inspection of the affiliation of the responding agencies, their population served, and broad census geographic division (Table 1) indicated that the survey respondents reasonably reflected the diversity of agencies across the nation. Since the major purpose of the survey was exploratory, i.e. to compile an open-ended inventory of ridesharing incentives for study in Arizona communities, rather than to make precise estimates of usage by all agencies, further assessments of potential non-response bias were not made.

Analysis of the data provided by the responding ridesharing agencies which is presented in the Findings section of this volume, along with the results of the literature search at the outset of Phase I, led to a review meeting with ridesharing personnel from the Maricopa and Pima Associations of Government and transportation planning personnel from the Arizona Department of Transportation. At this meeting, a set of seven ridesharing incentive groups, corresponding to the major aspects of the home-work commuting trip, were accepted for further study in Phases II and III.

Phase II

Phase II began with the development of survey research designs for the collection of commuter and employer preference data regarding the seven incentive groups emerging from Phase I. Inasmuch as Arizona ridesharing programs to date have concentrated on the centers of state population, the

TABLE 1

Profile of Ridesharing Agencies Surveyed

Characteristic	Number	Percentage
RSA Affiliation[a]		
Governmental		
City	23	14.7%
County	23	14.7
Association of Governments	27	17.3
State	40	25.6
Federal	13	8.3
Non-Governmental		
Non-Profit	27	17.3
Profit	3	1.9
Population Served by RSA[b]		
Population Size		
Less than 200,000	18	18.6%
200,000 to 399,000	22	22.7
400,000 to 599,000	11	11.3
600,000 to 799,000	5	5.2
800,000 to 999,000	5	5.2
1,000,000 to 1,999,000	14	14.4
2,000,000 to 2,999,000	8	8.2
3,000,000 to 4,999,000	9	9.3
5,000,000 and over	5	5.2
Number of Counties Served[b]		
One	31	39.2%
Two	14	17.7
Three	7	8.9
Four to Six	13	16.5
Seven to Nine	11	13.9
Ten and over	3	3.8
Census Geographic Division[b]		
New England	6	6.3%
Middle Atlantic	8	8.3
East North Central	15	15.6
West North Central	8	8.3
South Atlantic	18	18.8
East South Central	8	8.3
West South Central	9	9.4
Mountain	10	10.4
Pacific	14	14.6

[a] Total more than 105 due to multiple responses

[b] Total less than 105 due to missing responses

Phoenix and Tucson metropolitan areas were both selected as study areas. In each area, a judgmental sampling plan was devised to represent the major organizations employing home-to-work commuters. By design, the sampling plan was structured to include organizations of varying employer size and of varying economic/institutional activity (manufacturing, mining, trade, communication services, transportation, medicine, government, and education) as characteristic of each metropolitan area. Virtually all organizations contacted agreed to participate (92%), resulting in a total of 12 different employers in Phoenix and 10 in Tucson, as shown in Table 2.

Within the 22 sampled organizations, personnel managers and corporate ridesharing coordinators were contacted and asked to participate in the survey effort by (1) selecting a sample of the employees at the worksite for purposes of responding to the commuter survey, (2) serving as a key informant for their organization by completing the employer survey. Personnel mamangers/ridesharing coordinators were instructed to select employees for the commuter survey at all occupational levels in the organization, regardless of present mode of commuting to work. Further, they were instructed to make their selections at random. Field checks confirmed compliance with these sampling instructions. Completed questionnaires by commuter respondents were returned anonymously to the employer representatives, who in turn forwarded them to the research team.

A total of 525 employees were selected by employers and given questionnaires. A response rate of 70% was achieved. Of the returned questionnaires, 338 (or 64% of the number distributed) were of usable quality. Of the 22 employers sampled, completed employer questionnaires were returned by 17, for a response rate of 77%. Owing to the high response rates in both surveys, the magnitude of potential nonresponse error is limited, and further efforts to appraise it were not made.

TABLE 2

Firms and Organizational Contacts in Employer Sample for Phoenix and Tucson Metropolitan Areas

Metropolitan Area	Firm	Organizational Contact
Tucson		
	Mountain State Engineering	Ms. Cheryl Springer (Acting Personnel Director)
	IBM	Mr. Bob Lindholm (Ridesharing Coordinator)
	Diamond's	Mr. Ed Duncan (Personnel Manager)
	University of Arizona	Ms. Cindy Lutz (Alternative Modes Coordinator)
	Anamax Mining	Mr. Walt Raub (Personnel Manager)
	Hughes Aircraft	Mr. Jim Mize (Manager of Employment)
	Burr Brown	Ms. Carolyn Swan (Rideshare Program Coordinator)
	El Dorado Hospital	Ms. Maria Elena McElroy (Director of Personnel)
	Sahuarita School District	Mr. Stephen LeBrecht (Superintendent)
	Levy's	Ms. Elizabeth Tolley
Phoenix		
	Arizona State University	Mr. Edward Hitchcock (Director of Parking and Transit Services)
	Phoenix Newspapers	Mr. Al Quesnel (Personnel Manager)
	Phoenix Transit	Mr. Kevin Healy

Continued

TABLE 2 (Continued)

Phoenix (continued)		
	Motorola	Mr. Dimitro Mr. Chuck Debow
	Arizona Department of Corrections Perryvale Facility	Ms. Carol Brooks (Ridesharing Coordinator)
	Syntex Ophthalmics	Ms. Cora Schlanger (Ridesharing Coordinator)
	Mountain Bell	Ms. Margaret Black
	Luke Airforce Base	Staff Sgt. Charles Murrell
	Phoenix Union School District	Dr. Roger Romero (Asst. Super. for Employee Relations)
	Intertel Communications	Ms. Linda Berry (Human Resources)
	Greyhound Corporation	Mr. John Beck (Director of Personnel)
	State of Arizona	Ms. Deborah King (Ridesharing Coordinator)

The survey questionnaire used for the commuters working at the organizations is shown in Volume 2. The instrument was developed to gather respondent data to accomplish the research objectives noted previously. In brief, the questionnaire was divided into two parts. In Booklet I, respondents provided information about (1) their present commuting arrangements and characteristics; (2) their attitudes and perceptions of ridesharing, including their estimates of the likelihood with which they would be ridesharing within the next 12 months; and, (3) their demographic and socioeconomic characteristics. Booklet II comprised the conjoint analysis task, in which respondents made appraisals of the impact of the seven groups of incentives (from Phase I) on their likelihood of ridesharing. Following accepted methods of conjoint analysis, respondents provided direct ratings of the impact of each incentive, as well as global ratings of the impact of combinations of incentives. Combinations of incentives were specially constructed so as to require respondents to make trade offs of individual incentives against one another. Each respondent made ratings of nine combinations, with each combination containing one specific incentive from all seven groups established in Phase I. Analysis of the data from the conjoint task allows more accurate assessment of the probable impact of incentives on individuals' likelihood of ridesharing, compared to replying only on respondents' direct ratings of impact. A more complete discussion of the conjoint methodology is given in Volume 2.

The survey questionnaire for employers is also shown in Volume 2. In brief, it sought to obtain information about (1) employers' perceptions of the perceived benefits and costs of employee commuter ridesharing; (2) their assessments of the acceptability of each of the incentives identified in Phase I; and (3) their appraisals of the probable impact of each incentive on the likelihood of increasing employee ridesharing. The latter were similar to the

direct appraisals made by commuters. Employee respondents, however, were not asked to provide data on the conjoint task.

All returned questionnaires from the commuter and employer surveys were edited, coded, and transferred to a data file for subsequent computer analysis in Phase III.

Phase III

Phase III comprised the analysis of data obtained in the commuter and employer surveys. The analysis plan involved five distinct stages: (1) identifying the ridesharing potential among segments of commuter population in both Phoenix and Tucson; (2) classifying commuters into market segments of varying potential; (3) determining the probable effectiveness of the various ridesharing incentives on increasing commuters' predispositions to ridesharing; (4) examining the acceptability of the various ridesharing incentives to employers; and (5) constrasting employers' perceptions of the probable effectiveness of the incentives to the commuters' assessments of the actual effects of the incentives on their own behavior.

In the first stage of analysis, ridesharing potential was operationalized with respect to two critical factors: the individual commuter's expressed attitude toward ridesharing vis-a-vis driving alone as a mode of travel to and from work, and the individual's assessment of his/her likelihood of adopting ridesharing on a regular basis within the coming 12 months, under present and forseeable circumstances. To ascertain commuters' attitudes toward ridesharing, a multi-item attitude scale was developed, which after scale testing and purification consisted of 9 separate statements about the advantages and disadvantages of ridesharing in relation to driving alone. Responents expressed the extent of their agreement or disagreement with each, and the pattern of

responses over the 9 items were analyzed to determine whether commuters beliefs about ridesharing were predominantly favorable, unfavorable, or neutral/moderate.

While detailed procedures for constructing the attitude scale are given in Volume 2, several methodological issues are worthy of note in this overview. First, the ridesharing attitude scale was found a highly reliable indicator of commuter attitudes, as reflected in its natural consistency (coefficient alpha) estimate of .89. Moreover, the nine items comprising the scale were chosen to represent each of the major dimensions of the domain of beliefs about ridesharing. The latter dimensions were established by a principal components factor analysis of a larger pool of 26 belief statements about ridesharing. In addition, the particular nine items comprising the ridesharing attitude scale were all found to discriminate significantly between known commuter ridesharers and non-ridesharers (solo commuters). Discriminant analysis of these two commuter groups based on the nine-item attitude scale enables correct classification of 77% of the commuters, which is significantly better than chance. As a result of these analyses, it was concluded that the ridesharing attitude scale demonstrated acceptable levels of reliability and validity to warrant further use in market segmentation efforts.

At this point the analysis focused only on the portion of the commuter population which was <u>not</u> presently ridesharing. Ridesharers were viewed as realized potential from the standpoint of future efforts to induce increased public adoption of ridesharing.

The second segmentation variable was the individual commuter's stated probability of ridesharing in the next 12 months, under present or foreseeable circumstances. These assessments were made along an 11-point fully-anchored rating scale from 0% to 100% , with extremes labelled "will definitely <u>not</u> be

ridesharing" (0%) and "will definitely be ridesharing" (100%). Scale increments were by 10 percentage points. This type of intention scaling has been used extensively in the psychological economics and marketing research literature for predicting consumer purchase behavior.

Knowledge of commuters' attitudes toward ridesharing and their likelihood of adopting ridesharing were used jointly to define nine possible attitude/intentions possibilities among non-ridesharing commuters as shown in Figure 1. Solo-driving commuters falling into segments A, B, C, and D were regarded as having reasonable potential for adopting ridesharing, with D posessing the most and A the least. All four segments were considered reasonable in potential since they were by definition not unfavorable in their views of ridesharing and, while their likelihoods of ridesharing at present might be as low as 10% or less, they might well respond favorably if incentives were made available in the future. Solo commuters falling into segments E are not of interest since regardless of incentive or attitude, will probably become ridesharers anyway. Those in segment F were deemed unlikely ridesharers regardless of incentive because of their unfavorable attitudes.

The second stage of analysis consisted of applying this market segmentation methodology to all non-ridesharing commuters surveyed in both the Tucson and Phoenix areas, resulting in the identification of four groups of particular interest for purposes of incentive assessment in each metropolitan market.

In the third stage of analysis, the seven incentive groups were evaluated statistically to detemine their impact on non-ridesharing commuters' likelihoods of adopting ridesharing. Estimates of impact were obtained from a hybrid conjoint model analytical procedure, using ordinary least squares (OLS) as the basis for statistical estimation. This procedure incorporated respondents' direct ratings of the impact of each individual incentive on their probability

FIGURE 1

Market Segmentation Analysis and Targeting Approach

RIDESHARERS

Liklihood of Ridesharing

Low (0% to 95%)	High (> 95%)
Target Market Segment "Poolers"	

NON-RIDESHARERS

Likelihood of Ridesharing

Attitude Toward Ridesharing	Low (10%)	Moderate (10% to 50%)	High (> 50%)
Mostly Unfavorable			
Mostly Neutral	Target Market Segment A	Target Market Segment B	
Mostly Favorable	Target Market Segment C	Target Market Segment D	

Note: Target segments enclosed in bold lines

of adopting ridesharing, along with conventional conjoint dummy variables representing the indirect impacts of incentives not assessable by direct ratings. Results from this stage of the analysis were displayed as graphical plots of the "part-worth" impacts of each incentive on likelihood of ridesharing adoptions, by each of the four market segments (A, B, C, and D) in each metropolitan area.

The fourth and fifth stages of analysis were accomplished by examining the frequency distribution of responses from the employer survey. Employers' perceptions of effective incentives were compared to those desired in stage three by commuters using the same likelihood response scale, in order to determine whether employers' perceptions were congruent with probable responsiveness to the incentives studied.

FINDINGS

Identification of Ridesharing Incentives

To identify a set of ridesharing incentives most appropriate for evaluation in Arizona metropolitan areas, Phase I of this study researched both existing secondary data sources and current ridesharing agencies. Since the latter provided more comprehensive and inclusive information than the literature review, it will be the focus of the findings presented here.

The national survey of ridesharing agencies was undertaken for two specific purposes: (1) to identify the frequencies of use of various alternative ridesharing incentives by ridesharing professionals; and (2) to ascertain their effectiveness as perceived by ridesharing professionals. Moreover, these data were to be used in determining a tightly-focused set of incentives particularly appropriate for the Phoenix and Tucson metropolitan areas, which would receive more intensive evaluation in the later phases of research in this study.

The basic approach to pursuing these objectives was to organize ridesharing incentives into three groups: (1) those sponsored or undertaken directly by a ridesharing agency; (2) those offered by the private sector, i.e. employer organizations; and (3) those sponsored by government agencies. Ridesharing professionals across the U.S. were asked to enumerate the specific incentives either presently used in their administrative areas, or which had been used in the past, within each sponsorship category.

As can be seen from Table 3, the chief incentives used by ridesharing agencies responding to the survey involve informational inducements such as public service announcements, publicity, public signage, as well as advertising in the form of direct mail and mass media. Also noteworthy are the use of employer workshops educational forums, training programs to more in-person communication support. As seen by ridesharing professionals, these essentially informational incentives vary in effectiveness, with public signage and ridematching efforts emerging as those most frequently designated "effective".

Private sector inducements in use in the areas of jurisdiction of responding RSAs are shown in Table 4. The most frequently identified employer-based ridesharing incentive was preferential parking, noted by nearly two thirds of the respondents. Also frequently used was the incentive of flexible work hours. Employer-sponsored vanpools and subsidized transit passes were mentioned by one fourth of the RSAs, followed by employer ridematching, employer-sponsored carpools, and free (versus preferential) parking. Many other incentives were also noted by respondents, as shown in Table 4, but were typically characteristic of less than 10% of the RSA jurisdictions surveyed. Among those incentives used in more than 10% of the RSA jurisdictions, there is agreement by ridesharing professionals that employer-sponsored vanpools are highly effective in encouraging commuter ridesharing. Some 85.7% of the RSAs

TABLE 3

Usage and Effectiveness of RSA-Sponsored Inducements

Inducement	Percentage of RSA Jurisdictions in Which Inducement Used		Percentage of RSAs Using Inducement Rating it:[a]		
	Currently	At Any Time	Effective	Ineffective	Difference
Public Service Announcements	53.3%	85.8%	45.5%	10.2%	35.3%
TV/Newspaper Publicity	53.3	85.7	37.8	13.3	24.5
Ridematching	72.4	84.8	68.5	6.7	61.8
Public Signage	64.8	76.2	70.0	7.5	62.5
Community Exhibits	39.0	74.2	28.2	24.4	3.8
Employer Workshops	33.3	66.6	45.6	23.5	22.1
Direct Mail	37.1	61.9	43.1	18.5	24.6
Paid Media Advertising	23.8	53.3*	48.1	16.1	32.1
Educational Forums	21.9	41.9	31.8	20.5	11.3
Training Programs	18.1	31.4	42.4	12.1	30.3

[a] Only includes responses based on current or past usage of inducement.

TABLE 4

Usage and Effectiveness of Private Sector Inducements

Inducement	Percentage of RSA Jurisdictions in Which Inducement Used		Percentage of RSAs Using Inducement Rating it:[a]		
	Currently	At Any Time	Effective	Ineffective	Difference
Preferential Parking	64.8%	64.8%	66.2%	10.3%	55.9%
Flexible Working Hours	46.7	46.7	57.1	10.2	46.9
Employer-Sponsored Vanpool	26.7	26.7	85.7	3.6	82.1
Subsidized Transit Passes	23.8	25.7	77.8	3.8	74.0
Ridematching by Employer	13.3	13.3	69.2	23.1	46.1
Employer-Sponsored Carpool	11.4	11.4	66.7	16.7	50.0
Promotional Activities	9.5	10.5	54.5	9.1	45.4
Free Parking	9.5	10.5	54.5	27.3	27.2
Employer-Owned Vehicles	9.5	9.5	100.0	0.0	100.0
Contest, Trips, Events	6.7	6.7	42.9	0.0	80.0
Signage	4.8	4.8	80.0	0.0	80.0
Coordinator on Worksite	3.8	3.8	100.0	0.0	100.0
Reserved Parking	3.8	3.8	75.0	0.0	75.0
Newsletter on Site	3.8	3.8	75.0	0.0	75.0
Reduced Parking Charges	3.8	3.8	75.0	0.0	75.0
Employer-Sponsored Buspool	2.9	2.9	100.0	0.0	100.0
On Site Bus Ticket Distribution	2.9	2.9	100.0	0.0	100.0
Employer Park and Ride	2.9	2.9	66.7	0.0	66.7
Parking Charges	2.9	2.9	66.7	0.0	66.7
Parking Lot Shuttle	2.9	2.9	33.3	33.3	0.0
Transit-Sponsored Vanpool	1.9	1.9	100.0	0.0	100.0
Tripper Service/Coordinator	1.9	1.9	50.0	0.0	50.0
Unrelated Incentives	1.9	1.9	50.0	0.0	50.0
Limit Parking Supply	1.9	1.9	0.0	0.0	0.0
Subsidized Drivers	1.0	1.0	100.0	0.0	100.0

[a] only includes responses based on current or past usage of inducement.

noting use of this incentive in their jurisdiction felt such vanpools were "effective". Subsidized transit passes and ridematching were also frequently designated as effective, as were employer-sponsored carpools and preferential parking. Flextime was noted effective by some 57% of the RSA professionals, the lowest figure among the heavily-used private sector incentives.

Government-sponsored inducements in use in the RSA jurisdictions studied are shown in Table 5. Noteworthy are the lower incidence figures for all incentives, compared to those sponsored by the private sector. The most frequently noted inducement was park and ride lots (1.4% mentioned). Somewhat less frequently noted was preferential parking (21.9%), special HOV (High Occupancy Vehicle) lanes on highways and transit fare subsidies to commuters (cited by 14.3% each), followed by government-sponsored promotional activities (10.5%), van loan programs (8.6%), reduced parking rates (8.6%), reversed bus lanes (6.7%), and free parking (5.7%). Others mentioned were noted by less than 5% of the respondents. The highest effectiveness ratings were obtained by HOV lanes, vanpool programs and transit fare subsidies, though all of the incentives noted above were cited "effective" by at least 50% of the respondents.

To examine the use and effectiveness of ridesharing incentives in areas across the U.S. that are most similar to Phoenix and Tucson, responding RSAs were matched to each major Arizona metropolitan area on population served by the RSA. Some 22 RSA jurisdictions were identified as similar to Phoenix in population (1 to 2.6 million), and another 21 as similar to Tucson (400,000 to 963,000). Tables 6 and 7 present the specific matched areas, the affiliation of the RSAs in each, and their broad geographic distribution.

Table 8 presents the incidence of ridesharing incentive usage for the 21 areas matched to Tucson, in each of the three broad groupings described earlier. Combining this information with the perceived effectiveness ratings made by

TABLE 5

Usage and Effectiveness of Government-Sponsored Inducements

Inducement	Percentage of RSA Jurisdictions in Which Inducement Used		Percentage of RSAs Using Inducement Rating it:[a]		
	Currently	At Any Time	Effective	Ineffective	Difference
Park and Ride Lots	31.4%	31.4%	66.7%	6.1%	60.6%
Preferential Parking	21.9	21.9	60.9	13.0	47.9
HOV Lanes	14.3	14.3	93.3	0.0	86.7
Transit Fare Subsidy	14.3	14.3	86.7	0.0	86.7
Promotional Activity	10.5	10.5	72.9	9.1	63.6
Van Loan Program	8.6	8.65	88.9	0.0	88.9
Reduced Parking Rates	7.6	7.6	50.0	12.5	37.5
Reserved Bus Lanes	6.7	6.75	42.9	14.3	28.6
Free Parking	5.7	5.7	66.7	16.7	50.0
Van Leasing Program	4.8	4.8	100.0	0.0	100.0
Worksite Marketing	4.8	4.8	80.0	0.0	80.0
Flextime for Employees	4.8	4.8	40.0	0.0	40.0
Metered Access	3.8	3.8	50.0	25.0	25.0
Interest-Free Loan for Ridesharing	3.8	3.8	50.0	0.0	50.0
Tax Credit for Employer	3.8	3.8	25.0	0.0	25.0
Vanpooling Program	2.9	2.9	100.0	0.0	100.0
Promotional Subsidy to Employer	2.9	2.9	66.7	0.0	66.7
Express Bus Scheduling	2.9	2.9	66.7	33.3	33.4
Off-Peak Reduced Transit Fare	1.9	1.9	100.0	0.0	100.0
Fringe-Area Parking Lots	1.9	1.9	100.0	0.0	100.0
State Vehicles for Ridesharing	1.9	1.9	100.0	0.0	100.0
Tax Write-Off, Depreciation	1.9	1.9	100.0	0.0	100.0
Reduced Tunnel Fares, Bridge Tolls	1.9	1.9	50.0	0.0	50.0

[a] only includes responses based on current or past usage of inducement.

TABLE 6

Profile of RSAs Matched to Tucson Area on Population

Areas Included (n=21)

Toledo OH	Akron OH
Nashville TN	Dayton OH
Norfolk VA	Richmond/Petersburg VA
Birmingham AL	Winston Salem NC
Tacoma WA	Peoria IL
Billings/Great Falls MT	Louisville KY
Albuquerque NM	Carson City NV
Grand Rapids MI	Washington DC
Knoxville TN	Concord NH
Lehigh Valley/Northampton PA	Sioux Falls ND
Marin & Sonoma Counties CA	

Average Population of Area Served: 632,995 (Range = 400,000 to 963,000)

RSA Affiliation

	No.	Pct
Governmental		
City	3	12.0%
County	2	8.0
Assoc. of Govts.	4	16.0
State	6	24.0
Federal	3	12.0
Non Governmental		
Non-Profit	7	28.0
Profit	0	0.0

Geographical Distribution, By Census Division

	No.	Pct
New England	1	5.0%
Middle Atlantic	3	15.0
East North Central	2	10.0
West North Central	4	20.0
South Atlantic	4	20.0
East South Central	0	0.0
West South Cental	0	0.0
Mountain	4	20.0
Pacific	2	10.0

[a] Total more than number in subset due to multiple responses.

[b] Total less than number in subset due to missing data.

TABLE 7

Profile of RSAs Matched to Phoenix Area on Population

Areas Included (n=21)

Memphis TN
Cleveland OH
Cincinnati OH
Jackson MS
Pittsburgh PA
Morristown, New Brunswick, Plainfield and Somerville NJ
Jefferson City MO
Ft. Lauderdale FL
Salt Lake City UT
Miami Fl
Orange County CA
Indianapolis IND
Dallas TX
Ft. Worth TX
Augusta ME
St. Paul MN
Des Moines IA
Milwaukee WI
Denver CO
Las Vegas NV
St. Louis MO
San Antonio TX

Average Population of Area Served: 1,610.021 (Range = 1,000,000 to 2,600,000)

RSA Affiliation

	No.	Pct
Governmental		
City	7	17.9%
County	6	15.4
Assoc. of Govts.	6	15.4
State	11	28.2
Federal	3	7.7
Non Governmental		
Non-Profit	5	12.8
Profit	1	2.6

Geographical Distribution, By Census Division

	No.	Pct
New England	0	0.0%
Middle Atlantic	1	11.1
East North Central	0	0.0
West North Central	1	11.1
South Atlantic	2	22.2
East South Central	2	22.2
West South Cental	3	33.3
Mountain	0	0.0
Pacific	0	0.0

[a] Total more than number in subset due to multiple responses.

[b] Total less than number in subset due to missing data.

TABLE 8

Usage and Effectiveness of Inducements in Areas Similar to Tucson on Population

Inducement	Percentage of RSA Jurisdictions in Which Inducement Used		Percentage of RSAs Using Inducement Rating It:[a]		
	Currently	At Any Time	Effective	Ineffective	Difference
RSA Sponsored					
Public Service Ads	52.4%	90.5%	42.1%	15.8%	26.3%
Publicity Releases	52.4	90.5	31.6	15.8	15.8
Public Signage	76.2	85.7	72.2	5.6	66.6
Ridematching	71.4	85.7	72.2	11.1	61.1
Employer Workshops	28.6	61.9	30.8	30.8	0.0
Community Exhibits	42.9	71.4	13.3	46.7	-33.4
Direct Mail	57.1	71.4	46.7	13.3	33.4
Paid Media Advertising	33.0	52.4	63.6	18.2	45.4
Training Programs	4.8	19.0	75.0	25.0	50.0
Educational Forums	23.8	47.6	10.0	30.0	-20.0
Private Sector Sponsorship					
Preferential Parking	71.4	71.4	53.3	13.3	40.0
Flexible Work Hours	47.6	47.6	40.0	0.0	40.0
Subsidized Transit Passes	42.9	42.9	66.7	0.0	66.7
Employer-Sponsored Van Pools	38.1	38.1	75.0	0.0	75.0
Free Parking	27.3	27.3	66.7	16.7	50.0
Ridematching	14.3	14.3	33.3	0.0	33.3
Promotions	9.5	9.5	100.0	0.0	100.0
Newsletter On-Site	6	16	100.0	0.0	100.0
Employer-Sponsored Car Pool	9.5	9.5	100.0	0.0	100.0
Unrelated Incentives	4.5	4.5	0.0	0.0	0.0
Government Sponsored					
Preferential Parking	19.0	19.0	50.0	25.0	25.0
Park and Ride Lots	23.8	23.8	40.0	40.0	0.0
Transit Fare Subsidy	22.7	22.7	80.0	0.0	80.0
Reserved Bus Lanes	18.2	18.2	75.0	0.0	75.0
HOV Lanes	13.6	13.6	100.0	0.0	100.0
Government Sponsored					
Van Pool Loan Program	13.6	13.6	66.7	33.3	33.4
Free Parking	13.6	13.6	33.3	0.0	33.3
Interest-Free Loan	9.1	9.1	100.0	0.0	100.0
Reduced Parking Rates	9.1	9.1	50.0	0.0	50.0
Flextime for Govt. Workers	9.1	9.1	50.0	0.0	50.0
Air Quality Regulation-EPA	9.1	9.1	50.0	0.0	50.0

[a] Only includes responses based on current or past usage of inducement

ridesharing professionals, the most effective frequently used RSA-sponsored inducements are (1) ridematching and (2) public signage. Among private-sponsored inducements, those most effective and frequently used are (3) preferential parking, (4) subsidized transit passes, (5) employer-sponsored van pools, and to a lesser extent, (6) flex time. Among more frequently employed and particularly effective government-sponsored inducements are (7) park-and-ride lots and (8) preferential parking.

Table 9 presents comparable findings for the 22 areas matched to Phoenix, where public signage and ridematching again emerge as the most effective, frequently used, RSA-sponsored inducements. Similarly, preferential parking, employer van pools and subsidized transit passes are again included. Perhaps more often owing their larger sizes, flexible work hours are more often viewed as effective in the Phoenix-matched areas than in the Tucson-matched areas. And as found for the Tucson-like areas, preferential parking, park and ride lots, and transit fare susidies are the most frequently mentioned effective inducements among the Phoenix-matched areas.

Overall, the survey results have suggested a number of different groups or types of incentive which appear to have found widespread application and substantial effectiveness in areas similar to Phoenix and Tucson. These may be summarized as follows:

1. Carpool parking (preferential, subsidized)
2. Vehicle for pooling (private car or employer-supplied van)
3. Rideshare arrangements (ridematching, coordinator)
4. Pick up point (park-and-ride lots)
5. Highway travel (HOV lanes)
6. Commuter reimbursement (subsidies)

TABLE 9

Usage and Effectiveness of Inducements in Areas Similar to Phoenix on Population

Inducement	Percentage of RSA Jurisdictions in Which Inducement Used		Percentage of RSAs Using Inducement Rating It:[a]		
	Currently	At Any Time	Effective	Ineffective	Difference
RSA Sponsored					
Public Signage	76.2	85.7	72.2	5.6	66.6
Ridematching	71.4	85.7	72.2	11.1	61.1
Publicity Releases	52.4	90.5	31.6	15.8	15.8
Public Service Ads	52.4%	90.5%	42.1%	15.8%	26.3%
Employer Workshops	28.6	61.9	30.8	30.8	0.0
Community Exhibits	42.9	71.4	13.3	46.7	-33.4
Direct Mail	57.1	71.4	46.7	13.3	33.4
Paid Media Advertising	33.0	52.4	63.6	18.2	45.4
Training Programs	4.8	19.0	75.0	25.0	50.0
Educational Forums	23.8	47.6	10.0	30.0	-20.0
Private Sector Sponsorship					
Preferential Parking	71.4	71.4	53.3	13.3	40.0
Flexible Work Hours	47.6	47.6	40.0	0.0	40.0
Subsidized Transit Passes	42.9	42.9	66.7	0.0	66.7
Employer-Sponsored Van Pools	38.1	38.1	75.0	0.0	75.0
Free Parking	27.3	27.3	66.7	16.7	50.0
Ridematching	14.3	14.3	33.3	0.0	33.3
Promotions	9.5	9.5	100.0	0.0	100.0
Newsletter On-Site	13.6	13.6	100.0	0.0	100.0
Employer-Sponsored Car Pool	9.5	9.5	100.0	0.0	100.0
Unrelated Incentives	4.5	4.5	0.0	0.0	0.0
Government Sponsored					
Preferential Parking	19.0	19.0	50.0	25.0	25.0
Park and Ride Lots	23.8	23.8	40.0	40.0	0.0
Transit Fare Subsidy	22.7	22.7	80.0	0.0	80.0
Reserved Bus Lanes	18.2	18.2	75.0	0.0	75.0
HOV Lanes	13.6	13.6	100.0	0.0	100.0
Government Sponsored					
Van Pool Loan Program	13.6	13.6	66.7	33.3	33.4
Free Parking	13.6	13.6	33.3	0.0	33.3
Interest-Free Loan	9.1	9.1	100.0	0.0	100.0
Reduced Parking Rates	9.1	9.1	50.0	0.0	50.0
Flextime for Govt. Workers	9.1	9.1	50.0	0.0	50.0
Air Quality Regulation-EPA	9.1	9.1	50.0	0.0	50.0

[a] Only includes responses based on current or past usage of inducement.

These groups of incentives were reviewed with representatives of the Maricopa and Pima Associations of Government and the Arizona Department of Transportation. Discussion suggested the value of considering yet another type of ridesharing incentive which might have considerable impact of individual commuters' willingness to rideshare: the social composition of the individuals sharing the journey to work. The discussions also served to identify meaningful specific incentives within each group. Emerging from these review meetings was the list of specific ridesharing incentives to be evaluated in subsequent phases of the research. These are shown in Figure 2.

Market Segmentation Analysis

To provide focus for the evaluation of the ridesharing incentives among Arizona commuters, a comprehensive market segmentation analysis was conducted. As described in the Methodology section of this volume (and in greater detail in Volume 2), the segmentation of commuters sought to identify groups of commuters in which the potential for ridesharing was most favorable. In this way, a program of incentives might be targeted so as to gain the maximum possible increase in ridesharing, by focusing first on the groups of commuters most likely to repsond to such inducements, and then successively on groups of lesser response likelihood.

The segmentation scheme adopted for this purpose first recognized the distinction between commuters who are presently ridesharing on a regular basis, versus those driving to work alone. Ridesharers as a group may be viewed as market potential which has already been captured. Such commuters who also express a strong likelihood of continuing to rideshare in the future are clearly valued, though their evaluations of ridesharing incentives are not of great interest since they plan to continue ridesharing regardless of strengthened incentives to that effect. On the other hand, ridesharers who have a low

FIGURE 2

Ridesharing Incentives Selected for Study

Incentive Group Specific Incentives	Description
A. Set Up of Car/Vanpool	
1. Self-Arranged:	You contact anybody who might be interested and set up the rideshare group yourself.
2. Computer List:	You receive a computerized list of interested people and call them to set up your own rideshare group.
3. Coordinator Arranges:	A ridesharing coordinator personally contacts you and matches you with other people, setting up the best ridesharing pool for your situation.
B. Vehicles and Drivers	
1. Share Vehicles and Driving:	All members of the group take equal turns driving their own vehicles and share expenses.
2. You Drive for Car/Vanpool:	You provide a car or van and do all the driving for the other riders and you are reimbursed for your expenses.
3. Driven in Employer Owned Vehicle:	Your employer provides a car or van, and you never have to drive.
C. Other Ridesharers:	
1. Co-Workers:	The other members of the ridesharing pool are all people you know at your place of work.
2. Other employees:	The other members of the ridesharing pool also work for the same employer, but are unknown to you.
3. Anybody:	The other members of the ridesharing pool are any persons going in the same general vicinity as you, possibly not to your employer.

Continued

Figure #2 (Continued)

D.	Reimbursement:	
	1. Car/Vanpool Reimbursement:	Members of the ridesharing pool pay their own expenses or share them as a group.
	2. Partial Subsidy:	One-half of the vehicle operating costs are paid for by a third party (such as your employer, a federal ridesharing agency, etc.).
	3. Full Subsidy:	All the vehicle operating costs are paid for in full by a third party.
E.	Pick Up Point	
	1. Park & Ride Lot:	Riders in the pool are picked up and dropped off at a special "Park & Ride" lot, with security and an enclosed waiting area, within 2 miles of your home.
	2. Home:	Riders are picked up and dropped off at their homes.
	3. Public Parking:	Riders are picked up and dropped off at a designated area in a public parking lot within 1 mile of home.
F.	Highway Travel	
	1. As a Regular Vehicle:	Ridesharing vehicles are treated just like all other vehicles on the highway.
	2. Immediate Vehicle Access:	Ridesharing vehicles have immediate access to the highway during rush-hour when freeway entrances are congested.
	3. High Speed Lanes:	Ridesharing vehicles travel in high-speed, low congestion lanes reserved for use only by ridesharing vehicles.
G.	Work Place Parking	
	1. Free Parking:	Ridesharing vehicles park free in employer lot or pay parking lot.
	2. Reserved Parking:	Special reserved parking for ridesharing vehicles is available at the closest point to the work building.
	3. Covered parking:	Covered parking is available only for ridesharing vehicles, at the closest point to the work building.

likelihood of continuing ridesharing in the future are of considerable interest, since the pool of ridesharing commuters may be maintained if not increased by retaining these individuals. Hence, their appraisals of ridesharing incentives vis-a-vis their future ridesharing likelihood are indeed of interest.

With respect to non-ridesharing commuters, four groups of interest may be discerned, based on their attitudinal receptivity to ridesharing as a form of home-work travel, and on their subjective likelihood of beginning to rideshare within the next 12 months. These groups are as follows: (A) commuters with neutral attitudes toward ridesharing, (i.e. neither strongly favorable nor unfavorable), but having low personal likelihoods of ridesharing, and (B) commuters as in (A) who have moderate likelihoods of ridesharing, (C) those with positive attitudes toward ridesharing, but having low personal likelihoods of adopting regular ridesharing, (D) again those commuters with favorable attitudes toward ridesharing, but only moderate personal likelihoods of becoming ridesharers. It is on these four groups of commuters that a program of incentives has its greatest potential to increase ridesharing since these individuals evidence either attitudinal or behavioral predisposition, in an approximate ordering of their listing above.

Clearly not of interest for the evaluation of incentives are non-ridesharing commuters who have unfavorable attitudes toward the activity of ridesharing, or alternately those who are certain of doing so anyway, regardless of what additional incentives might be brought to bear. Even though a commuter may not be entirely precluded from ridesharing, the segmentation scheme recognizes varying levels of predisposition and intention toward ridesharing. Underlying the categorization of an individual into a target segment are what might be called set rational constraints, which result in two individuals with similar attitude toward ridesharing having differing intention levels. For example, both segments could have favorable attitudes toward ridesharing, but

vary in intention to rideshare. Such factors as the length of the two individuals' commuting trips, the typs and availability of parking each faces, and the setting of the trip within the household daily activity pattern (e.g., shopping, transportation of children, etc.) can account for the differing intention. Volume 3 details the situational constrants found in both metropolitan areas. This method of categorization would suggest that the incentives must effectively meet each segments unique needs which differ.

Key findings from the market segmentation analysis are shown in Tables 10 and 11. Approximate estimates are presented of the relative sizes of the different segments as observed in the survey of Phoenix and Tucson Commuters undertaken in Phase II of this study. Separate estimates are presented by city and for each segment within the categories of currently ridesharing commuters and non-ridesharing commuters. Since the survey sampling method was not designed to assure accurate representation of the overall community population by categories and cities, only the representativeness within each category within each city is assured.

Helpful for interpreting Tables 10 and 11 are the response distributions for both the ridesharing attitude scale and the personal likelihood of ridesharing measure. These are shown along the margins of the tables. Roughly one-third of the non-ridesharing Phoenix commuters hold favorable attitudes toward ridesharing, some 40% neutral or moderate, with the balance of 23% unfavorable. Relatively few -- about 10% -- indicate they expect to become ridesharers within the next 12 months with greater than 50% certainty. Half rate their chances as moderate (10% to 50%), while the remaining 38% indicate their likelihood to be low (less than 10%). The figures are comparable in the Tucson sample, though somewhat less favorable ridesharing attitudes and personal likelihoods of adopting ridesharing are apparent. More detailed tabulations on these points appear in Tables given in Volume 3.

TABLE 10

Target Market Segments: Phoenix Non-Ridesharers

Attitudes Towards Ridesharing	Likelihood of Ridesharing In the next 12 Months: Less than 10%	10% to 50%	Greater than 50%	Total (Row %)
Generally Unfavorable	12.0%	10.0%	1.0%	23.0%
Neutral or Mixed	Segment A 12.0	Segment B 25.0	4.0%	41.0%
Generally Favorable or Highly Favorable	Segment C 14.0	Segment D 16.0	6.0%	36.0%
Total	38.0%	51.0%	11.0%	100.0%

N = 100 Respondents

TABLE 11

Target Market Segments: Tucson Non-Ridesharers

Attitudes Towards Ridesharing	Likelihood of Ridesharing In the next 12 Months: Less than 10%	10% to 50%	Greater than 50%	Total (Row %)
Generally Unfavorable	16.7%	13.0%	0.0%	29.7%
Neutral or Mixed	Segment A 21.2	Segment B 18.5	.9%	40.6%
Generally Favorable or Highly Favorable	Segment C 7.4	Segment D 18.5	3.7%	29.7%
Total	45.4%	50.0%	4.6%	100.0%

N = 108 Respondents

Often attitudes and behavioral intentions of the sort noted above in the market segmentation scheme are closely related to the socioeconomic and demographic characteristics of respondents. To examine this possibility, an analysis of the sex, age, education and total household income profiles of the four target market segments of non-ridesharers in Tucson and Phoenix was undertaken. Owing to small sample size, however, differences observed appear inconclusive, and for the most part are systematic indications of any recognizable pattern. For these reasons the interested reader is referred to the detailed tables in Volume 3. Although the caution concerning small sample size within individual target market segments must be noted, the apparent heterogeneity of the commuter subgroups suggests the utility of the market segmentation approach presented here. Likely ridesharing adopters may be more readily identified using this approach rather than through use of more traditional socio-demographic descriptors.

Impact of Incentives on Commuter Ridesharing Intentions

Having segmented the commuter market in each metropolitan area into five distinct groupings of individuals based on their present mode of travel to work, attitudes toward ridesharing, and current disposition to adopt/continue ridesharing, it is now appropriate to evaluate the incremental effects of the various designated incentives upon further inducing commuter ridesharing. This section of the report presents findings from the conjoint analysis procedures which were undertaken to determine the impact of the incentives selected in Phase I upon commuters future ridesharing intentions.

Prior to examining the results of the conjoint analysis, it is perhaps useful to consider the simple ratings of the impact of ridesharing incentives as directly assessed by commuters. As noted earlier, such data are the basis of most previous evaluations or ridesharing incentives. For purposes of comparison

to other studies, the mean direct ratings of incentives' impacts on likelihood of ridesharing are shown in Tables 12 and 13 for Phoenix and Tucson respectively.

A key feature of the conjoint analysis methodology is its ability to determine incentives' effects on ridesharing intentions both as directly stated two types of effects, direct and indirect, may vary substantially. If commuters are able to accurately state in a direct fashion the impact of a particular incentive on their ridesharing intentions, the direct effects will be large and the indirect effects close to zero. If commuters are unable or unwilling to directly assess the impact of a particular incentive on their ridesharing intentions, their pattern of choices involving tradeoffs of the incentive against others studies may indicate substantial indirect (or unarticulable) effects of the incentive. The usefulness of these distinctions is substantial when attempting to establish the "true" impacts of incentives upon respondents' future ridesharing intentions.

Each incentive's impact on the target segments was assessed by examining the coefficients of a hybrid conjoint model (Green, 1984) estimated with OLS regression procedures. Separate estimates were obtained for each of the five market segments in both Phoenix and Tucson. Thus, the results permit determination of which specific incentives have what specific effects on commuter ridesharing intentions for any segment of interest.

The major results of the OLS estimation are shown in Tables 14 and 15 for Phoenix and Tucson, respectively. Taking the Phoenix results first, and examining the direct effect coefficients shown for the non-ridesharers in Segment A (neutral attitudes/low likelihood), the only value statistically significant is that for the group of reimbursement incentives. For these commuters, only increasing compensation appears to appreciably raise their intentions to rideshare. In non-ridesharing Segment B the group of incentives

TABLE 12

Respondents' Direct Ratings of Impact of Incentives
on Likelihood of Ridesharing:
Tucson Non-Ridesharer Target Market Segments

Incentive Group Incentive Level	Mean Increased Likelihood of Market Segment[b] A	B	C	D
Setup of Car/Van Pool				
Self-Arranged	1.778	1.762	2.111	1.375
Computer List	1.889	2.333	2.444	2.438
Coordinator Arranges	2.444	3.286	2.778	3.188
Vehicles and Drivers				
Share Driving & Vehicles	1.667	2.714	2.222	2.688
You Drive For Van/Car Pool	1.667	2.048	1.889	1.563
Driven in Employer-Owned Vehicle	2.333	3.810	3.667	3.063
Other Ridesharers				
Co-workers	2.444	3.429	2.667	2.750
Other Employees	2.000	2.857	2.667	2.500
Anyone	1.444	2.238	2.444	1.812
Reimbursement of Operating Costs				
Car/Van Pool Shared	2.111	2.286	2.111	2.438
Partial Subsidy	2.556	3.333	3.111	3.438
Full Subsidy	3.333	4.143	35565	3.938
Pick Up Point				
Park-and-Ride Lot	1.556	2.857	2.222	2.882
Home	2.333	3.476	3.111	3.875
Public Parking	1.556	2.857	2.222	2.375
Highway Travel				
Regular Vehicle	1.222	1.857	2.111	1.625
Immediate Access	1.889	3.524	2.667	2.500
Reserved High Speed Lanes	2.556	3.810	3.444	3.063
Work Place Parking				
Free Parking	2.222	2.952	2.889	2.063
Reserved Parking	2.444	3.333	3.222	2.812
Covered Parking	3.222	3.905	4.000	3.125
Total Respondents	12	21	14	16
Excluded Respondents[c]	3	4	5	0

[a] Expressed on 5-point scale with 1 = "No More Likely" to 5 = "Much More Likely.
[b] See previous table for definition of Market Segments.
[c] Excluded due to zero variation in ratings of scenarios in conjoint task.

TABLE 13

Respondents' Direct Ratings of Impact of Incentives
on Likelihood of Ridesharing:
Tucson Non-Ridesharer Target Market Segments

Incentive Group Incentive Level	Mean Increased Likelihood of Market Segment[b] A	B	C	D
Setup of Car/Van Pool				
Self-Arranged	1.500	1.278	2.500	2.000
Computer List	1.714	2.111	2.375	2.111
Coordinator Arranges	2.643	2.222	2.875	2.556
Vehicles and Drivers				
Share Driving & Vehicles	1.929	2.722	3.125	3.056
You Drive For Van/Car Pool	1.286	1.944	1.750	1.722
Driven in Employer-Owned Vehicle	3.286	2.944	4.250	3.444
Other Ridesharers				
Co-workers	2.071	2.667	3.750	2.944
Other Employees	1.571	1.667	3.000	1.944
Anyone	1.643	1.278	2.500	1.611
Reimbursement of Operating Costs				
Car/Van Pool Shared	2.143	2.222	3.250	2.444
Partial Subsidy	2.786	2.833	3.250	3.278
Full Subsidy	3.714	3.111	3.625	4.000
Pick Up Point				
Park-and-Ride Lot	2.500	2.278	2.625	2.722
Home	3.071	3.611	4.000	3.556
Public Parking	2.214	1.944	2.375	2.222
Highway Travel				
Regular Vehicle	2.071	1.944	1.875	1.611
Immediate Access	3.071	2.722	3.125	2.667
Reserved High Speed Lanes	3.071	2.556	3.875	3.056
Work Place Parking				
Free Parking	2.071	2.722	4.000	2.500
Reserved Parking	3.214	3.056	4.000	3.611
Covered Parking	3.786	3.333	4.125	3.722
Total Respondents	14	20	8	20
Excluded Respondents[c]	5	2	0	2

[a] Expressed on 5-point scale with 1 = "No More Likely" to 5 = "Much More Likely.
[b] See previous table for definition of Market Segments.
[c] Excluded due to zero variation in ratings of scenarios in conjoint task.

TABLE 14

OLS Regression Estimates of Hybrid Conjoint Model
Coefficients For The Phoenix Target Market Segments

Incentive Group Variables[a]	Regression Coeffocient for Target Market Segment				
	A	B	C	D	Poolers
Setup of Car/Van Pool	.165	.025	-.374*	-.096	.325***
Self-Arranged					
Computer List	.511	.095	.063	.153	-.026
Coordinator Arranges	.709*	.087	.305	.506*	-.056
Vehicles and Drivers	.185	.223***	.255*	.115	-.083
Share Vehicles and Driving					
You Drive	-.292	-.070	.143	.308	.042
Driverin Employer-Owned Vehicles	.356	.159	.040	.456*	.120**
Other Ridesharers	.181	.011	.311	.025	.124
Co-Workers					
Other Employees	.229	-.113	.120	.1188	.015
Anybody	.290	-.188	.081	-.119	-.008
Reimbursement of Operating Costs	.375**	.153	.175	.158	.027
Car/Van Pool Reimbursement					
Partial Subsidy	-.213	-.124	.275	-.299	.029
Full Subsidy	-.846*	.028	.362	.167	.153**
Pick Up Point	.147	.077	.173	.000	.049
Park-and-Ride Lot					
Home	.582	.331	.119	.385	.056
Public Parking	.569	.272	-.024	.027	.055
Highway Travel	-.163	.029	.144	.296****	.093
As a Regular Vehicle					
Immediate HOV Acess	.333	.257	.709*	.026	.191***
High Speed HOV Lane	.559	.215	-.098	.256	.184***
Work Place Parking	.109	.215***	-.099	.106	.034
Free Parking					
Reserved Parking	-.360	-.002	.170	.224	.070
Covered Parking	-.387	.035	.577	.556**	.050
Adjusted R^2	.830	.870	.871	.886	.775
F-Statistic	19.9****	61.0****	26.9****	45.6****	26.1****

* Significant at the .90 Confidence Level
** Significant at the .95 Confidence Level
*** Significant at the .99 Confidence Level
**** Significant at the .999 Confidence Level
[a] The first incentive in each category is the "zero-level" dummy variable and therefore no coefficient is required for model estimation. Coefficients for each incentive group represent incentive group means.

TABLE 15

OLS REGRESSION ESTIMATES FOR HYBRID CONJOINT MODEL
COEFFICIENTS FOR THE TUCSON TARGET MARKET SEGMENTS

Incentive Group Variables[a]	Regression Coeffocient for Target Market Segment				
	A	B	C	D	Poolers
Setup of Car/Van Pool	-.134	.178*	.071	.287****	.290***
Self-Arranged					
Computer List	.697**	-.145	.386	.135	.080
Coordinator Arranges	.188	-.118	-.030	.016*	-.0832
Vehicles and Drivers	-.011	.244****	.090	.006	.077*
Share Vehicles and Driving					
You Drive	-.162	-.093	-.353	-.409**	-.095
Driverin Employer-Owned Vehicles	.687**	.245	.438	.660****	.240*
Other Ridesharers	-.109	-.053	.045	.212***	-.067
Co-Workers					
Other Employees	.005	.141	.429	-.177	.104
Anybody	-.444	-.296	-.151	-.299	-.488**
Reimbursement of Operating Costs	.500****	.325****	.250**	.091	.034
Car/Van Pool Reimbursement					
Partial Subsidy	.382	.034	.058	.300	-.148
Full Subsidy	-.356	.220	.018	.223	.140
Pick Up Point	-.073	-.066	-.274**	.311****	.202****
Park-and-Ride Lot					
Home	.101	.555*	1.089***	-.271	.354**
Public Parking	.021	-0942	-.182	-.271	.033
Highway Travel	.015	.208***	,259*	.061	.076
As a Regular Vehicle					
Immediate HOV Acess	.722**	-.451**	-.728*	.341	.089
High Speed HOV Lane	.822***	-.044	-.703	.559**	-.137
Work Place Parking	.366**	.184**	.287*	.066	-.022
Free Parking					
Reserved Parking	-.315	.001	.328	-.576**	-.083
Covered Parking	-.581	.085	.443	-.108	.104
Adjusted R^2	.874	.900	.901	.891	.766
F-Statistic	19.9****	60.5****	32.3****	64.2****	45.8****

* Significant at the .90 Confidence Level
** Significant at the .95 Confidence Level
*** Significant at the .99 Confidence Level
**** Significant at the .999 Confidence Level
[a] The first incentive in each category is the "zero-level" dummy variable and therefore no coefficient is required for model estimation. Coefficients for each incentive group means.

concerning the vehicles and driving arrangements, and that concerning workplace parking each have significant effects. Thus these individuals appear to be motivated by different incentives, since the compensation incentive found significant in Segment A has no apparent effect on persons in Segment B, and vice versa. In non-ridesharing Segment C, incentives concerning the initial establishment of the pooling arrangements, as well as those concerning the vehicles and driving arrangements each have a significant impact on these individuals' ridesharing intentions. In Segment D non-ridesharers, the highway travel incentives (immediate highway access and HOV lanes) alone have an impact.

Among Tucsonans, Segment A non-ridesharers reveal significant effects of two incentive groups -- reimbursement, and workplace parking. The former effect was also observed among Segment A respondents in Phoenix. In the non-ridesharers of Segment B, <u>five</u> of the seven incentives tested appear to significantly increase ridesharing intentions. These are the initial pooling set-up arrangements, vehicles and driving arrangements, reimbursement, highway travel provisions, and workplace parking. Segment C members are influenced by reimbursement and the site of the pooling pick-up point. In Segment D, incentives concerning pooling setup, the social composition of the ridesharing, and the pick-up point each have significant effects.

It is evident that the direct effects of incentives to influence ridesharing intentions vary by segment and across cities. To portray these results graphically, and at the same time incorporate the contributions of indirect incentive effects described earlier, a series of conjoint "part worth" likelihood impact plots were prepared. These are shown in Figure 3 for Phoenix and Figure 4 for Tucson.

To read the "part worth" likelihood impact plots, the vertical axis is interpreted as the total increased likelihood of ridesharing attributable to the specific incentive shown on the horizontal axis. Each plot shows a group of

FIGURE 3
PHOENIX IMPACT PROFILES

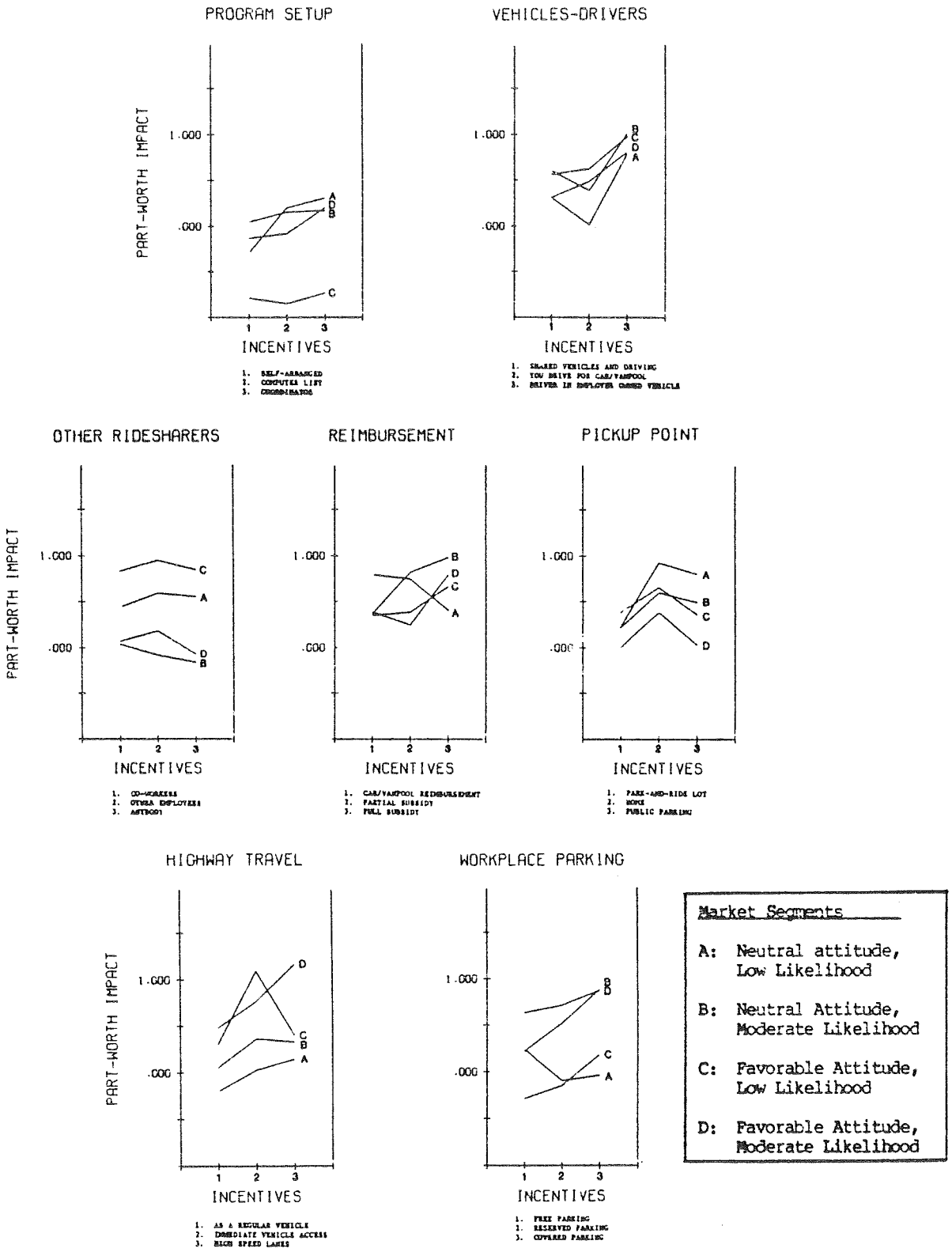
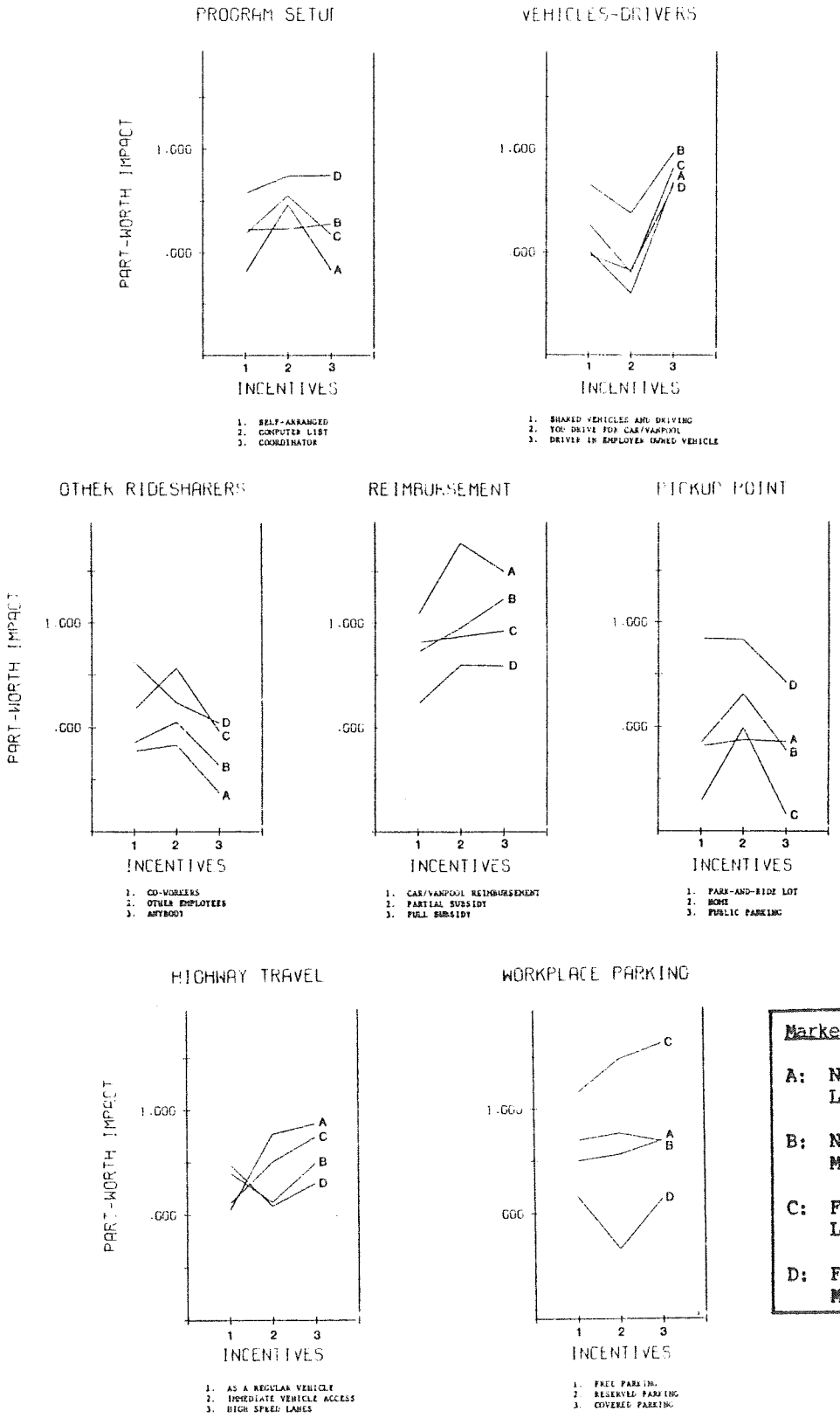


FIGURE 4

TUCSON IMPACT PROFILES



Market Segments

A: Neutral attitude, Low Likelihood

B: Neutral Attitude, Moderate Likelihood

C: Favorable Attitude, Low Likelihood

D: Favorable Attitude, Moderate Likelihood

three incentives, for the four distinct target market segments (A, B, C, and D) of non-ridesharers. Plots for the current ridesharing target market segment appear on Figure 5. It is important to recognize that these plots reflect the total effectiveness of the various incentives studied, insofar as increasing commuters' predisposition to rideshare. Thus they include both the direct effects as respondents are able to articulate them, as well as the indirect effects not articulated but nevertheless implicit in the trade off choices made by respondents in the conjoint analysis tasks.

Referring to Figure 3, the reader may quickly and easily determine the overall effectiveness of any given incentive within any target market segment. If, for example, Segment D is of interest (Segment D consists of non-ridesharing commuters who are both attitudinally and behaviorally predisposed toward ridesharing), by scanning all seven plots it appears that the most potent incentive conerns highway travel of the ridesharing vehicle, specifically incentive #3 or HOV lanes. Also quite potent among Segment D commuters is covered workplace parking. Notably without appreciable effect on ridesharing intention are any incentives concerning social composition of the other ridesharers in the vehicle, arrangements for the establishment of the pool, and non-home pickup points, as shown by part worth values close to zero.

Generalizing across the Phoenix non-ridesharer target market segments and recognizing that they do vary with respect to the impact of the ridesharing incentives studied, the following factors emerge as having large and positive effects on commuter ridesharing intentions: (1) have pick-up point, (2) being driven in an employer-owned vehicle, and (3) full subsidy of ridesharing expenses. Workplace parking incentives appear to strongly affect only Segments B and D, who are substantially favorably predisposed toward ridesharing. HOV lanes are of strong interest only to Segment D, and immediate highway ramp access to Segment C. The social composition of the ridesharing pool has an

impact only on those segments marginally predisposed to ridesharing — C and A. Incentives concerning the establishment of initial ridesharing arrangements appear only weakly motivating, and actually negative in impact on Segment C.

Turning to the Tucson non-ridesharer target market segments in Figure 4, again considerable variation is evident with respect to the impact of ridesharing incentives. However, consistently large and positive effects for all segments appear for (1) being driven in a employer-owned vehicle and (2) receiving a full subsidy of ridesharing expenses. Workplace parking incentives strongly affect Segments C, A and B, but not D. Home pick-up point has a strong effect only on Segment D. Either HOV lanes or immediate highway access for ridesharer vehicles have an impact on Segments A and C, and coordinator setup of the initial pooling arrangements affects only Segment D appreciably.

The first step of analysis with regards to current ridesharing is the examination of the mean values of direct ratings on each incentive (see Tables 16 and 17). As noted earlier, however, these direct ratings portray only a portion of the total effects of any incentive. These ratings, combined with the regression results of Table 15 and Table 16 for poolers, resulted in the plots of incentive impact shown in Figure 5.

Plots for the ridesharer target market segments in each city in Figure 5 show that, overall, there is consistency between city-segments across ridesharing incentive effects. Among Phoenix residents, the incentives with the greatest influence on increasing the likelihood of continuing to rideshare include (1) being driven in an employer-owned van and (2) being picked up by the ridesharing pool at home or a nearby public parking lot. Surprisingly low in influence are workplace parking incentives. Among Tucson ridesharers, especially strong effects on likelihoods of continuing ridesharing are covered workplace parking and riding in a company-owned van. Incentives concerning the initial arrangements for ridesharing, as well as its social composition, appear

TABLE 16

DIRECT RATINGS OF EFFECTIVENESS OF INCENTIVES IN INCREASING THE PERCEIVED LIKELIHOOD OF CONTINUED RIDESHARING: PHOENIX CAR/VAN POOLER TARGET MARKET SEGMENT

Incentive Group Specific Incentive	Mean Increased Likelihood On a 1 to 5 Scale[a]
Setup of Car/Van Pool	
Self-Arranged	2.158
Computer List	2.842
Coordinator Arranges	2.053
Vehicles and Drivers	
Share Vehicles and Driving	3.632
You Drive	2.053
Driven in Employer-Owned Vehicle	4.053
Other Ridesharers	
Co-workers	3.526
Other Employees	2.895
Anybody	1.947
Reimbursement of Operating Costs	
Car/Van Pool Reimbursement	3.632
Partial Subsidy	3.737
Full Subsidy	4.263
Pick Up Point	
Park-and-Ride Lot	2.947
Home	3.421
Public Parking	2.632
Highway Travel	
As a Regular Vehicle	2.211
Immediate HOV Access	3.158
High Speed HOV Lane	3.579
Work Place Parking	
Free Parking	3.263
Reserved Parking	3.947
Covered Parking	3.474
Number of Respondents:	19

[a] Expressed on 5-point scale with 1 = "No More Likely" to 5 = "Much More Likely.

TABLE 17

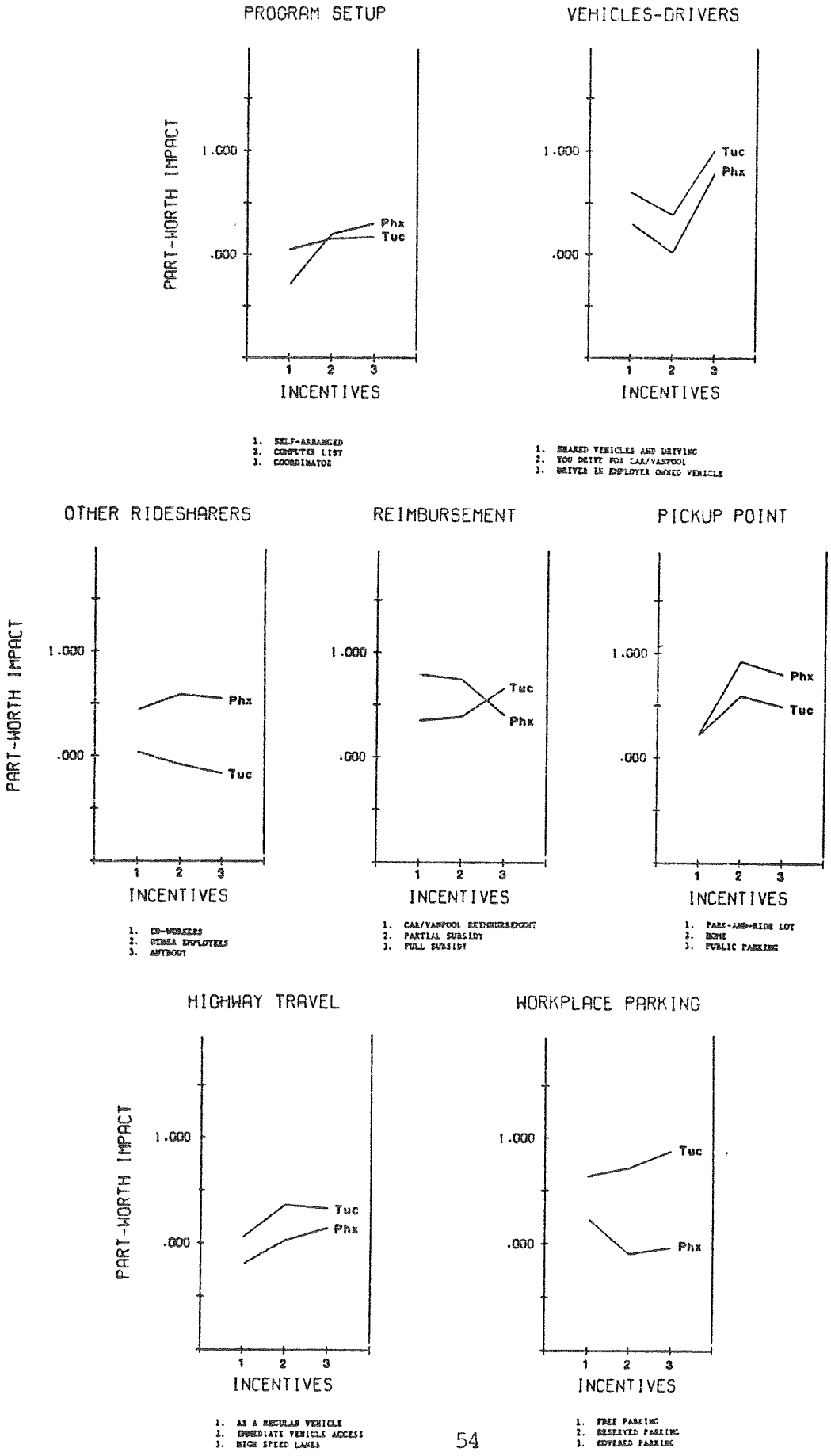
DIRECT RATINGS OF EFFECTIVENESS OF INCENTIVES IN INCREASING THE PERCEIVED LIKELIHOOD OF CONTINUED RIDESHARING: TUCSON CAR/VAN POOLER TARGET MARKET SEGMENT

Incentive Group Specific Incentive	Mean Increased Likelihood On a 1 to 5 Scale[a]
Setup of Car/Van Pool	
Self-Arranged	2.730
Computer List	2.243
Coordinator Arranges	2.595
Vehicles and Drivers	
Share Vehicles and Driving	3.270
You Drive	1.784
Driver in Employer-Owned Vehicle	3.243
Other Ridesharers	
Co-workers	3.784
Other Employees	2.892
Anybody	1.622
Reimbursement of Operating Costs	
Car/Van Pool Reimbursement	2.919
Partial Subsidy	3.243
Full Subsidy	3.865
Pick Up Point	
Park-and-Ride Lot	2.378
Home	3.784
Public Parking	2.162
Highway Travel	
As a Regular Vehicle	2.351
Immediate HOV Access	2.676
High Speed HOV Lane	3.027
Work Place Parking	
Free Parking	2.973
Reserved Parking	3.000
Covered Parking	3.270
Number of Respondents:	33

[a] Expressed on 5-point scale with 1 = "No More Likely" to 5 = "Much More Likely.

FIGURE 5

RIDESHARER PROFILES



to have little impact on inducing current ridesharers to remain so in the future. Neither city's ridesharers appear to attach great consequence to the issue of ridesharing reimbursement; moreover, the Phoenix results are anomalous at the full subsidy level; this may be due either to sampling error or individual idiosyncrasy. It should be noted that while the segmentation method integrates both attitude toward ridesharing and intention to rideshare, actual behavior may vary. However, given the use of both measures of behavioral predisposition and the importance of the decision to the individual, past research suggests a high degree of correspondence between desired and actual behavior.

Employer Feasibility and Effectiveness

Foremost at this stage of analysis is the determination of which incentives identified above are viewed by employers of commuters as (1) feasible and (2) effective in stimulating ridesharing. Table 18 presents the Phoenix and Tucson employers' assessments of their likelihood of adopting various ridesharing incentive programs at full cost and at half cost (or one-half reimbursement by government). At full cost only computerized ridematching is viewed as a moderately likely organizational response among the both Phoenix and Tucson employers; less than half currently offer such a program. Moreover, employers typically noted only modest chances of getting a full-time company ridesharing coordinator appointed. However, the most significant finding is the perceived infeasibility from the employers' perspectives of providing one of the more potent incentives observed from the conjoint analysis of commuters responses -- company-owned vans for employee ridesharing. Though none were offering such an incentive at the time of the study, the majority clearly felt this would be unlikely to be adopted in their organizations. Similar results are obtained for the other relatively costly incentive, an employer subsidy to ridesharing

TABLE 18

Organizational Likehood of Adoption For Selected Incentive Programs
Under Differing Cost Reimbursement Alternatives

Level of Cost Reimbursement	Phoenix Employers (n=9)		Tucson Employers (n=8)	
Specific Incentive	No. of Firms Currently Offering Incentive	Average Likelihood of Adoption Among Remaining Firms	No. of Firms Currently Offering Incentive	Average Likelihood of Adoption Among Remaining Firms
No Reimbursement of Costs of Incentives to Employer				
Free Computerized Ridematching	4	56.0%	2	40.0%
Full-Time Ridesharing Coordinator	1	22.5	2	16.7
Vans Provided for Ridesharing	0	5.6	0	8.7
One-Half of Commuting Costs Reimbursed	0	13.3	0	13.7
All Commuting Costs Reimbursed	1	12.5	0	28.7
One-Half Reimbursement of Cost of Incentives to Employers				
Free Computerized Ridematching	4	58.0%	2	35.0%
Full-Time Ridesharing Coordinator	1	31.3	2	20.0
Vans Provided for Ridesharing	0	12.2	0	28.7
One-Half of Commuting Costs Reimbursed	0	23.3	0	26.2
All Commuting Costs Reimbursed	1	21.3	0	38.8

employees. Though the likelihood of adoption of incentives by employers increases when partially reimbursed, it does so only very slightly.

The employers surveyed in both Phoenix and Tucson felt that full operating cost subsidies to employees would be the most effective inducements to increase the likelihood of commuter ridesharing. These results appear in Table 19. As employees. Though the likelihood of adoption of incentives by employers increases when partially reimbursed, it does so only very slightly.

The employers surveyed in both Phoenix and Tucson felt that full operating cost subsidies to employees would be the most effective inducements to increase the likelihood of commuter ridesharing. These results appear in Table 19. As noted earlier, employees do not appear as dependent on reimbursement as these employers views would suggest. Interestingly, employer provided and driven vans are rated moderately effective in increasing the likelihood of ridesharing among Phoneix employers, and highly effective among Tucson employers, in accord with commuters' appraisals. HOV lanes and covered parking are viewed as moderately effective in Phoenix, and slightly less so in Tucson, despite some target market segments' apparently strong responsiveness to these incentives. Employers and commuters are largely in accord on the ineffectiveness of the social composition of the rideshare pool. Though Tucson and Phoenix employers do acknowledge the importance of home pickup, it also appears they may understate its actual significance in inducing ridesharing among certain target market segments. Finally, it seems the importance is overstated of a full-time ridesharing coordinator on site.

Lately, as background to the employer views presented in Phoenix and Tucson above, responding organizations claimed to be relatively active and enthusiastic in encouraging employee ridesharing. However, employers were clear in seeing ridesharing as benefiting the employee more so than the organization itself. These results are presented in Volume 3, along with selected additional tabulations.

TABLE 19

Employer-Rated Effectiveness of Incentives on Increasing The Likelihood of Ridesharing: Phoenix and Tucson Metropolitan Areas

Incentive Group Incentive Level	Mean Increased Likelihood [a] Phoenix Employers	 Tucson Employers
Setup of Car/Vanpool		
Self-arranged	1.778	2.125
Computer List	2.667	2.875
Coordinator Arranges	3.333	3.625
Vehicles and Drivers		
Share Driving and Vehicles	1.889	2.250
You Drive for Van/Carpool	2.444	2.500
Driven in Employer-Owned Vehicles	3.556	4.000
Other Rideshares		
Co-Workers	2.667	3.500
Other Employees	2.000	2.500
Anyone	1.333	1.625
Reimbursement of Operating Costs		
Car/Van Pool Shared	1.889	2.125
Partial Subsidy	3.000	3.500
Full Subsidy	4.222	4.125
Pick Up Point		
Park-and-Ride Lot	2.222	2.625
Home	3.333	3.750
Public Parking	2.111	3.250
Highway Travel		
Regular Vehicle	1.444	1.875
Immediate Access	2.889	2.375
Reserved High Speed Lanes	3.556	2.875
Work Place Parking		
Free Parking	2.667	2.750
Reserved Parking	3.111	3.375
Covered Parking	3.556	3.375
Number of Firms	9	8

[a] Expressed on 5-point scale with 1 = "No More Likely" to 5 = "Much More Likely.

CONCLUSIONS

Emerging from the findings of this study are several key conclusions of interest to transportation planners. First and foremost is the value of a segmentation approach in attempting to encourage commuter ridesharing. This research employed an attitudinal-predispositional method of identifying different market segements, in which groups of non-ridesharing commuters were arrayed according to whether their attitudes toward ridesharing were favorable, unfavorable, or neutral, and likewise whether their self-perceived likelihood of adopting ridesharing was low, moderate or high. From the nine resulting groupings, four were selected on the basis of potential for inducing participation in ridesharing. Most interestingly, these groups of differing potential did <u>not</u> vary consistently in demographic terms, home-work travel behavior, or personal situational characteristics. Hence traditional demographic/socioeconomic segmentation approaches may not as effectively isolate the targets of maximum potential.

What is of even greater importance, however, is the considerable variation between segments, even within Phoenix or Tucson, on the effectivenss of the different incentives studies. Apparently persons in Segment A are motivated by different factors than those in Segment D in regards to ridesharing. Moreover, a given incentive does not appear to have the same effect on all segments. Once a target segment is chosen, however, the particular incentives most appropriate for it above can be determined from the findings of this research.

In addition to the segment differences within cities, there also appears to be considerable differences between Phoenix and Tucson. Designing effective ridesharing programs requires attention to the specific structure of metropolitan area's commuting patterns.

As far as the effectiveness of particular incentives, the key findings here are the relatively high levels of commuter interest in employer-owned vanpools, especially compared to the relatively low potential impact induced by on-site ridesharing coordinators. Though the latter clearly plays an important role it appears more facilitative than motivational. Other incentives studied vary in their ability to increase ridesharing intentions, and are best viewed in the context of attempting to seek out the market potential of particular segments. Given the findings on commuter preferences, it is indeed surprising that from an employer point of view, van pools are seen as neither terribly effective in inducing ridesharing, nor especially likely to be adopted by the organization.

Owing to the nature of the conjoint analysis estimates plotted in the figures, the increased likelihood of any desired set of specific incentives can be determined by simply adding the quantities shown on the vertical axis, to arrive at a total value for the set. The resulting totals for different contemplated incentive programs may then be compared to select that most likely to stimulate ridesharing.