

RIDE-SHARING ACTIVITIES OF VIRGINIA INDUSTRIES

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(The opinions, findings, and conclusions expressed in this report are those of the authors and not necessarily those of the sponsoring agencies.)

Virginia Highway & Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the Virginia
Department of Highways & Transportation and
the University of Virginia)

Charlottesville, Virginia

September 1977
VHTRC 78-R6

0424

ABSTRACT

This study sought to measure the extent of existing ride-sharing programs among Virginia industries, the potential for additional ride sharing, as presently perceived by management, and the type of information thought to be most useful to firms considering ride-sharing programs.

A survey questionnaire was distributed to all manufacturing and mining firms with fifty or more employees. Of the 1,050 firms contacted, 482, or 46%, replied. Of these responses, 357 were suitable for complete analysis.

From the survey, it was found that approximately half of Virginia manufacturing firms have a ride-sharing program of some type. The vast majority of these programs consist of carpools organized by the employees with little or no assistance from the firm. Van- or buspools existed in fewer than 10% of the firms. Larger firms tend to be more receptive to ride sharing than smaller firms and support a wider range of program types.

Only 12% of the firms without ride-sharing programs are definitely willing to consider a program, but almost two-thirds are possibly interested. Larger firms are more likely to show an interest in a new program than smaller firms. Among the interested firms, carpooling is the most commonly chosen type of program, which is consistent with the finding for existing ride-sharing programs.

Seventy-five percent of the firms without ride-sharing programs thought that additional information would be helpful. Information most frequently requested concerned methods to encourage employees to become involved in a program.

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BACKGROUND

Ride-sharing programs have been consistently lauded as an economical and relatively convenient method of increasing the efficiency of the transportation system for travel to and from work. A variety of vehicle types such as cars, vans, or buses can be utilized in ride sharing, but the essential feature that separates ride sharing from other modes of travel is that commuters collectively transport themselves to their place of work.

Ride sharing has several advantages over traditional transit modes. It is adaptable to a wide range of travel situations, it requires little, if any, capital outlay, and the small operating costs are usually borne by the commuters themselves. Pooling can also serve as an adjunct to transit by meeting the excesses in demand which occur during the peak traffic period. Experiences of the Knoxville, Tennessee, commuter express service have shown that traditional transit may not totally serve home/work trips because of its relatively fixed capital and labor cost which cannot easily be adjusted to the high intensity and short-term commuter travel demands.⁽¹⁾

The advantages of ride sharing over individual commuting include a reduction in energy consumption, lower levels of air pollution, lessened rush hour congestion, reduced parking demand, and increased access to places of employment by those who do not have the use of an automobile. At a more tangible, individual level, ride sharing saves the commuter money through lower fuel and maintenance bills, longer vehicle life, and possible elimination of the need for a second car.

In spite of the personal and social advantages of ride sharing, the desire for the unfettered personal mobility provided by the single occupant automobile has resulted in a general decline in ride

sharing over the last thirty years. The Arab oil embargo of 1973-74 led to a temporary resurgence of pooling, but with the resumption of a plentiful fuel supply, the incidence of ride sharing returned to precrisis levels.⁽²⁾

To counteract the decline in auto occupancy rates, many industries have, as a public service, developed employee ride-sharing programs. These programs often are conducted in cooperation with civic groups or state, local, or regional governments. Federal demonstration grants have been made available to help finance new programs, and a wide range of program types have been developed. At present, ride-sharing programs have been promoted by such a variety of private and public organizations that it is difficult to assess the present state of program development in Virginia. Ride-sharing programs have been coordinated to a limited extent on a regional level, but in looking into the subject it was found that a comprehensive evaluation of the use of these programs on a state-wide basis was lacking.

PURPOSE AND SCOPE

The purpose of this study was to determine the nature and extent of existing ride-sharing programs in Virginia industries and to assess the potential for new programs as perceived by management. In addition, an attempt was made to discover the type of information that would be most useful to firms considering a program, problems which might be encountered in implementing programs, and the effect of industry location, size, and nature of the product produced on the incidence of existing and potential ride sharing.

The study was designed to assist policy makers and industry in their evaluation of the potential for ride sharing, and the extent to which state resources should be directed toward providing information, incentives, and promotion. Actual levels of ride sharing activity occurring as a result of existing programs were not specifically addressed; rather emphasis was given to the degree of program development within industry and the potential for additional programs.

METHODOLOGY

A survey questionnaire (see Figure 1) was distributed by mail to all Virginia manufacturing, mining, and quarrying firms with fifty or more employees. The questionnaires were addressed to either the plant manager or firm president and were mailed over a period of a few weeks in April 1976. Of the 1,050 firms contacted, 482, or 46%, replied. Of these replies, 357 questionnaires, or 34% of the total sample, contained all the data necessary for complete analysis.

VIRGINIA HIGHWAY AND TRANSPORTATION RESEARCH COUNCIL

SURVEY OF RIDE-SHARING ACTIVITIES

1. Do you have a ride-sharing program in your organization? (Check one) Yes No

ANSWER QUESTIONS 2, 3 and 4 ONLY IF YOUR ANSWER TO QUESTION 1 IS "YES". IF YOUR ANSWER IS "NO", GO TO QUESTION 5.

2. If your answer to Question 1 is yes, how is the ride-sharing program arranged? (Check one)

- Solely by employees with no involvement of firm or institution.
- With assistance from firm or organization in organizing or running the program.
- Other. (Specify) _____

3. If your answer to Question 1 is yes, indicate the type of program your organization has (Check one or more)

- Car pool (an automobile owned by one of the riders or by your organization that carries employees between home and work).
- Van pool (a 10-to 12-passenger van owned either privately or by your organization that is used instead of an automobile).
- Bus pool (a bus owned by either a transit company or your organization that picks up your employees at specified stops, but travels directly to your place of business).
- Other. (Specify) _____

4. If you have a ride-sharing program, please furnish additional details about the program on the reverse side of this sheet or on separate sheets.

5. If you do not have a ride-sharing program, would you be interested in considering one? (Check one)
 Yes No Possibly

6. If your answer to Question 5 is yes, which type of program would you most likely select? (Check one or more)

- Car Pool Bus Pool
- Van Pool Other. (Specify) _____

7. Would additional information about operating or assisting with ride-sharing programs be useful to you in planning such activities? Yes No

8. If your answer to Question 7 is yes, what type of information would be most important to you? (Check one or more)

- Costs and benefits of ride-sharing programs.
- Methods to encourage employees to become riders in the program.
- Methods for identifying interested employees.
- Administration and management procedures.
- Other. (Specify) _____

9. If you think your firm or organization would be interested in future information about a ride-sharing program or if you have a ride-sharing program now, would you please furnish the name of the person who should be contacted.

To gain some understanding of the factors which might affect a firm's receptiveness to ride-sharing programs, the survey respondents were classified in terms of three variables: number of employees, location by geographical region of the state, and the type of production in which the firm was involved. Survey responses were then compared with the variables by use of cross tabulations provided by the computer program, Statistical Package for Social Sciences (SPSS). A confidence interval of .95 was assigned as the test for significance, and only those correlations that met this standard are reported here. A description of the classification system and a breakdown of the responding firms into each classification are provided in Appendix A.

SURVEY RESULTS

Information derived from the survey is presented in four subject categories: existing ride-sharing activities, potential for additional programs, information that would be helpful to firms that are considering programs, and selected experiences of industries with ride-sharing programs.

Existing Ride-sharing Activities

Fifty percent of the respondents noted that there was at least some degree of ride-sharing activity in their firms. This figure appears to be somewhat conservative, and probably represents only those firms in which the degree of ride sharing was considered to be significant by the respondents. Based on the analysis of survey comments, it can be assumed that ride sharing is being practiced to some extent in almost every firm. (For an analysis of the problems associated with the survey responses see Appendix B.)

Levels of ride sharing varied significantly between areas of the state. The Hampton Roads area reported ride-sharing programs in 64% of the firms. This area is the home of an extensive military-industrial complex, and the high rate of ride sharing is indicative of the long history of ride-sharing programs in this area dating back to World War II. By contrast, only 33% of the firms in the Upper Piedmont region reported ride sharing. The paucity of programs in this area cannot be attributed to any specific factors, especially when it is noted that the adjoining Lower Piedmont and Shenandoah areas had relatively high levels of ride sharing — 59% and 55%, respectively.

There was a significant variation in the rates of ride sharing between different types of firms. A higher than average rate was reported in the Textile-Apparel category, where 62% of the firms reported programs. This is probably in part due to the firms' having standardized shifts and fairly large plants. The rate for the Printing-Publishing category is much lower than average, with only 32% of the firms reporting programs. The low level of ride sharing in this Category is attributable to irregular work hours which would break up possible ride-sharing groups and relatively small plant sizes which would reduce the number of employees available to participate in a program.

Present Ride-sharing Organization

Ride-sharing programs are arranged largely through the initiative of the employees with little or no assistance from the firm. In over 82% of the firms with ride sharing, the programs were arranged solely by the employees. While there is little correlation between the type of firm or location and the degree of assistance from the management, the size of the firm is a definite factor. As can be seen in Figure 2, smaller firms are less likely than larger firms to assist in ride-sharing programs. There are a number of possible reasons for the greater degree of assistance for ride-sharing programs by large firms. They control greater resources in the form of capital, organization systems, and information, and they usually have specialized administrative units such as personnel departments which are capable of coordinating ride-sharing activities. Financing can be arranged directly by the firm, or funds can be borrowed from employee credit unions. Furthermore, because there are more employees, larger firms tend to develop greater congestion and parking problems. Thus, since larger firms have a greater influence over local conditions, their policies toward ride sharing can generally gain a much greater return for their effort than could similar policies by smaller firms.

Type of Ride Sharing Used

Table 1 summarizes the type of ride-sharing programs found in Virginia's industries. Of those firms with ride sharing, carpooling is the most popular mode, representing 79.1% of the programs, with the remainder being almost equally divided between vanpooling and buspooling. As in ride sharing in general, levels of carpooling vary significantly between areas of the state, with 53% of the responding firms in the Hampton Roads area reporting carpooling as compared to 29% in the Upper Piedmont area.

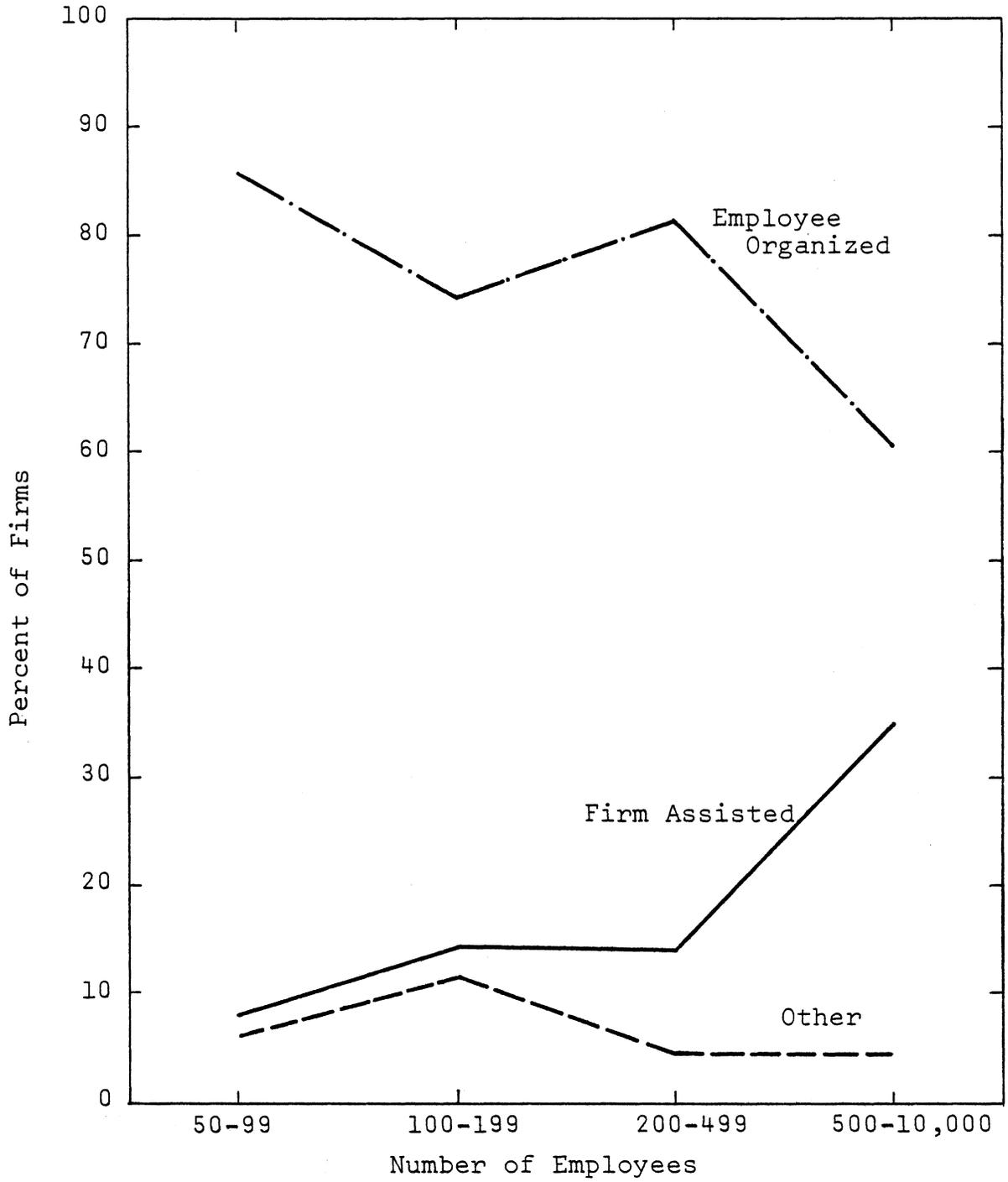


Figure 2. Methods of arranging ride-share programs for various size firms.

Table 1

Existing Ride-sharing Programs by Type

Program Type	Freq.	Percent Firms with Programs	Percent All Firms
Carpool	151	79.1	42.3
Vanpool	19	9.9	5.3
Buspool	16	8.4	4.5
Other	5	2.6	1.4
TOTAL	191	100.0	53.5

Larger firms show slightly higher rates of carpooling than do smaller firms, but not enough to be significant. Vanpooling and buspooling, however, are much more prevalent in the larger firms (see Figure 3). The skewed distribution for these programs indicates a greater receptiveness to vanpools and buspools by the larger firms. This tendency may be due in part to the ability of the larger firms to support the capital outlays required for vanpools and buspools. Also the concentration of these programs in large firms may create a greater potential effect on the commuting industrial labor force than is immediately apparent. By weighing the survey responses by the number of employees in each of the respondent firms, an estimate of the number of employees exposed to vanpooling and buspooling programs can be calculated. The results show that 20% of the people in the industrial labor force have a vanpool program in their place of work, while 24% have a buspool program available.

The mode of transportation utilized in the ride-sharing program correlates with the method of program organization. Figure 4 shows that only about 15% of the carpool programs were organized with the aid of the firm, while almost 37% of the vanpool programs and slightly more than 31% of the buspool programs were assisted by the firm. It is reasonable to assume that capital intensive programs such as vanpooling and buspooling often require support from the management and administrative expertise of the firm to be able to succeed.

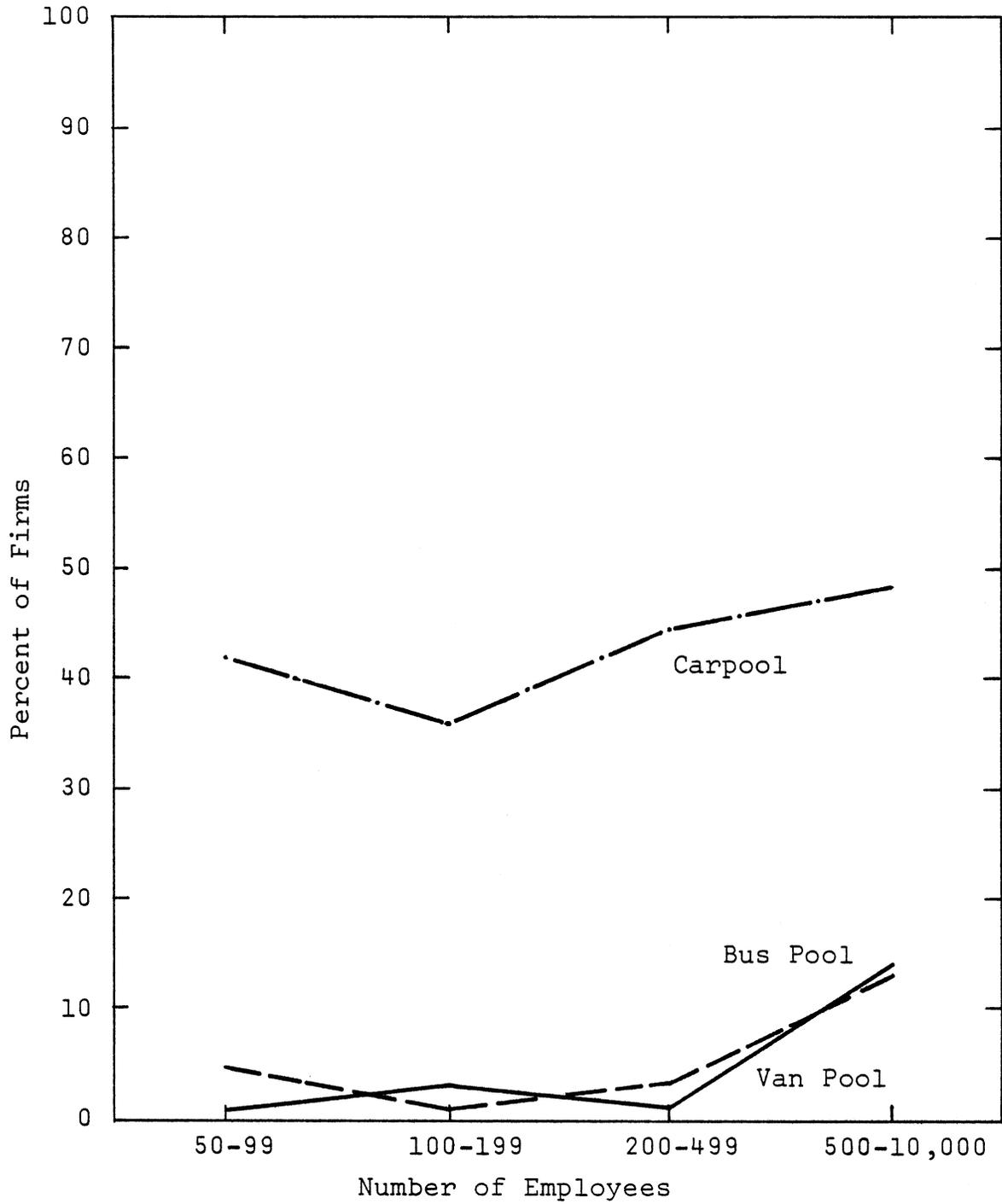


Figure 3. Percent of firms utilizing carpools, vanpools, and buspools by number of employees.

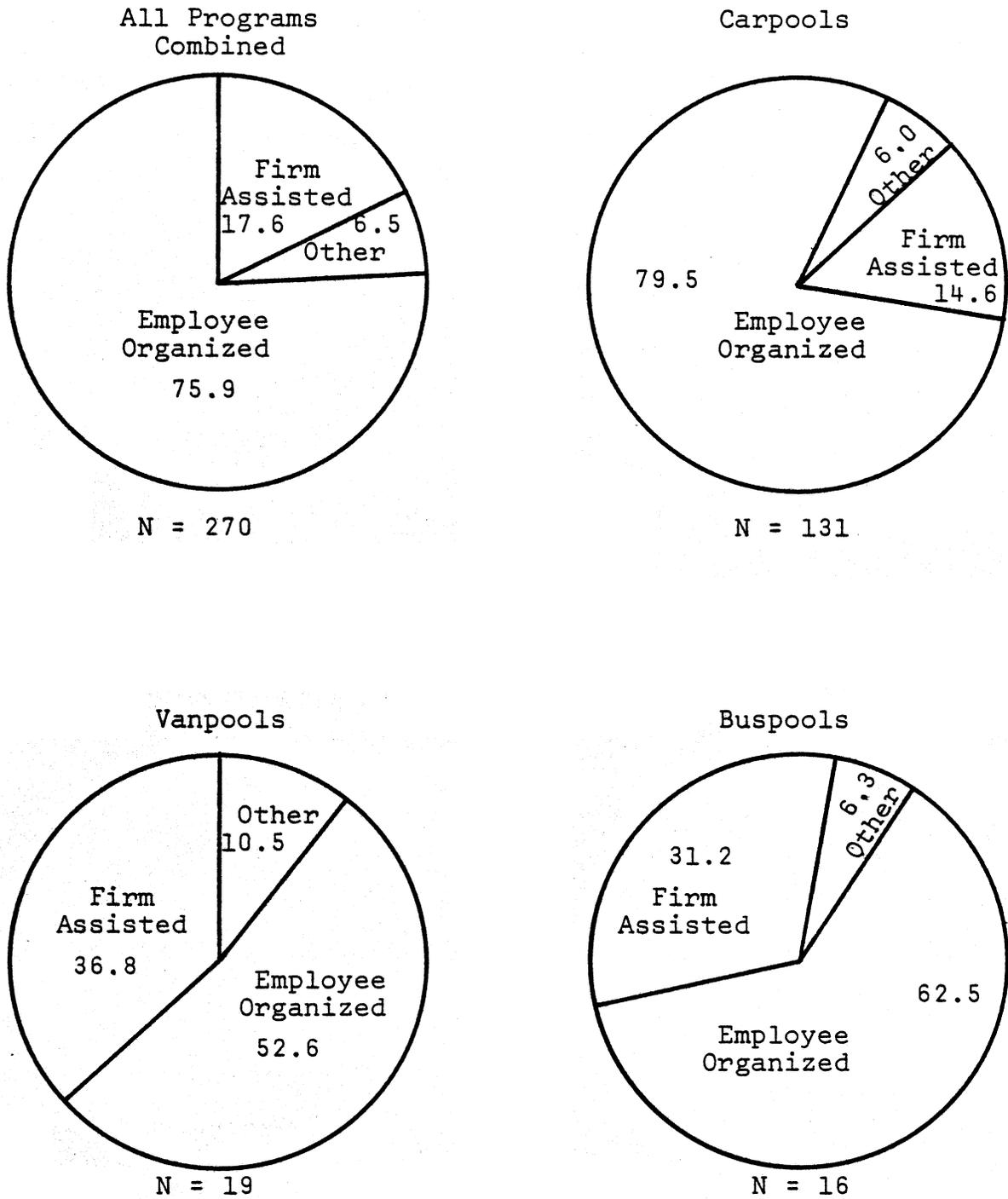


Figure 4. Percentages of firm assisted programs for carpools, vanpools and buspools.

Potential for Additional Ride-sharing Activities

When those firms without a ride-sharing program were asked whether or not they were interested in considering a program, 14% indicated a definite interest, while more than half stated that they might possibly consider one. Thus, as shown in Table 2, the overall potential for new ride-sharing programs could be as high as 68% of those firms which presently do not have a program.

Table 2

Firms' Interest in New Ride-Sharing Programs

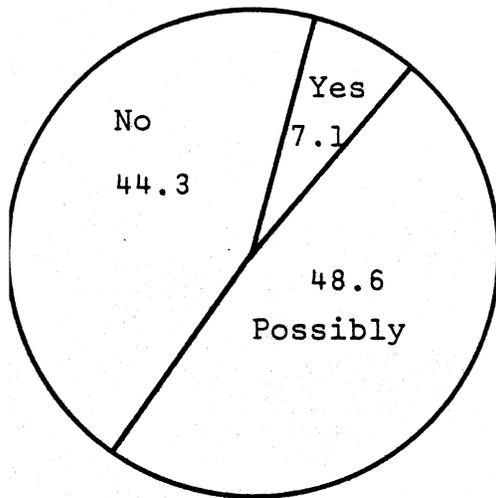
<u>Response</u>	<u>Frequency</u>	<u>Percent Response</u>
Yes	34	14.4
No	74	31.4
Possibly	128	54.2
	<hr/>	<hr/>
Total	236	100.0

Of the firms without a ride-sharing program, the larger ones show a greater interest in starting a program than do smaller ones. In fact, in the largest firm category, 80% of the firms presently without a ride-sharing program stated that they might be willing to consider one (see Figure 5).

The types of ride-sharing programs that would be selected if firms were to start programs are shown in Table 3.

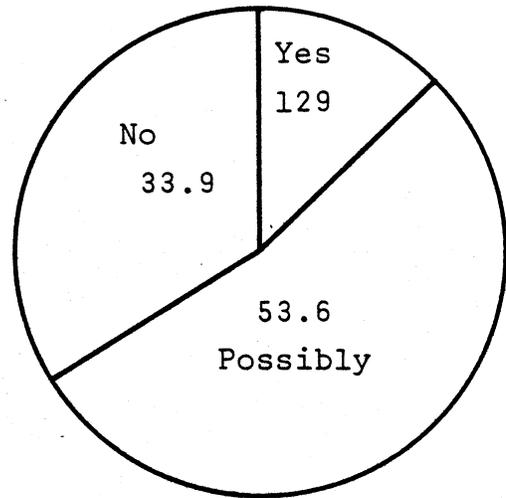
The most likely form of new ride-sharing, as perceived by industry, is carpooling, which represents 83% of the responses. There is a consistency between the proportions of existing program types and the proportions of potential program types, as can be seen by comparing Table 1 with Table 3.

Small
50-99



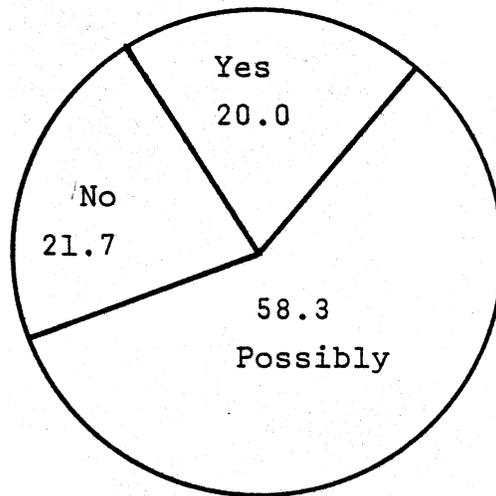
N = 103

Medium Small
100-199



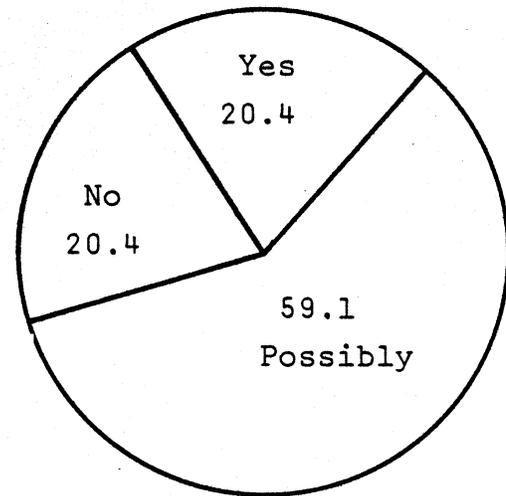
N = 89

Medium Large
200-499



N = 86

Large
500-10,000



N = 79

Figure 5. Interest in a new ride-sharing program by number of employees expressed as percentage of responding firms.

Table 3

Prospective Ride-Sharing Programs by Type

<u>Program Selected</u>	<u>Frequency</u>	<u>Percent Response</u>
Carpool	94	83.4
Vanpool	11	9.0
Buspool	8	6.2
Other	2	1.4
	<hr/>	<hr/>
Total	115	100.0

Information Requested About Ride-Sharing

Sixty-two percent of the respondents indicated a need for additional information concerning ride-sharing programs. Table 4 compares the distributions of responses by firms with and without ride-sharing programs. As can be seen, those firms without ride-sharing programs requested information in almost 75% of the cases, while only 50% of the firms which already have programs desired information. The high degree of interest in ride-sharing information further indicates a willingness on the part of those firms without programs to consider one.

Firm size proved to be a significant factor in the tendency to request information (see Figure 6). Larger firms were much more receptive than smaller firms, with 72% of the respondents in the largest firm category indicating that information about ride sharing would be helpful.

Table 4

Need for Information, by Percentage of Respondents

<u>Desire Information and Assistance</u>	<u>Firms With Program</u>	<u>Firms Without Program</u>
Yes	50.2	74.4
No	49.8	25.6
	<hr/>	<hr/>
Total	100.0	100.0

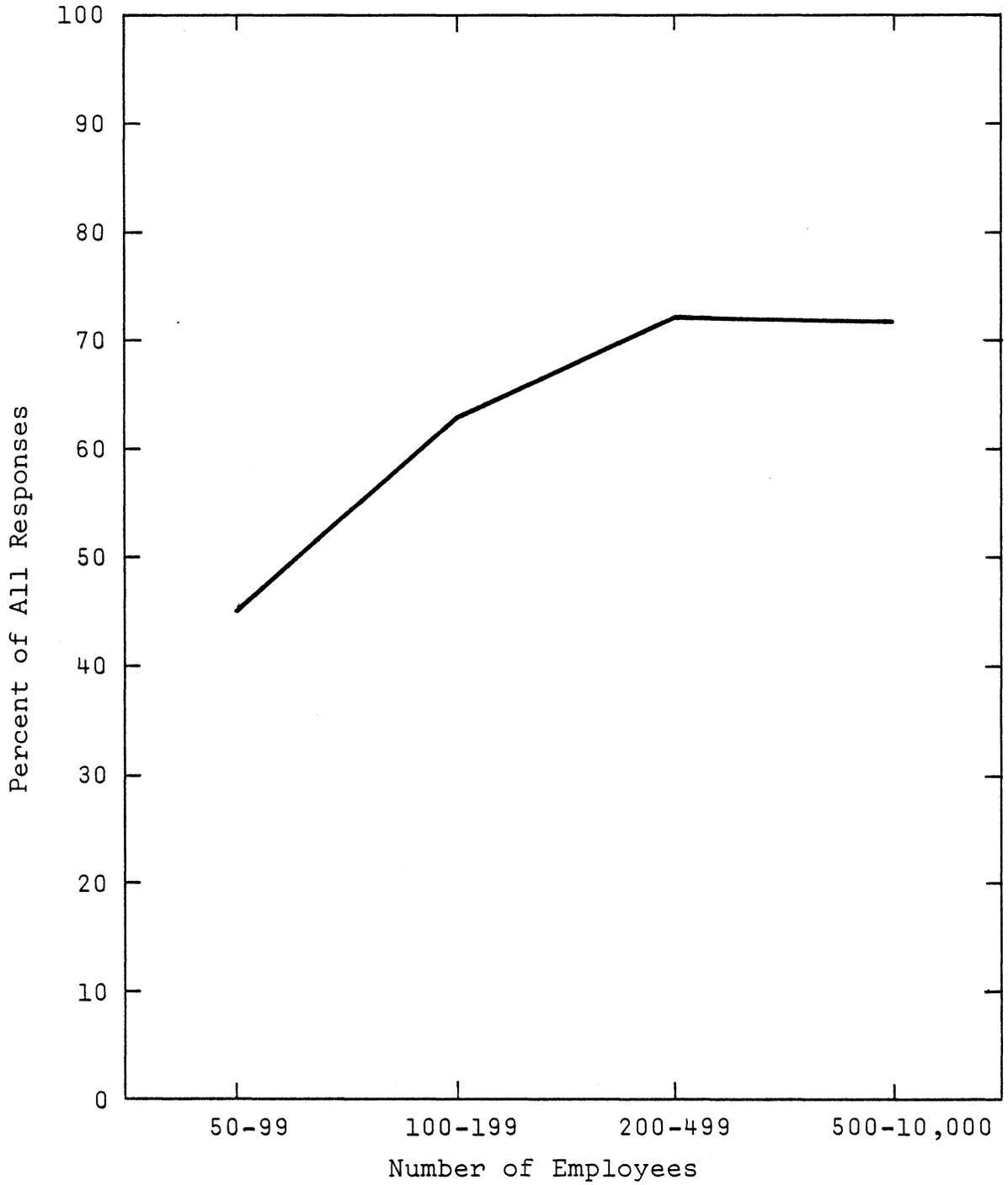


Figure 6. Percentages of firms indicating desire for information about ride-sharing programs by number of employees.

The type of information requested by industry is summarized in Table 5. Methods to encourage employees to begin ride-sharing was requested by over 40% of the respondents, while techniques to identify interested employees, information about cost and benefits of ride-sharing programs, and administrative or management procedures were each requested by about one-quarter of the firms.

Table 5

Type of Information Requested by Industry

<u>Type of Information</u>	<u>Frequency</u>	<u>Percent Response</u>
Methods to encourage employees	148	41.5
Techniques to identify interested employees	102	28.6
Cost and benefits of ride-sharing programs	99	27.7
Administration and management techniques	81	22.7
Other important information	4	1.1

Selected Experiences of Industries
With Ride-sharing Programs

Over 74 respondents furnished additional comments concerning their programs. These can be categorized into six subject areas as follows:

1. description of existing ride sharing
2. extent of ride sharing within the firm
3. reasons why the firm does not have a ride-sharing program
4. programs that were unsuccessful
5. programs that were successful
6. planning for future programs .

Descriptions of Programs

A wide variety of programs were described in the respondents' comments. The degree of program development ranged from personal contacts with information being passed by word of mouth to promotional campaigns with computer matching systems, company incentives, and subsidized vanpools and buspools. The average firm's program, however, is generally limited to carpools arranged by the employees with very little management supervision. In many of the firms ride-sharing arrangements are so informal that the respondents stated that there were no ride-sharing programs in the firms, even though the employees' ride-sharing arrangements were described in the respondents' comments.

Grid location maps appear to be very popular with firms having programs, and the company newsletter is often used to promote ride-sharing. Commuter matching programs were occasionally used, but only ten of these programs were very effective. A special effort seems to have been made to supply transportation to employees who live great distances from the firms. These programs, which were often subsidized by the firm, were directed at tapping otherwise unattainable sources of labor. Van- and buspools operated by the employees, or by contract haulers, and serving employees from rural areas, ranged as far as one hundred miles from the plant location.

One respondent noted that his firm had organized a ride-sharing program with a neighboring plant. Both firms standardized their work shifts to accommodate the program, and a common ride locator board was provided for the employees of both firms.

Public transit is often utilized by firms in large metropolitan areas. Short shuttle pickup services are coordinated with municipal transit services, and in some areas transit routes are subsidized by the firms to provide services to the employees.

To overcome the congestion of the highways in the Washington metropolitan area, one firm noted that it has organized a series of park and ride locations in the suburban areas. From the pickup points, employees are transported by vans to the main office, utilizing the I-95 commuter lane and thereby considerably reducing commuting time.

Extent of Ride Sharing Within the Firm

Although no specific request was made to provide information about the degree of employee involvement in ride-sharing programs, nine of the responding firms provided estimates of the extent of

ride sharing in their firms. This figure varied from between 25% to 70% participation by employees, and from 2.5 to 4.0 persons per vehicle. These estimates compare favorably with the baseline ride-sharing rate of about 40% found to be the average in a number of large firms in a study made in Knoxville, Tennessee, in 1974.⁽³⁾

Reasons for Not Pooling

Irregular working hours, constantly changing shifts, or overtime on a moment's notice prevented many firms from initiating ride-sharing programs. To overcome these problems, a few firms took measures to ensure that everyone in a given carpool were assigned to the same shift, and that no member of a carpool would be asked to work overtime without advance notice. One firm noted that the preferential treatment of those who were in carpools was a constant source of irritation to those who were not.

Low densities of employee residences over wide areas was given often as a factor limiting ride sharing. This was particularly evident in small or highly specialized firms whose labor pool tended to be widely dispersed. On the other hand, one firm noted that it had no ride-sharing program because its employees lived nearby and usually walked to work.

Unsuccessful Ride-share Programs

A few companies have attempted to initiate ride-sharing programs only to have them fail because of a lack of interest on the part of their employees. Of these, a few firms supplied the following information.

In the summer of 1974 a map of our area and a bulletin board for employees interested in carpooling were posted near our cafeteria. Employee interest was minimal (3 out of approximately 2,500 employees) and was attributed to the assumption that most employees interested in carpooling were already in one.

Another firm, in cooperation with the Northern Virginia Transportation Commission, attempted to set up a computer based carpool program. The firm, with more than 500 employees, noted that "employee interest was slight, and usage involved perhaps only one person on an occasional basis."

Some new programs resulted in what could be termed "partial success," as in the comments below;

In early 1975 an extensive program of ride sharing was initiated with heavy communication support in the plant newspaper. Employees were encouraged to carpool and "rides wanted" and "riders wanted" columns in the classified ads were given top priority. A special preferred area in the parking lot was set aside for carpools; the transit company was given preferred treatment in arriving and departing at the main gate. Meanwhile, general employees established private bus routes from outlying areas, and these were given preferential parking and arrival and departing treatment, plus free advertising in the plant newspaper.

Unfortunately, interest has waned considerably, especially over the past six or eight months; the subsidy to the transit company grew too great and it was discontinued. [The transit company itself now runs a similar route and is given preferred treatment in loading and unloading and free advertising in the plant paper.] One private bus still runs and is being given preferential treatment. There continues to be a significant number of car pools among employees.

Successful New Ride-sharing Programs

In contrast to the comments above, an equal number of firms have developed successful programs. For example, one firm developed a matching system for those employees who lived in the same general area. As an incentive, reserve parking spaces were given to those carpools that consisted of a driver and three riders. The respondents stated that "The program had great success, forming 23 carpools with 4 persons or more per vehicle, which in theory eliminated 69+ cars daily."

Another plant, which incidentally is owned by the same corporation as the plant whose problems were described in the previous section, initiated a general ride-sharing promotion campaign. Since then, carpooling has increased up to an average of three riders per car and private vans and buses are operating from distant rural areas.

Planned Future Ride-sharing Programs

Several respondents noted that while they did not have a ride-share program at the time the survey was conducted, they were working on a plan for implementing a program. One firm is planning for a buspool, two are planning for a vanpool, and two are designing an employee organized carpool. One firm is expecting to move to a new building in about six months and is considering a van or bus system for employees which they might otherwise lose.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Fifty percent of major industrial and mining firms have ride-sharing programs.
2. Ride sharing is more prevalent than elsewhere in the Hampton Roads area where the military-industrial complex has promoted extensive ride sharing.
3. The majority of ride-sharing programs are arranged by the employees, with little assistance from the firm.
4. Large firms generally offer more assistance in organizing the ride-sharing program than do small firms.
5. Carpooling is utilized in 79% of the firms with ride sharing; vanpooling is used in 10%; and buspooling in 8%.
6. Vanpools and buspools are much more common in large firms than in small firms.
7. Of the firms without ride-sharing activities, 68% indicated an interest in starting a program.
8. Carpooling is the most popular mode of potential ride sharing, having been selected by 83% of those firms considering a program. Vanpools and buspools were chosen by 10% and 7% of the firms, respectively. These proportions are consistent with those for existing ride-sharing programs.
9. Over half of the firms stated that additional information would be useful, with methods to encourage employees being thought of as most important, followed by techniques to identify interested employees, cost-benefit information, and administrative and management procedures.

10. Irregular working hours and constantly changing shifts often prevent effective ride-sharing programs from being initiated.
11. Incentives such as the I-95 multipassenger lane and preferential parking for employees who share rides are noted by management as reasons for ride sharing in their firms.
12. During the fuel shortage many firms initiated a wide range of ride-sharing programs. When gasoline once again became available, interest in ride sharing lessened considerably.
13. Management appears to believe that lack of motivation on the part of employees is the greatest obstacle to initiating ride sharing.

Recommendations

The following general recommendations are based on results of the study. Several of these can be implemented by state and local programs or by industry. Other involve further research and study.

1. Increasing the quantity and quality of ride-sharing programs in Virginia should be encouraged by the provision of information and incentives. Successful implementation of ride-sharing programs is largely dependent upon adaptation to the specific conditions within the individual firms.
2. Efforts toward promotion of buspools and vanpools should be directed at large firms where experience has shown that they are likely to be successful. Carpooling programs, however, were found to be widely accepted in all sizes of firms and should find a greater degree of success in all firms.
3. Methods for overcoming irregular work hours and lack of employee motivation must be developed if ride-sharing programs are to be implemented in many firms.
3. Areas that should be addressed in future studies include a case study of selected ride-sharing programs in operation, development of strategies for the implementation of carpool programs, and a determination of how best to coordinate the efforts of government and industry within the state.

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ACKNOWLEDGEMENT

This report is based on survey data collected during the period April - June 1976 under the supervision of Moreland Herrin, visiting research associate.⁽⁴⁾ The authors acknowledge the work of Mr. Herrin in developing the survey questionnaire and organizing the data in form suitable for analysis. We also acknowledge the cooperation and support of Jack H. Dillard, who initially suggested the need for information about ride-share activities in Virginia. Jerry Korf provided valuable assistance in developing computer printouts and data reductions. Neal Robertson and Gary Allen reviewed early drafts of the report and made many valuable suggestions. Notwithstanding the assistance received in preparing the report, the authors are wholly responsible for its contents.

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APPENDIX A
SURVEY CLASSIFICATION SYSTEM

MAIN TYPE INDUSTRY CLASSIFICATION

Based on the nature of the product produced, the main type classification is the broadest industrial subgrouping available from the Virginia State Chamber of Commerce Industrial Listing. In this study, the more closely related of the Listing's 22 categories were combined to produce a classification system of 14 groups. The largest category is the Textile-Apparel grouping with over 74 responding firms. Other important categories are Machinery, Paper-Publishing, and Chemical Refinery (see Table A-1).

Table A-1

Main Type Industry Classification

Type	Code	Absolute Frequency	Relative Frequency
Mining	1	26	7.2
Food	2	26	7.2
Tobacco	3	4	1.1
Textile-Apparel	4	74	20.7
Lumber-Wood	5	34	9.5
Furniture-Fixture	6	14	3.9
Paper-Publish	7	41	11.5
Chem. Refine	8	38	10.6
Leather	9	3	.8
Primary Metal	10	12	3.4
Machinery	11	58	16.2
Transportation	12	12	3.4
Measure-Analyze	13	7	2.0
Miscellaneous	14	8	2.2
	Total	357	100.0

NUMBER OF EMPLOYEES

Four size categories were created with approximately equal numbers of firms in each group (see Table A-2). Smaller firms are much more common than larger firms, so that when a distribution of responding firms is presented by the number of employees in increments of 100, an almost logarithmic slope is produced.

Table A-2

Number of Employees

Category	Absolute Frequency	Percent
0 - 99	103	28.9
100 - 199	89	24.9
200 - 499	86	24.1
500 - 10,000	79	22.1
	Total	357
		100.0

AREA

Comparisons between different areas of the state were made by combining adjacent regional planning districts into eight major geographical regions (see Table A-3 and Figure A-1).

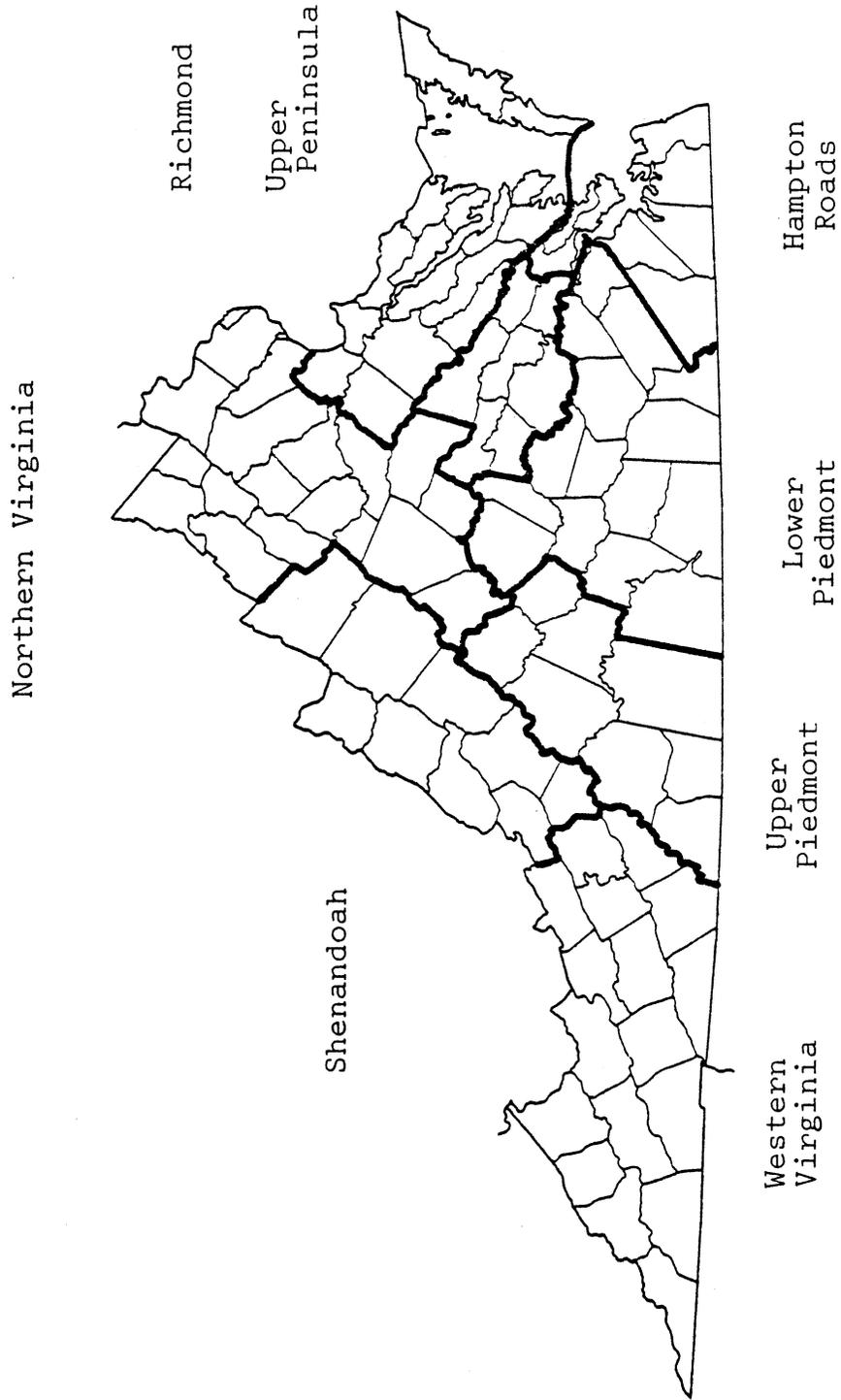
Area boundaries were established so as to create a nearly equal distribution of firms in each region. Also, an attempt was made to group the regional planning districts in a manner which would best utilize natural geographic boundaries as well as the general urban pattern.

Table A-3

Area Classification

Category Label	Code	Absolute Frequency	Relative Frequency (Percent)
Western Virginia	1	59	16.5
Shenandoah Valley	2	49	13.7
Northern Virginia	3	48	13.4
Upper Piedmont	4	55	15.4
Lower Piedmont	5	44	12.3
Richmond	6	47	13.2
Northern Tidewater	7	10	2.8
Southern Tidewater	8	45	12.6
	Total	357	100.0

Figure A-1. Geographical regions for comparison between areas of the state.



APPENDIX B

ERROR INDUCED BY QUESTIONNAIRE DESIGN

The first question on the survey questionnaire asked: Do you have a ride-sharing program in your organization? This question could, and apparently was, interpreted in three or more ways by the responding firms. To a few, the phrase "ride-sharing program in your organization" was thought to imply a formal, management organized ride-sharing program. If this assumption was made and the respondent answered "no", the questionnaire would then direct the respondent to go to question five, thus missing the clarification of ride-sharing types presented in questions two through four. Another less strict interpretation could be made from the designation "ride-sharing program"; it could be interpreted to mean a formal organization with a systematic approach to pooling. The final and intended interpretation was that the question was asking if any type or degree of ride sharing was being practiced by the employees of the firm.

To support the argument that the questionnaire was often misinterpreted, it was found that in over 20 cases the respondent answered "no" when asked if the firm had a ride-share program, and yet went on in the comments to describe the firm's employee-sponsored program. In that the comments were supplied by only one respondent in five, the number of firms that misunderstood the question could have been very large.

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