

CHAPTER SIX: VEHICLE OCCUPANCY TRENDS AND PATTERNS

Key Findings

- Average vehicle occupancy, measured as person miles per vehicle mile, continues to decline in all travel purpose categories, and notably in work travel. The overall average has descended from 1.9 in 1977 to 1.7 in 1983 and to 1.6 in 1990.
- The key factors in this decline seem to be declining family size and increasing vehicle availability. Along with other factors, these trends have shrunk the pool of those available to carpool or use transit.
- A separate factor of significance is that vehicle occupancy tends to increase with increasing length of trips, improving the energy efficiency and the costs of long distance travel.



he overall increase in share of travel by personally operated vehicles was not that substantive in the 1980's—the share increasing from 82 percent in 1983 to roughly 87 percent in 1990. However, the numbers of vehicles on the road increased more substantially because of the declining number of persons per vehicle, i.e., average vehicle occupancy. Vehicle occupancy patterns are important attributes of travel because they indicate a great deal about the relative efficiency of personal vehicle travel and the prospective congestion generated by vehicle use.

Two aspects of current vehicle occupancy trends are particularly significant. The first is that vehicle passengers tend to look very much like transit users in demographic terms. In many respects, they are competing for the

same pool of travelers, a market that is declining in overall size. The competition for this shrinking market, particularly in work travel, says a great deal about opportunities for increases in transit use and improvements in average occupancy.

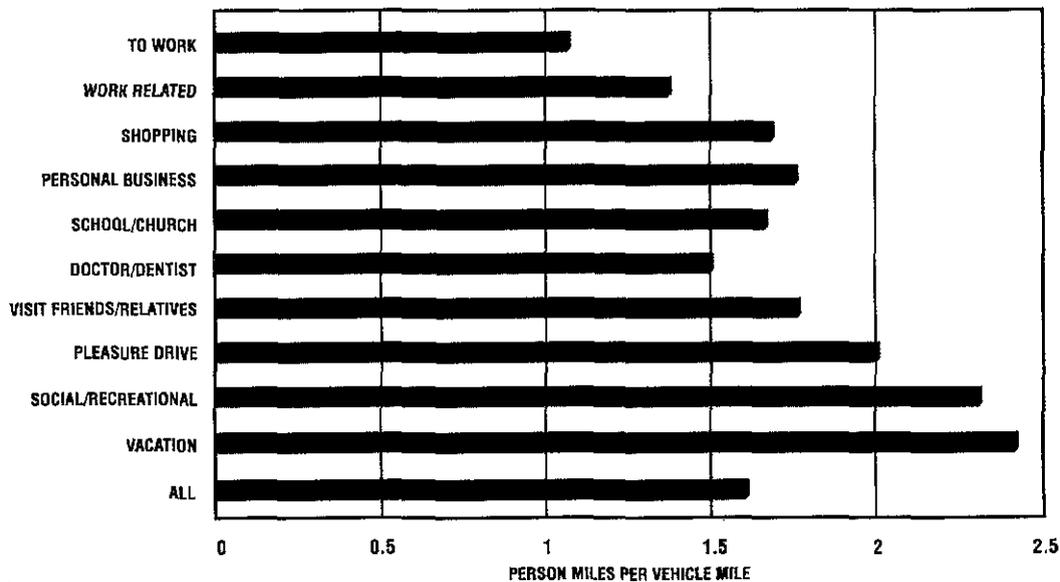
The second aspect of the issue is that the number of passengers riding in a vehicle significantly changes the costs per user. While this has an important impact in commuting, it is even more significant in intercity travel where the competitive costs in air, bus, or rail are person-based, not vehicle-based. Thus, average occupancies for long trips are important determinants of the perceived costs to travelers in personal vehicles contrasted to travel by common carrier.

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Figure 31 shows the average occupancy by trip purpose, as found in the 1990 NPTS, calculated as the number of passenger miles divided by the

FIGURE 31

**Average Vehicle Occupancy by Trip Purpose
1990**
(Person Miles per Vehicle Mile)



Source: NPTS

number of vehicle miles traveled. Thus, these statistics represent occupancies that reflect the distances traveled in that the occupancies observed in long trips are given more weight than short trips. This is important because trip length tends to have a significant impact on the average value of vehicle occupancies. All trip purposes tend to have occupancy rates that are comprised of short trips where occupancy tends to be lower than average and long trips where occupancy tends to be higher than average. For trips that are usually very short, such as shopping or personal business travel, this is not very significant, but for trips that have a long distance component, such as pleasure driving, vacation travel, and visits to friends and relatives, it can have a major impact. For instance, while the average for all trips is 1.6 person miles per vehicle mile, the average for trips with a length greater than 40 miles is almost 1.9. Thus, the longer the vehicle trip, the more fuel efficient and less expensive it is per unit of travel.

Consistent with historical patterns, work purposes tend to have lower occupancy levels than other

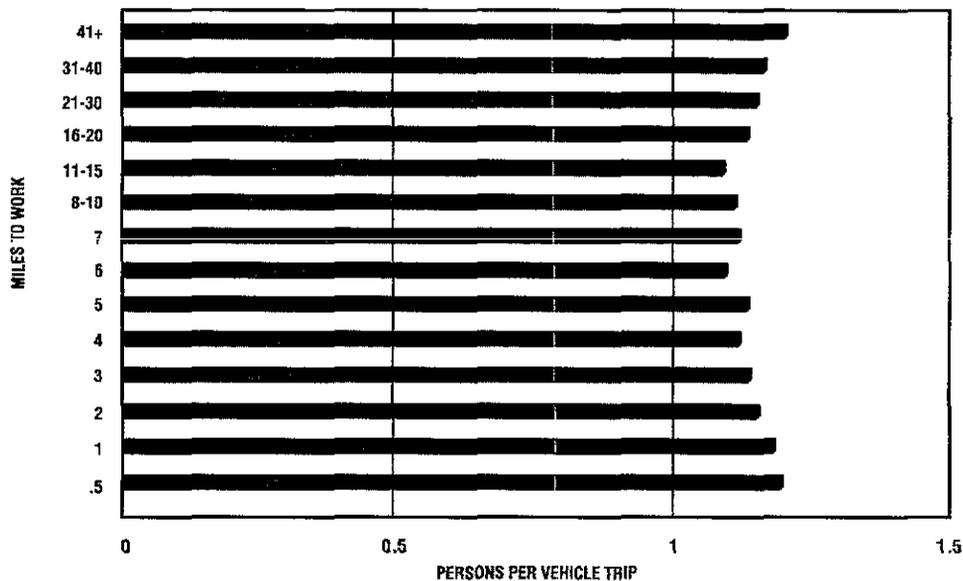
trip purposes. This is to be expected given that other purposes often involve family activities or involve a driver serving the needs of a passenger, as in a parent taking a child to a dentist. Current levels for work trips are about 1.14 person miles per vehicle mile, down from about 1.3 in the past. Work trip occupancies are seen as crucial to congestion management because they directly affect the number of vehicles on the road in peak travel periods. Figure 32 displays work trip vehicle occupancy on the basis of persons per vehicle trip, so that the differences by trip length can be shown better. Interestingly, work trips show a bimodal distribution with respect to distance, as shown in the figure. Vehicle occupancies are high for very short trips, decline to a minimum at about 5 miles, and then rise again to about 1.2 for long work trips. These long trips are often the source of large car or van pools designed to overcome the costs and tedium of long distance work trips. These long distance carpools have a tremendous impact on reducing overall vehicle miles of travel.

A further source of concern is the shifting

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FIGURE 32

**Work Trip Vehicle Occupancy by Trip Length
1990**
(Persons per Vehicle Trip)



Source: NPTS

distribution of vehicle occupancies as indicated in work trip data from the AHS for 1985 and 1989. The sharpest decline was in four-person carpools, which declined 26 percent, while three-person pools declined 14 percent and two-person pools declined only 6 percent. Two-person pools now constitute over 76 percent of all carpools. These trends diminished overall carpool efficiency by reducing average occupancies from 1.10 to 1.07, as measured in that survey.

The overall trend in vehicle occupancies continues to decline. For 1990, the average occupancy for all travel purposes was 1.6 person miles per vehicle

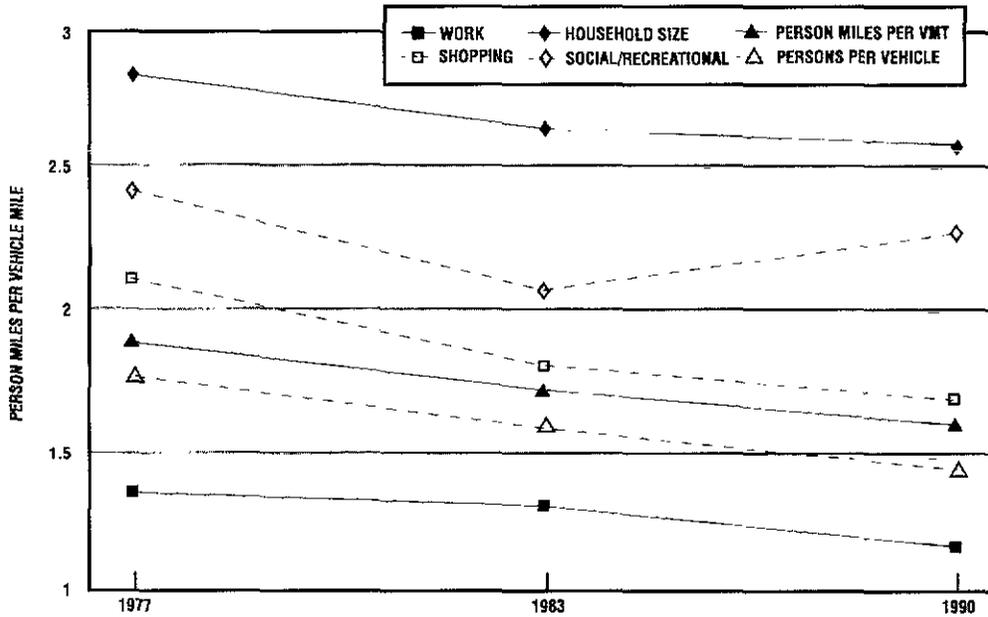
mile, contrasted to a rate of 1.7 in 1983 and 1.9 in 1977, observed in previous NPTS surveys. These trends are depicted in Figure 33, which shows the long-term declining trend in the average for all trips and in representative purpose categories.

Figure 33 provides further insight into the “why” of declining average vehicle occupancies. Two factors that affect occupancies are also shown in the figure. The first is the trend in average household size, as measured in the NPTS, showing a parallel declining pattern. Clearly the decline in household members has affected occupancies in household related kinds of tripmaking, such as social, recreational, and

This suggests that the decline in the number of persons without vehicles and the increased general availability of vehicles have affected the occupancy trend, as would be expected. In effect, both these trends result in fewer people available to be passengers. These two factors, along with the increased dispersion of work destinations, seem to portend a continuation of low levels of vehicle occupancy.

FIGURE 33

Average Vehicle Occupancy by Trip Purpose
1977, 1983 & 1990
(Person Miles per Vehicle Mile)



Source: NPTS

vacation trips. The second factor shown is persons per vehicle, which, as household vehicles have increased faster than persons in the population, has also exhibited a declining trend. This suggests that the decline in the number of persons without vehicles and the increased general availability of vehicles have affected the occupancy trend, as would be expected. In effect, both these trends result in fewer people available to be passengers. These two factors, along with the increased dispersion of work destinations, seem to portend a continuation of low levels of vehicle occupancy.

Further Work

There is a great deal of useful further work to be

done. A question remains regarding whether transit competition with private vehicle passengers has affected vehicle occupancy and vice versa. The scale of the overall vehicle passenger/transit market needs to be quantified and its trend patterns analyzed. The importance of long distance carpools to overall work trip VMT reduction needs quantification.

A review of vehicle occupancy by purpose to assess the relative components of change would not seem to be worth it. The volatility of occupancies by trip length due to sample size is a statistical problem that needs consideration. If increasing average trip lengths increase occupancy rates and average lengths are increasing, this should be a mitigating factor in the long-term trend of decline.

