

The Demography of the U.S. Vehicle Fleet: Observations From the NPTS

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The Demography of the U.S. Vehicle Fleet

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Executive Summary

One of the important trends observed in the NPTS data has been the increasing share of vehicle miles of travel generated by the older vehicle fleet. This is a product of two factors: the increasing proportion of the fleet that consists of older vehicles; and the increasing travel activity of these older vehicles. This study uses NPTS data as the fundamental source to examine the characteristics of the vehicle fleet specifically in terms of age, identify the characteristics of the owners of the vehicles in the aging fleet, and describe the ways in which those vehicles are used.

Paralleling our aging human population is the aging population of vehicles in our national auto fleet. The demography of the aging vehicle fleet is a subject that has not been carefully examined by transportation analysts. It is a dramatic and important story.

In 1969, the age of the vehicle fleet (back then the minuscule number of personal pickups and vans were not counted) was 5.1 years. By 1977 it had increased to an average age of 5.6 years, by 1983 it was 7.6 and by 1990 it was 7.7 years. (After 1977 the NPTS differentiated vans and pickups from autos showing that they tended to be slightly older than autos.)

A number of the points made in the report are summarized here.

- Total travel growth has been substantial, almost all of it coming from older vehicles.
- Growth in the size of the vehicle fleet has come not so much from expanded sales but from declines in scrappage of vehicles as they age.
- Total travel by vehicles two years of age or under has increased only slightly in absolute terms and therefore has sharply diminished as a share of total travel.
- In 1969 vehicles two years of age or under accounted for 42 percent of total travel, declining to a current level of 22 percent.
- Almost half, 48 percent, of current travel is generated by vehicles of six years of age or greater, whereas in 1969 only a quarter of travel came from such vehicles.
- VMT by the four age groups has grown to be roughly equal in shares in the range of 500-600 billion VMT each.
- Vehicles ten years old or greater now generate as many miles of travel as do vehicles two years and under (22 percent).
- The black and hispanic populations own older vehicles than the average for the nation. The differences in age diminish with increasing household vehicle ownership.
- Older cars tend to be used more for work travel than the average for all vehicles.
- Women tend to use newer cars than men.
- Travel purposes where new vehicles tend to predominate are work connected business travel and social-recreational travel.
- The Pacific and Mountain regions have a larger share of older vehicles than their share of all vehicles.
- Rural areas and small metro areas tend to have a disproportionate share of old vehicles.
- Large numbers of older vehicles in the central cities of western states could have substantial impacts on air quality.

The implications of the aging of the fleet are profound and can only be sketched here. Further, more detailed work needs to be done. The characteristics of the aging fleet and its use tell us a great deal about the mobility of our population.

Its most significant point in terms of public policy impact is the lag in penetration of the vehicle fleet of future innovations in areas such as fuel efficiency, pollution generation, and safety.

The fuel consumption characteristics of this older fleet clearly lag that of the newer fleet. The pollution control characteristics are probably even more pronounced. National focus is crucial. Analysis of ways to really make progress against the air pollution characteristics of transportation may well determine that this is a central problem to be addressed.

In terms of safety there are so many new safety features—anti-lock brakes, airbags, traction control, etc. that will only slowly gain share of the fleet—that the implications for accidents, injuries and deaths is almost frightening. Its importance for the ability to generate IVHS related changes in the fleet will be of major concern.

I. The U.S. Vehicle Fleet

In 1990 the resident population of the United States was about 240 million, according to the NPTS; also in 1990 the vehicle fleet population in use by that human population was in excess of 165 million. Such a large population, of people or vehicles, has its own special nature and characteristics. Little has been done to effectively explore the characteristics of the vehicle population. If we are going to peaceably coexist with that vehicle population we need to know more about it—specifically where it has been historically, where it is now, and where the trends indicate that it is tending.

Long term patterns of growth are presented in Figure I.1, which shows the indexed growth rates of the nation's human population, households, workers, drivers, and vehicle population.¹ The variables charted clearly differentiate themselves into three clusters. The first cluster consists of only one variable, the national population growth trend. It has grown slowly in the period, increasing by slightly more than 21 percent over the 21 year period of observation. The second cluster consists of three variables all growing at roughly the same rate of between 48 and 58 percent over the period. This group includes household growth, worker growth and licensed driver growth: note that licensed drivers increased at almost three times the rate of growth of the general population. The third cluster, vehicular growth, grew at an extraordinary rate of over 125 percent: six times the rate of population, and twice the rate of growth of the number of drivers.

Considered in absolute terms the growth in vehicles has been similarly substantial. Table I.1 shows that total vehicles increased by over 90 million while the total population only added about 40 million persons in the period of observation. The scale of the increases is revealing. In descending order they are:

Vehicles	92 million
Drivers	60 million
Workers	42 million
Population	42 million
Households	30 million

¹ Vehicles will be used as a term throughout this discussion as defined in the NPTS; that is vehicles are motorized vehicles, including automobiles, vans, pickup trucks and other light vehicles used for personal transportation. When it is intended to separately treat autos or trucks they will be specifically identified. In 1969, before the boom in pickup truck use for personal needs, the NPTS survey did not include pickup trucks.

**Figure I.1:
DEMOGRAPHIC GROWTH TRENDS: 1969 = 100, 1969-1990**

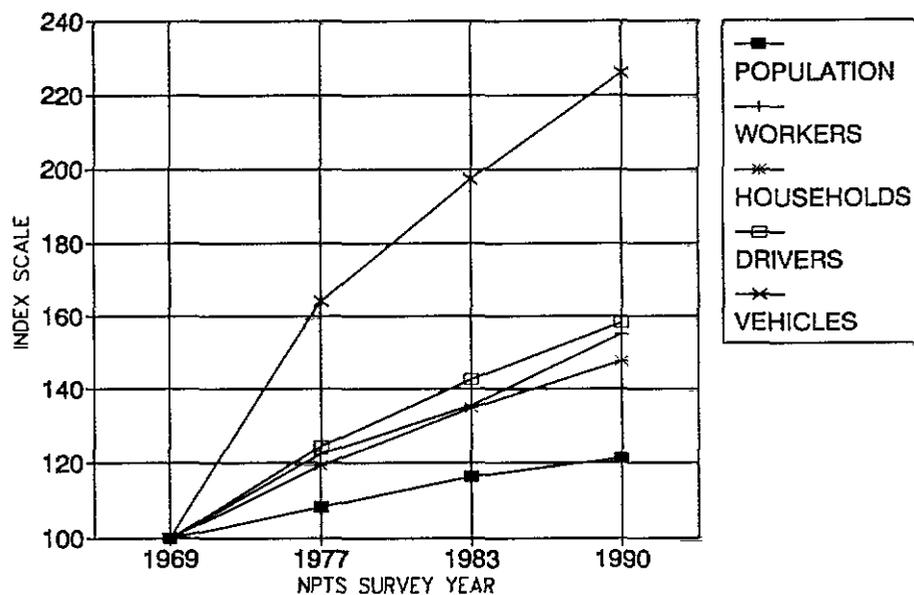


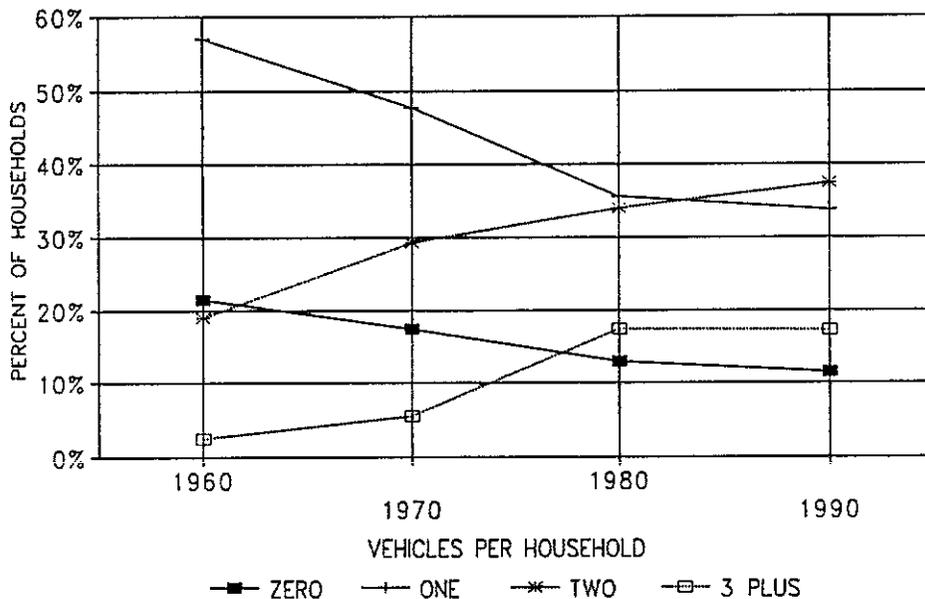
Table I.1: BASIC DEMOGRAPHIC MEASURES (IN MILLIONS)

	Pop.	Workers	Households	Drivers	Vehicles
1969	197	76	63	103	73
1977	213	93	75	128	120
1983	229	103	85	147	144
1990	239	118	93	163	165

However, as prodigious as these numbers are, there are signs of a slowing in the fleet's expansion. If one considers the levels of change it is most striking in annual terms. From 1969 to 1977 the annual increase in the size of the vehicle fleet was almost exactly 6 million vehicles, from 1977 to 1983 it dropped to 4 million vehicles per year and from 1983 to 1990 it reached a level of 3 million new vehicles per year added to the fleet. The current level of growth is about 1.8 percent per year which places the U.S. well behind most of the other nations in the world in annual vehicle growth rate.

Figure I.2 makes a further point regarding the trends in vehicle growth. It depicts the shares of households by vehicle ownership groupings. These data are generated from the decennial census and differ somewhat from the NPTS values. They suggest that there seems to be a stabilizing of percentages of households by vehicle ownership level. The significant shifts in shares of households by vehicle ownership seems to have ended in the 1980 to 1990 period, most notably the historically dramatic increases in shares of households with three or more vehicles actually reversed. This is further supported by the trends in NPTS data regarding vehicles per household which show that the big increases were achieved in the 1969-1977 period and have remained relatively stable since then. From 1969 to 1977 vehicles per household jumped from 1.16 to 1.59, but have increased to only 1.77 since.

**Figure I.2:
HOUSEHOLDS BY VEHICLES AVAILABLE TRENDS 1960-1990**



Aging Characteristics of the Fleet

The key point about the development of the vehicle fleet is that it is not particularly the product of a boom in annual vehicle sales. Figure I.3 shows the annual sales of vehicles in the United States, both domestic and foreign-made, from 1976 to 1990. While there has been growth in total annual sales it has not been dramatic. *After the declines in the early eighties, a product of recession, sales have exhibited no particular growth pattern.* Total annual sales have been higher after the recession than before, but not dramatically so: annual vehicle sales have moved in a range between 14 and 15 million vehicles per year, picking up the trend from 1978. The most significant change has been the increase in light truck sales in the post-1982 period.

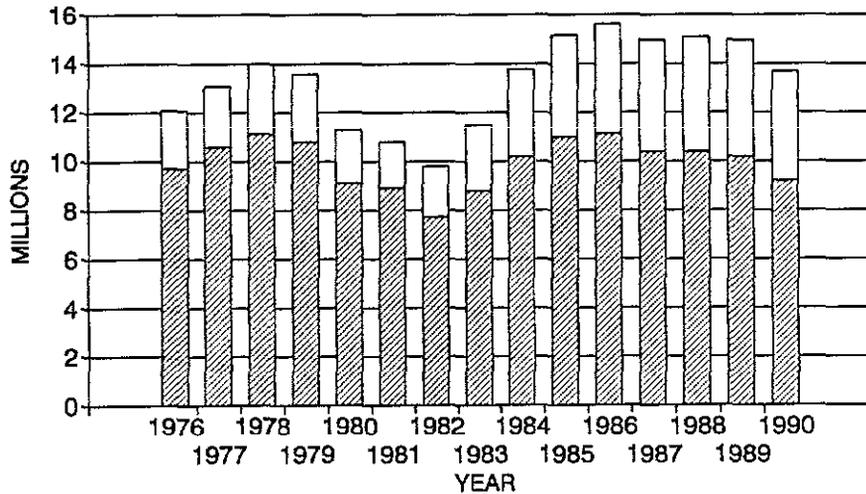
Figures I.4 and I.5 compare the 1980 and 1990 sales and retirements statistics for autos and trucks. Figure 4 shows that both births and deaths of autos were slightly greater in 1990 compared to 1980 with the net effect of slightly fewer autos added to the fleet in 1990 than in 1980. The data for trucks show a much greater difference in sales and retirements than in autos. Overall, the year 1990 added almost 2.5 million vehicles in net terms to the fleet, over 2 million of which were trucks. Figure I.6 summarizes these points.

What these data suggest is that, in large part due to trucks, the net retention of vehicles has increased over the years. A study by the Oak Ridge National Laboratory² demonstrates this effectively. Figures I.7 and I.8, show the survival rates for both autos and trucks. It is evident from the charts that historically trucks have had a tendency to last longer than autos. The trends indicate that the probability of survival of older vehicles has increased for both autos and trucks over the three time periods studied. For example, in the 1966-73 period a 15-year-old auto had a survival rate of less than 10 percent and by the 1978-89 period that probability had increased to more than 25 percent. A 15-year-old truck had a probability of survival of 44 percent in the 1966-73 period rising to almost 54 percent. So the auto fleet has improved in survival more than trucks but still lags behind trucks considerably.

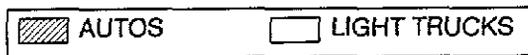
This has meant that the average age of the vehicle fleet has increased from slightly above 5 years in 1969 to almost 8 years by 1990. Table I.2 provides the detailed data for average ages of the auto and truck fleets. As shown in the table, the average age for automobiles has climbed steadily over the years. The average for trucks has been more erratic, actually dropping from 1983 to 1990. This could be primarily attributable to the dramatic increases in light truck sales since the 1982 recession for use as personal vehicles.

² Study of Vehicle Scrappage Rates, Miaou, Shaw-Pin, 1990

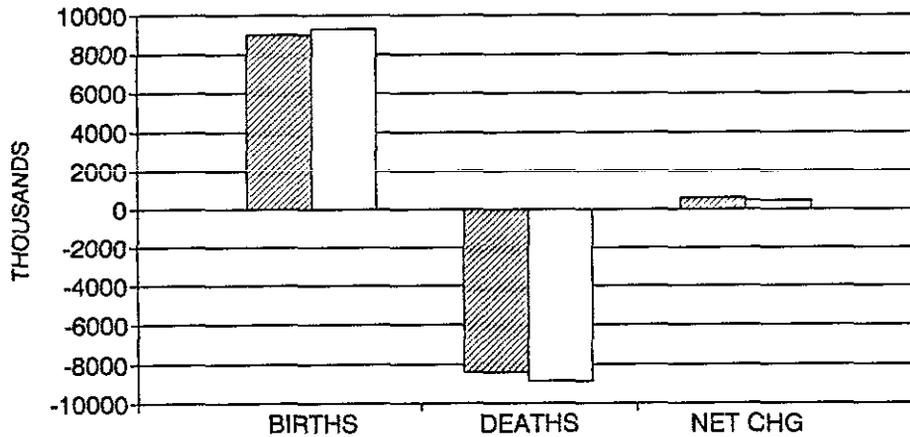
**Figure I.3:
VEHICLE FLEET SALES BY YEAR DOMESTIC AND IMPORTS 1976-1990**



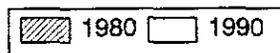
SOURCE: ORNL



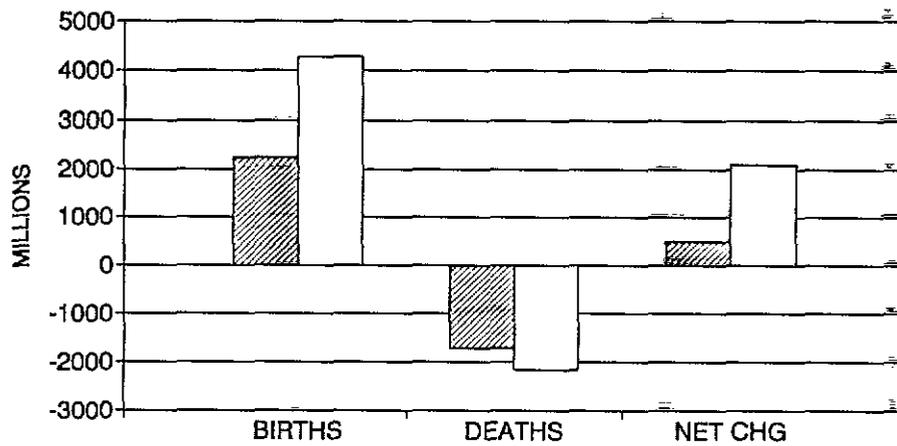
**Figure I.4:
AUTO SALES AND RETIREMENTS 1980-1990 COMPARED**



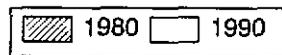
SOURCE: ORNL



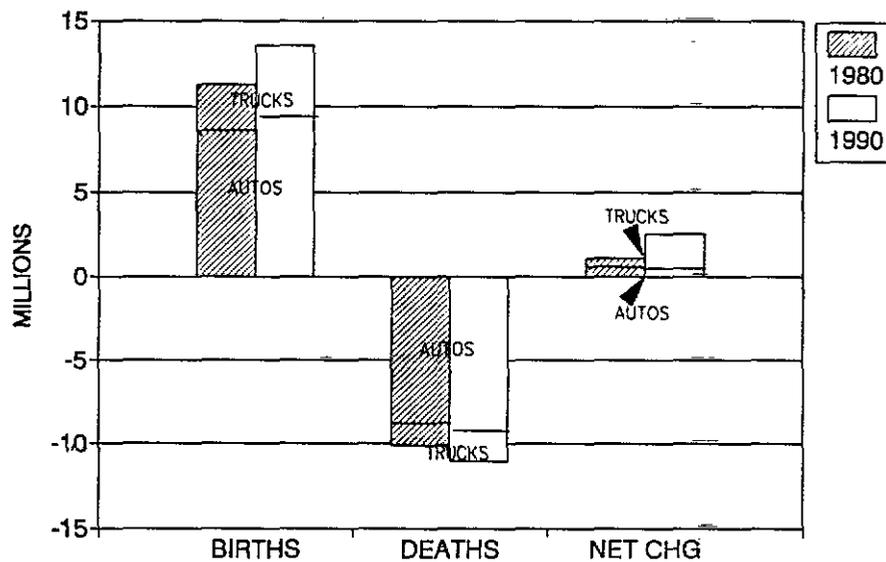
**Figure I.5:
TRUCK SALES AND RETIREMENTS 1980-1990 COMPARED**



SOURCE: ORNL

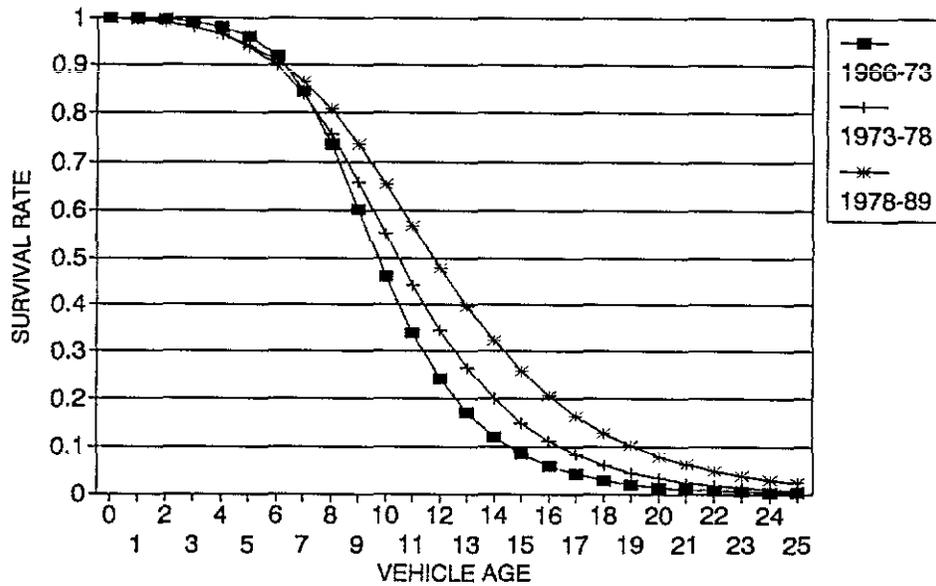


**Figure I.6:
VEHICLE SALES AND RETIREMENTS 1980-1990 COMPARED**



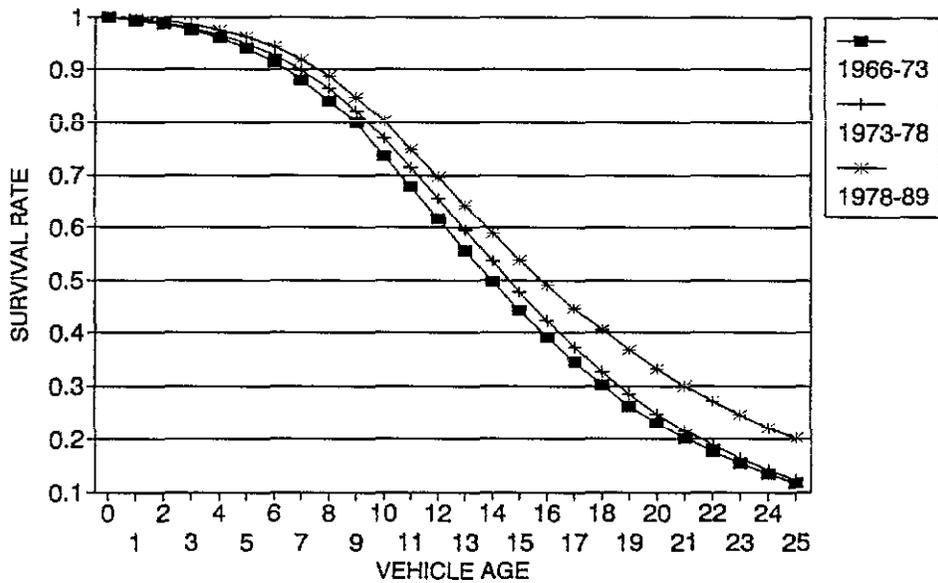
SOURCE: STAT. ABS.

**Figure I.7:
VEHICLE SURVIVAL RATES FOR AUTOMOBILES 1966-1989**



SOURCE: HWY STATISTICS; FHWA

**Figure I.8:
VEHICLE SURVIVAL RATES FOR TRUCKS 1966-1989**



SOURCE: HWY STATISTICS; FHWA

Table I.2: VEHICLE AVERAGE AGE TRENDS

Vehicle	1969	1977	1983	1990
Auto	5.1	5.5	7.2	7.6
Truck	—	6.4	8.8	8.0
All	5.1	5.6	7.6	7.7

These averages were the product of changing distributions of the fleet by age group. Notable in this distributional change is the decline in the share of the new fleet up to two years of age. It declined from almost 32 percent of the fleet in 1969 to less than 17 percent in 1990. At the same time the share of the fleet ten or more years old had the reverse pattern increasing its share from roughly 11 percent to over 30 percent.

More detailed information on the growth of the fleet by age appears in Figure I.9. This very graphically illustrates that the number of vehicles under two years of age has remained roughly the same for over twenty years. Thus the total increase in the fleet is almost exclusively a product of the increase in older vehicles, and the increases in vehicles in the fleet of more than 10 years of age is most pronounced. Viewed in terms of total vehicles we see an interesting story unfold. All of the fleet increases have occurred in the older age categories, most notably the over ten year fleet. The 3-5 year fleet about doubled, the 6-9 year fleet almost tripled, and the ten and over fleet increased more than 6 times.

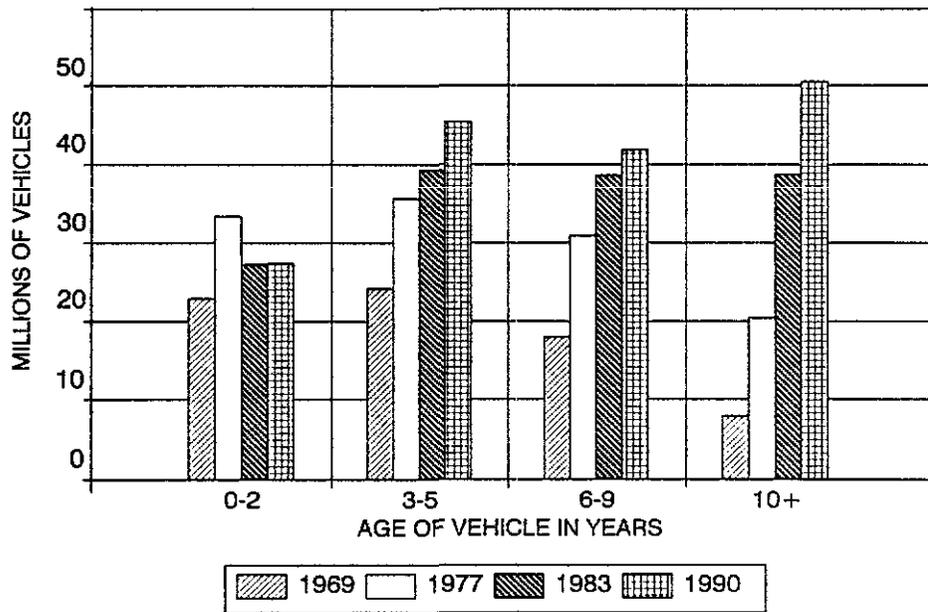
This is most emphatically depicted by Figure I.10 which shows the net change in total vehicles by age group between the 1969 and 1990 surveys of the NPTS. The number of vehicles 10 years of age or more in the fleet has jumped by more than 40 million vehicles, almost half of the total increase in vehicles in the period. Clearly the U.S. population has increased their ownership of vehicles not so much by adding new vehicles but by not throwing the old ones away. The figures suggests a story of the U.S. population buying vehicles at a roughly constant rate but then not discarding them with age. The comparisons of sales with scrappage and survival rates confirm this.

Figure I.11 shows the age distribution of the vehicle fleet in percentage terms for the four NPTS survey years. Most significant in the depiction are the variations in the distribution for vehicles of 10 years of age and over. The decline in percentage terms of the first year of sales is also pronounced. The pattern throughout the central elements in the distribution is a little less clear.

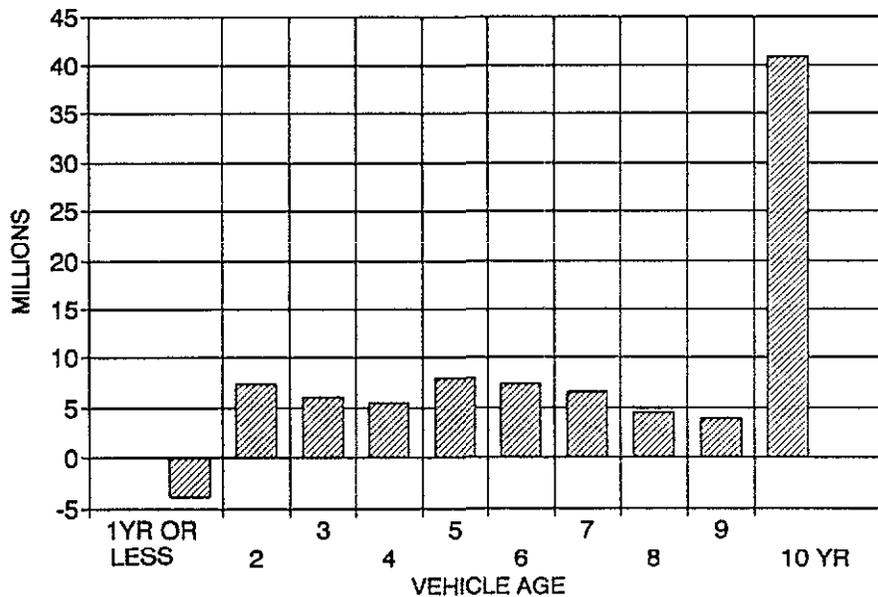
Useful corroboration of the NPTS data for 1990 is provided by the ORNL presentation of R.L.Polk data from registrations, *reproduced by permission here*. As can be seen from Figure I.12, the registration data and NPTS survey data are almost identical—the significant area of difference, not unexpectedly, is in the number of vehicles of one year of age or less.

This is a picture with both positives and negatives. The good news is that the fleet is lasting longer. The typical vehicle today can last ten years or more, which was almost unheard of in the sixties. This has positive implications for the recycling needs of the vehicle fleet. On the negative side it suggests that the ability for innovations to permeate the fleet is increasingly difficult. There are important safety, fuel efficiency and pollution control innovations becoming part of the fleet every year. These will enter the main stream only very slowly.

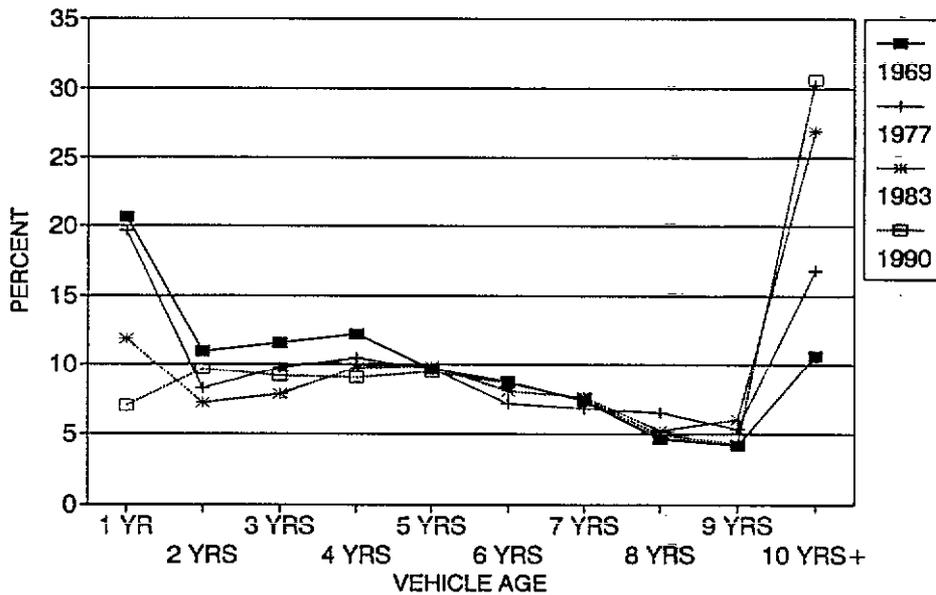
**Figure I.9:
SIZE OF THE VEHICLE FLEET BY AGE GROUP 1969-1990**



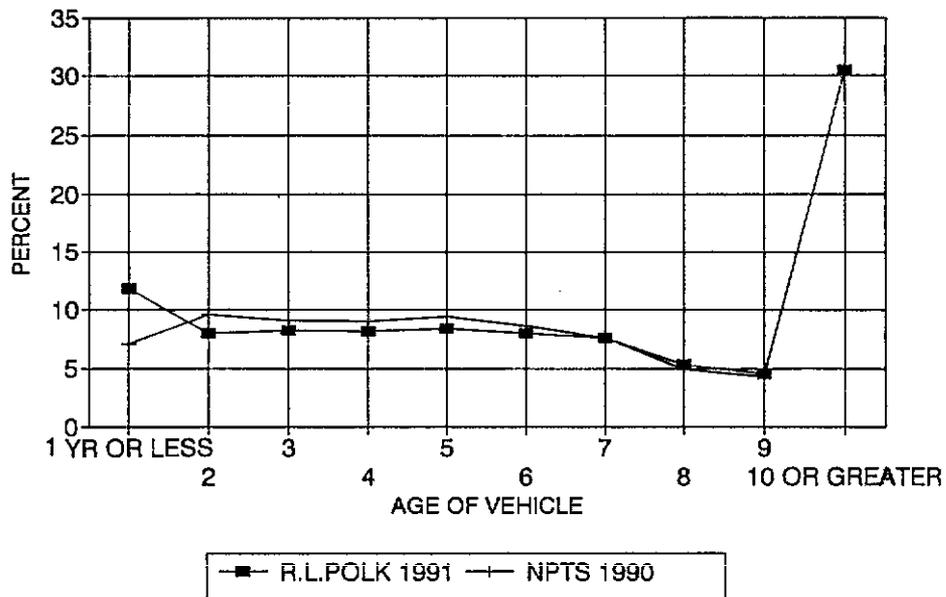
**Figure I.10:
NET INCREASE IN THE VEHICLE FLEET BY VEHICLE AGE 1969-1990**



**Figure I.11:
PERCENT DISTRIBUTION OF THE VEHICLE FLEET BY AGE: 1969-1990**



**Figure I.12:
AGE DISTRIBUTION OF THE VEHICLE FLEET FROM TWO SOURCES**



II. Who Owns the Older Vehicle Fleet?

All of this must be evaluated in the context of increasing vehicle availability per capita. The demographic characteristics of the population using these older vehicles—their age, sex, income and locational characteristics—is an important story. Trip purposes and time of day factors could also be crucial. The NPTS provides an amazingly rich resource to better understand the undercurrents in these trends.

Distribution by Race

There appears to be a tendency for different racial and ethnic cohorts to have different vehicle ownership characteristics with respect to age. These differences are not dramatic. The data cited here are based on the race or hispanic status of the head of household. Overall, the ownership of the auto fleet is differentially distributed by race and ethnicity with the non-hispanic white population owning a greater share of the fleet than blacks or hispanics. This is consistent with stage in the life cycle, income and locational factors that govern ownership. The white non-hispanic population, with 73 percent of the population, owns 82 percent of the vehicles; the black population, with 12 percent of the population, has 9 percent of the fleet; and the hispanic population, with 9 percent of the population, has 6 percent of the fleet. Table II.1 shows that ownership distribution within vehicle age group.

Race/Ethnicity	% Pop 1990 Census	% Households With Vehicles	Vehicles in HH	%Vehs	%Vehs >10 Yrs Old
White, Non-Hispanic	72.7	82.1	1.92	83.6	—
Black	12.1	9.1	1.29	7.8	—
Hispanic	9.0	6.0	N.A.	5.7	—
Other	7.6	2.8	N.A.	2.8	—

Figure II.1 depicts the average age of vehicles owned for non-hispanic whites, blacks, and hispanics, by number of vehicles in the household. In one-vehicle households the average of vehicles for white non-hispanic households is less than 6.5 years, rising to over 7 for black households, and about 7.5 years for hispanics. The patterns shown suggest that as the number of vehicles increases in the household the differences in average household fleet age between the racial and ethnic groups decline. This would seem to be consistent with what one would expect based on the relationships of income levels of households and vehicle ownership. For example, at the three vehicle ownership level the differences in age of the household fleet between black and white households is inconsequential. At the four vehicle and above level (where sample sizes are very limited) both black and hispanic household fleet ages are newer than that of the white population.

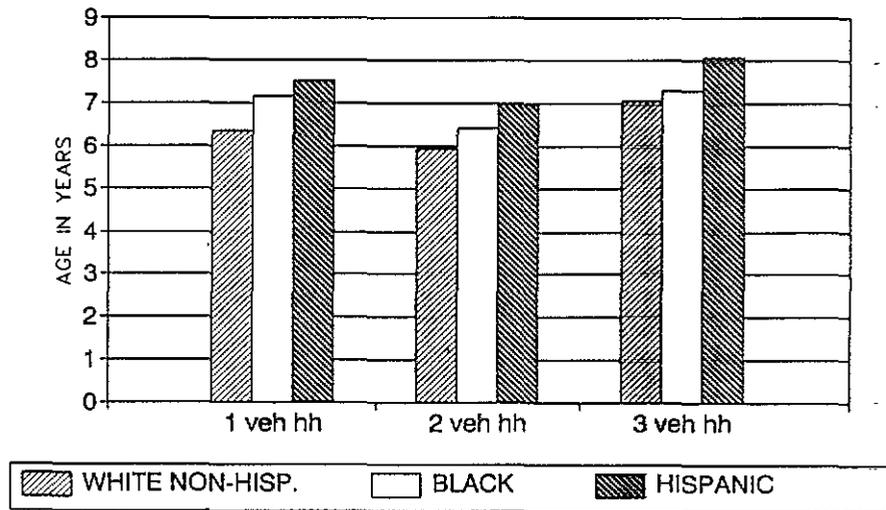
Distribution by Sex

It is not always feasible to establish the specific age of vehicles stratified by the sex of the owner. In households where there is only one vehicle all household members with licenses will use it; similarly, where there are multiple vehicles and multiple licenses there will be cross-over use of vehicles. Where the principal user is identified there is a slight indication that females tend to have the use of newer vehicles than

males. For male drivers, 16.3 percent of them are the principal driver of a vehicle of two years of age or newer, compared to 16.9 percent for female drivers, a slight difference. The difference is more accentuated by looking at the distribution of the fleet of seven years or greater. About half of male drivers, 51.4 percent, are the principal drivers of vehicles seven years of age or greater, whereas only 41.2 percent of women are. This is accentuated by the differential ownership of trucks by males which tend to be older.

Of the 10.8 million trucks 7 years of age or older, 9.6 million have males as the principal driver. Table II.2 summarizes some of the basic statistics by vehicle type. The percentages shown relate to the shares of the fleet held by the principal drivers.

**Figure II.1:
AVERAGE AGE OF VEHICLES IN HOUSEHOLDS
BY NUMBER OF VEHICLES AND RACE OF HEAD**

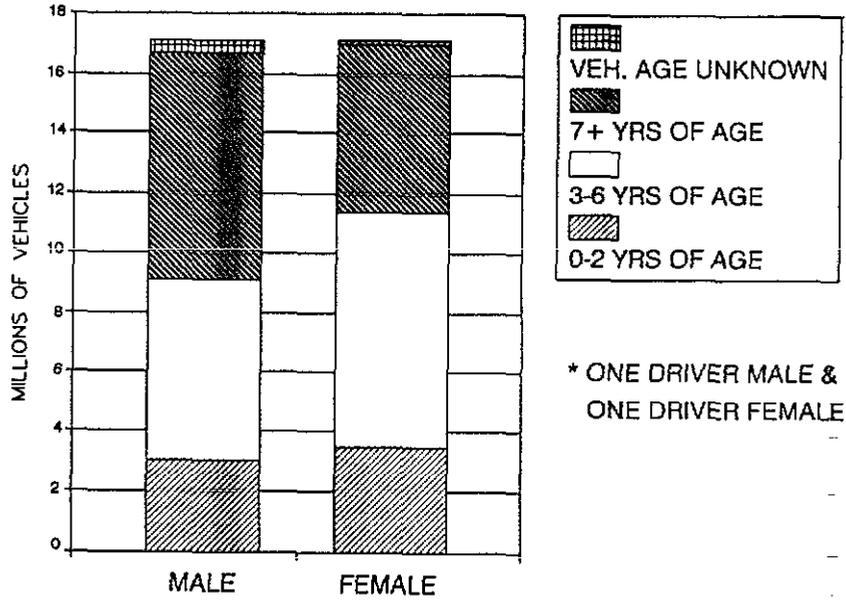


**TABLE II.2: VEHICLE AGE AND
SEX CHARACTERISTICS
(VEHICLES IN THOUSANDS)**

Vehicle Age	Male	Female	Total
0-2 Auto-Van	7,093	9,645	16,740
Pickup	3,489	433	3,922
Total	10,713	10,097	20,852
%	(51.4)	(48.6)	(100)
3-6 Auto-Van	14,844	23,483	38,330
Pickup	6,111	1,152	7,264
Total	21,170	24,645	45,819
%	(46.2)	(53.8)	(100)
7+ Auto-Van	23,294	23,882	47,180
Pickup	9,599	1,189	10,788
Total	33,716	25,134	58,854
%	(57.3)	(42.7)	(100)
All Vehicles	68,943	60,879	129,842
	(53.1)	(46.9)	(100)

The NPTS Databook looks at a specific and interesting case. Table 3.33 of the Databook examines the age distribution of vehicles in households with exactly two drivers, one female, one male, and exactly two cars. The data are distributed based on knowledge of who is the principal driver of each vehicle. Based on these data it appears clear that women tend to have access to the newer vehicles in such households; the average age of vehicles used by men was 7.23 years while that of women was 5.85 years. Figure II.2 provides greater detail on this pattern. It shows that 20 percent of women use vehicles of two years of age or newer while only 17.5 percent of men do; and almost 45 percent of men use vehicles over seven years of age, while only 33 percent of women do. Among the factors that may affect this pattern would be that males tend to use non-automobile vehicles more than women and these vehicles tend to be slightly older than autos. But a more significant supposition, only anecdotal in its data support, is that because women would tend to drive children more, and because new cars tend to be safer, they would more likely use the safer, and therefore newer car. This seems to be supported by the growing safety consciousness among young parents, borne out by sales trends. This also seems borne out by the trip purpose patterns discussed later in this report.

**Figure II.2:
AGE OF VEHICLES BY SEX OF DRIVER FOR
2 VEHICLE / 2 DRIVER HOUSEHOLDS***

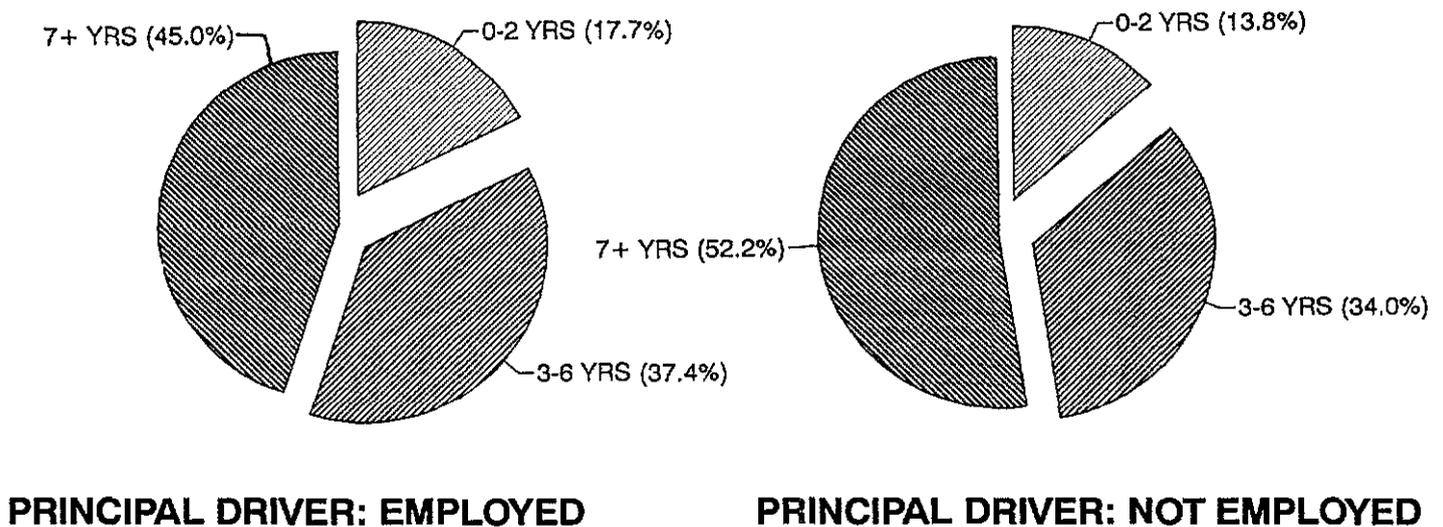


Distribution by Employment Status

As expected, those that are employed tend to have newer vehicles than those not employed. Interestingly, the numbers are greater than the male/female differences discussed above. About 17.7 percent of those employed, full or part-time, have a vehicle of two years of age or newer, while those not employed have about 13.8 percent of their vehicles in the same age group. This is a difference of 3.9 percentage points, contrasted to a .6 percent difference between females vs males. Figure II.3 further depicts some of these data.

It must be recognized that these data compare the vehicle's principal user by employed or not employed status, which is very different than unemployed status. The not-employed would include the retired, who can be quite wealthy, and also would include the spouses of the employed, whose labor force status is other than employed.

**Figure II.3:
DISTRIBUTION OF VEHICLES BY AGE**



Distribution by Income

Unlike most countries, low income households in the United States are substantial owners of vehicles. The average auto ownership rates for households by income class are shown in Table II.3. Households below \$10,000 in income still average one vehicle per household.

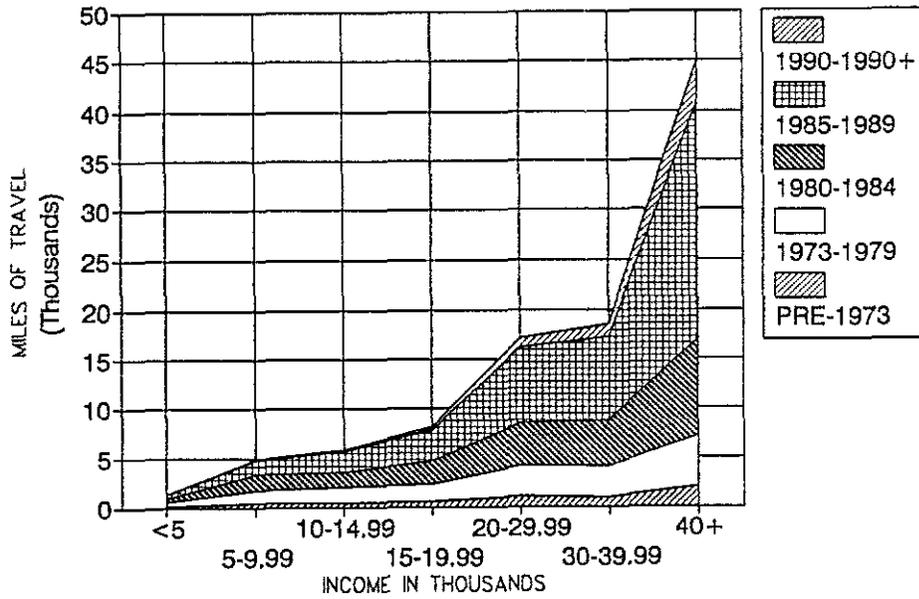
**Table II.3: VEHICLE OWNERSHIP
BY INCOME GROUP**

Income Class (000'S)	Number of Households	Average Vehicle Ownership
Under \$10,000	9,252	1.0
\$10,000-19,999	13,011	1.4
\$20,000-29,999	12,294	1.7
\$30,000-39,999	11,323	2.0
\$40,000 Plus	21,704	2.3
All Incomes	93,347	1.8

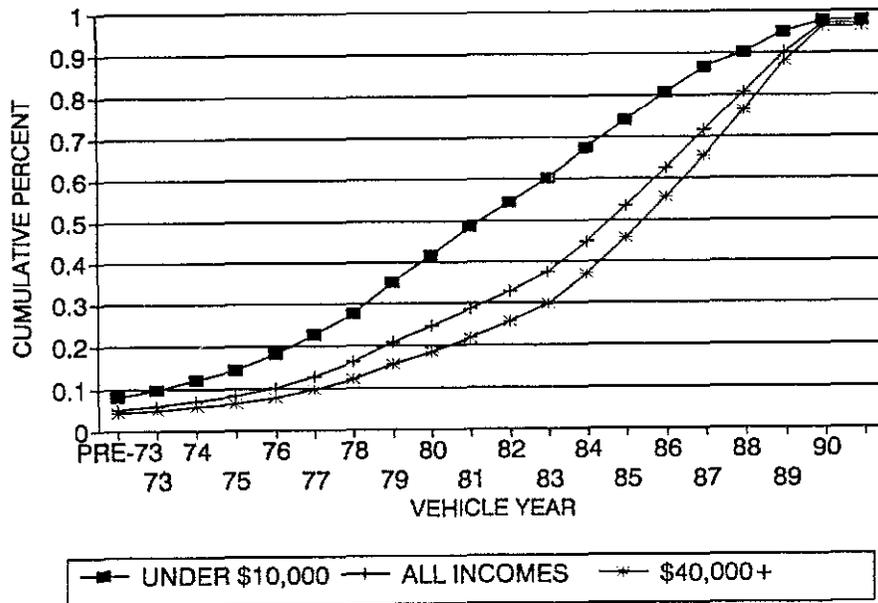
Not surprisingly lower income households tend to own and use older vehicles. Figure II.4 shows the total VMT generated by each income group in vehicles of differing age. The figure shows that while the share of travel produced by older vehicles among the higher income groups is small, the total amount is still greater than that produced by the lower income groups. A perhaps more effective way to visualize the relationship between income and vehicle age is presented in Figure II.5 containing cumulative levels of travel (VMT) by age of vehicle for the extreme low and high categories of income available in the NPTS and for all income groups. As shown in the figure, low income drivers produce a large share of their travel in old vehicles, e.g. about 50 percent of all vehicular travel by those whose incomes are below \$10,000 occurs in vehicles older than 1981, whereas for the high income group that percentage is not reached until between the 1985 and 1986 vintages.

Another factor related to income, shown in Figure II.6, is that lower income groups tend to travel fewer miles per year. The figure shows that, for instance, over half of travel per vehicle by the lowest income group is less than 7,500 miles per year. In contrast, the higher income group produces only 30 percent of its travel at less than 7,500 miles per year per vehicle. This linkage of lower travel levels and older vehicles is one in which cause and effect is not clear. Poor quality vehicles may inhibit travel by lower income groups.

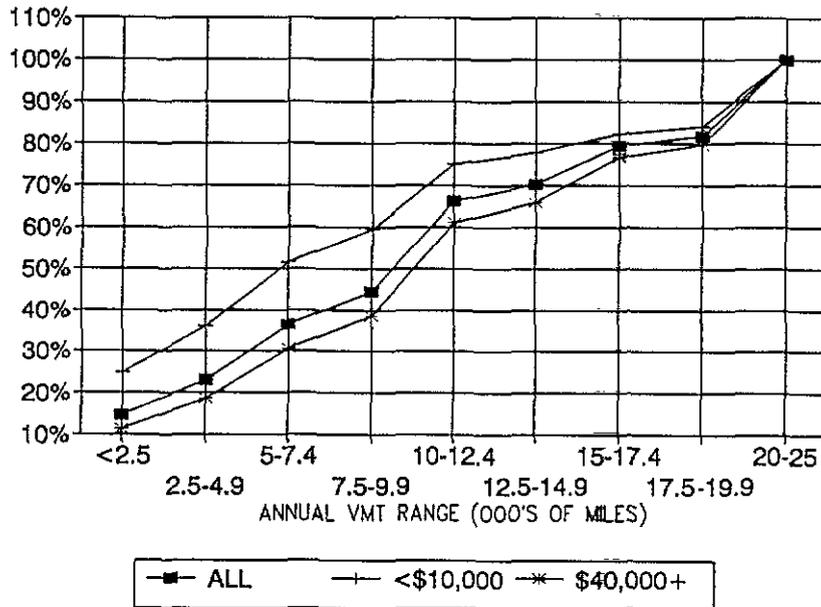
**Figure II.4:
VMT BY VEHICLE AGE BY INCOME CLASS**



**Figure II.5:
SHARES OF TRAVEL BY AGE OF VEHICLE FOR SELECTED INCOME GROUPS**



**Figure II.6:
CUMULATIVE % VMT BY VMT PER VEHICLE FOR SELECTED INCOME CLASSES**



III. Geographic Distribution of the Fleet

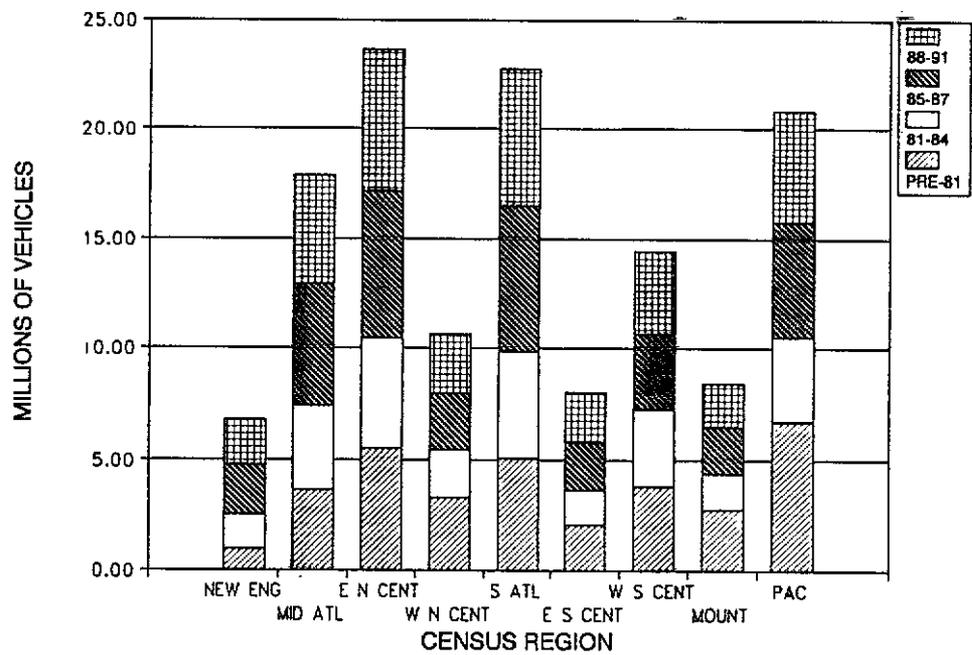
Distribution by Region

Like the population the automobile fleet has been migrating toward the South and the West. We know that like the population the vehicle fleet is not distributed uniformly across the nation. This leads to the question of whether the distribution by age of vehicle follows the general pattern for all vehicles. Figure III.1 presents the distribution of the total fleet by four age groupings. Figure III.2 a map of the Census Region boundaries is provided for reference. The most significant aspect of this distribution is that there are some surprises with respect to the distribution of the older fleet. In the nation overall about 25 percent of vehicles are pre-1981. Most regions are close to that percentage, but there are several outliers. In the East, both the New England and Mid-Atlantic regions have significantly less than average shares of the older fleet—New England has less than 14 percent of its fleet in the pre-1981 age group, while the Middle Atlantic is closer to 20 percent.

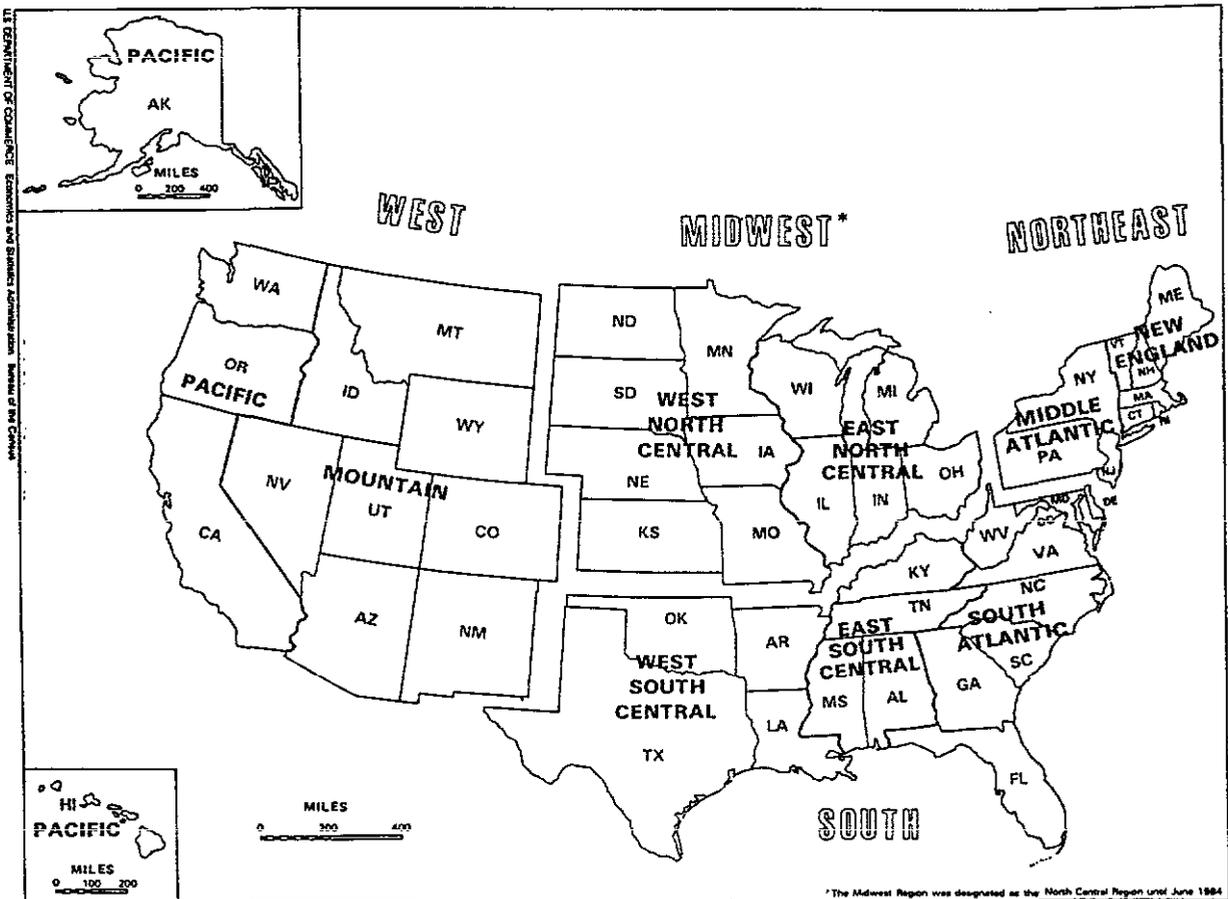
Three regions have over 30 percent of their fleet in the pre-1981 group. The West North Central region has about 31 percent. This may be a product of two factors; this area is heavy in three vehicle households and would be expected therefore to have older third and fourth cars. Also, this is an area that is heavily oriented to pick-up trucks which tend to be older than passenger autos. The other regions with notable age bias in vehicles are the Mountain (33%) and Pacific (32%). A factor worth noting is that this is the area where dry hot conditions tend to minimize rust and corrosion and may contribute to vehicle longevity. The substantial shift of the national population to these regions may be a factor in the aging of the fleet in that a larger share of the national population is living in areas today that are not as hostile to vehicles as in the past. Overall, the Mountain and Pacific states with 22 percent of the nation's vehicles have more than 28 percent of the vehicles that are pre-1981.

The shares that each region has of the national set of pre-1981 vehicles are shown in Figure III.3. Because these vehicles are likely to be implicated in air quality issues, it is important to know where these vehicles are with respect to urban areas. The data indicate that these vehicles are differentially distributed with respect to urbanized status. In the West North Central region about 25 percent of all vehicles are inside the central city of an urbanized area but only 21 percent of pre-1981 vehicles are located there. And while areas outside the metro areas of the region held 58 percent of vehicles, they accounted for 67 percent of the pre-1981 fleet. The Mountain and Pacific states show a similar pattern with a greater share of pre-1981 vehicles in the rural areas, but with an overall smaller share of vehicles in rural areas in general. Table III.1 shows the percentage distribution of vehicles within Census Region by metropolitan area status.

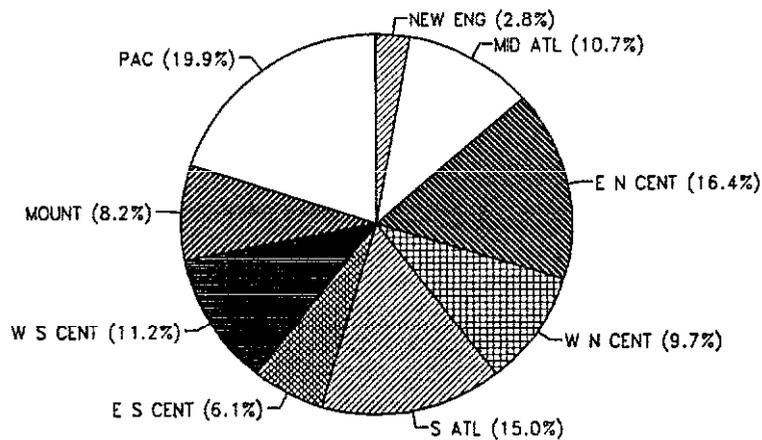
**Figure III.1:
DISTRIBUTION OF THE VEHICLE FLEET BY CENSUS REGION
AND AGE OF VEHICLE**



**Figure III.2:
CENSUS REGIONS AND DIVISIONS OF THE UNITED STATES**



**Figure III.3:
DISTRIBUTION OF PRE-1981 VEHICLES BY CENSUS REGION**



**Table III.1: DISTRIBUTION OF PRE-1981 VEHICLES
BY METRO STATUS**

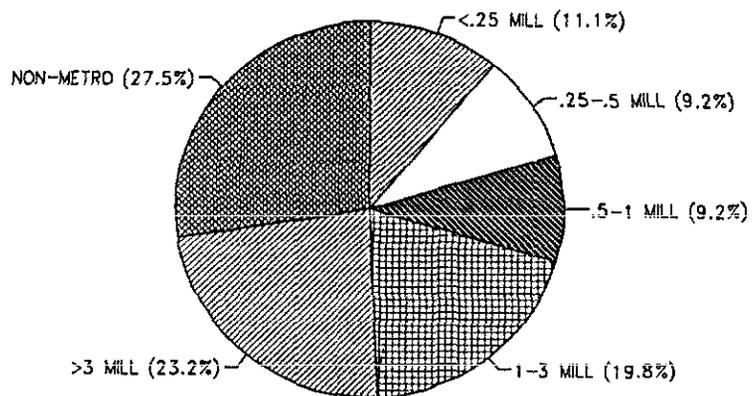
Region	Percent in	Percent in	Not in MSA
	MSA Central City	MSA; Not in Central City	
New England	25.0	31.8	43.1
Middle Atlantic	26.5	43.3	30.3
East North Central	32.2	21.0	46.8
West North Central	21.2	11.6	67.2
South Atlantic	26.9	24.4	48.7
East South Central	22.2	8.2	69.6
West South Central	45.6	11.4	43.0
Mountain	40.7	14.9	44.4
Pacific	38.1	33.7	28.2
Total	32.3	23.5	44.3

The average annual vehicle miles of travel for pre-1981 vehicles in these areas do not seem to indicate any remarkable characteristics to differentiate them from the national average. Of course these vehicles tend to be operated for fewer miles per year than the average for all vehicles, as expected. In many regions the central city vehicles traveled more than the suburban or rural vehicles, possibly due to being the single household vehicle in central cities where vehicle ownership is lower. This is supported by analysis by metro area size which indicates that the heaviest use of old vehicles is in the largest metro areas over 3 million where annual miles of about 9600 are indicated contrasted to ranges around 8600 miles in the smaller metro areas. When mileages are compared by area size, without stratification by age, mileages are uniform across size strata at about 12,500 miles per vehicle.

Distribution by Metro Area Size

The distribution of pre-1981 vehicles by metro area size is shown in Figure III. 4. It indicates that in total numbers most of the vehicles are in non-metro areas and in areas over 3 million. If each metro area size group is compared to the national average of about 25 percent of all vehicles are represented by those pre-1981 in age, there are several notable variations from the national average. Most significantly the locations with the highest proportions of pre-1981 vehicles are in the smallest metro areas, those below 250,000 and in non-metro areas. Small metro areas have 28 percent old vehicles and non-metro areas have 29 percent. The largest metro areas have the smallest proportion of old vehicles with less than 20 percent pre-1981 vehicles in the over 3 million population group.

**Figure III.4:
DISTRIBUTION OF PRE-1981 VEHICLES BY METRO AREA SIZE**



IV. Vehicle Travel

Further making the point of the expanding quality of the fleet is the fact that that fleet is not just around but it is being used. If the older fleet was just being retained by the population, with low levels of attendant use, that would be a matter of only anecdotal interest, but it appears that that is not the case. It is a well known attribute of vehicle travel that new vehicles tend to be used more than older vehicles. This characteristic continues, but it continues in an overall pattern of increasing travel by all vehicles, independent of age. This is most notable in the 1983-1990 period and is particularly pronounced among the older fleet. Figure IV.1 captures that pattern for age groups most clearly. Its primary characteristic is that the disparity between annual travel levels by vehicle age is diminishing. While the new fleet of 2 years or less increased in VMT per vehicle by 7 percent between 1969 and 1990, the percentage increases in VMT increased in each age group up to a 41 percent increase in the VMT of the fleet over 10 years of age. Figure IV.2 provides greater detail showing VMT per year for individual years of vehicle age. As is shown in the figure the 1990 annual travel measures for vehicles in each age group has almost uniformly increased from the values for earlier periods. Figure IV.3 from the Residential Transportation Energy Consumption (RTEC) survey performed by the Energy Information Agency of the DOE provides further support to the general pattern observed in the NPTS. RTEC basically covers the intervals in the period between the 1983 and 1990 NPTS observations.

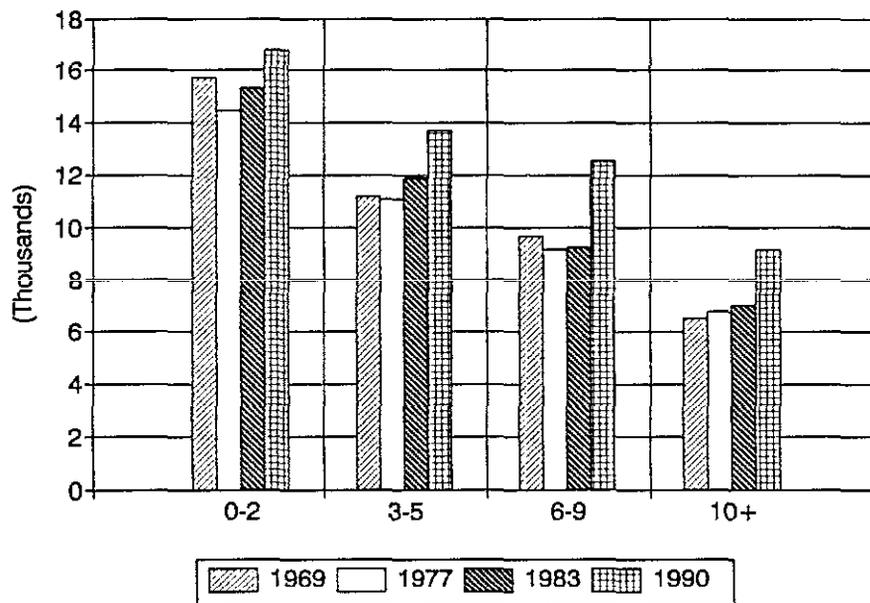
Examining the component elements of the vehicle miles of travel data for 1990 in more detail provides further understanding. It appears that the trips made per vehicle decline slowly with vehicle age, most notably after the seventh year. More significantly, average trip length also declines with vehicle age, and declines more substantially than does the trip rate. After the fifth year of age trip length has significantly diverged from the norm. Figure IV.4 depicts these patterns using an index with the first year as 100. Total vmt/vehicle, of course, also declines following the trip and trip length patterns.³

Again, R.L. Polk data provide corroboration of these observations. Figure IV.5 compares the NPTS VMT distribution by age to that observed in the 1991 R.L. Polk data set.

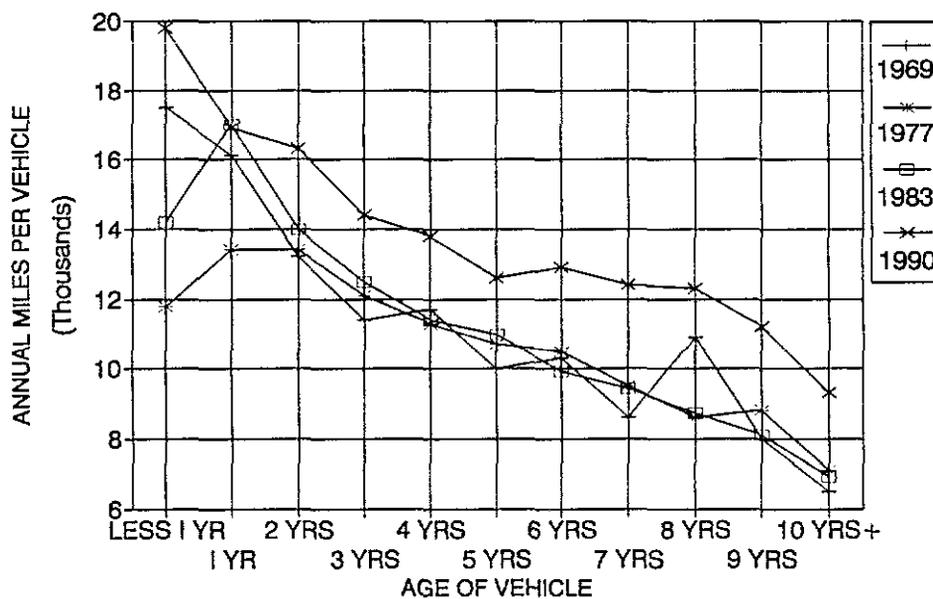
Greater understanding of the nature of the travel generated by vehicle age group can be obtained by looking at the distributions of travel by annual mileage range for each vehicle age group. These data are difficult to depict. Figure IV.6a, b, and c shows the percentage distribution of travel by annual mileage range for three vehicle ages—pre-1963 vehicles (i.e. 17 years old at the time of the 1990 survey), 1980 vehicles (10 years old) and 1990 vehicles. The key point made in this graphic is that the average mileage per year of older vehicles tends to fall in a low range, e.g. almost 50 percent of the vehicles of a vintage earlier than 1963 traveled less than 2,500 miles per year. Alternatively, the new vehicles, the 1990s, had only about five percent of their vehicles with such little mileage (see IV.6c), whereas over 25 percent of them traveled in excess of 20,000 miles per year. As expected the 1980 vehicles held the central position between the two extremes of new and old. These data also illustrate the classic lumpiness of mileage estimates clustering around the five and ten thousand mile values.

³ VMT/vehicle as used here is the product of trips/vehicle and average trip length.

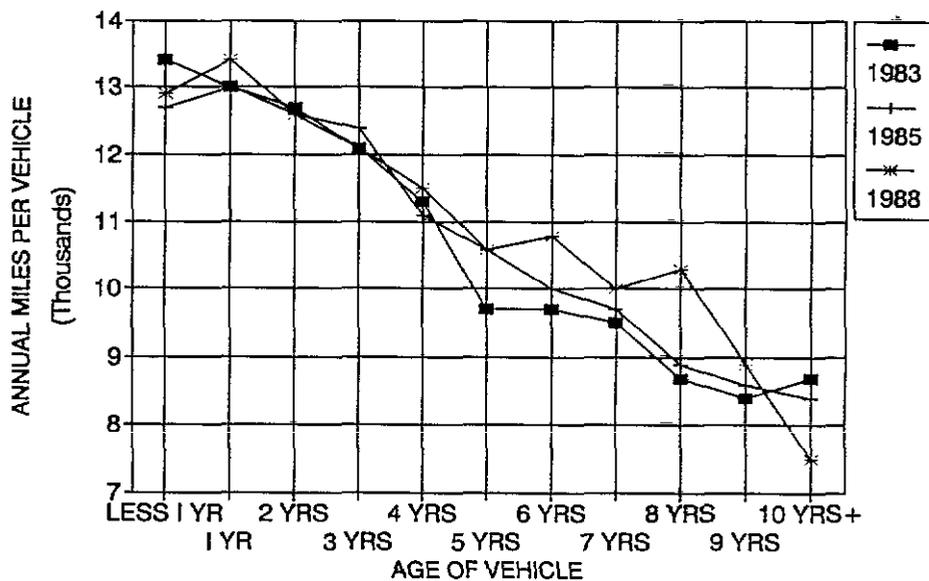
**Figure IV.1:
VEHICLE MILES OF TRAVEL PER VEHICLE BY AGE GROUP 1969-1990**



**Figure IV.2:
ANNUAL VMT PER VEHICLE BY VEHICLE AGE FOR NPTS SURVEY YEARS**

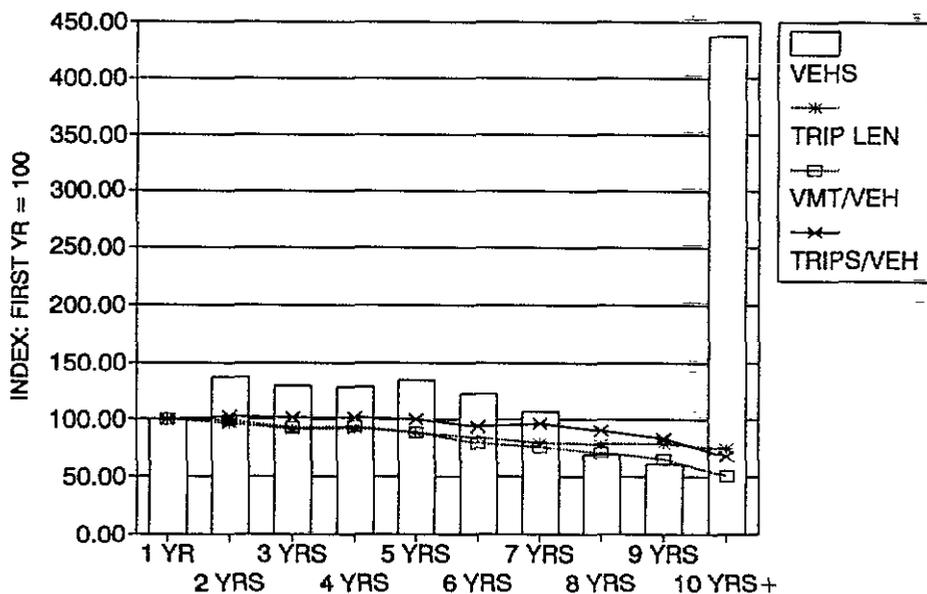


**Figure IV.3:
ANNUAL VMT PER VEHICLE BY VEHICLE AGE FOR RTECS* SURVEY YEARS**

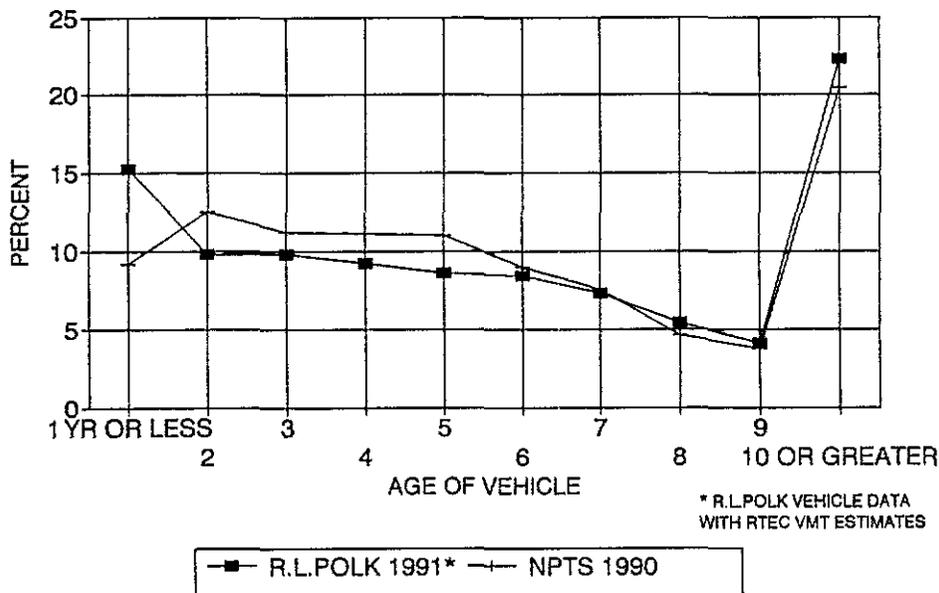


Res. Trans. Energy Consum. Survey: EIA

**Figure IV.4:
SUMMARY STATISTICS BY VEHICLE AGE GROUP 1990**



**Figure IV.5:
VMT DISTRIBUTION OF THE VEHICLE FLEET FROM TWO SOURCES**



**Figure IV.6a:
% VEHICLES BY ANNUAL MILES TRAVELED BY AGE OF VEHICLE**

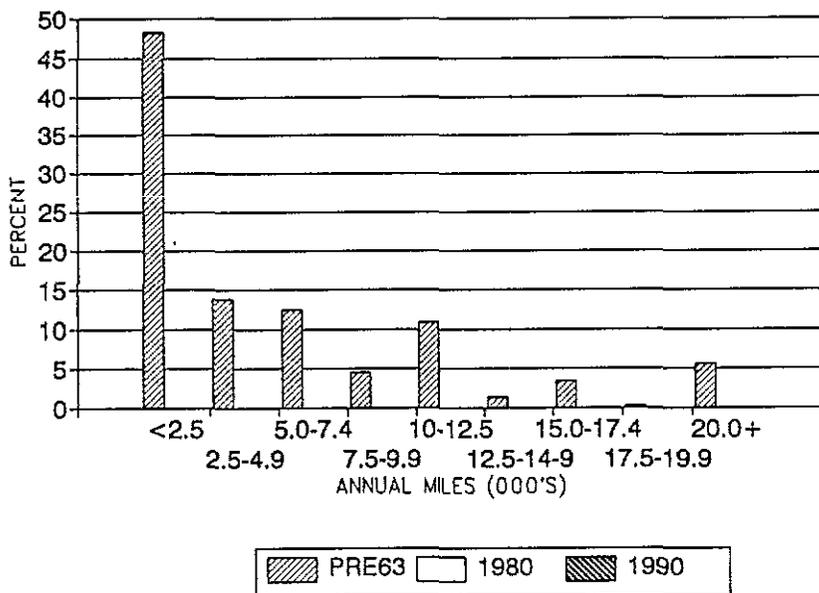


Figure IV.6b:
% VEHICLES BY ANNUAL MILES TRAVELED BY AGE OF VEHICLE

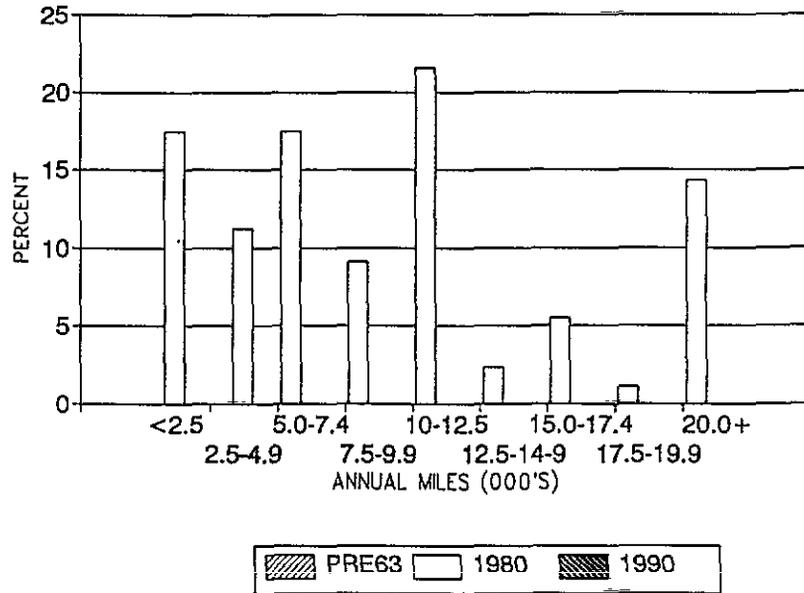
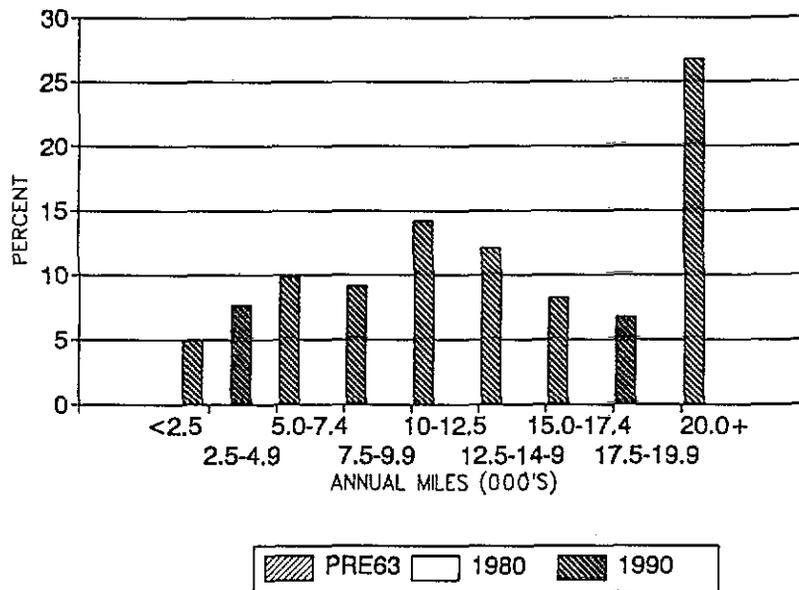


Figure IV.6c:
% VEHICLES BY ANNUAL MILES TRAVELED BY AGE OF VEHICLE



The question remaining is what shares of total travel are being generated by different vehicle age groups. Figure IV.7 goes a long way toward answering that question. A number of points are made by this chart:

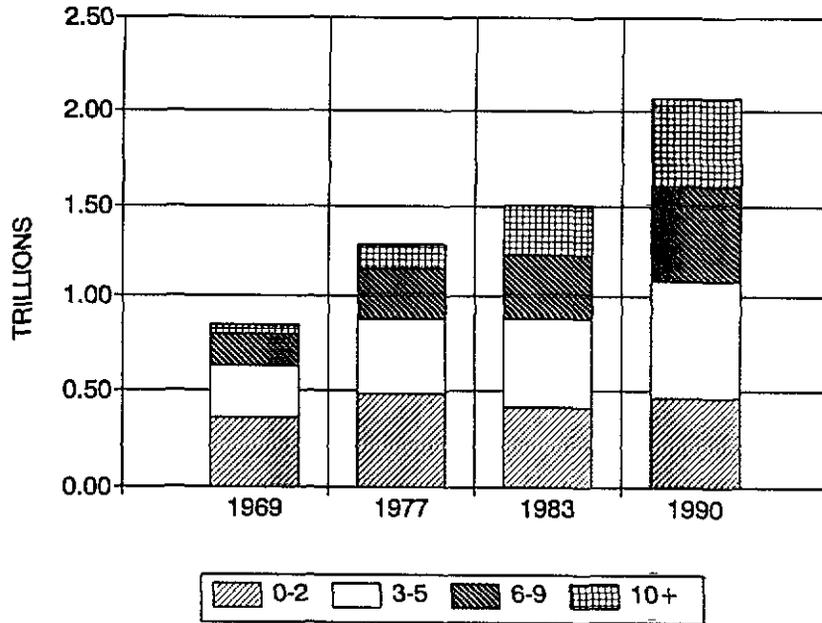
- total travel growth has been substantial, almost all of it coming from older vehicles;
- total travel by vehicles two years of age or under has increased only slightly in absolute terms and therefore has sharply diminished as a share of total travel;
- in 1969 vehicles two years of age or under accounted for 42 percent of total travel, declining to a current level of 22 percent;
- almost half, 48 percent, of current travel is generated by vehicles of six years of age or greater, whereas in 1969 only a quarter of travel came from such vehicles;
- VMT by the four age groups has grown to be roughly equal in shares in the range of 500-600 billion VMT each;
- vehicles ten years old or greater now generate as many miles of travel as do vehicles two years and under (22 percent).

Distribution by Purpose

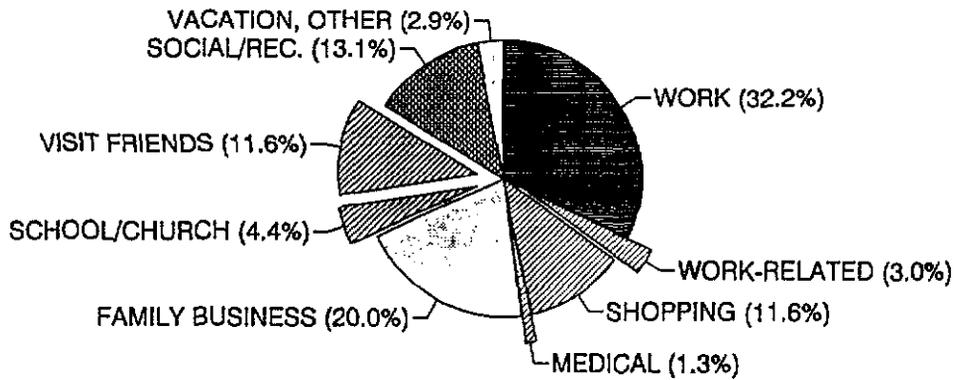
The discussion above indicates that there are changes in trip rates and trip lengths as vehicles age. A factor that could affect this would be the tendency for vehicles of certain ages to be used for selective purposes rather than general use. There are other questions as well that better understanding of the purpose-related travel of vehicles by age can answer. We have noted the tendency for women to use newer vehicles; is this purpose related? We are very interested in the safety, fuel efficiency and pollution consequences of older vehicles; how is this affected by purpose relationships?

One way to examine the patterns is to look at the VMT distributions by purpose of each vehicle age group and determine the extent to which there are any patterns that are discernible. The overall distribution of VMT by purpose of travel for all vehicles, independent of age, is shown in Figure IV.8. Comparison to this distribution by each vehicle age group indicates that pattern differences are not dramatic, but that there are some purpose categories where a tendency toward purpose specialization can be noted. Care must be exercised because looking at minor purpose categories by vehicle age category can stretch the NPTS sample beyond its capabilities. The trip purpose categories that show no special leanings in regard to vehicle age include: trips for shopping, family business, school/church, and visit Doctor/Dentist purposes. All of these tend to be intuitively acceptable. One of the key patterns of interest is the work trip pattern, which show a tendency for a greater share of the travel activity of older vehicles to be used for work than the average. This is depicted in Figure IV.9, in which the share of a vehicle's use for work, for each vehicle age group, is plotted against the average share for all vehicle age groups. For example, 1991 vehicles have about a half percent less share of their travel oriented to work travel than do all vehicles without respect to age. All of the vehicles with shares greater than the average of 21.6 percent are vehicles older than 1983. Other patterns that show more distinctive tendencies by age are: work-related business purposes, which tend to have higher shares among newer cars; and social-recreational purposes which also are shifted toward newer vehicles.

**Figure IV.7:
VEHICLE MILES OF TRAVEL BY VEHICLE AGE 1969-1990**

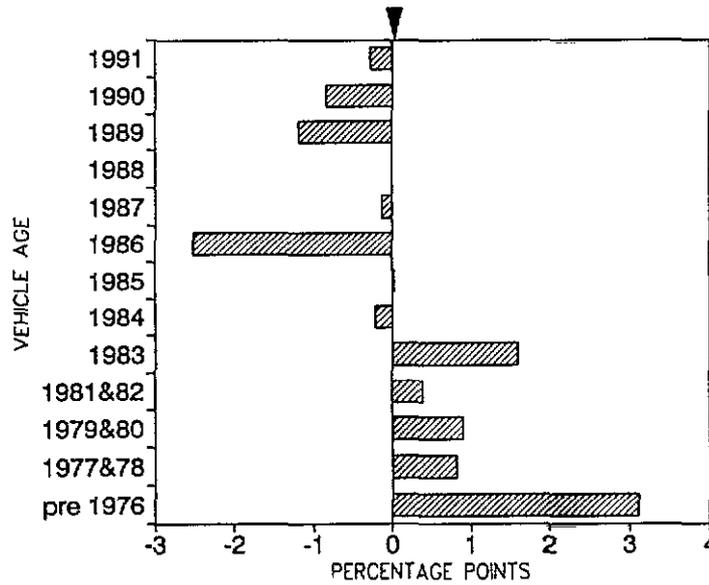


**Figure IV.8:
SHARES OF VEHICLE MILES OF TRAVEL BY PURPOSE**

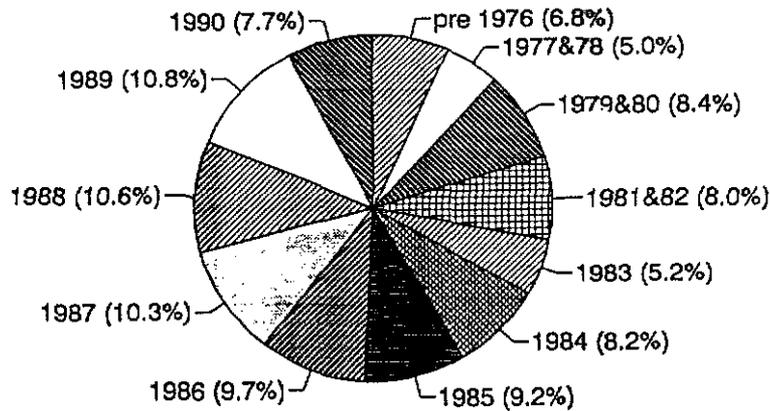


Another way to look at the purpose-vehicle age relationship is to establish the vehicle age components of certain important purposes and determine the extent to which vehicles of certain ages differentially contribute to travel for that purpose. The most important of these is work travel. Figure IV.10 depicts the shares of work trips in vehicles, by age of vehicle. It indicates that, for instance, slightly more than 20 percent of work trips are made by vehicles of 1980 vintage or older. The share of all trips by this vehicle age group is between 18 and 19 percent. In work-related activities, vehicles that are two-or-less years old account for over 37 percent of work-connected business trips but account for less than 30 percent of all trips. The category Other Social and Recreational Travel exhibits a similar pattern, with just below 33 percent of "soc-rec" trips accounted for by newer vehicles vs 30 percent for vehicles of all ages.

**Figure IV.9:
SHARE OF WORK TRIPS BY VEHICLE AGE
(AVERAGE SHARE OF ALL VEHICLES = 21.6%)**



**Figure IV.10:
SHARES OF WORK TRIPS BY AGE OF VEHICLE BY AGE GROUP 1976-1990**



V. Safety, Energy and Pollution Effects

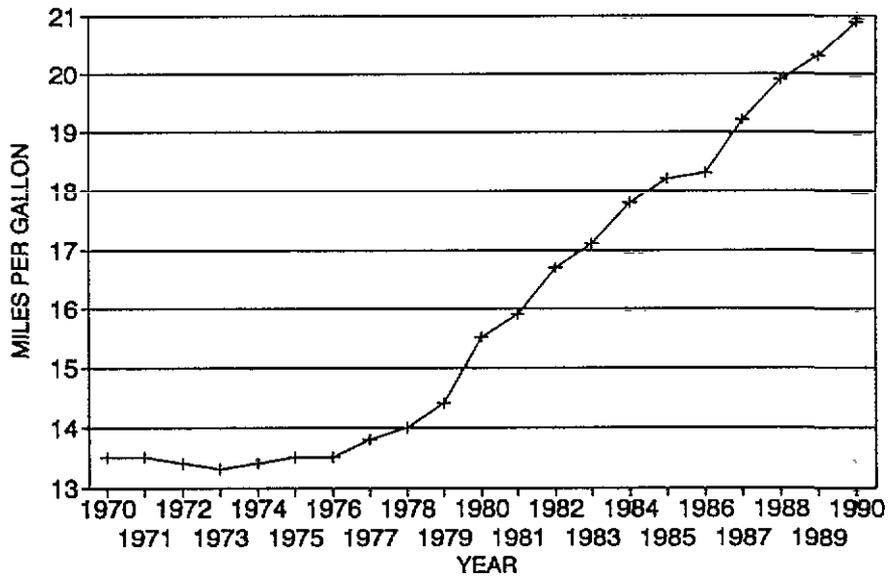
The implications of the shift in the character of the vehicle fleet is profound and can only be sketched here. The aging of the fleet has important consequences for the mobility of our population. Its most significant point in terms of public policy impact is the lag in penetration into the vehicle fleet of innovations that are being developed now in areas such as fuel efficiency, pollution generation, and safety.

The fuel consumption characteristics of this older fleet clearly lag that of the newer fleet. Figure V.1 shows the significant gains achieved in fuel economy of the vehicle fleet by year. From a level of about 13.5 miles per gallon when the first energy shock hit in the early 70's the fuel economy of the fleet has risen to a level approximating 21 miles per gallon by 1990. This suggests that for each mile of VMT occurring in older vehicles we pay a substantial energy penalty. These averages, of course, reflect the fleet composition by age as of 1990. The actual sales-weighted fuel economy for 1990 vehicles was 27.6 for autos, 20.5 for light trucks, averaging 24.8 for the 1990 fleet.

The air pollution control consequences are probably even more pronounced. The year 1981 was a key turning point in the air quality control characteristics of the vehicle fleet. The differences in pollution per vehicle mile for vehicles pre- and post-1981 are extraordinary. A national focus on the characteristics of the aging fleet is critical. The NPTS can be valuable policy research resource in responding to this challenge. This is a key place to start to really attack the pollution problems in America.

In terms of safety there are so many new safety features—anti-lock brakes, airbags, traction control, etc.—that will only slowly gain penetration into the fleet that the implications for accidents, injuries and deaths is frightening. The approaching opportunities of IVHS will be diminished by the slow rate of adoption of new technologies that are dependent on new vehicle development. Many of the benefits of a fleet that lasts longer, and they are substantial, for resource conservation and minimizing junk yards, and other aspects of a disposable fleet may be lost if the benefits of penetration of the fleet with positive technological advances are not achieved.

Figure V.1
VEHICLE FLEET FUEL ECONOMY BY YEAR 1970-1990



SOURCE: HWY STATISTICS; FHWA

**Appendix Table: DETAILED PERCENT DISTRIBUTION OF VEHICLES
BY AGE AND VEHICLE TYPE**

Vehicle Age	Autos	Truck/Van	RV's	Total
<=1	6.4	8.8	11.6	7.0
2	9.2	10.9	4.8	9.6
3	8.9	9.7	5.8	9.1
4	9.1	9.1	2.3	9.0
5	9.7	8.4	3.1	9.4
6	9.0	7.5	6.1	8.6
7	7.9	6.3	5.7	7.5
8	5.2	3.8	4.5	4.9
9	4.6	3.3	1.2	4.3
>=10	30.0	32.2	54.9	30.6
Number of Vehicles				
(000's)	120,712	37,110	821	158,543
Average Age	7.6	8.0	10.4	7.7

Source: ORNL

