

Trends in Automobile Ownership and Indicators of Saturation

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Trends in automobile ownership and the effects of underlying social factors are examined here in a broad perspective for the purpose of developing indicators of potential growth and saturation in the ratio of automobiles to population.

The historical growth of automobile ownership rates for the nation as a whole is recapitulated. The growth rate in automobile ownership for the ten states with the largest increase in automobile registrations is compared with the growth rate in the group of remaining states, indicating the effect of increasing urbanization.

Rates of growth in automobile ownership for selected states are studied in relation to the major determining factors in each state with particular attention to the effect of growing urbanization.

This study is a first step toward development of a model which could be used to gage the potential growth of automobiles and indicate the point at which the ratio of automobiles to population has reached or will reach saturation level in a particular geographic area.

•**ECONOMIC INDICATORS** serve as diagnostic tools in the examination of the health of the economy. Gross National Product, the Index of Industrial Production and the Rate of Unemployment are a few regularly used indicators of the level of economic activity and its growth rate.

Indicators of automobile ownership may be used by highway researchers and planners to measure the increase in ownership. Some available indicators of the existing levels and trends in automobile ownership are automobiles per capita; autos per household; number of occupied housing units with no car, one car and two or more cars available; automobile registrations per licensed driver; and automobile registrations per potential owner.

Personal ownership is the main consideration of this report. Data on this specific type of ownership are indicative rather than explicit. Therefore, the indicators used here, although not showing the precise number of automobiles owned by individuals, do indicate the level of ownership in one area as compared to another and the growth in individual automobile ownership.

Before analyzing recent data on automobile ownership by state and local area, a brief description is given of the historical growth of automobile production and registrations for the whole nation.

DISAGGREGATION METHOD

The analytical approach used in this paper is the disaggregation method by which the whole is divided into major components and then subdivided into smaller components. The United States is first divided into two major component areas, the first of which included the ten states having the largest absolute increases in automobile registrations during the 1953 to 1963 period (California, Texas, Florida, New York, Ohio, Pennsylvania, Illinois, New Jersey, Michigan and Georgia). The remaining states comprise the other area. Automobiles per capita in each of the two groups of states are studied in relation to underlying socio-economic factors such as population, personal income per capita, population concentration and existing automobile availability. The ten state group is then broken down into three subgroups made up of the states having high, medium, and low growth rates in autos per capita. Some socio-economic factors are then related to these varying rates of growth in automobile ownership.

Some states are studied individually to analyze the effect on the growth in automobile ownership of such economic and social factors as existing automobile availability, personal income per capita, population density of large cities, population change between central city and suburbs, and the relative use of public transportation for the journey to work.

To demonstrate the use and analysis of these data at the local level, two counties with high levels of automobile ownership are examined with respect to the basic underlying factors (Los Angeles, California, and Nassau, New York).

Data Sources

The key indicators of level of automobile ownership, by state, are developed from data published by the U. S. Bureau of Public Roads and the Bureau of the Census. Automobile registrations and licensed drivers, by state, are published annually by Public Roads in Highway Statistics (1). Population estimates by state are published annually by the Census Bureau in its Current Population Reports (2). Data on automobile availability were compiled by the Census Bureau through a 25 percent sample survey in urban areas (5 percent elsewhere) conducted in conjunction with the 1960 Housing Census (3).

Automobile registration data in this paper are taken from Highway Statistics, Table MV-1. These data are compiled for the calendar year from reports of state authorities. The reported data are supplemented in some instances by information from other sources to represent registrations as uniformly as possible. When the registration year is not more than one month removed from the calendar year, registration-year data are given. When the registration year is more than one month removed, registrations are given for the calendar year.

Registrations of privately and commercially owned automobiles (including taxicabs) are not segregated in Table MV-1. The total number of automobiles (excluding station wagons) commercially owned in fleets of four or more is estimated at 8,200,000 (14). In addition, an indeterminate but large number of automobiles are owned individually, and in fleets of less than four, by small business men and shopkeepers, many of whom use their cars for both business and pleasure. Commercial ownership, while comprising a large segment of private and commercial registrations, is considered a fairly stable proportion of the total and, therefore, does not impair the usefulness of these data in making trend analyses of private automobile ownership.

Automobiles available to a housing unit represent passenger automobiles, including station wagons, and some company cars owned or regularly used and ordinarily kept at home by any of the occupants of the unit. Taxicabs, pickups or

larger trucks, and dismantled or dilapidated cars in an early stage of being junked were not included.

These data are based on results of the 1960 Census of Housing conducted by the Bureau of the Census as of April 1, 1960. Automobile availability data provided cross-section information on household ownership of automobiles for 1960 by state, county and city. Trend information, therefore, is not provided by these data.

Automobile ownership by household at the national level is quoted annually in Automobile Facts and Figures (4). These data are based on sample surveys conducted by Alfred Politz Research, Inc., as part of the National Automobile and Tire Survey sponsored by Look magazine, and are useful for trend analyses at the national level only.

Data on automobile ownership and family expenditures for auto purchase and operation by urban families were collected in the Survey of Consumer Expenditures in 1960-61 conducted by the Bureau of Labor Statistics. Some of these data are compared with those of 1950 in the March 1964 number of the Monthly Labor Review (5). Trend data on automobile ownership and family expenditures for automobile purposes are thus provided for large urban areas.

The registration data are applied to the population data to obtain the autos per capita ratios used to indicate trends in automobile ownership by state. Census data on automobile availability are used to indicate the level of ownership by state and local areas.

HISTORICAL RECORD

Growth of an Industry

Nationally, over the past half-century, automobile registrations have grown to a total of almost 72 million at the end of 1964. Auto production rose to an unprecedented level in 1955 when it attained an output of 7.9 million passenger cars (the 1955 high was largely attributable to the extension of automobile credit from 24 to 36 months) and approached this total again in 1964 with an estimated output of 7.7 million units (Table 1).

By adjusting the curve in Figure 1 to overcome abnormal periods, it can be shown that factory sales of automobiles followed a growth pattern characterizing a successful industry, referred to as the law of growth (6). After the experimentation and introduction stage between 1895 and 1910 came the period of public acceptance when production increased rapidly as the product was woven into the social fabric. In the mid-twenties the automobile industry entered the third stage of growth with production increasing at lower rates. The depression, war, and early postwar periods that followed distorted the growth pattern. Thereafter, production resumed the normal growth pattern of the third stage. Production increased more gradually with the approaching fourth stage of stability. Thus, by smoothing the automobile production curve on 5-yr average production figures up to 1930, ignoring the depression, war, and early postwar periods from 1930 to 1950 and extending the curve between the high and low production figures of the fifties, a growth curve is depicted which is common to many industries.

With the exception of the depression and war periods, the ratio of persons per new automobile sold declined continuously to 21 in 1955 (Table 1). Ratios of average annual production to population in each 5-yr period have remained virtually unchanged over the last three 5-yr periods (1950-54, 1955-59, 1960-64), indicating only slightly higher production levels, in relation to population than that of the 1925-1929 period (Fig. 1). In relation to the trend line, production has been somewhat above normal during the last two years.

TABLE 1
TRENDS IN PRODUCTION AND REGISTRATIONS OF AUTOMOBILES SINCE 1900^a

Year	Population (thousands) July, 1 ^b	Automobile Registrations (thousands) ^c	Automobile Production ^d	Persons per Automobile Registration	Persons per New Automobile Sold	Registrations per New Automobile Sold
1900	76,094	8	4,192	9,511.8	18,152.8	1.91
1905	83,820	77	24,250	1,088.6	3,456.5	3.18
1910	92,407	458	181,000	201.8	510.5	2.53
1915	100,549	2,332	895,930	43.1	112.2	2.60
1920	106,466	8,132	1,905,540	13.1	55.8	4.27
1925	115,832	17,440	3,735,171	6.6	31.0	4.67
1930	123,077	22,973	2,787,456	5.4	44.2	8.24
1935	127,250	22,495	3,273,874	5.7	38.9	6.87
1940	132,457	27,372	3,717,385	4.8	35.6	7.36
1945	133,434	25,691	69,532	5.2	1,919.0	369.48
1950	151,868	40,185	6,665,863	3.8	22.8	6.03
1955	165,069	51,951	7,920,186	3.2	20.8	6.56
1960	179,992	61,307	6,674,796	2.9	27.0	9.18
1961	183,057	63,012	5,542,707	2.9	33.0	11.37
1962	185,890	65,649	6,933,240	2.8	26.8	9.47
1963	188,616	P 68,683	7,637,728	2.7	24.7	8.99
1964	191,300	P 71,864	7,700,000(Est)	2.7	24.8	9.33

^aData derived from Automobile Manufacturers Association, Inc. Automobile Facts and Figures, 1963, 1964; U. S. Bureau of Public Roads, Highway Statistics, Table MVI; and U. S. Bureau of the Census, Statistical Abstract of the United States, p. 5, 1964.

^bExcludes Armed Forces abroad.

^cPrivate and commercial.

^dFactory sales.

Increasing Automobile Registrations and Production Requirements

Automobile production has doubled from an annual average of less than 3 million cars in the early twenties to almost 6 million in the late fifties. During these four decades automobile scrappage rose from less than 1 million to over 4 million. The net addition to total automobile registrations was the same in both these periods (Table 2).

Thus, as the existing fleet grows, scrappage replacement places greater demand on production, causing an increasing pressure on the resources necessary to produce this major consumer durable, accentuated by the annual model changeover. Under near full-employment conditions, competing demand for the labor, raw materials

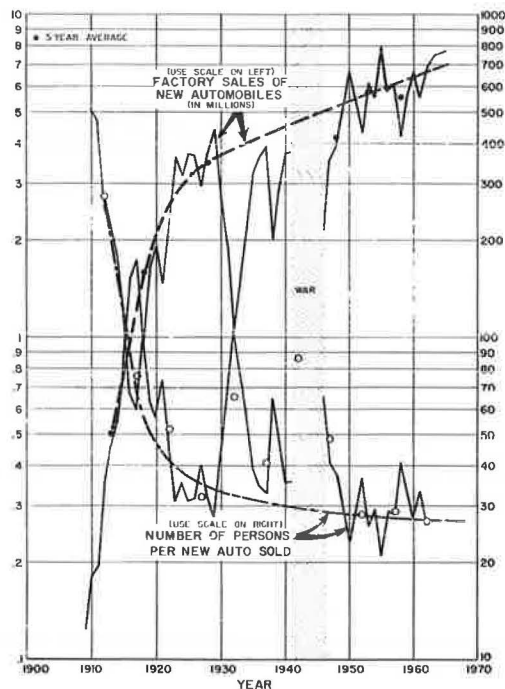


Figure 1. Trend in automobile production.

TABLE 2
AUTOMOBILE PRODUCTION, REGISTRATIONS
AND SCRAPPAGE^a

Period	Cumulated Automobile Production (thousands)	Increases in Automobile Registrations (thousands)	Automobile Scrappage (thousands) ^b
1921-1925	14,288	9,308	4,980
1956-1960	27,711 ^c	9,356	20,531

^aDerived from Automobile Facts and Figures, p. 20, 1964 Ed.; data estimated by Automobile Manufacturers Association.

^bThe amount for the 1921-1925 period is the difference between production and registrations. It does not, therefore, account for the effect of changes in inventories of new and used car dealers. The amount for the 1956-1960 period is estimated by the American Manufacturers Association.

^cDomestic sales only.

and components will result in rising costs to the automobile manufacturer and his suppliers, who will pass them on to the consumer. Under some conditions, the inflationary push will be especially troublesome; the unnecessary drain on resources eventually is likely to be even more serious.

Underlying Factors

Effective demand, consumers' desire to own coupled with ability to buy, was the economic factor underlying the rapid increases in automobile registrations of the early twenties and the post World War II increases up to the mid-fifties. Demand in the twenties reflected the general public acceptance of the automobile and extensive road improvements enhanced the desirability of having a family car. Family income was sufficient to create a large automobile market.

Because of the low incomes during the depression and suspended production during World War II, the desire of many of these people was frustrated. The rise in income during the war, along with increased personal savings resulting from wartime spending restrictions, provided the ability to buy. These factors were behind strong effective demand of the postwar period which saw production and registrations increase rapidly until they caught up to the growth level similar to that of the early 1920's when the automobile had already established itself as a popular mode of travel (Fig. 2).

By the late forties and early fifties, the number of consumers desiring to own automobiles had greatly increased. There were those persons whose wartime savings put them in a position to buy cars; something they could not afford before the war. Many others wanted to replace their wornout prewar models with new cars. This large pool of effective automobile demand lay dormant during the war because production had been suspended. In addition, there were the many newly licensed young drivers, as well as many elderly people who were now able to buy cars.

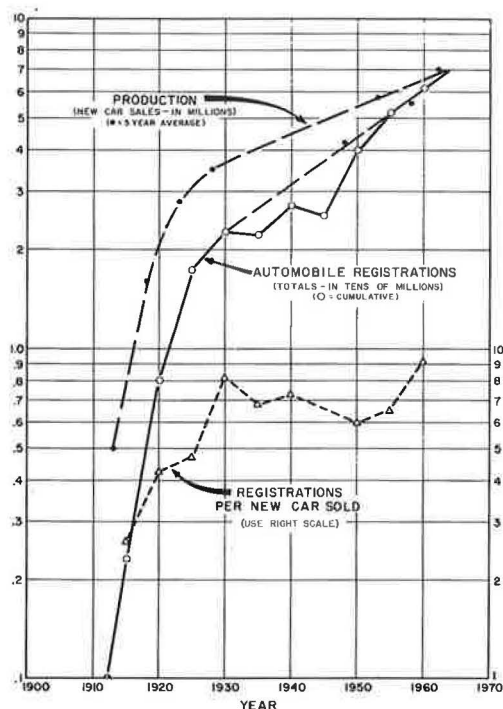


Figure 2. Trends in automobile production and registrations, 1912-1960.

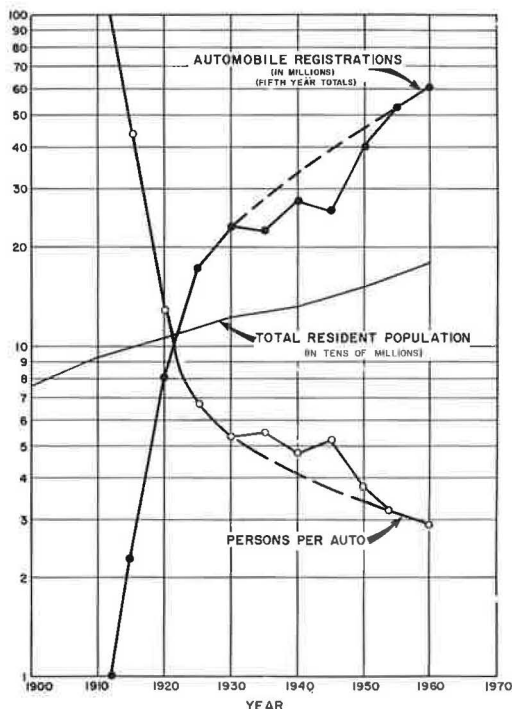


Figure 3. Trends in automobile registrations and population.

Between 1947 and 1956 registrations jumped 74 percent, about the same rate as during the twenties. In the more recent period, 1956 to 1963, the increase in registrations was 31 percent, half that of the earlier period (Fig. 3).

Automobile Ownership by Household

Multicar ownership has steadily become more important and has been a major factor in the market for some time. Households owning two, three or more cars have more than doubled in the past ten years. From 4.2 million households in 1954, they have increased to 8.7 million in 1963 (Table 3). In 1954 multicar households owned 23 percent of the automobiles; now they own approximately 35 percent. Households having one car increased slightly from 30.1 million to 34.6 million during this period while the number of those with no car remained unchanged. Had multicar households increased at the same rate as one-car households, the total number of automobiles now in use would be approximately 10 percent less than its present total (Fig. 4).

Rising multicar ownership coincides with the rapid growth of suburban population as indicated in Table 4.

Members of families who move to the suburbs find their mobility limited by the lack of transportation. Often the head of the household uses the family car to get to work or on the job, leaving his wife without means to carry out important errands, keep medical or dental appointments or visit persons several miles distant. As children come of age and acquire drivers' licenses, they, too, desire to own automobiles—a demand supportable by steadily rising family real income. States with high proportions of their population residing in large central cities, such as New York, Illinois and Pennsylvania,

TABLE 3
AUTOMOBILE OWNERSHIP BY HOUSEHOLD, 1954-1963^a

Year	Total Households	Cars per Household			
		None	One	Two	Three or More
(a) Millions					
1954	47.0	12.7	30.1	3.8	.4
1955	47.9	12.8	30.3	4.3	.5
1956	49.0	13.0	30.4	4.9	.7
1957	49.9	13.4	30.3	5.4	.8
1958	50.5	12.9	31.2	5.7	.7
1959	51.4	13.2	31.2	6.4	.6
1960	52.3	12.8	32.4	6.4	.7
1961	53.7	13.0	33.3	6.6	.8
1962	54.5	12.5	34.1	7.2	.7
1963	55.9	12.6	34.6	7.5	1.2
(b) Percent					
1954	100.0	27.0	64.0	8.1	0.9
1955	100.0	26.7	63.3	9.0	1.0
1956	100.0	26.6	62.0	10.0	1.4
1957	100.0	26.9	60.7	10.8	1.6
1958	100.0	25.5	61.8	11.3	1.4
1959	100.0	25.7	60.7	12.4	1.2
1960	100.0	24.5	62.0	12.2	1.3
1961	100.0	24.2	62.0	12.3	1.5
1962	100.0	22.9	62.6	13.2	1.3
1963	100.0	22.5	61.9	13.5	2.1

^aData quoted in Automobile Facts and Figures, Automobile Manufacturers Association.

TABLE 4
MULTICAR OWNERSHIP AND GROWTH OF SUBURBAN POPULATION

Area	Households in Each Group Owning 2 or More Cars (%)	Total Multicar Households (%)
Metropolitan area		
In central cities:		
500,000 or over	8.4	9.1
Under 500,000	13.1	13.9
Metropolitan suburbs	21.3	38.8
Outside metropolitan area:		
Non-farm	15.8	31.0
Farm	14.0	7.2

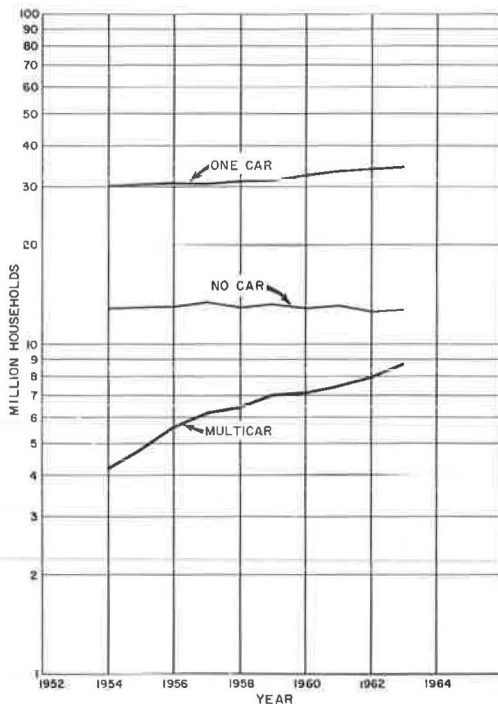


Figure 4. Trends in automobile ownership by households.

TABLE 5
HOUSEHOLD OWNERSHIP OF AUTOMOBILES RELATED TO UNDERLYING
POPULATION FACTORS IN 1960

State	Occupied Housing Units		State Population in Central Cities of over 400,000 (%)	Persons/Sq Mi in Central Cities of over 400,000 (No.)
	No Car Available (%)	Two or More Cars Available (%)		
New York	47.0	12.0	49.5	23,456
Illinois	23.5	16.6	35.2	15,836
Pennsylvania	23.4	17.7	23.0	13,612
Texas	17.6	27.2	23.0	2,871
California	15.7	31.0	28.7	5,675

where the population density (persons/sq mi) is high, have high percentages of households with no car available and low percentages of households with two or more cars available (Table 5).

Thus, households without cars are most prevalent in large, densely populated central cities where public transportation is available. Of course, households without cars, in which there is no person qualified to drive, or in which income is extremely low, can be found in both urban and rural areas.

ANALYSIS OF INDICATORS OF AUTOMOBILE OWNERSHIP AND SATURATION

Commentaries on Saturation

Most analysts anticipate that eventually the rate of ownership will reach some point of stability or a saturation level. Are we approaching it at the present time anywhere in the United States?

In the article *Need We Fail in Forecasting?* Kanwit, et al. advised that

Most highway economists and planners are conservative enough to believe that a saturation point in the ownership of motor vehicles will be reached eventually, after which further increases in registrations will depend on further increases in total population, and shifts from segments having lower saturation points to those having higher ones. What are these saturation points? No one can safely predict yet, what they may be, but the long-term trend lines appear to be stabilizing in some areas of high-density registrations. [Emphasis added.]

It has been believed in some quarters that a practical limit will have been reached when there is one motor vehicle registered for each operator licensed. (10)

Schmidt and Campbell in *Highway Traffic Estimation* stated

As to the saturation point and its data, one can only surmise. California now (1955) registers a vehicle for each two and two-tenths residents and a passenger car for each two and four-tenths residents. There has been some thought that the limit for passenger cars will be reached with two cars per household. On this basis the limit would be one and seven-tenths persons per passenger car. (11)

In Future Highways and Urban Growth, Wilbur Smith and Associates, after comparing ownership rates in some urban study areas, concludes

If this is the case it would appear that an ownership ratio of about one car for every 2.5 persons represents a normal saturation level.

Relating licensed drivers to family income and car ownership the same report concludes

Thus where cars are few, the ratio of drivers to cars is high; where cars are many, the ratio to cars tend to approach one. It would appear, therefore, that high-income families may be gradually approaching an upper limit of car ownership (one licensed driver per car owned). (12)

These and other specialists in the field of highway research generally agree that saturation will be attained when the automobile ownership rate remains stable for a reasonable period of time. An acceptable period of stability, perhaps 3 to 5 years, may be determined by the historical rate of change in the automobile-population ratio under social and economic conditions peculiar to the geographical areas under study. This period would take into account the effect of normal business-cycle patterns.

Group of Leading States vs Group of Remaining States

During the 10-yr period from 1953 to 1963, automobile registrations in the country as a whole increased 50 percent from 46 million to 69 million. At the same time, population increased 24 percent, from 152 million to 189 million.

More than half of the increase in automobile registrations was concentrated in the 10 states having the largest absolute increases in automobile registrations from 1953 to 1963, as indicated in Table 6.

Use is sometimes made of 10 leading states to illustrate relatively large increases in state automobile registrations. The U. S. Bureau of Public Roads, for example, in its annual press release on motor vehicle registrations by state, comments on the degree of concentration of registrations in the 10 states having the largest number of registrations.

In Automobile Facts and Figures, 1962, the Automobile Manufacturers Association ranks the states according to: (a) the total number of passenger car registrations; (b) increase in passenger car registrations, 1952 to 1962; and (c) percent increase in passenger car registrations, 1952 to 1962.

In America's Needs and Resources, Wilfred Owen discusses the growth of automobile ownership in the United States. He uses the 10 states with the largest increases in automobile registration from 1941 to 1952 to demonstrate the concentration of registrations (13).

It is interesting to compare the ranking of the 10 states used by Wilfred Owen in his study to those used in this study. Owen chose the 10 states having the largest increases in automobile registrations from 1941 to 1952. Nine of

TABLE 6
INCREASE IN AUTOMOBILE
REGISTRATIONS, 1953-1963

State	Number	Percent
California	3,019	64.3
Texas	1,381	52.7
Florida	1,289	119.0
New York	1,245	33.9
Ohio	1,209	43.8
Pennsylvania	1,123	38.8
Illinois	1,020	39.6
New Jersey	837	52.5
Michigan	730	30.2
Georgia	592	69.9
Total - 10 states	12,445	49.5
Remaining states ^a	9,949	47.1
United States	22,394	48.4

^aIncludes Hawaii and Alaska in 1963 only.

TABLE 7
CHANGES IN POPULATION DISTRIBUTION AND AUTOMOBILES

States	1953		1963	
	Population (%)	Automobile Registration (%)	Population (%)	Automobile Registration (%)
Ten-state group	52.3	54.4	54.0	54.8
Remaining states	47.7	45.6	46.0	45.2
Difference in percentage points	4.6	8.8	8.0	9.6

these states remained in the top 10 for the 1953 to 1963 period. Georgia replaced North Carolina in tenth place and there was some reshuffling in rank among the other nine.

California and Texas retained first and second positions respectively, while Florida moved up from eighth to replace New York in third place. New York, Ohio, Pennsylvania and Illinois remained in the middle of the group while Michigan fell from sixth to ninth place to join New Jersey and Georgia at the lower end. Population increases and migration explained much of relative increases in automobile registrations in these states.

Effect of Urbanization

Population in the United States is heavily concentrated in this small number of states, and is becoming more so. Automobiles, too, are heavily concentrated, but the movement toward greater concentration is slower. The 10 selected states had the largest increases in the numbers of automobile registrations over the past 10 years.

These 10 states are highly urbanized, containing 92 of the nation's 212 standard metropolitan statistical areas in 1960: California, 10, Texas, 21, New York, 7, Florida, 7, Ohio, 13, Pennsylvania, 12, Illinois, 7, New Jersey, 5, Michigan, 10, and Georgia, 6.

TABLE 8
RECENT TRENDS IN AUTOMOBILE REGISTRATIONS AND RELATED DATA, 1953-1963^a

State	Population			Automobile Registrations			Automobiles per Capita			Personal Income per Capita	
	1953 (thousands)	1963 (thousands)	Change 1953-63 (\$)	1953 (thousands)	1963 (thousands)	Change 1953-63 (\$)	1953	1963	Change 1953-63 (\$)	In 1963 Dollars	
										1953	1963
California	12,157	17,590	44.7	4,693	7,712	64.3	0.39	0.44	12.8	2,478	2,974
Texas	8,417	10,323	22.6	2,619	4,000	52.7	0.31	0.39	25.8	1,773	2,068
Florida	3,289	5,653	71.9	1,083	2,372	119.0	0.33	0.42	27.3	1,757	2,111
New York	15,470	17,708	14.5	3,673	4,918	33.9	0.24	0.28	16.7	2,458	3,013
Ohio	8,553	10,173	18.9	2,761	3,970	43.8	0.32	0.39	21.9	2,310	2,470
Pennsylvania	10,632	11,424	7.4	2,897	4,020	38.8	0.27	0.35	29.6	2,177	2,452
Illinois	9,010	10,182	13.0	2,574	3,594	39.6	0.29	0.35	20.7	2,515	2,948
New Jersey	5,148	6,470	25.7	1,594	2,431	52.5	0.31	0.38	22.6	2,537	2,915
Michigan	6,868	8,116	18.2	2,419	3,149	30.2	0.35	0.39	11.4	2,443	2,541
Georgia	3,570	4,140	16.0	847	1,439	69.9	0.24	0.35	45.8	1,418	1,864
10 state total	83,114	101,779	22.5	25,160	37,605	49.5	0.30	0.37	23.3	2,279	2,647
Remaining states	75,842	86,837	14.8	21,129	31,078	47.1	0.28	0.36	28.6	1,776	2,214
U. S. total	158,956	188,616	18.7	46,289	68,683	48.4	0.29	0.36	24.1	2,039	2,447

^aU. S. Bureau of the Census, Statistical Abstract of the United States, 1964.

U. S. Bureau of Public Roads, Highway Statistics, Table MV-1. U. S.

Office of Business Economics, Survey of Current Business, Apr. and Aug. 1964.

Changes in percent distribution of population and automobiles in this 10-state group, compared with the group of remaining states, illustrates the relative shifts in concentration (Table 7).

Resulting changes in the ratio of automobiles per capita over the 1953 to 1963 period and changes in personal income per capita are shown in Table 8. The higher rate of increase in income in the group of remaining states has reduced the disparity between the two groups from \$503 to \$433 per capita, one important reason why autos per capita shows a higher rate of growth in the remaining state group.

The ten selected states represent the most populous sections of the country. The Middle Atlantic and Midwest account for six of the ten states. California is the only Pacific state included and Texas the only southwestern state. Two states, Florida and Georgia, represent the southeast.

These 10 states contain 20 of the 24 largest urban complexes with over 1 million inhabitants. The 20 urban areas are characterized by a wide range in population size and density as well as in income and automobile availability. The dominance of urban population in some states, e.g., New York, Illinois, and California, largely determines these factors for the whole state, in California the urban dominance is offset by its low urban population density.

Automobile Ownership

The 1960 Census provides detailed data on automobile availability, by state and local area, that may be used in conjunction with the autos-per-person ratio. In a given state, for example, the rate of increase in the autos-per-capita ratio may be analyzed in relation to the percentage of occupied housing units with no cars available. A relatively low percentage of housing units without cars in 1960 implies extensive automobile

TABLE 9
FACTORS UNDERLYING GROWTH IN AUTOMOBILE OWNERSHIP IN 10 LEADING STATES, RANKED BY PERCENTAGE INCREASE IN AUTOMOBILES PER CAPITA, 1953-1963^a

State	Change-Auto- mobiles per Capita (%)	Change- Personal Income per Capita ^b (%)	Percentage of Total Occupied Housing Units in 1960 with		Central Cities with Population > 400,000 in 1960 ^c					Workers Using Public Trans- portation, 1960 (%)
					Population (thousands)	State Total Population (%)	Persons/Sq Mi	Population Change 1950-1960		
			No Car Avail- able	Two or More Cars Avail- able				Central Cities	Outside Central Cities	
High group:	30.0	16.1	21.0	22.3	5,753	19.3	4,689	21.5	32.6	-
Georgia	45.8	31.5 ^d	25.8 ^d	22.3	487	12.3	3,802 ^d	47.1 ^d	33.9	7.0
Pennsylvania	29.6	12.6	23.4	17.7	2,604	23.0	13,612	-5.2 ^d	30.0 ^f	16.0
Florida	27.3	20.1	18.7	23.6	456	9.2	3,235 ^d	106.1 ^d	68.4 ^d	5.8
Texas	25.8	16.6	17.6	27.2	2,206	23.0	2,871 ^d	53.4 ^d	32.0	5.5
Medium group:	22.0	13.1	20.2	20.4	5,805	22.4	10,224	-0.3	62.3	-
New Jersey	22.6	14.9	19.8	22.6	405	6.7	17,161	7.7	30.7 ^{d,g}	18.9
Ohio	21.9	7.1	16.9	23.1	1,850	19.1	6,167 ^d	3.1	57.9 ^d	10.1
Illinois	20.7	17.2	23.5	16.6	3,550	35.2	15,836	-1.9	71.5 ^d	20.3
Low group:	12.6 ^e	14.5 ^e	15.3 ^e	29.2 ^e	14,489	35.9	11,231	3.2	76.1	-
New York	16.7	22.6	47.0	12.0	8,315	49.5 ^d	23,456 ^d	-1.9	69.7	37.1
California	12.8	20.0	15.7	31.0 ^d	4,504	28.7	5,675	21.2	75.4	7.7
Michigan	11.4	4.0 ^d	14.4	25.3	1,670	21.3	11,964	-9.7	79.3	7.3
10-state group	23.3	16.1	22.3	21.7						
Remaining group	28.6	24.7	23.5	19.6						
U. S. total	24.1	20.0	21.5	21.5						

^aData derived from U. S. Bureau of the Census, U. S. Summary of Population, 1960-PC (1) 1A; U. S. Summary of Social and Economic Characteristics PC (1) 1C; Census of Housing HC (1); U. S. Bureau of Public Roads, Highway Statistics (data adapted from Table MV-1); and U. S. Office of Business Economics, Survey of Current Business, Apr., Aug. 1964.

^b1963 dollars.

^cAnnexations to central cities between 1950-1960 were very substantial: Atlanta, Ga. 171, 467; Tampa, Fla. 140, 331; San Antonio, Dallas and Houston, Texas, 583, 392; Columbus, Ohio, 75, 635; and San Diego, California, 65, 843.

^dDenotes major influencing factors.

^eExcludes New York.

^fExcludes the New Jersey counties in Philadelphia, Standard Metropolitan Statistical Area.

^gThis gain was in New Jersey, but outside a Pennsylvania central city.

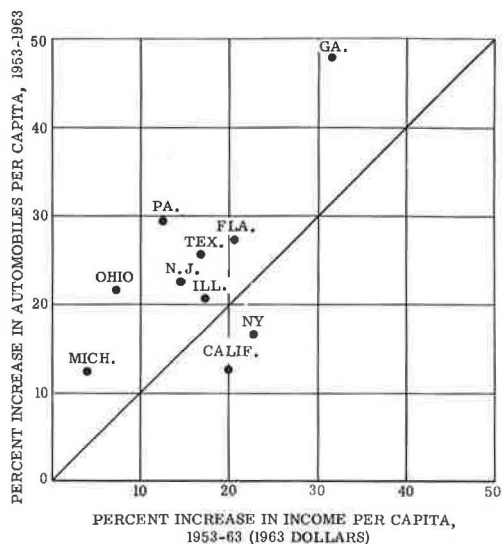


Figure 5. Trend in automobiles per capita and personal income for 10 selected states.

ownership and should be associated with a relatively low rate of recent and future growth in the autos-per-capita ratio. A high percentage of housing units with two or more cars available also indicates extensive automobile ownership that would dampen the growth of the autos-per-capita ratio.

Constraint on automobile availability is largely determined by the rate of growth in personal income per capita, population density in large cities, urban and suburban population shifts. In Table 9 these factors are compared for the two state groups and each of the selected 10 states.

Therefore, by dividing the United States into two groups of states on the basis of the absolute growth in automobile registrations over the past decade, comparisons can be made which give some insight into the factors determining automobile ownership. Better insight into the relative impacts of these variables requires a closer look at the 10 states which lead the country in the number of automobile registration

increases but, as a group, lag behind the rest of the country in the growth-rate of automobile ownership.

STATE GROUPS BY RATE OF GROWTH

Factors Influencing Trends in Autos per Capita

Comparisons of the socio-economic variables determining automobile ownership for the 10 states are presented in summary form in Table 9. For each of these states,

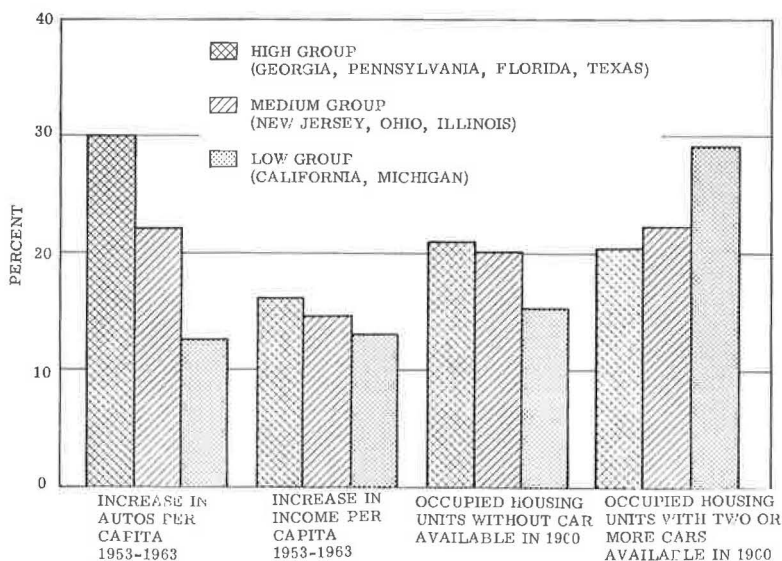


Figure 6. Increase in automobile ownership and major factors in three groups of states.

trends in autos per capita are presented with data on income per capita (Fig. 5), multi-car and no car availability, shifts in central city and suburban populations, changes in population density of large central cities, and use of public transportation. The states are ranked according to percent increase in automobiles per capita over the 10-yr period, 1953 to 1963. They are then grouped as high (25 percent or over); medium (20 to 24 percent); and low (under 20 percent).

In Table 9, trends in automobile ownership are represented by the percent increases in automobiles per capita shown in column 1. In columns 3 and 4, percentages of occupied housing units, in 1960, with no cars available and with two or more cars available, indicate the extent of automobile ownership existing today.

Trends in automobile ownership (column 1 of Table 9) may be compared with trends in constant dollar personal income per capita (column 2) and the existing levels of automobile ownership (columns 3 and 4). Data are compared for the high, medium and low groups of states. (New York is excluded from these groups because its extremely low degree of automobile availability puts it in a class by itself.)

The averages for the three groups show some association between the increases in autos per capita and income per capita. This is especially apparent in the cases of Georgia and Michigan. In California, however, the effect of a relatively high income is offset by the existing high degree of automobile availability.

Figure 6 shows the relationship of these factors in the three groups of states. While the high and medium groups have similar percentages of automobile availability, they differ widely in the growth of autos per capita and income per capita, indicating income as a causative factor. The difference in the growth of automobile ownership in the medium and low groups is related to the existing levels of automobile availability.

TRENDS IN SOME INDIVIDUAL STATES AND LOCAL AREAS

Georgia

Georgia's rapid growth in automobile ownership is associated with a high rate of increase in income per capita (Table 8). Georgia's per capita income was among the lowest in the nation in 1953. From \$1,418 (1963 dollars) in 1953, it rose 32 percent

TABLE 10
AUTOMOBILE OWNERSHIP AND FAMILY EXPENDITURES FOR AUTO PURCHASE AND
OPERATION, UNITED STATES AND FIFTEEN URBAN AREAS, 1950 AND 1960^a

Urban Area	Percentage of Families Owning Autos, End of Year		Percent Change 1950 to 1960	Auto Expenditures as a Percent of Total Family Expenditures		Percent Change 1950 to 1960
	1960	1950		1960	1950	
United States ^b	72	59	22.0	13.0	11.8	-
Los Angeles	85	72	18.1	16.3	15.1	8.0
Cleveland	81	65	24.3	11.7	12.2	-4.0
Northern New Jersey	80	58	38.0	13.2	9.1	45.1
Detroit	77	n.a.	-	15.5	n.a.	-
St. Louis	77	57	35.1	13.1	12.8	2.3
Seattle	76	65	16.9	11.1	13.4	-16.4
Washington, D. C.	72	n.a.	-	11.3	n.a.	-
San Francisco	71	63	12.7	12.9	12.4	4.0
Chicago	70	54	30.0	12.8	10.1	26.7
Atlanta	68	55	24.4	14.8	11.9	24.3
Baltimore	68	48	41.7	12.4	10.3	20.4
Boston	67	42	60.0	12.1	8.2	47.6
Philadelphia	67	41	63.4	12.4	8.1	53.1
Pittsburgh	67	51	31.4	13.6	11.0	23.6
New York	50	39	30.6	8.3	5.5	50.9

^aData derived from U. S. Bureau of Labor Statistics, Monthly Labor Review, Vol. 87, No. 3, p. 279, Mar. 1964.

^bIncludes all U. S. urban areas.

to \$1,864 in 1963. This factor along with a high (25.8) percent of households without cars in 1960, low density urban population and slightly used public transportation greatly stimulated automobile ownership in Georgia.

The continued development of Atlanta as a major manufacturing and distribution center was a major factor behind the sharp rise in the state's per capita income figure. The percent of total family expenditures in Atlanta for automobile purposes increased from 12 percent in 1950 to 15 percent in 1960, slightly above the 13 percent national average (Table 10). Auto expenditures have increased faster than income as indicated by the high 46 percent increase in autos per capita relative to the 32 percent increase in real income per capita. The automobiles per capita ratio in Georgia has increased at varying rates. The rate of increase from 1950 to 1956 was almost twice that between 1956 and 1961. Since 1961, however, it has increased sharply. This growth curve closely parallels that of personal income per capita (Fig. 7).

Michigan

Michigan's low increase of 11.4 percent in autos per capita over the past ten years coincides with a very low 4.0 percent increase in income per capita (Table 8).

Another depressant to rising automobile ownership is the high degree of automobile availability existing in 1960 as shown in the low percentage of households without cars and the high percentage of multicar households. Adverse economic conditions of 1954, 1958 and 1961 had strong impact on Michigan's manufacturing industries, especially automobile and allied industries. Increased automation in these industries made a large number of lay-offs permanent. Michigan was also adversely affected by shifts in the country's military production. The change in defense purchases from conventional weapons to missiles resulted in a decline in Michigan's share of prime military contracts from 9.5 percent of the United States total in the 1951 to 1953 period to 2.7 percent of the total in 1962 (8, 9).

Heavy lay-offs are reflected in the movement of the index of annual per capita income (Fig. 7).

Michigan's per capita income did not recover to its 1956 high until 1963. Autos-per-capita did not exceed the 1955 level until 1962, although the autos-per-licensed-driver ratio of 0.79 in 1963 was still significantly lower than the high of 0.85 in 1955, yet considerably higher than the low of 0.69 in 1958 and 1959 (see Tables 11 - 18).

Movement of the population from the central city of Detroit to the suburbs was largely responsible for maintaining the higher rate of increase in per capita autos over per capita income. Comparison of these factors is given in Table 9. The 80 percent increase in population outside the central city and the 10 percent decrease in the central city indicate a strong movement to the suburbs.

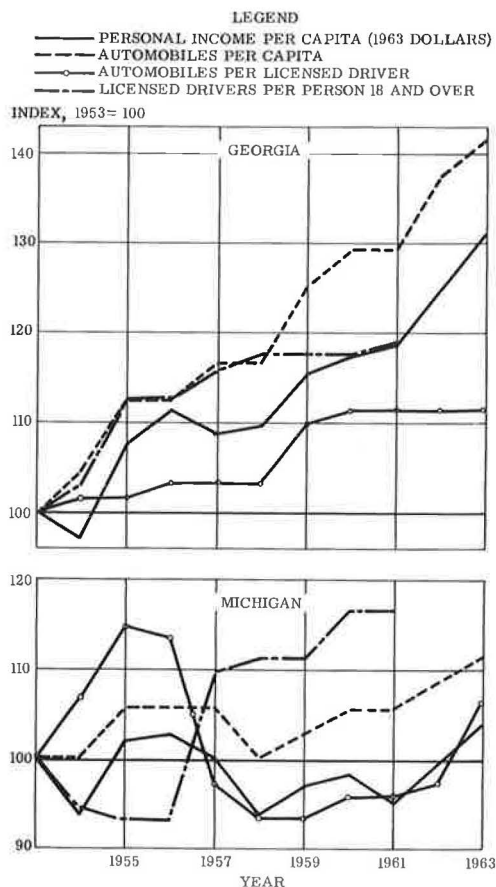


Figure 7. Indexes of automobiles, licensed drivers, and personal income per capita in 1963 dollars (1953 = 100) for Georgia and Michigan.

TABLE 11
TRENDS IN AUTOMOBILE PER CAPITA AND PER LICENSED DRIVERS
IN THE UNITED STATES, 1950-1963^a

Year	Resident Population (thousands)	Automobile Registrations ^b		Persons Age 18 and Over (thousands)	Licensed Drivers		Automobile per Licensed Driver
		(thou- sands)	Per Capita		(thousands)	Per Person Age 18 and Over	
1950	151,868	40,185	0.26	104,190	62,193	0.60	0.65
1951	153,982	42,525	0.28	104,748	64,444	0.62	0.66
1952	156,393	43,653	0.28	105,417	66,826	0.63	0.65
1953	158,956	46,251	0.29	106,286	69,870	0.66	0.66
1954	161,884	48,286	0.30	107,400	72,183	0.67	0.67
1955	165,069	51,951	0.31	108,669	74,686	0.69	0.70
1956	168,088	54,003	0.32	109,768	77,659	0.71	0.70
1957	171,187	55,693	0.33	110,916	79,616	0.72	0.70
1958	174,149	56,645	0.33	111,980	81,537	0.73	0.69
1959	177,135	59,322	0.33	113,637	84,498	0.74	0.70
1960	179,992	61,307	0.34	115,430	87,361	0.76	0.70
1961	183,057	63,012	0.34	117,103	88,852	0.76	0.71
1962	185,890	65,649	0.35	118,444	90,705	0.77	0.72
1963	188,616	68,683	0.36	119,824	93,811	0.78	0.73

^aData derived from U. S. Bureau of Public Roads, Highway Statistics, Tables MV-1 and MV-12; and U. S. Bureau of the Census, P-25 Series, Nos. 146, 193, and 265.

^bPrivate and commercial.

TABLE 12
TRENDS IN AUTOMOBILES PER CAPITA FOR TEN SELECTED STATES, 1950-1963^a

Year	California	Texas	New York	Florida	Ohio	Pennsyl- vania	Illinois	New Jersey	Michigan	Georgia
1950	0.37	0.30	0.22	0.28	0.30	0.24	0.26	0.28	0.33	0.20
1951	0.38	0.30	0.23	0.30	0.32	0.26	0.27	0.29	0.34	0.21
1952	0.38	0.29	0.23	0.31	0.32	0.26	0.28	0.30	0.33	0.22
1953	0.39	0.31	0.24	0.33	0.32	0.27	0.29	0.31	0.35	0.24
1954	0.38	0.33	0.25	0.34	0.33	0.28	0.29	0.31	0.35	0.25
1955	0.40	0.35	0.26	0.36	0.34	0.29	0.30	0.33	0.37	0.27
1956	0.40	0.35	0.26	0.37	0.35	0.30	0.31	0.33	0.37	0.27
1957	0.40	0.36	0.26	0.38	0.35	0.31	0.32	0.33	0.37	0.28
1958	0.40	0.35	0.26	0.39	0.36	0.32	0.33	0.33	0.35	0.28
1959	0.40	0.36	0.27	0.40	0.36	0.32	0.32	0.34	0.36	0.30
1960	0.42	0.36	0.27	0.41	0.37	0.33	0.33	0.35	0.37	0.31
1961	0.42	0.36	0.27	0.40	0.37	0.33	0.33	0.36	0.37	0.31
1962	0.42	0.38	0.27	0.41	0.38	0.34	0.34	0.36	0.38	0.33
1963	0.44	0.39	0.28	0.42	0.39	0.35	0.35	0.38	0.39	0.34

^aData derived from population and automobile registration information published by: U. S. Bureau of the Census, U. S. Census of Population 1960, PC (1) 1A; and U. S. Bureau of Public Roads, Highway Statistics, Table MV-1.

TABLE 13
PERSONAL INCOME PER CAPITA (CONSTANT 1963 DOLLARS)^a

Year	California	Texas	New York	Florida	Ohio	Pennsyl- vania	Illinois	New Jersey	Michigan	Georgia
1950	2,343	1,706	2,398	1,640	2,054	1,995	2,326	2,280	2,143	1,296
1951	2,402	1,713	2,360	1,621	2,201	2,044	2,399	2,358	2,199	1,345
1952	2,455	1,756	2,397	1,680	2,253	2,070	2,416	2,437	2,244	1,385
1953	2,479	1,774	2,458	1,758	2,311	2,178	2,516	2,537	2,443	1,419
1954	2,456	1,807	2,464	1,749	2,193	2,069	2,478	2,524	2,289	1,378
1955	2,628	1,882	2,597	1,898	2,358	2,191	2,599	2,636	2,492	1,524
1956	2,729	1,950	2,725	1,994	2,458	2,325	2,747	2,735	2,510	1,579
1957	2,723	1,977	2,768	1,992	2,454	2,340	2,728	2,761	2,445	1,544
1958	2,675	1,952	2,715	1,954	2,286	2,259	2,596	2,642	2,291	1,556
1959	2,810	2,018	2,861	2,061	2,405	2,319	2,710	2,736	2,370	1,639
1960	2,820	1,984	2,875	2,036	2,413	2,335	2,728	2,756	2,398	1,665
1961	2,858	2,020	2,897	2,016	2,387	2,338	2,789	2,817	2,320	1,681
1962	2,916	2,043	2,964	2,090	2,440	2,401	2,895	2,877	2,428	1,771
1963	2,974	2,068	3,013	2,111	2,474	2,452	2,948	2,915	2,541	1,864

^aData adapted from Survey of Current Business, p. 16, Aug. 1964.

TABLE 14
TRENDS IN AUTOMOBILES PER LICENSED DRIVER^a

Year	California	Texas	New York	Florida	Ohio	Pennsyl- vania	Illinois	New Jersey	Michigan	Georgia
1950	0.75	0.83	0.61	0.61	0.72	0.63	0.57	0.71	0.73	0.58
1951	0.77	0.79	0.61	0.63	0.72	0.67	0.63	0.73	0.74	0.58
1952	0.76	0.73	0.62	0.63	0.69	0.66	0.62	0.72	0.70	0.59
1953	0.77	0.74	0.63	0.67	0.71	0.67	0.61	0.73	0.79	0.61
1954	0.76	0.74	0.63	0.69	0.71	0.63	0.64	0.74	0.79	0.62
1955	0.80	0.81	0.67	0.73	0.73	0.69	0.67	0.76	0.85	0.62
1956	0.80	0.78	0.67	0.71	0.74	0.70	0.66	0.75	0.84	0.63
1957	0.79	0.79	0.64	0.71	0.76	0.69	0.67	0.78	0.72	0.63
1958	0.78	0.79	0.65	0.73	0.74	0.66	0.69	0.80	0.69	0.63
1959	0.77	0.80	0.65	0.76	0.78	0.66	0.71	0.78	0.69	0.67
1960	0.76	0.81	0.64	0.79	0.77	0.64	0.72	0.77	0.71	0.68
1961	0.75	0.77	0.65	0.77	0.75	0.73	0.74	0.75	0.71	0.68
1962	0.85	0.78	0.66	0.77	0.75	0.67	0.75	0.76	0.72	0.68
1963	0.85	0.78	0.64	0.77	0.78	0.69	0.69	0.77	0.79	0.68

^aData derived from Highway Statistics, Tables MV-1 and MV-12, U. S. Bureau of Public Roads.

TABLE 15
RATIO OF LICENSED DRIVERS PER PERSON 18 YEARS OF AGE AND OVER FROM 1950 TO 1961^a

Year	California	Texas	New York	Florida	Ohio	Pennsyl- vania	Illinois	New Jersey	Michigan	Georgia
1950	0.71	0.53	0.48	0.67	0.60	0.54	0.63	0.53	0.66	0.54
1951	0.69	0.59	0.51	0.70	0.64	0.54	0.60	0.55	0.68	0.59
1952	0.71	0.63	0.52	0.72	0.67	0.57	0.63	0.57	0.71	0.60
1953	0.73	0.65	0.53	0.75	0.68	0.59	0.67	0.59	0.72	0.63
1954	0.74	0.69	0.54	0.77	0.70	0.63	0.65	0.61	0.68	0.65
1955	0.75	0.69	0.54	0.77	0.71	0.62	0.67	0.64	0.67	0.71
1956	0.77	0.71	0.58	0.82	0.73	0.64	0.70	0.65	0.67	0.71
1957	0.80	0.72	0.59	0.85	0.74	0.67	0.70	0.63	0.79	0.73
1958	0.82	0.72	0.60	0.83	0.74	0.70	0.68	0.63	0.80	0.74
1959	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1960 ^b	0.85	0.73	0.67	0.81	0.76	0.77	0.69	0.68	0.84	0.74
1961	0.86	0.77	0.61	0.80	0.78	0.69	0.69	0.72	0.84	0.75
1962	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1963	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

^aData derived from U. S. Bureau of the Census, Series P-25, Nos. 130, 151, 172, 194, 258, 267 for Civilian Population combined with total military population for each state; and U. S. Bureau of Public Roads, Highway Statistics, Table MV-12.

^bCensus data used for 1960 was for April 1. Annual data by age, and by state was not published by Census for years, 1959, 1962 and 1963.

TABLE 16
PRIVATE AND COMMERCIAL AUTOMOBILE REGISTRATIONS, 1950-1963, IN THOUSANDS^a

Year	California	Texas	New York	Florida	Ohio	Pennsylvania	Illinois	New Jersey	Michigan	Georgia
1950	3,937	2,311	3,240	798	2,427	2,529	2,282	1,347	2,115	692
1951	4,203	2,453	3,425	895	2,555	2,686	2,401	1,450	2,218	753
1952	4,397	2,447	3,481	971	2,631	2,753	2,459	1,509	2,224	799
1953	4,693	2,619	3,673	1,083	2,761	2,897	2,575	1,594	2,419	847
1954	4,857	2,739	3,880	1,181	2,884	3,011	2,688	1,678	2,479	893
1955	5,275	3,043	4,116	1,368	3,090	3,198	2,852	1,801	2,726	986
1956	5,562	3,114	4,263	1,513	3,236	3,337	2,977	1,838	2,740	1,015
1957	5,783	3,250	4,253	1,684	3,341	3,421	3,068	1,882	2,814	1,054
1958	5,947	3,278	4,347	1,777	3,361	3,491	3,119	1,960	2,717	1,077
1959	6,256	3,435	4,472	1,934	3,478	3,587	3,213	2,020	2,787	1,152
1960	6,625	3,524	4,492	2,041	3,625	3,713 ^{1/2}	3,302	2,115	2,883	1,219
1961	6,859	3,601	4,608	2,116	3,697	3,791	3,377	2,241	2,938	1,258
1962	7,226	3,823	4,761	2,249	3,821	3,901	3,483	2,305	3,015	1,351
1963	7,712	4,000	4,918	2,372	3,970	4,020	3,594	2,431	3,149	1,439

^aData derived from Highway Statistics, Table MV-1.

TABLE 17
NUMBER OF LICENSED DRIVERS IN FORCE, 1950-1963 IN THOUSANDS^a

Year	California	Texas	New York	Florida	Ohio	Pennsylvania	Illinois	New Jersey	Michigan	Georgia
1950	5,183	2,797	5,290	1,303	3,377	4,037	3,995	1,891	2,886	1,187
1951	5,471	3,117	5,572	1,420	3,553	4,022	3,792	1,985	3,003	1,304
1952	5,804	3,358	5,634	1,531	3,802	4,171	3,970	2,082	3,162	1,354
1953	6,127	3,556	5,859	1,619	3,889	4,350	4,219	2,190	3,265	1,390
1954	6,351	3,733	6,061	1,709	4,085	4,754	4,171	2,279	3,146	1,446
1955	6,631	3,875	6,144	1,882	4,219	4,640	4,254	2,386	3,196	1,597
1956	6,965	4,009	6,400	2,138	4,386	4,792	4,489	2,461	3,272	1,623
1957	7,622	4,168	6,628	2,385	4,404	4,944	4,586	2,420	3,885	1,623
1958	7,622	4,168	6,688	2,432	4,537	5,251	4,534	2,462	3,959	1,717
1959	8,154	4,282	6,885	2,553	4,606	5,416	4,538	2,574	4,040	1,729
1960	8,694	4,352	7,062	2,659	4,694	5,770	4,565	2,757	4,078	1,791
1961	9,173	4,691	7,090	2,756	4,919	5,221	4,586	2,969	4,114	1,846
1962	8,542	4,881	7,267	2,919	5,066	5,816	4,647	3,044	4,160	1,975
1963	9,053	5,101	7,664	3,073	5,100	5,852	5,229	3,169	3,977	2,102

^aData derived from Highway Statistics, Table MV-12.

TABLE 18
RESIDENT POPULATION 18 YEARS OF AGE AND OVER, 1950-1963 IN THOUSANDS^a

Year	California	Texas	New York	Florida	Ohio	Pennsylvania	Illinois	New Jersey	Michigan	Georgia
1950	7,285	5,229	10,960	1,958	5,611	7,460	6,325	3,549	4,401	2,185
1951	7,889	5,325	10,905	2,030	5,687	7,300	6,303	3,588	4,416	2,228
1952	8,164	5,341	10,918	2,138	5,664	7,347	6,345	3,669	4,460	2,241
1953	8,435	5,434	11,109	2,167	5,743	7,325	6,316	3,683	4,500	2,213
1954	8,553	5,421	11,277	2,223	5,872	7,563	6,380	3,748	4,607	2,233
1955	8,872	5,589	11,314	2,447	5,978	7,427	6,396	3,731	4,781	2,249
1956	9,088	5,626	10,986	2,623	5,978	7,434	6,451	3,812	4,878	2,276
1957	9,200	5,712	11,218	2,794	5,990	7,424	6,526	3,834	4,890	2,303
1958	9,254	5,769	11,188	2,924	6,149	7,519	6,683	3,924	4,921	2,309
1959	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1960	10,268	5,941	10,474	3,271	6,198	7,504	6,642	4,056	4,864	2,410
1961	10,635	6,127	11,658	3,450	6,312	7,518	6,607	4,100	4,918	2,459
1962	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1963	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

^aData derived from U. S. Bureau of the Census, Census data for 1950 and 1960, current population survey bulletin (P-25 series) estimates for 1951 through 1959.

California

California leads all the states by far in the number of automobile registrations. The automobile is ubiquitous. A low percentage of households do not own a car while a high percentage of households own two or more. These factors explain why California had a low rate of increase in automobile ownership, as measured by the indicators, autos per capita and autos per licensed driver.

Unlike Michigan, where the low increase in per capita income was a major deterrent to increased automobile ownership, California's personal income per capita increased at the national rate (Table 8).

Existing multiple car ownership in California appears to be the major influence which prevented the increase in autos per capita from being much more than Michigan's. Opposing trends in central city population growth was another influencing factor. While population is increasing in the central city of Los Angeles, it is decreasing in Detroit. The effects of these developments are demonstrated in the data in Table 9.

Evidence of saturation levels in automobile ownership is seen in the recent flattening of the autos-per-capita curve for Los Angeles and San Francisco. Wayne County's (Detroit plus suburbs) curve has not yet begun to flatten. Further indications of saturation may be seen in Table 10 which shows San Francisco and Los Angeles among the lowest of the 15 large urban areas in the growth from 1950 to 1960 in the percent of families owning automobiles.

The increasing proportion of Southern California's population residing in large central cities opposed to the declining proportion in the central city of Detroit, coupled with California's greater percentage of households with two or more cars, caused

autos per capita to increase at approximately the same rates in both California and Michigan and thereby offset the probable effect of the much higher rate of increase in California's per capita income. Part of California's higher income may be attributed to the sharp rise in the state's percentage of total military prime contract awards. It rose from 13.6 percent in the 1951 to 1953 period to 23.9 percent of the total in 1962 (8, 9).

Automobiles per capita increased 10 percent from 1953 to 1959. Autos-per-licensed driver leveled off between 1955 and 1961 and thereby regaining about the previous level. Since 1953, licensed drivers per persons 18 years of age and over increased considerably (See Fig. 8). As in Michigan, an increasing proportion of California's total population, as well as persons 18 and over, are acquiring operators licenses, although there is little increase in the proportion of licensed drivers owning cars.

New York

Trends in automobile ownership in New York are quite similar to California's though for different reasons. Percent increases in autos per capita and income per capita were slightly greater than California's. New York's 22.6 percent increase in per capita income was a little above the national rate of 20.0 percent.

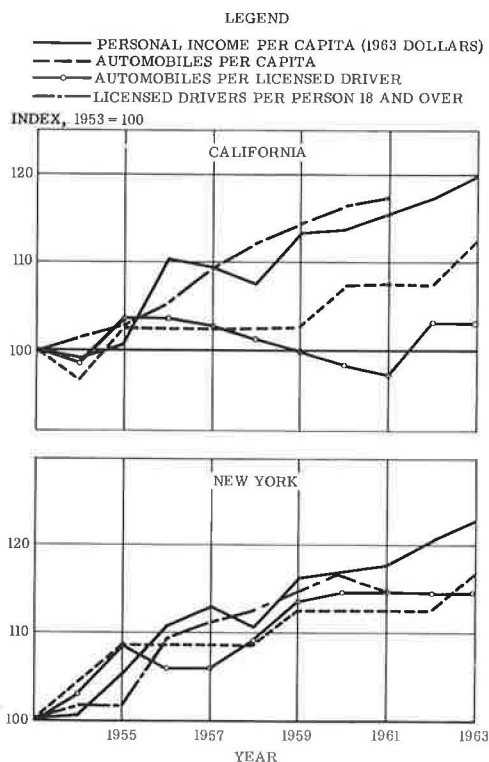


Figure 8. Indexes of automobiles, licensed drivers, and personal income per capita in 1963 dollars (1953 = 100) for California and New York.

The state's increase of 16.7 percent in autos per capita was considerably below the 24.1 percent increase for the country as a whole.

The dominant influence in the state is New York City where almost half the state's population resides. Very high population density and extensive public transportation facilities are the two major factors which operate against high rates of automobile ownership.

New York state's increase in autos per capita, which exceeded Michigan's and California's, is due, in no small part, to the slight decline in the population of New York City and the accompanying large increase in its suburban population. This is an old city which took form in the pre-automobile era when people walked, rode bicycles, or used public transit for transportation for business or pleasure. Under these conditions travel distance was a very important factor. After automobile ownership became significant and good roads were provided, distance became less important and people moved increasingly to areas of lower density.

Local Areas

In Los Angeles, which had its greatest increase in population during the automobile age, heavy population densities are only now beginning to develop. A city's central business district serves important functions which require large numbers of people to travel to and from the center, thereby increasing the daytime population density. This process, which is now taking place in Los Angeles, gives newer cities a tendency to grow more like the old cities. Some indication of the effect of the population movement on automobile ownership may be seen in the relative growth between 1950 and 1960 in the percentage of families owning autos (See Table 10). New York's 30.6 percent increase is considerably higher than the 18.1 percent increase for Los Angeles.

The population movement out of New York's central city to areas of lower density on the city's outskirts (fringe areas in Bronx and Queens counties) and the larger movement to the suburbs outside the city, Nassau and Suffolk counties, for example, have increased the autos-per-capita ratio for the entire New York City. In Nassau County, this ratio has been stable for the past ten years and it shows very little increase in Los Angeles—two areas of similarly low population densities (Table 19). Currently implied saturation levels in Nassau County and Los Angeles appear to be the result of similar social and economic conditions. Relatively low population

TABLE 19
TREND IN AUTOMOBILES PER CAPITA FOR SELECTED COUNTIES, 1953-1963^a

State, County and Principal City	Automobiles per Capita										
	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Pennsylvania											
Philadelphia Co. (Philadelphia)	0.19	0.19	0.20	0.20	0.20	n.a.	0.20	0.24	0.24	0.25	0.25
Allegheny Co. (Pittsburgh)	0.23	0.24	0.26	0.26	0.26	n.a.	0.28	0.29	0.29	0.29	0.29
Texas											
Harris Co. (Houston)	0.28	0.29	0.31	0.29	0.32	n.a.	0.36	0.34	0.34	0.34	0.34
Ohio											
Cuyahoga Co. (Cleveland)	0.30	0.31	0.32	0.33	0.33	n.a.	0.33	0.34	0.34	0.34	0.36
Illinois											
Cook Co. (Chicago)	0.24	0.26	0.27	0.20	0.20	n.a.	0.20	0.20	0.20	0.20	0.30
New York											
Nassau Co. (New York)	0.37	0.37	0.37	0.36	0.34	n.a.	0.36	0.37	0.38	0.37	0.36
5 Boroughs New York	0.15	0.15	0.16	0.16	0.16	n.a.	0.16	0.17	n.a.	0.18	0.18
Erie Co. (Buffalo)	0.28	0.29	0.30	0.29	0.29	n.a.	0.28	0.31	0.31	0.32	0.33
California											
Los Angeles Co. (Los Angeles)	0.40	0.38	0.40	0.40	0.40	n.a.	0.42	0.42	0.43	0.42	0.43
San Francisco Co. (San Francisco)	0.28	0.27	0.29	0.29	0.29	n.a.	0.30	0.34	0.34	0.34	0.34
Michigan											
Wayne Co. (Detroit)	0.31	0.31	0.33		0.32	n.a.	0.32	0.36	n.a.	0.36	0.38

^aData adapted from Automobile Facts and Figures, Automobile Manufacturers Association, Annual Edn. 1954, 61, R. L. Polk and Co.

densities with mostly single dwelling units (despite increasing multiple dwelling units) are common characteristics, important in explaining the high degree of automobile availability.

The two areas involve somewhat differing levels of saturation: Los Angeles at approximately 0.43 autos per person and Nassau at about 0.37 autos per person. No increase in Nassau, and only slight increase in Los Angeles, since 1953 in autos per capita are indicated. Close examination of relevant 1960 census data reveals some interesting variations in the basic factors responsible for the differences in the automobile ownership saturation levels.

The higher median family income in Nassau is associated with a higher degree of automobile availability: only 7.7 percent of its households with no cars available compared with 16.7 percent in Los Angeles in 1960. Age composition appears to be the main factor underlying this difference. Both areas have similar percentages of their populations in the age group 21 to 64 years, which encompasses the great majority of automobile owners, but Nassau has a much larger percentage of youngsters and Los Angeles a 50 percent greater proportion of oldsters (See Table 20). Older citizens probably constitute many of the Los Angeles households without cars.

Use of public transportation for the trip to work is much more significant in Nassau County. Almost one-fourth of the Nassau population use it compared with only 8 percent in Los Angeles. Yet, Nassau has more extensive automobile availability. Many workers in Nassau County commute to work in New York City via Long Island Railroad, using an automobile to travel to the nearest railroad station. In a great many cases the housewife chauffeurs her husband to the station, so that she may have the car available during the day. Others travel by car to the outlying subway station in Queens County. The automobile is usually a necessary adjunct of the trip to work.

Los Angeles, on the other hand, places scant reliance on public transportation for work travel. Nevertheless, households without automobiles in Los Angeles are twice as large, proportionately, as in Nassau County. Perhaps public facilities in Los

TABLE 20
SOCIAL AND ECONOMIC CHARACTERISTICS RELATED TO AUTOMOBILE OWNERSHIP IN
SELECTED COUNTIES^a

Counties	Median Family Income 1959 (\$)	Population by Selected Age Groups (1960)			Occupied Housing Units in 1960 with		Workers Using Public Trans- portation in 1960 (%)
		5 to 20 Years (%)	21 to 64 Years (%)	65 Years and Over (%)	No Car Avail- able (%)	Two or More Cars Avail- able (%)	
Pennsylvania							
Philadelphia County ^b	5,783	24.5	55.1	10.4	44.0	7.9	41.2
Allegheny	6,173	26.1	53.7	9.6	25.9	14.7	23.6
Texas							
Harris County	6,040	28.9	52.8	5.4	16.7	30.0	10.4
Ohio							
Cuyahoga County	6,943	26.0	53.8	9.2	21.3	21.8	23.2
Illinois							
Cook County	7,287	25.1	54.8	8.9	31.6	13.1	33.5
New York							
Nassau County	8,515	30.0	52.7	6.2	7.7	30.8	24.6
Erie County	6,395	26.5	52.7	9.3	22.1	14.6	18.0
California							
Los Angeles County	7,046	25.9	54.2	9.2	16.7	31.5	8.3
San Francisco County ^b	6,717	20.3	59.2	12.6	42.1	11.1	36.8
Michigan							
Wayne County	6,597	27.1	53.3	8.0	21.5	21.4	16.2

^aData derived from U. S. Department of Commerce, County and City Data Book, 1962, Items 10, 11, 12, 49, 71, and 72.

^bCity and county are coterminous; others include substantial suburban areas.

Angeles are more extensively used for nonwork trips. The larger percentage of persons 65 years and over in Los Angeles, many of whom are retired, live close to the central business district and use public transportation for nonwork trips such as for personal business, social, and recreational purposes, which may explain much of the variation between the two counties in the use of public transit.

Youths 5 to 20 years of age comprise a larger proportion of Nassau's population. Included in this group are the teenagers who do not yet own automobiles themselves but belong to households owning automobiles. This age distribution is a depressing factor on the present ratio of automobiles per capita.

The basic characteristics in Table 20 provide some insight into the reasons behind the variations. Differences in level of automobile ownership and in apparent saturation levels (Table 19) are explained, at least in part, by various socio-economic factors such as income, the age distribution of the population, and use of public transportation (which, in turn, reflects density of population and city age) as shown in Table 20. With the understanding of these underlying factors, reasonable estimates may be made of the future growth and saturation of automobile ownership at the county level. If a time series on these underlying factors were available on a continuing basis, correlation analyses would provide knowledge of the relative effects of these factors on the rate of growth in autos per capita, indication would be obtained with respect to the point at which likely saturation levels might be attained, under varying conditions of residential density and population composition.

SUMMARY

Automobile ownership, a prime determinant of highway needs, has been growing nationally at a decelerated rate in recent years. This growth pattern implies future saturation-stability in one or more indicators; automobiles per capita, autos-per-licensed drivers, and percent of households owning automobiles.

Most of the increase in automobile registrations over the past decade has come as the result of households acquiring second and third cars. Multicar ownership reflects major characteristics of the contemporary American economy—rising real personal income, suburban residence, and larger families.

Population in the United States is becoming more concentrated in large metropolitan complexes. The 10 states having the largest increases in automobile registrations over the past 10 years are the states in which most of the largest urban agglomerations are located. Growth of automobile ownership in this group of states is slower than in the remaining group of states. In each of these two groups of states, however, the growth in automobiles is closely associated with the rate of growth in income.

State-by-state comparisons reveal the relative importance of other social and economic characteristics, as well as income, in determining the growth of automobile ownership. Per capita income was shown to be the prime determinant behind Georgia's rapid growth in automobiles. In California extensive automobile availability appears to be the major factor causing autos per capita to rise at a slow rate. Michigan's slow rate of growth in autos is attributable to a combination of a low increase in income and existing widespread automobile availability. In New York the relatively slow growth in autos per capita is fundamentally due to New York City's population density and its excellent public transport.

County data on automobiles per capita have reached plateaus in such counties as Allegheny (Pittsburgh), Nassau and San Francisco. Age composition is the strong factor in Nassau, while population density and availability of public transportation are key factors in San Francisco. Relatively low income, resulting from unstable employment and availability of public transit, are major influences in Pittsburgh.

RECOMMENDATIONS FOR FURTHER STUDY

The analysis of automobile ownership and of related data presented in this paper is intended to demonstrate methods of using published data from the U. S. Bureau of Public Roads, the Census Bureau, and other sources which would make possible more accurate interpretation of the indicators of ownership and identify evidence of approaching saturation.

Lack of historical data on some of the underlying data now prevent more refined correlation analyses, and the tasks which await the researcher in this field are considerable. Areas which should be canvassed include:

1. Inclusion of additional factors, especially attitudes toward ownership under various conditions of congestion, high operating costs, and improved public transportation.
2. More extensive application of the socio-economic factors suggested in this paper to other statistical metropolitan areas.
3. Analysis of factors affecting various levels of consumer expenditures for transportation, area differentials in these expenditures, and the trend in them. Data from the U. S. Bureau of Labor Statistics would furnish an appropriate source.
4. Review and evaluation of the ownership assumptions in area transportation studies and of the basic assumptions made in projecting ownership.
5. More extensive search for the evidence of, and conditions making for, saturation levels of ownership.

This paper has demonstrated the application of a normal growth curve to national registration data. Similar investigation might be rewarding on a state and area basis. Changes in urban structure, and in the relation between downtown and suburbia are clearly in the making. Public attitudes toward ownership are certain to be modified with these and other changes. Recognition of these changes, and of the effect on ownership rates must be made a part of the forecasting technique.

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