

# Collecting Statistics on Vehicles in Use

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• IN EARLY 1960 the Bureau of Business and Economic Research at the University of Missouri was asked by the State Highway Commission to prepare a report to the State Legislature on future financing of Missouri roads. The author made the 20-yr projections of indicators of highway use. These forecasts of the behavior of three major indicators—motor vehicle registrations, fuel consumption, and motor vehicle travel—became the basis for financial projections of registration fees and motor fuel taxes.

During the preparation of the forecasts, the unavailability of inadequacy of certain data series that were requested from the Missouri State Highway Department became apparent. Some examples of major questions needing more adequate data were the following:

1. What effect would compact cars have on registration fees, fuel consumption, and travel?

2. What impact would multiple car ownership have on travel mileage and fuel consumption of second and third cars?

3. What effect would piggy-back transportation by railroads have on the number of trucks, their weight, and their zone of registration—local or beyond local?

4. How much travel in Missouri was done by out-of-state vehicles and what was their impact on fuel consumption and travel mileage? Was the trend for out-of-state travel different from domestic travel?

5. What effect did the present tax differential between Missouri and surrounding States have on fuel consumption by out-of-state vehicles and domestic consumption?

6. What were the trends in fuel usage of diesel gasoline motors?

These are some of the more complex questions for which answers were desired for making projections and they would have required either cross-tabulations of data that were simply not available or new data that had never been gathered. However, it was apparent that even the major series of data to be projected (that is, motor vehicle registrations and travel mileage) might need improved accuracy and reliability.

As a result, two studies were made for the Missouri State Highway Department: (a) a survey of the present methods of collecting statistics on highway use; and (b) a design of a procedure for recording vehicles in actual use in Missouri.

In considering the general applicability of the findings reported, it must be kept in mind that this is a case study of Missouri conditions. However, some of the conclusions may have more general applicability insofar as some of the problems encountered are similar to those in other States.

The first general finding to report is that registration data that the State Highway Department receives from the State Division of Revenue

are dominated by that Division's concern with immediate availability for use by police and sheriff departments, field collection, and size of the registration form to fit existing file and photostatic facilities. Relatively little concern is shown for the data needs of highway engineers and planners.

To be more specific, Missouri adopted the "continuous registration" procedure for passenger cars a few years ago. This method spreads the actual registration of passenger cars as evenly as possible over twelve months of the year. The method is relatively new and has been adopted in several States in the last few years. Although it seems to be an excellent procedure from the standpoint of the registration authorities, it appears to present some rather difficult problems of interpretation and analysis to those who would use the information for statistical purposes.

There is, for example, the problem of distinguishing between the concept of a "flow" or "volume" and a "stock" or "inventory." The number of vehicles in use (or registered) is a stock. A certain number of vehicles exists on any given day and if technically feasible, that number could be counted on any one selected day. The size of this stock of vehicles in use changes, of course, from day to day. Newly manufactured vehicles enter the stock of vehicles in use through automobile dealers, and for any particular State, used vehicles come in from other States. Vehicles also disappear daily by out-migration from the State to other States and by scrappage. However, vehicles in use (or registered) are a stock that, like any population of human beings or animals, is increased by births (new manufactures and in-migration) and decreased by deaths (out-migration and scrappage). "Vehicles in use during a given year" means the average level of the inventory of ve-

hicles as it was composed of 365 individual daily stocks of vehicles in use.

The number of vehicles registered at the end of the year includes scrapped vehicles as well as out-migrations during the year and is, therefore, likely to exceed the number of vehicles in use at the end of the year. If it were technically feasible, one would like to be able to take an inventory or count of all vehicles in use on any one day during the year. The more commonly used registration methods come closer to this type of cross-section count by requiring owners to register their vehicles by a certain date, usually early in each year. R. L. Polk and Company stops counting registrations about midyear and thus probably avoids some of the counting of scrappage and out-migration.

With the "continuous registration" procedure, there exists a danger that registered vehicles are regarded as a "flow" or "volume" rather than a "stock" that exists on any one selected date.

This is the problem in Missouri where the Department of Revenue (Motor Vehicle Registration Division) reports only the renewal notices for passenger cars to the State Highway Department. More precisely, the Motor Vehicle Division files the registration of passenger cars by the month in which the car is registered. One month before the renewal of an owner's registration is due the department sends out a notice on an IBM card which serves both as a reminder and as an application for re-registration. It is a copy of this renewal notice which the State Highway Department receives.

Thus, the State Highway Department is not notified at the time of original registration but only eleven months later that a car has been registered that apparently is still in the same owner's hands and has come up for re-registration or renewal. For example, a passenger car

is registered by its owner in December 1960. The State Highway Department is notified in November 1961 that the car is ready for re-registration. The statistician then counts this car as part of the 1960 registration. No particular confusion of stock and volume exists in this example. However, the Highway Department statistician has had to wait eleven months beyond the end of 1960 to receive a complete record of 1960 registrations.

As an example where confusion over flow and inventory concepts arises, the following illustration will serve to point up a common statistical difficulty.

Sometimes the owner of the car registered in December 1960 buys another one during 1961. For example, he may have bought a new 1962 model in September 1961. This transaction was then handled as a transfer of license plate to the new car, for which the owner paid a transfer fee. His renewal again comes up in December 1961. By November 1961, the Motor Vehicle Division has moved the owner's card, showing the vehicle registered in December 1960, from its primary place in the file and has placed the new 1962 model car in the primary position. The owner and the State Highway Department now receive a copy of the renewal notice which identifies the 1962 model car bought in September 1961 as the owner's car. The State Highway Department statistician, however, must now make one of several alternative decisions:

1. Assume that all renewal notices mailed out in November 1961 represent the December 1960 registrations, and thus place a 1962 model car into the 1960 registration year.

2. Trace back all transactions that took place during the year to avoid the previous type of error; or

3. Assume that December 1961 renewal notices are part of the

December 1960 to December 1961 registrations, and thus fall into the flow vs stock error.

A somewhat extreme example has been chosen, using a new model car (1962) that ends up in the 1960 registration, a year during which it obviously had not been manufactured as yet, to make clear the basic difficulty encountered by a system of using renewal notices to accumulate detail registration records at the Missouri State Highway Department.

Even without the special difficulties encountered in Missouri because renewal applications rather than original registrations are used for detailed analysis by the Highway Department, the "continuous registration" procedure presents problems to the statistical analyst. If an original registration file is accumulated by the State Highway Department, then this file must be purged either monthly or annually for duplications that enter because of changes in ownerships. That is, the February file must be compared to the January file and all ownership changes that occurred in February but also registered in January pulled out. In March, the entire procedure must be repeated to select all ownership changes in March who also registered in January or February. This procedure, or a similar one, would have to be used every month through December each year. Each time the files are compared, the number of individual items increases, of course, until by December about 1,400,000 individual items must be run through in Missouri. The Missouri State Highway Department apparently adopted the renewal notice procedure primarily because it would have been faced with this large and costly collating task.

It has been estimated that only 75 percent of the registration data represent currently accurate information. The other 25 percent are duplications due to the practice of

TABLE 1  
 A COMPARISON OF ANNUAL U.S. PASSENGER CAR REGISTRATIONS<sup>1</sup> AS COMPILED BY  
 U.S. BUREAU OF PUBLIC ROADS TO ESTIMATES OF PASSENGER CAR REGISTRATIONS  
 AND CARS IN USE BASED ON R. L. POLK AND COMPANY DATA, 1954-1960

Year	U.S. Bureau of Public Roads December 31	R. L. Polk and Company			Difference Between Estimates		Ratio of B.P.R. to Polk	
		Cars Reported Registrations July 1	Registration Estimate to End of Year Adjustment <sup>1</sup> 2	Cars in Use Estimate at End of Year Adjustment <sup>2</sup> 3	Col. 1 - Col. 3	Col. 1 - Col. 4	Col. 1 ÷ Col. 3	Col. 1 ÷ Col. 4
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1960	--	57.1	--	--	--	--	--	--
1959	59.6	55.1	58.0	53.7	1.6	5.9	1.03	1.11
1958	56.9	52.5	54.8	52.0	2.1	4.9	1.04	1.09
1957	55.9	51.4	54.3	50.1	1.6	5.8	1.03	1.12
1956	54.2	49.8	52.7	48.3	1.5	5.9	1.03	1.12
1955	52.1	47.4	51.0	46.7	1.1	5.4	1.02	1.12
1954	48.5	--	--	43.9	--	4.6	--	1.10

<sup>1</sup> Source: "Automobile Facts and Figures," 1958, 1959-60, 1961 Editions, Automobile Manufacturers Association. Number of passenger cars in millions.

<sup>2</sup> Polk reports registrations as of July 1, whereas BPR registrations are reported as of December 31. To reconcile these registration estimates, the number of new passenger cars registered during the first six months of each year was added to the Polk midyear registration data.

<sup>3</sup> The number of new passenger cars registered during the first six months of each year was subtracted from the Polk registration for July 1 of that year to provide a comparison of estimated cars in use at the previous December 31 to annual registrations reported by BPR for the previous year.

pro-rating or to changes that have not as yet entered the registration file or registrations that come in after listings have been prepared.

As to commercial vehicles, the State Highway Department receives the complete original registration record in the form of a deck of IBM cards sometime during February or March the year following the registration year. Because all commercial vehicle owners must register in January of each year, these data for most commercial vehicle registrations are again over a year old. Of course, the truckers have made numerous changes from the original registration because of changing needs for their operation from "local to beyond local" or from one type and weight combination of tractor trailer to another. At least these changes have been taken care of by the time the State Highway Department receives the data. However, a specific type of vehicle originally registered may be in use for only a part of the year. At present only the last registered vehicle is left in the IBM deck under the vehicle number. It then becomes a huge task to try to match the various license numbers and to bring together a composite picture of the various ways in which the particular owner has used the vehicle in question during the year. In this case it would seem to be desirable to prorate the type of vehicle in use on a time basis and in fact to establish a weighted composite that would reflect the actual use made of the various combination units.

A series of vehicles in use seems a much better base with which to correlate fuel consumption and travel mileage of vehicles domestic to the state than are registration figures. Registration figures are good for financial planning of registration fees. The number of reported vehicles as registered in a 1-yr period contains, however, a substantial number of scrapped vehicles. This scrappage

may run as high as 8 percent and duplicate registrations which slip in for various reasons may raise the difference between vehicles in use and registrations to perhaps as much as 20 percent.

Table 1 compares U.S. passenger car registrations as compiled by the U.S. Bureau of Public Roads to a reasonable estimate of the number of vehicles in use based on adjusted R. L. Polk and Company figures. Because Polk runs its registrations only to midyear and scrappage is relatively small during the first half of the registration year, the Polk data are assumed to be closer to "vehicles in use" at midyear than the year-end registration total reported by the Bureau of Public Roads. However, because the midyear closing date used by Polk is not comparable to the end-of-year date used by the Bureau of Public Roads, the actual Polk registration data have been rolled back to the beginning of the year by a subtraction of new car registrations during the first 6 months of the year. It must be borne in mind that the adjusted Polk data still include the first 6 months of scrappage. Therefore, the difference between adjusted Polk data and Bureau of Public Roads data allows only a rough and minimum estimate of the difference between vehicles in use and vehicles registered. For the years 1954 through 1959 the registration data compiled by the Bureau exceeded the adjusted Polk data between 9 and 12 percent each year.

The second major finding concerns the traffic count data that serve in part at least to establish travel figures. There exists a natural conflict between the needs of the design engineers and the needs of the economic and financial planner. Design engineers need information on specific segments of the road network and because design of roads is a day-to-day job it is easy to understand that the planning division concentrates on

traffic counts suitable for this type of work. Travel information is needed less frequently and has less immediate visible value. It is useful for longer range planning studies.

Traffic counts designed to develop travel information do not have to be made on each and every specific segment of the road network. Travel information could easily be developed from a sampling of a small part of the entire network. A carefully designed sample can develop more accurate information than the present set-up whereby travel is counted very frequently on some roads and not at all on others. In the past, Missouri has concentrated traffic counts on the rural State network. Relatively little work has been done on the county roads but it may be considered reasonably adequate in view of the relatively small contribution that the county roads make to total travel mileage. However, the program in the cities needs to be augmented. It is totally inadequate for developing travel mileage figures. They are derived from the difference between statewide estimates and the total of separate estimates for the rural State and county systems.

Conclusions and recommendations for policy on collecting statistics on indicators of highway use are the following:

1. In an over-all evaluation of the traffic counting program and the motor vehicle registration data, one should theoretically be comparing the value of the statistics to the users; that is, their utility to the cost of producing these data. It is most difficult to assess the specific value of the data to their individual users and

only slightly less difficult to rank order these in terms of value to their users.

2. As the program functions at present, it appears that the highest value is placed on individual design requirements and the service rating assigned on the rural State highway system and on the day-to-day requests for motor vehicle registration information. Travel mileage data insofar as they are obtained come as a by-product of the operation on the State's rural highway system. For the county roads traffic program, travel data contribute the major part of the value obtained but they are not collected in the most efficient and representative manner. In the cities, the traffic counting programs contribute primarily to design of individual State highways. Detail motor vehicle registration data are inaccurate for passenger cars. They do not even check out with the totals reported. They are reasonably accurate but not current for commercial vehicles.

3. Whether the values or utilities presently obtained are the most desirable and whether the amounts spent are balanced to obtain the largest utilities is a difficult question to answer. If, however, a higher value is put on long-range planning and over-all planning for all roads and streets in the State, then the present operation appears to be out of balance with respect to amounts spent on specific areas and values obtained. A better balanced program would call for substantially more and better quality motor vehicle registration, fuel consumption, and travel estimates and more attention to the coordination of the design problems of the entire road network of Missouri.