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THE STATUS OF THE OHIO HIGHWAY SYSTEM
WITH RESPECT TO THE STATE'S AGRICULTURAL INDUSTRY

By

Thomas G. Myers and Donald W. Larson

AGR. ECON. & RURAL SOC.
REF. ROOM 1112
THE OHIO STATE UNIVERSITY
2120 FIFTH ST.
COLUMBUS, OHIO 43210

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This is the sixth interim report on a series of studies analyzing transportation services for Ohio Agriculture. The authors wish to thank Karlene Robison, Kathy Weaver and Janice Christensen for their most valuable assistance in the preparation of this report.

*Technical Assistant and Professor, respectively, Department of Agricultural Economics and Rural Sociology, The Ohio State University, and the Ohio Agricultural Research and Development Center.

Executive Summary

The purpose of this report, which is prepared for the Ohio Department of Agriculture, is to identify and examine the important issues concerning highway transportation that affect the state's agricultural industry. The need for a report of this type was brought about by concern over the deteriorating condition of Ohio's rural roads and bridges. For example, the County Engineers Association of Ohio reports that there are nearly 18,000 deficient county-maintained bridges in the state. They further estimate that the cost to repair and rehabilitate these bridges is 2.2 billion dollars. In addition to this, the Ohio Department of Transportation (ODOT) reports that highways should be resurfaced every 10 years in order to maintain a satisfactory roadway condition. This means that approximately 1,900 miles of the 19,219 miles of ODOT-maintained highways require resurfacing annually. Currently there are only enough funds available to resurface 1,200 miles of highway. The funding situations with many of the county, township and municipal highway departments are similar if not worse.

There are several reasons why a situation such as this has developed. The number of demands being placed on the state's highway network has increased dramatically over the past several decades. Not only have the total number of motor vehicle registrations increased by 281 percent since 1950, but the sizes and weights of many commercial trucks and farm vehicles have risen as well. This becomes especially important when it

is viewed in light of the fact that the General Accounting Office reports that one 80,000 pound tractor-trailer causes 9,600 times as much damage to a highway as one 4,000 pound automobile.

Inflation and decreased fuel consumption are also important factors that have contributed to the highway funding deficit. The cost of highway construction materials, many of which are petroleum derivatives, increased along with the price of crude oil. This, along with the fact that labor costs have also gone up sharply, has meant that many highway department budgets have simply not had enough funds to perform an adequate amount of repairs to the state's roads and bridges. The largest single source of revenue for Ohio's highway departments is the motor vehicle fuel tax. Even though the tax was recently increased from 7 to 11.7 cents per gallon, the increased popularity of fuel-efficient cars has caused an 8.3 percent reduction in the total gallons of fuel taxed in Ohio since 1978. Overall, this has resulted in a reduction in the nominal as well as inflation-adjusted levels of revenue that have been collected from this important source.

The importance of a sound highway system to Ohio's agricultural industry is demonstrated by the enormous volumes of products and commodities that are transported by trucks and other vehicles over the state's roads and bridges. While it is true that rail and water shipments are also used to a large extent for the movement of agricultural products, the speed and versatility that is provided by a good highway system cannot be matched when

it comes to serving the many widely dispersed agricultural production sites in the state.

This report discusses eight suggested solutions that could be employed to alleviate the highway funding deficit. The solutions that the authors feel should receive the most attention are to increase the axle-mile tax and the motor vehicle registration fees.

The Status of the Ohio Highway System
With Respect to the State's Agricultural Industry

Introduction

The Ohio highway system, which is made up of 110,169 miles of roadway and 37,529 bridges, represents a capital investment greater than the total of all other Ohio public projects put together. The significance of this system to the entire population of the state is evidenced by the fact that the annual sum of highway usage by all vehicles within the state comes to a staggering 75 billion miles. There has been an increasing amount of attention over the past several years given to the funding and condition of this system due to the fact that maintenance programs have been unable to keep pace with the deterioration caused by increased road usage, aging and weather. The objective of this report will be to examine this and other highway transportation issues that affect Ohio agriculture.

The first section of this report will discuss the importance of a sound highway system to the state's agricultural industry. A presentation of current and future demands for highway transportation will also be given.

The second section will present the current condition of Ohio's roads and bridges. This will be followed by a detailed analysis of the entire state's highway taxation and revenue distribution system. An indication of the anticipated highway maintenance funding deficit for the next five years will also be included in this section.

The final portion of this report will focus on various alternative solutions to this problem as well as questions that may require further detailed examination.

Agriculture's Need for a Sound Highway System

Ohio ranks in the top ten nationally in the production of 36 agricultural products, attesting to its importance and versatility as an agricultural producer. The state has the third largest industrial payroll in the United States and yet still maintains agriculture as its leading industry.^{1/} In order for this huge industry to function properly, an enormous amount of farm supplies such as fertilizer and chemicals need to be shipped into the state. In addition to this, many of Ohio's agricultural products are transported out of the state. These commodities must travel long distances to export terminals at the Gulf of Mexico or the Atlantic Coast, to export destinations via the Great Lakes, or to various domestic locations. The efficiencies of water and rail are necessary for these long-distance movements. However, because the state's agricultural production sites are dispersed over such a large area, there are many shorter distance hauls required in order to properly distribute these supplies and agricultural commodities. The speed and versatility of trucking cannot be matched for these hauls. The Midwest Association of State Departments of Agriculture reported that as of 1977 there were 876,100 motor trucks in Ohio engaged primarily in farming and agribusiness operations. Table 1 gives an indica-

Table 1. Ohio Agricultural Commodities and Supplies
That are Transported Primarily by Truck

	1975	1976	1977	1978	1979	1980
	(million lbs.)					
Fertilizer	3474	3959	4097	3942	4458	4735
Milk	4130	4315	4335	4165	4170	4220
Cattle	852	866	920	864	599	678
Hogs	650	648	627	535	778	693
Sheep	28	25	34	24	25	24
Poultry	147	151	155	179	161	141
Eggs (mil.)	2090	1994	1941	2140	2235	2316

Source: Ohio Agricultural Statistics

tion of the immense volume of agricultural products and supplies that are transported by truck in Ohio each year.

In addition to those products mentioned in Table 1, the U.S. Department of Agriculture reported that 100 percent of Ohio's 157.8 million pound fresh fruit and vegetable crop arrived at the nation's principal markets by truck in 1980.^{2/} There is also a tremendous amount of grain transported on the state's highway network. In 1977, Ohio elevators and grain processing firms received 114.4 million bushels of grain* from out-of-state origins. Of this amount, 95 percent was carried by truck from states such as Michigan, Indiana and Kentucky. There were also 368.4 million bushels of grain transported from Ohio farms to grain firms in 1977.^{3/} Virtually all of this amount traveled on the state highway system. While the water and rail modes controlled over 94 percent of grain shipments from Ohio to out-of-state destinations, the truck mode is the decided choice of grain shippers for the numerous short hauls they require. Table 2, which is a projection of Ohio grain production through 1999, indicates that grain shipments by truck within the state should definitely increase in the future.

Independent research reports by Henderson, Barr and Stout indicate that livestock production on Ohio farms may decrease in the next decade.^{4/} While this may be true, the projected increase in grain and oilseed production should be enough to

*"Grain" as it is used here includes corn, soybeans, wheat and oats.

Table 2. Grain and Oilseed Production for 1977 and Trend Projections for Ohio, 1984, 1989 and 1999

Grains	1977	1984	1989	1999	1999 as percent of 1977
(000,000 bu.)					
Corn	380.1	440.0	475.0	550.0	145
Soybeans	119.9	175.0	200.0	225.0	188
Wheat	72.4	70.0	72.0	75.0	104
Oats	24.8	28.0	27.0	26.0	105
Total	597.2	713.0	774.0	876.0	147

Source: Projected Production of Grain and Oilseeds and Consumption by Livestock in Ohio for 1985, 1990 and 2000, Baldwin and Larson.

cause an overall increase in the demand for highway transportation by Ohio farmers and agribusinessmen.

The next sections of this report will examine the current condition of Ohio's roads and bridges. Special attention will be given to those factors which have contributed to the relatively recent decline in the condition of this transportation network.

Condition of Ohio's Highways

The responsibility for Ohio's highway system is shared by five levels of the government. The five levels are: Federal, State, County, Township and Municipality. Table 3 indicates the composition of the highway system based on maintenance responsibilities.

The deteriorating condition of the Ohio highway system, both urban and rural, is becoming increasingly apparent each year. It is becoming more and more difficult to find a street or highway that does not have potholes and cracks in need of repair. According to a 1977 General Accounting Office report, highways are deteriorating at a 50 percent faster rate than they are being repaired.^{5/} There are several reasons why this has occurred. Since 1975, highway budgets have been hit hard by inflation, and the nation has also experienced four of its worst winters in history. These harsh winters put a dual strain on the highway maintenance departments. They not only increase the need for additional expenditures for snow and ice removal, but they also intensify the amount of roadway deterioration.

Table 3. Existing Mileage in the Ohio Highway System

Road Type	Mileage
Township roads	39,604 miles
County roads	29,813 miles
State highways	19,219 miles
Interstate system	1,570 miles
Village & City streets	<u>19,963 miles</u>
Total	110,169 miles

Source: Classification by Surface Type of Existing Mileage in Each County, Ohio Department of Transportation

Interstate Highways

The case of Ohio's portion of the Interstate Highway System is an example of a situation that is typical of the state's entire highway network. Practically all of the Interstate mileage in Ohio was designed and built for maximum truck weights of 78,000 pounds; then in 1975 the Ohio General Assembly revised the maximum permitted gross vehicle truck weight to 80,000 pounds. Even though this 2,000 pounds more per truck may not seem like much, it results in a tremendous increase in the amount of stress placed on the highways and hastens deterioration of the pavements (See Figure 1). Also, there are 2.5 times more trucks using the Interstate Highway System than were predicted when the highways were built.^{6/} Pavements on these highways were designed for a life span of 20 years before major work should be needed. However, with the larger volumes and heavier loaded trucks, major repair work is needed much sooner than originally anticipated. The first resurfacing of most Interstate highways is needed in eight years for blacktop pavements and 14 years for concrete pavements in order to maintain a satisfactory roadway condition.^{7/} The Ohio Department of Transportation (ODOT) estimates that 1,057 miles (out of 1,570) total) of Ohio's Interstate Highway System will need resurfacing over the next six years at a cost of \$132,500 per mile.

State Highways

The situation with much of the rest of the state's highway system is similar. There are not enough funds to maintain an

already weakened system that is having increased demands placed upon it. To protect the basic road structure, ODOT reports that each mile of state-maintained highway should, at a minimum, be resurfaced every 10 years. This means that of the 19,000 miles of state highways in Ohio, 1,900 miles should be resurfaced each year. Currently, ODOT resurfaces only about 1,200 miles annually, a situation which can have disastrous financial consequences in the future. The cost of major reconstruction on a road which has incurred basic structural damage can be 5-8 times greater than the cost of resurfacing.

Rural Roads

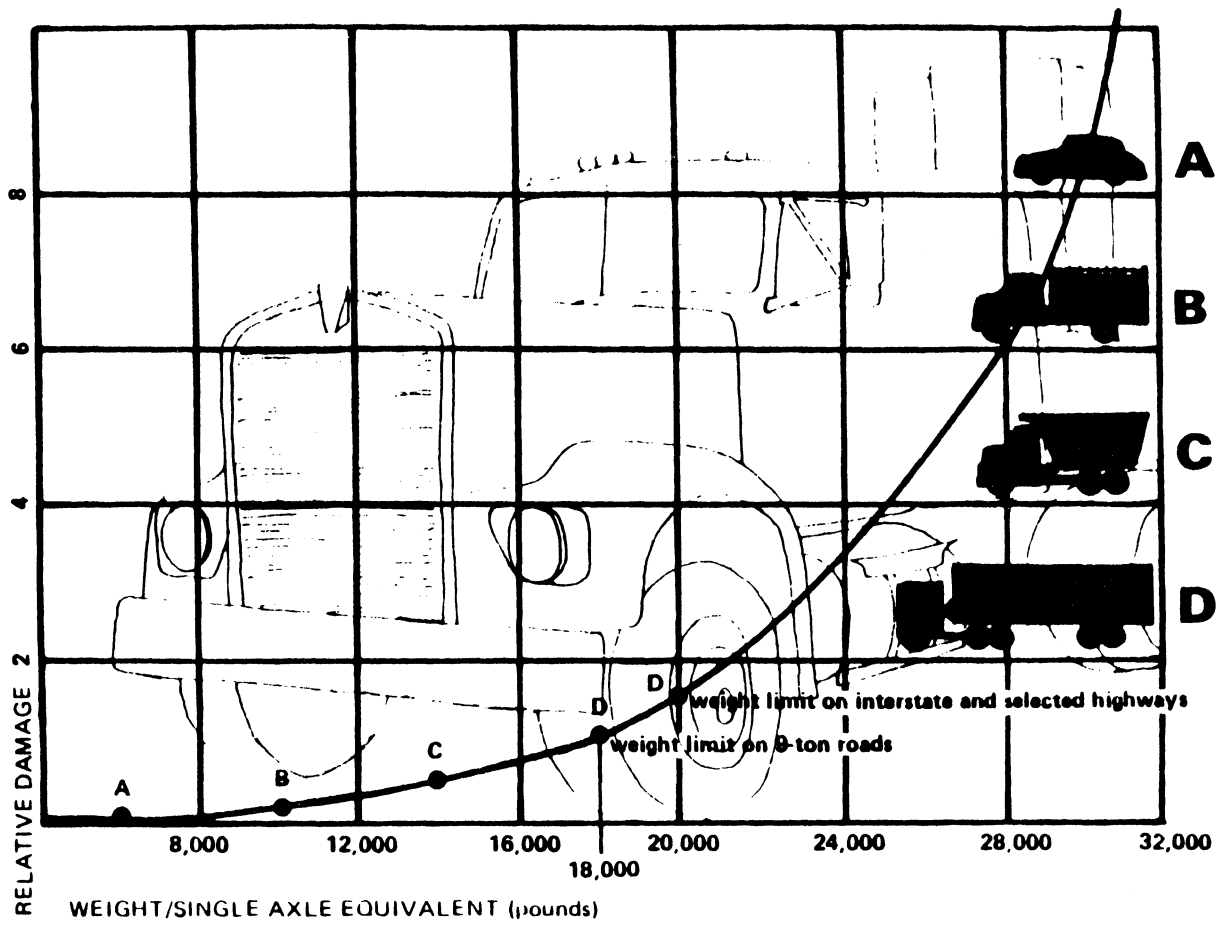
Many of Ohio's county and township roads are also faced the dilemma of decreasing highway maintenance budgets coupled with an increase in demand for highway usage. A majority of Ohio's rural roads were built before 1935 and were only designed to accommodate trucks up to 8 tons gross weight.^{8/} Recent technological advancements have resulted in larger farm equipment and trucks that weigh many times more than this amount. It is no longer uncommon for a farmer to own a semi or other large vehicle to be used in the transportation of commodities such as grain and fresh vegetables. Trucks also serve agriculture by delivering to farmers and supply stores such products as dry and liquid fertilizers, feeds, seeds, petroleum, and heating oil as well as numerous other items which are vital to agricultural operations. These factors point out that a significant number of large vehicles are traveling on Ohio's rural roads and bridges.

The standard rural road is currently designed to support axle weights of up to 18,000 pounds. The increase of the allowable axle weight limit to 20,000 pounds is cause for concern to county and township highway departments. While the increase applies only to vehicles on the state and interstate highways, any unauthorized trucks with 20,000 pound axle loads would inflict 50 percent more damage to rural roads than trucks with 18,000 pound axle loads.^{9/} The information in Figure 1 illustrates this relationship.

Condition of Ohio Bridges

Many Ohio roads and bridges were originally built in the 1920s and 1930s. As mentioned previously, the sizes and weights of farm machinery and delivery vehicles have increased dramatically since that time. Coal trucks, grain and feed trucks, milk trucks, fertilizer applicators, and tractors can easily weigh anywhere from 5 to 40 tons or more. While the maximum legal gross vehicle weight on any Ohio road is 40 tons, there are bridges on many county road systems which are rated to carry 12-15 tons of total weight per vehicle. Some bridges have ratings as low as 5-6 tons. Bridges which have restricted ratings are posted and vehicles are required to either reduce their loads or detour around the bridge. In reality, many heavy vehicle drivers pay little heed to bridge postings because of the costs involved in reducing loads or detouring, and because bridge postings are rarely enforced.

Figure 1: Damage Level Escalation Due to Added Vehicle Weight Per Axle



Source: Minnesota Department of Highways, Axle Load: Effects on Highway, p.2.

Identifying Bridge Deficiencies

Bridge inadequacies fall into two categories, "structural deficiencies" and "functional deficiencies." Structural deficiencies weaken a bridge and often necessitate legal-load-limit reductions. ODOT lists the following examples of common structural deficiencies:

- Structural members of an older bridge are sound but too small for today's heavier traffic loads.
- Main bridge members are deteriorating so badly as to reduce load capacity.
- Main bridge members are damaged by vehicle collision, reducing strength.
- Piers or abutments are weakened by weathering or overloads.
- Bridge footings are undermined by changes in stream flow.

Functional deficiencies are those factors such as original bridge design and bridge approach which do not meet modern traffic volume or safety and other standards. Common functional deficiencies include:

- A roadway is too narrow for modern traffic.
- The horizontal or vertical alignment of a bridge and the approaching roadway is poor.
- The clearance above or below a bridge is insufficient for passage of modern traffic.
- Poor waterflow under a bridge causes flooding upstream.

ODOT Maintained Bridges

The Ohio Department of Transportation is responsible for the maintenance of 11,634 of the 37,529 bridges in the state. ODOT rates 4,265, or one third, of the bridges it maintains as only 80 percent sufficient. That is to say serviceability has depreciated by at least 20 percent. ODOT reports that 605 of its bridges have a sufficiency rating of less than 50 percent and need immediate replacement. It is estimated that the cost of replacing these 605 "critical-condition" bridges could easily cost in excess of \$600 million over the next five years.^{10/} Given expected ODOT bridge funding of only \$250 million for that period, most of the replacements will simply have to wait. This is a problem that can be expected to worsen in the near future due to the fact that many of the ODOT-maintained highway bridges are nearing the projected end of their useful life (See Table 4).

County Maintained Bridges

The County Engineers Association of Ohio has conducted an extensive inventory of the bridges in the state that are maintained totally or in part by the county highway departments. These bridges were rated by degree of sufficiency. The sufficiency rating system is based on nationally accepted standards established by the Federal Highway Administration and the American Association of State Highway and Transportation Officials. Every bridge's serviceability is expressed as a percentage between zero and 100. The ratings are calculated according to the adequacy of each bridge's roadway width, safe load-carrying

Table 4. Distribution of ODOT-Owned Bridges by Estimated Remaining Life on the State Highway System, October, 1980

Estimating Remaining Life in Years	Number of Bridges
Less than 5	316
10	1,172
20	2,279
30	2,367
40	4,234
50	1,086
60	114
70	21
80	39
90	<u>6</u>
Total	11,634

Source: State Highway Bridges, Ohio Department of Transportation.

capacity, vertical and horizontal clearance and the ability to handle current traffic patterns. A summary of the inventory is given in Table 5.

Table 5 indicates that 25,029 of Ohio's 37,529 highway bridges are maintained at least in part by the counties. State-wide there is a reported total of 5,482 (22%) bridges with a sufficient rating of less than 50%. These bridges are considered to need replacement. There is also a total of 9,432 bridges (38%) with a rating of 50% to 80%. The degree of rehabilitation needed on these bridges lessens in amount as the sufficiency rating approaches 80 percent. The County Engineers Association further estimates that as many as 5,000 county bridges were not included in this inventory. Hence, they assume that an additional 3,000 bridges ($5,000 \times 0.60$) should be considered to have a sufficiency rating of 80 percent or less with 1,100 (22%) of them needing to be replaced and 1,900 (38%) needing to be rehabilitated.

This inventory also estimates that the total cost of replacing or rehabilitating the nearly 18,000 deficient county bridges in Ohio is 2.2 billion dollars. This huge "repair bill" seems even larger when it is realized that the cumulative total revenue for all of Ohio's county and township highway departments was approximately \$220 million in 1980. The huge difference between these totals illustrates the improbability of a significant portion of these repairs being completed under the current funding arrangement.

Table 5. Summary of County Bridge Inventory Conducted
by the County Engineers Association of Ohio,
May, 1981

Sufficiency Rating	Replacement	Rehabilitation
Reported (0% - 49.9%)	5,482	
Not Reported (0% - 49.9%)	1,100	
Reported (50% - 80%)		9,432
Not Reported (50% - 80%)		<u>1,900</u>
TOTALS BY CATEGORY	6,582 (22%)	11,332 (38%)
TOTAL DEFICIENT BRIDGES		17,914
TOTAL COUNTY BRIDGES		25,029

Source: Report on County Bridges, County Engineers Association
of Ohio.

Estimate of Funding Deficit

Following is a summary of estimates pertaining to the amount of revenue required to upgrade and maintain Ohio's roads and bridges over the next 5 years. It should be noted that these figures are intended only as rough estimates to illustrate the large deficit between the level of currently available highway revenue and the total amount of revenue required. The cost figures do not reflect such necessary maintenance items as mowing, pavement marking, research or the erection of signs and lights. The number of miles of highway requiring resurfacing is based on Ohio Department of Transportation data. These figures assume that a paved roadway needs resurfacing every 10 years and they are intended to reflect the number of miles of roadway in the state that have some type of bituminous or concrete surface structure.

The 4.66 billion dollar total shown in Table 6 should be contrasted with the information in Table 7. This table shows the major Ohio highway revenue sources since 1978 plus an estimate of revenues through 1986. The estimated total revenue for the next five years is \$4.06 billion. This is less than the anticipated required level of repair expenditures from Table 6. The actual size of this deficit in funding becomes even greater when it is realized that a large portion of the state's highway revenues are used for expenditures other than resurfacing and bridge repair.

Table 6. Estimated Ohio Bridge and Roadway Repair Costs Through 1986

Item	Cost
Bridge Repair & Rehabilitation	(000 Dollars)
County & Township Maintained	\$2,150,835
ODOT Maintained	<u>600,000</u>
Sub-Total	\$2,750,835
Highway Resurfacing	
Interstate:	
176 miles X 5 Years X \$132,500/Mile =	\$ 116,600
Four Lane:	
135 miles X 5 Years X \$102,250/Mile =	\$ 69,019
Two Lane:	
6,376 miles X 5 Years X \$ 41,500/Mile =	\$1,323,000
Urban:	
1,600 miles X 5 Years X \$ 50,000/Mile =	<u>\$ 400,000</u>
Sub-Total	\$1,908,619
Total Bridge Rehabilitation and Highway Resurfacing Requirements for the Next Five Years	\$4,659,454

Source: Report on County Bridges and various Ohio Department of Transportation publications.

Table 7. Ohio Collected Highway Revenues From All Sources, 1978-81 and Estimates for 1982-86

Source	1978	1979	1980	1981	1982	1983	1984	1985	1986
	(Million Dollars)								
Motor Fuel	406	417	392	378	567	554	540	526	515
Axle Mile	47	51	47	48	50	52	54	56	59
Vehicle Registration	145	217	156	276	276	277	277	278	279
Patrol Fines	<u>13</u>	<u>13</u>	<u>15</u>	<u>15</u>	<u>15</u>	<u>15</u>	<u>16</u>	<u>16</u>	<u>17</u>
Subtotal	611	698	610	717	908	898	887	876	870
-Debt Service	-68	-62	-75	-80	-82	-78	-75	-72	-70
Total	543	636	535	637	826	820	812	804	800

Source: Highway Financing, Ohio Department of Transportation.

Before suggesting any alternative methods of relieving this funding deficit, the current status of Ohio's highway taxation and revenue distribution structure will be presented.

Highway Tax Revenues and Distribution

The majority of the funds for the financing of Ohio's highway system come from the following four sources:

1. Motor Vehicle Fuel Tax
2. Axle Mile Tax
3. Registration and Licensing Fees
4. Highway Patrol Fines

These charges, as well as their distribution structure, are stipulated by the Ohio Constitution. Each of the four revenue sources will be discussed separately.

Motor Vehicle Fuel Tax

The Motor vehicle fuel tax, totaling 11.7 cents per gallon, is composed of five separate tax funds. Each fund has its own method of distribution of revenue. The revenue from the tax is earmarked for highway-related purposes in accordance with Article XII, Section 5a of the Ohio Constitution. The first fuel tax was enacted in 1925 and other major changes to the tax are as follows:

<u>Year</u>	<u>Change</u>	<u>Total Tax After Change</u>
1925	2¢/gallon tax enacted	2 cents
1927	1¢/gallon increase	3 cents
1929	1¢/gallon increase	4 cents
1933	1¢/gallon reduction	3 cents
1947	1¢/gallon increase	4 cents
1953	1¢/gallon increase	5 cents
1959	2¢/gallon increase	7 cents
1981	3.3¢/gallon increase	10.3 cents
1982	1.4¢/gallon increase	11.7 cents

The first 0.5 percent of the total fuel tax collected is transferred to the Waterways Safety Fund. The remainder is distributed with approximately 75 percent allocated to state (ODOT) highway programs and 25 percent going to local (counties, municipalities, and townships) highway programs. More specifically, the five funds are distributed as follows:

<u>Tax Rate</u>	<u>Disposition of Revenue</u>
2 cents per gallon	Gasoline Excise Tax Fund <ul style="list-style-type: none">- 30% to municipalities in proportion to their motor vehicle registrations- 25% to all counties in state by equal division- 45% to state highway fund
2 cents per gallon	Highway Construction Funds <ul style="list-style-type: none">- 7.5% to municipalities in proportion to their motor vehicle registrations- 7.5% to all counties in state by equal division- 17.5% to all townships in state by equal division- 67.5% to state highway fund
2 cents per gallon	Supplementary Highway Construction Fund <ul style="list-style-type: none">- 100% to state highway fund
1 cent per gallon	<ul style="list-style-type: none">- 100% to state for highway bond retirement funds
4.7 cents per gallon	<ul style="list-style-type: none">- 10.7% to municipalities in proportion to their motor vehicle registrations- 9.3% to all counties in state by equal division- 5.0 % to all townships in state by equal division- 75% to state highway fund

Table 8 shows the distribution of motor vehicle fuel taxes to local governments in 1980.

Axle-Mile Tax

The axle-mile tax is levied on commercial vehicles in relation to the number of axles they use in operation and the number of miles they are driven over public highways in Ohio. This tax was enacted in 1953 and is intended primarily for highway bond retirement. The highway use tax rates range from one-half cent per mile to two and one-half cents per mile. The rates have not changed since 1953.

As in past years, the majority of the tax revenue in fiscal year 1981 was generated by those vehicles in the two-cents-per-mile bracket. This bracket includes the conventional five axle semi. An indication of the increase in the weight of commercial vehicles in Ohio can be seen by comparing the axle-mile tax revenues of 1965 and 1981 shown in Table 10. Not only did the total amount of tax increase, but the proportion of the tax levied against heavier vehicles also increased. This shows that heavy trucks are placing increased demands on the state's roadways. This point will be discussed in greater detail in a later section of this report.

Because it would be infeasible for the Department of Taxation to monitor the number of miles driven by each commercial vehicle in Ohio, the reporting of the axle-mile tax is voluntary. This in turn raises the question as to whether or not the correct amount of tax is being collected.

Table 8
MOTOR VEHICLE FUEL TAXES DISTRIBUTED
TO LOCAL GOVERNMENTS, CALENDAR YEAR 1980, BY COUNTY

County	Total	Amount To Counties	Amount To Townships	Amount To Municipalities	County	Total	Amount To Counties	Amount To Townships	Amount To Municipalities
Adams	\$ 711,678	\$ 420,000	\$ 234,000	\$ 57,678	Logan	\$ 825,343	\$ 420,000	\$ 265,200	\$ 140,143
Allen	1,040,908	420,000	187,200	433,708	Lorain	2,163,999	420,000	280,800	1,463,199
Ashland	818,116	420,000	234,000	164,116	Lucas	3,188,628	420,000	171,600	2,597,028
Ashtabula	1,183,229	420,000	421,200	342,029	Madison	731,376	420,000	218,400	92,976
Athens	769,344	420,000	218,400	130,944	Mahoning	1,553,904	420,000	218,400	915,504
Auglaize	811,484	420,000	218,400	173,084	Marion	931,192	420,000	234,000	277,192
Belmont	931,994	420,000	249,600	262,394	Medina	1,119,816	420,000	265,200	434,616
Brown	735,258	420,000	249,600	65,658	Meigs	665,440	420,000	187,200	58,240
Butler	1,711,572	420,000	202,800	1,088,772	Mercer	773,532	420,000	218,400	135,132
Carroll	677,044	420,000	218,400	78,644	Miami	1,006,320	420,000	187,200	399,120
Champaign	716,416	420,000	187,200	109,216	Monroe	734,001	420,000	280,800	33,201
Clark	1,090,568	420,000	156,000	514,568	Montgomery	3,114,696	420,000	202,800	2,491,896
Clermont	751,264	420,000	218,400	112,864	Morgan	664,780	420,000	218,400	26,380
Clinton	744,132	420,000	202,800	121,332	Morrow	712,688	420,000	249,600	43,088
Columbiana	1,049,264	420,000	280,800	348,564	Muskingum	1,047,556	420,000	390,000	237,556
Coshocton	889,620	420,000	343,200	126,420	Noble	677,044	420,000	234,000	23,044
Crawford	897,924	420,000	249,600	228,324	Ottawa	717,908	420,000	187,200	110,708
Cuyahoga	9,057,592	420,000	62,400	8,575,192	Paulding	663,686	420,000	187,200	56,486
Darke	905,592	420,000	312,000	173,592	Perry	723,912	420,000	218,400	85,512
DeFiance	764,052	420,000	187,200	156,852	Pickaway	763,108	420,000	234,000	109,108
Delaware	853,852	420,000	280,800	153,052	Pike	675,874	420,000	218,400	37,474
Erie	881,568	420,000	140,400	321,168	Portage	1,079,404	420,000	280,800	378,604
Fairfield	963,372	420,000	202,800	340,572	Preble	731,756	420,000	187,200	124,556
Fayette	676,388	420,000	156,000	100,388	Putnam	760,193	420,000	234,000	106,193
Franklin	5,574,180	420,000	265,200	4,888,980	Richland	1,227,932	420,000	280,800	527,132
Fulton	742,136	420,000	187,200	134,936	Ross	880,848	420,000	249,600	211,248
Gallia	699,875	420,000	234,000	45,875	Sandusky	812,340	420,000	187,200	205,140
Geauga	754,072	420,000	249,600	84,472	Scioto	860,952	420,000	249,600	191,352
Greene	1,340,252	420,000	187,200	733,052	Seneca	917,344	420,000	234,000	263,344
Guernsey	841,512	420,000	296,400	125,112	Shelby	803,100	420,000	218,400	164,700
Hamilton	4,260,448	420,000	187,200	3,653,248	Stark	1,884,080	420,000	265,200	1,198,880
Hancock	983,460	420,000	265,200	298,260	Summit	3,393,384	420,000	202,800	2,770,584
Hardin	769,720	420,000	234,000	115,720	Tuscarawas	1,560,780	420,000	374,400	766,380
Harrison	712,950	420,000	234,000	58,950	Union	1,145,356	420,000	343,200	382,156
Henry	727,673	420,000	202,800	104,873	Van Wert	717,312	420,000	218,400	78,912
Highland	773,980	420,000	265,200	88,780	Vinton	719,039	420,000	187,200	111,839
Hocking	645,476	420,000	171,600	53,876	Washington	634,824	420,000	187,200	27,624
Holmes	672,024	420,000	218,400	33,624	Warren	921,000	420,000	171,600	329,400
Huron	974,264	420,000	319,200	235,064	Wayne	949,188	420,000	343,200	185,988
Jackson	705,396	420,000	187,200	98,396	Williams	976,933	420,000	249,600	307,333
Jefferson	980,632	420,000	218,400	342,232	Wood	743,908	420,000	187,200	136,708
Knox	906,396	420,000	343,200	143,196	Wyandot	1,073,786	420,000	273,600	380,186
Lake	1,658,588	420,000	78,000	1,160,588					
Lawrence	800,549	420,000	218,400	162,149					
Licking	1,268,464	420,000	405,600	442,864					
					Total	\$103,386,632	\$36,960,000	\$20,576,400	\$45,850,232

SOURCE: Ohio Auditor of State.

Footnotes

- 1/ Midwest Agribusiness, "Its Impact on the Nation's Economy and International Trade," Midwest Association of State Departments of Agriculture, July 1, 1981, p. 3.
- 2/ Ohio Truck Times, "1981 Fact Book," Spring 1981, p. 24.
- 3/ Ohio Grain Flows by Mode of Transportation and Type of Grain Firms for 1970 and 1977: A Comparison," Ohio Agricultural Research and Development Center, Hennen, Baldwin, Larson and Sharp, p. 6.
- 4/ Ibid., p. 1.
- 5/ "Increased Truck Size and Weight," Central States Resource Center, September 1980, p. 2
- 6/ "Interstate Highway System," Ohio Department of Transportation, February 1981, p. 12.
- 7/ Ibid., p. 12.
- 8/ "A Circuity Cost Model for Rehabilitation/Closure of Rural Bridges," Ohio Agricultural Research and Development Center, Nyamaah and Hitzhusen, 1982, p. 1
- 9/ "Ohio Rural Road and Bridge Problems: Issues and Alternative Solutions," Pesch and Larson, August 17, 1981, p. 4.
- 10/ "State Highway Bridges," Ohio Department of Transportation, February, 1981, p. 1.
- 11/ Report to the Congress of the United States by the Comptroller General, "Excessive Truck Weight: An Expensive Burden We Can No Longer Bear," July 16, 1979, p. 23.
- 12/ Ibid., p. 1.
- 13/ Ohio Cost Allocation Study, "Legislative Summary," Ohio Department of Transportation, July 1982, p. 35.
- 14/ Pesch and Larson, op. cit., p. 6.
- 15/ "Issues in Rural Road Management," Jerry E. Fruin, University of Minnesota, January 1979, p. 3.
- 16/ "Ohio Rural Road and Bridge Problems: Issues and Alternative Solutions," Pesch and Larson, August 17, 1981, p. 12.

Table 9. Axle-Mile Tax Assessed on Trucks Traveling in Ohio

	Single Unit 3 or more Axles	Tractor- Trailer 3 Axles	Tractor- Trailer 4 Axles	Tractor- Trailer 5 or more Axles	Commercial Car ^{a/}
Cents Per Mile	0.5	1.0	1.5	2.0	2.5

^{a/}A "commercial car" is defined as either a full-size truck with a trailer or a tractor-2 trailer combination.

Source: Ohio Department of Taxation

Table 10. Axle-Mile Tax Revenue in Ohio in 1965 and 1981

Rate Per Mile	F. Y. 1965		F. Y. 1981	
	\$ Collected	Percent of Total	\$ Collected	Percent of Total
0.5 cents	\$ 550,949	2.4	\$ 1,039,045	2.2
1.0 cents	1,898,292	8.4	780,744	1.6
1.5 cents	8,307,189	36.8	3,626,224	7.5
2.0 cents	10,711,300	47.4	40,237,928	83.5
2.5 cents	1,137,649	5.0	2,493,270	5.2
Total	22,605,379	100.0	48,177,211	100.0

Source: 1965 and 1981 Annual Report, Ohio Department of Taxation.

Persons at the Department of Taxation reported that they do not feel that a significant amount of revenue is being lost due to non compliance with the tax. This is mainly attributed to the fact that both the owner and the operator of each vehicle must file separate mileage statements. While the owner is responsible for payment of the tax, each person is liable for the information they report. However, the Department of Taxation does feel that some under-reporting on the tax occurs when the owner and the operator of the vehicle are the same person. They estimated that 10 percent of the mileage goes unreported with these latter type of returns.

Registration and Licensing Fees

Operator's license and chauffeur's license fees are collected annually. This revenue, approximately \$10 million, is allocated to the Department of Highway Safety for the Highway Safety Fund (30 percent) and the Driver Education Fund (70 percent).

Motor vehicle registration fees plus 50 cents registrar's fees are also collected annually. The majority of this revenue goes to county, township or municipal highway departments. A flat fee is used for automobiles (\$20.00), transit buses (\$12.00) motorcycles (\$10.00), and house and travel vehicles (\$35.00). Counties, and municipalities within counties, may levy an additional \$5.00 vehicle license tax. Forty-one counties and 125 municipalities currently impose this tax. Fees for other vehicles such as commercial cars and trucks, buses (nontransit)

and farm vehicles are based on weight with a minimum fee. The fees for these latter three types of vehicles are given specifically in Table 11.

The first motor vehicle registration fee in Ohio was adopted in 1906. The charge was \$5.00 and it covered all gasoline and steam motor vehicles. In 1925, a separate graduated rate schedule for commercial vehicles was added. This fee for commercial vehicles was increased in 1932 and once again in 1951 to its present level. (See Table 11). In addition to this, a separate graduated rate schedule was enacted in 1937 for farm trucks. The passenger car registration fee was increased from \$5.00 to \$10.00 in 1948. It remained at this level until 1980 when it increased to \$20.00.

All registration fees are constitutionally earmarked for highway purposes. After any bond retirement obligations and administrative expenses are met, the remaining revenues are distributed as follows:

- 34% to municipality or county of registration;
- 47% to county in which vehicle owner resides;
- 9% to counties in the ratio of the number of miles of county roads to the state total;
- 5% to townships in the ratio of the number of miles of township roads to the state total;
- 5% divided equally among the counties.

Highway Patrol Fines

Ohio Highway Patrol fines collected from citations are allocated as follows: 45 percent to the Department of Transportation for highway maintenance and repair and fifty-five percent to the

Table 11. Motor vehicle Registration Graduated Rate Schedule for Commercial Trucks, Farm Trucks and Motor Buses

Type of Vehicle	Vehicle Registration Fee
Commercial Trucks, tractors, semi-trailers, trailers	\$15.00 plus:
First 2,000 lbs.	\$.85 per 100 lbs.
2,001 - 3,000 lbs.	\$1.40 per 100 lbs.
3,001 - 4,000 lbs.	\$1.90 per 100 lbs.
4,001 - 5,000 lbs.	\$2.20 per 100 lbs.
5,001 - 6,000 lbs.	\$2.40 per 100 lbs.
6,001 - 10,000 lbs.	\$2.80 per 100 lbs.
10,001 - 12,000 lbs.	\$3.00 per 100 lbs.
Over 12,000 lbs.	\$3.25 per 100 lbs.
Farm trucks	\$5.00 plus:
First 3,000 lbs.	\$.50 per 100 lbs.
3,001 - 4,000 lbs.	\$.70 per 100 lbs.
4,001 - 6,000 lbs.	\$.90 per 100 lbs.
6,001 - 10,000 lbs.	\$2.00 per 100 lbs.
Over 10,000 lbs.	\$2.25 per 100 lbs.
Motor buses	
First 2,000 lbs.	\$.85 per 100 lbs.
2,001 - 3,000 lbs.	\$1.30 per 100 lbs.
3,001 - 4,000 lbs.	\$1.80 per 100 lbs.
4,001 - 6,000 lbs.	\$2.00 per 100 lbs.
6,001 - 10,000 lbs.	\$2.40 per 100 lbs.
Over 10,000 lbs.	\$2.75 per 100 lbs.

Source: Ohio's Taxes, Ohio Department of Taxation

county or municipality in which the fine was assessed for the general fund or road and street repair.

Issues Concerning the Equity of Highway Revenue Sources

Highway Revenue and Inflation

As mentioned earlier in this report, one of the reasons that highway maintenance departments have not had the necessary funding to perform needed repair work is inflation. According to the United States Department of Transportation construction cost index, the cost of essential highway construction materials has increased by 376 percent since 1965. In addition to this, the nominal amount of dollars collected from the motor vehicle fuel tax is expected to continue trending downward in the future due to the increase in gasoline prices and the subsequent consumer preference for increasingly fuel-efficient cars. Figures 2, 3 and 4 show the amount of revenue collected from the motor vehicle fuel tax, motor vehicle registration fees and the axle mile tax respectively. Each graph shows the nominal amount of revenue and revenue adjusted for inflation using the construction cost index.

As can be seen from the graphs, the inflation adjusted amount of highway revenue being collected is less today than it was in the 1950s. Figure 5 shows the total amount of highway miles traveled by all classes of trucks in Ohio since 1965 as well as the increase in the total number of passenger cars registered in the state since 1955. Both of the items in Figure 5 demonstrate the dramatic increase in total highway usage that has occurred

Figure 2. Nominal and Deflated Values of Ohio Motor Vehicle Fuel Tax Collection, 1954-1981

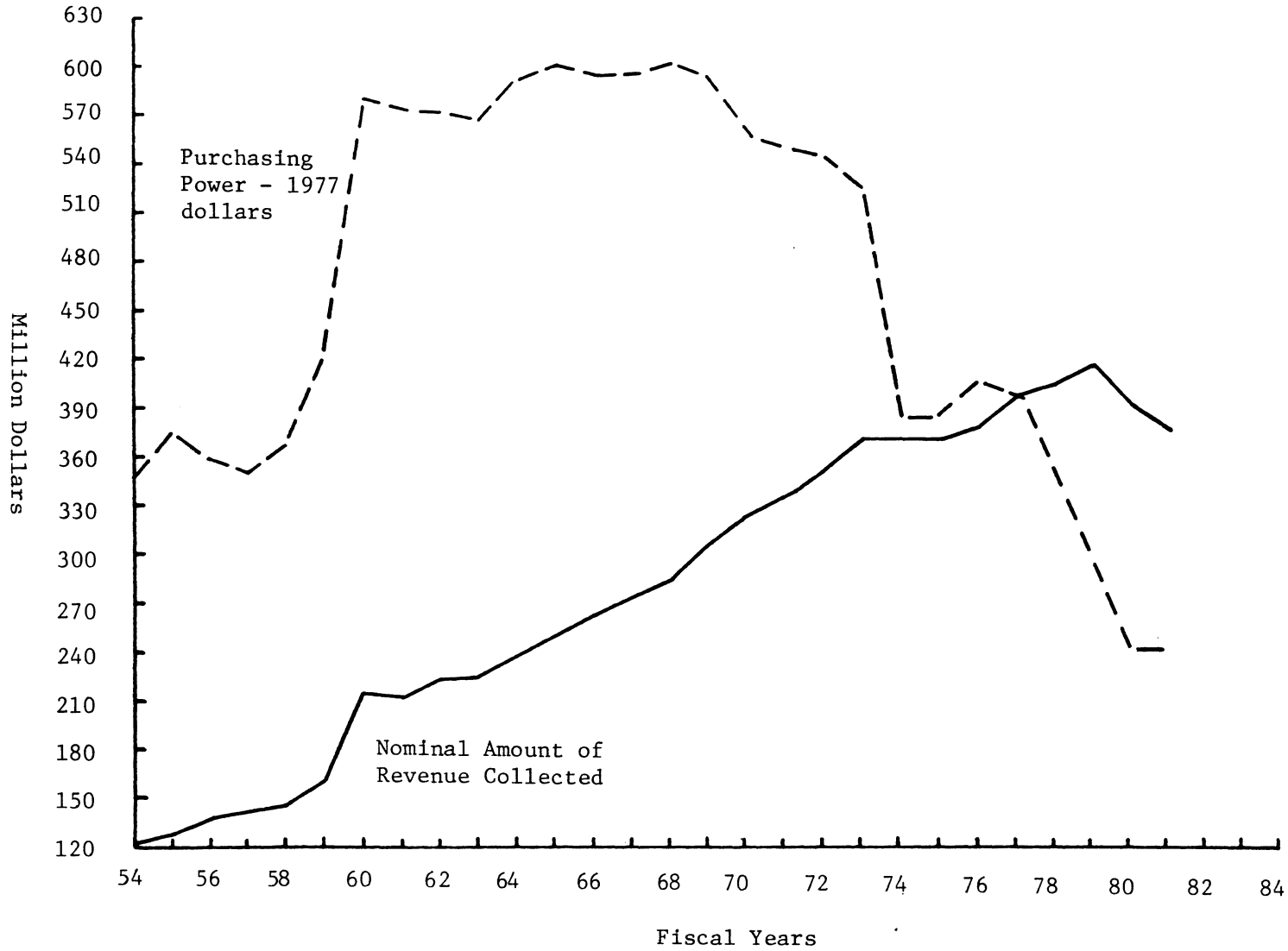


Figure 3. Nominal and Deflated Values of Ohio Motor Vehicle Registration Fees, 1950-1980

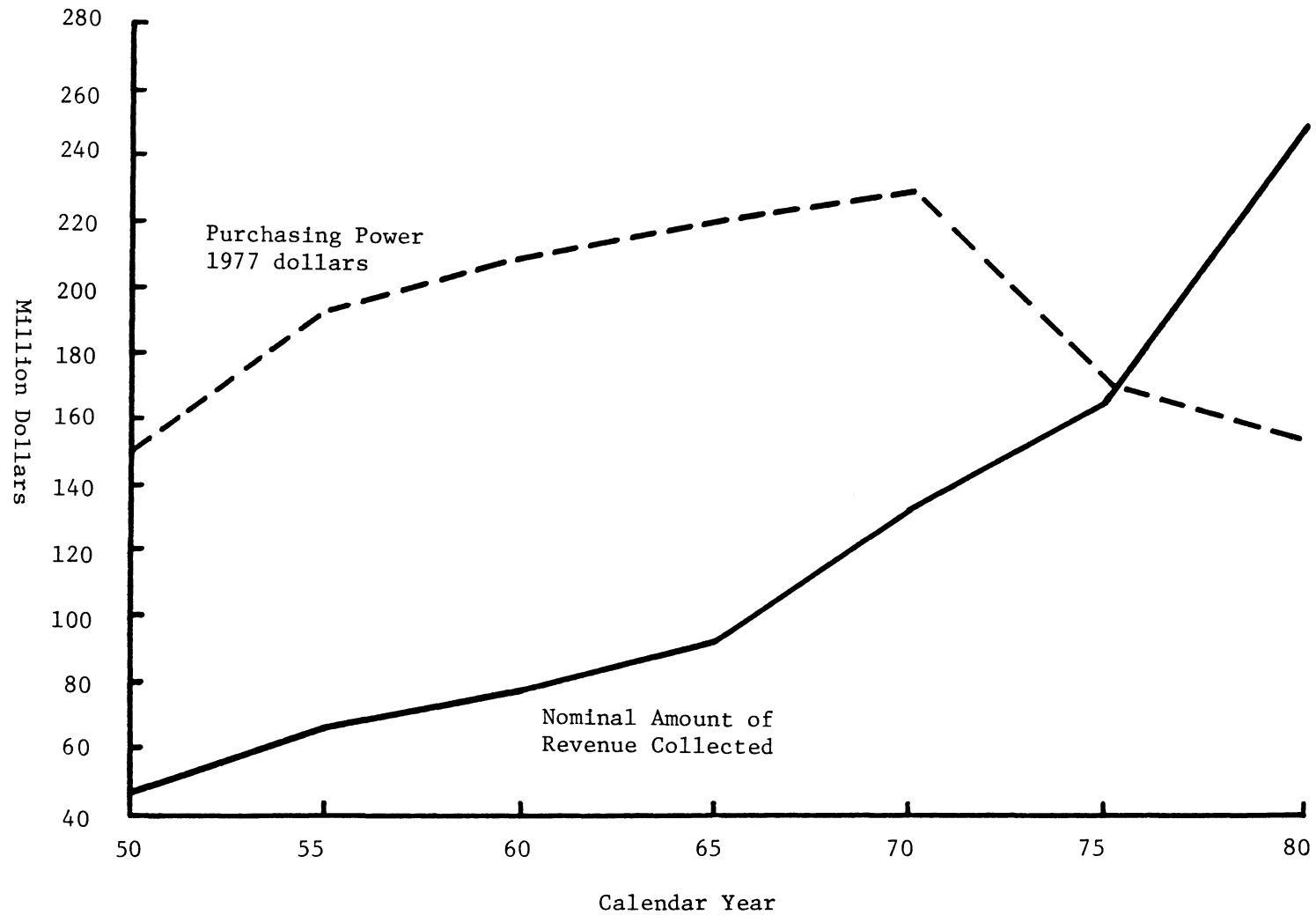


Figure 4. Nominal and Deflated Value of Ohio Axle-Mile Tax Collections, 1954-1981

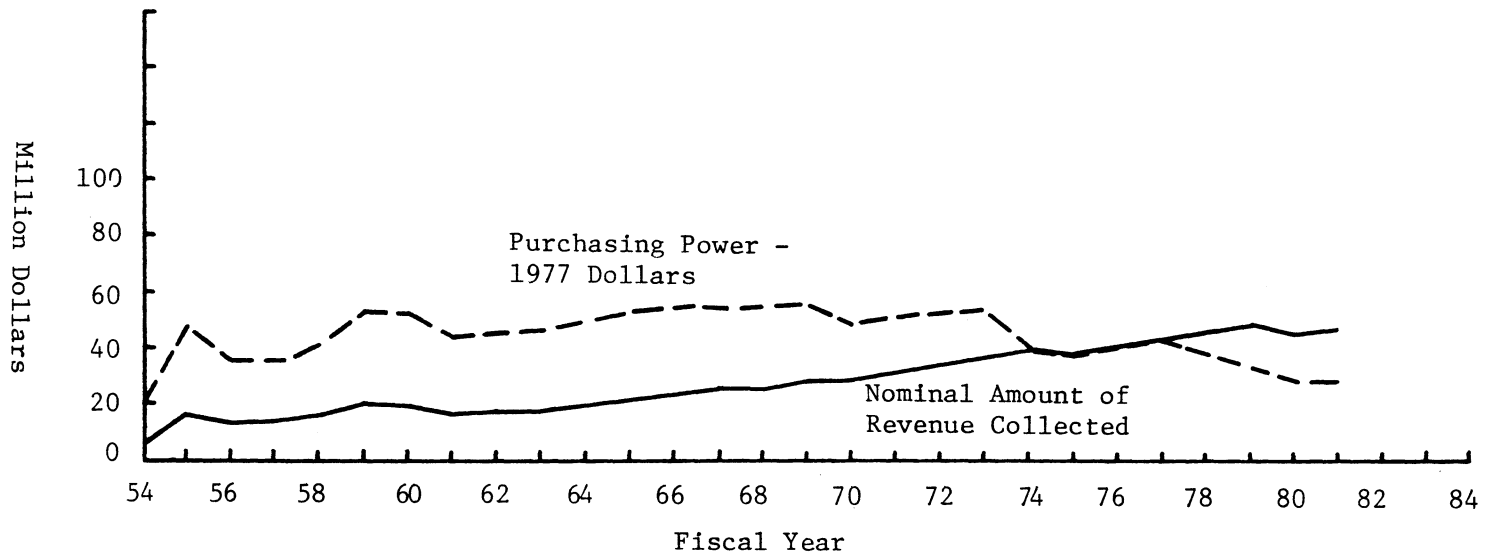
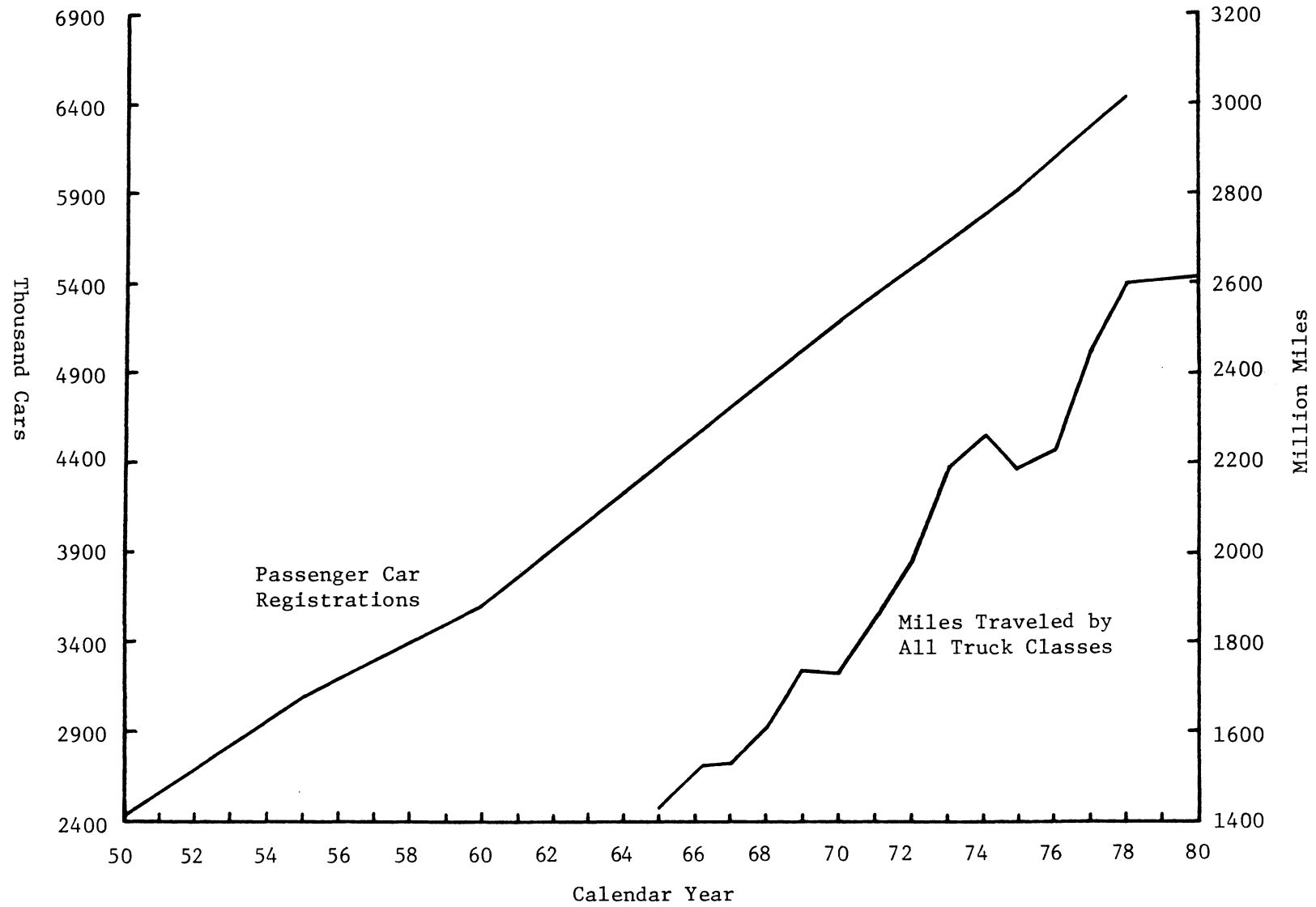


Figure 5. Ohio Passenger Car Registrations, 1950-1978 and the Total Number of Miles Traveled by All Classes of Trucks in Ohio, 1965-1980



in the state over the past three decades. When this is viewed in light of the information contained in Figures 2, 3 and 4, the conclusion that highway users in Ohio may not be paying enough tax in order to maintain a sound highway system can easily be reached.

Another closely related issue is that of how much revenue each type of vehicle should be required to pay. There is much controversy surrounding the issue of vehicle weights and related highway damages. Trucking organizations attempt to downplay the amount of damage that heavy vehicles inflict on roadways and bridges. However, there is a growing amount of evidence to the contrary.

The Ohio Revised Code has changed very little since 1953 concerning the legal weight limits for highway vehicles. The maximum weight per axle was set in 1953 at 19,000 pounds. This was increased in 1975 to 20,000 pounds per axle with a maximum allowable vehicle weight of 80,000 pounds. However, as was demonstrated by Table 10, the frequency of heavier vehicle travel on the state's highways has risen sharply since 1965.

A 1979 General Accounting Office report states that one 80,000 pound five-axle tractor-trailer has the same impact on an interstate highway as at least 9,600 automobiles.^{11/} The amount of damage also increases exponentially as the weight limits are exceeded (See Figure 1). Furthermore, national statistics show that about 22 percent of the loaded tractor-trailers exceed state weight limits.^{12/} This problem is especially serious when heavy vehicles travel on rural roads and bridges.

The GAO report states that various farm products including grain, produce, meat and milk are often shipped in overweight trucks. Their review of an Ohio grain firm showed that during a 4-week period, 61 percent of the incoming trucks exceeded the 80,000 pound gross weight limit. The average overload was 5,600 pounds, with one tractor-trailer being 14,300 pounds over the gross weight limit.

Current Ohio weight enforcement efforts are apparently insufficient to prevent overweight trucking. This is hurting our state's highway system in two ways. First of all, revenue is lost due to the lack of citations. ODOT states that weigh stations on the Ohio interstate system have a citation rate of less than 1 percent. This low rate is due primarily to the fact that truckers are almost always aware of when and where weigh stations are in operation. The second, and most important, effect is the damage caused by the overweight vehicles.

One factor that may be contributing to the large number of overweight vehicles in Ohio is the fine structure. The GAO concluded that the effectiveness of state weight enforcement programs depends largely on the severity of fines. When overweight fines are less than the profits from routine overweight operations and the chances of getting caught are slim, fines become an acceptable cost of doing business.

The Highway Patrol weigh station on I-71 in Delaware County reported that the penalty for a gross vehicle weight violation of any amount is \$110. This ranks in the lower 1/3 of the 19

states in the nation that charge fixed fines for these types of violations.

Uniformity of State Weight Limits

The nation's trucking industry has shown a considerable amount of concern over the fact that the size and weight limits for commercial vehicles vary in each state. The truckers claim that this hinders their economic efficiency. This is a special problem for long distance east-west hauls. For example, most states (including Ohio) have set the maximum allowable gross vehicle weight limit at or near 80,000 pounds. However, three states have a weight limit of only 73,280 pounds. These three states are Illinois, Missouri and Arkansas. Their respective locations form a "barrier" that prohibits the long distance movement of 80,000 pound loads over most east-west routes in the country.

Another similar problem occurs between Ohio and Michigan. The latter state allows gross vehicle weights of up to 148,000 pounds. A grain shipper may often be faced with the situation in which he or she has transported a load of grain 100 miles through Michigan but can not legally deliver the load to one of the several grain terminals at Toledo located 6-8 miles over the Ohio border.

While this report is not suggesting that states should necessarily increase their maximum allowable weight limits, an increased amount of uniformity in this area would certainly

simplify and hopefully increase the overall efficiency of the trucking industry.

Ohio Cost Allocation Study

The Ohio Legislature has taken positive steps toward determining the exact nature of the relationship between heavy vehicles and subsequent highway damage. They passed House Bill 102, which became law on July 1, 1981. This requires that a highway cost allocation study be completed by ODOT and the Ohio Department of Taxation (DOT). According to an interim report completed by ODOT in December, 1981, H.B. 102 instructs ODOT to "determine the relationship between the highway activities of the design, construction, maintenance, resurfacing, rehabilitation and reconstruction of highways and the various classes of vehicles on Ohio highways with their differing rates of usage." ODOT is further instructed to determine the costs associated with the above list of highway activities, including environmental costs, and identify those costs which can be directly attributed to specific vehicle classifications. The interim report states that the Department of Taxation will "identify the revenues generated by the various vehicle classes and then compare them to the costs that have been attributed to each vehicle class as a result of the Transportation Department study." If the costs which have been attributed to each vehicle class are not matched closely by the tax revenues paid by each vehicle class, DOT will develop alternative revenue-raising proposals.

The final results of the Ohio highway cost allocation study were not yet complete at the time that this report was written;

however, ODOT has released a partial summary of its portion of the study. As mentioned above, the objective of this particular section of the cost allocation study was to determine the costs generated by the various classes of vehicles using the highway system.** The results indicated that approximately 25 percent of all highway costs were "directly attributable" to specific vehicle classes. Furthermore, the report states that more than 90 percent of these "directly attributable" highway costs are caused by trucks.^{13/} The report also emphasizes the point that research presently being conducted throughout the country could considerably expand the range of highway costs that are capable of being termed attributable in the near future.

The above sections of this report have presented the current situation and discusses the problems surrounding Ohio's roads and bridges. The remainder of this report will identify possible alternative solutions that may be used to correct the maintenance shortfall.

Suggested Solutions

The complexity of the highway funding issue will likely require more than one step in order to alleviate the funding deficit. For this reason it should be kept in mind that a combination of several of these alternative solutions may prove to be the best possible course of action. The following solutions have been ranked in accordance with their perceived feasibility and importance as viable alternatives.

**The scope of the Ohio highway cost allocation study was limited to the state-maintained highway system.

1. Increase the Axle-Mile Tax

While the Ohio Cost Allocation Study is considering this issue in even greater detail, currently available information from the Study as well as other sources tends to support the claim that heavy trucks are not paying an amount of revenue equal to the costs generated by their use. Figures 4 and 5 also show that heavy trucks are traveling an increased number of miles while paying a decreased amount of tax (after correcting for inflation). This evidence leads to the conclusion that an increase in the axle-mile tax would be an appropriate measure in order to collect funds from the vehicles that are causing a majority of the highway resurfacing costs.

2. Increase Vehicle Registration Fees

This could be accomplished by assessing different fees on vehicles, according to the vehicle's "book" value or gross vehicle weight. Table 12 shows that compared to other states, Ohio's flat \$20 registration fee is very low for vehicles with high book values.

Table 5 indicates that 67 percent of the bridges in the state are maintained at least in part by county highway departments. Table 5 further states that 60 percent of these bridges need either replacement or rehabilitation.

One advantage of increasing the vehicle registration fee is that the majority of the increased revenue would go directly to the county and township highway departments. Under the current revenue distribution system, this appears to be the simplest way of alleviating the bridge funding deficit.

3. Increase Efforts to Enforce Vehicle Weight Restrictions

It is imperative that Ohio protect its road and bridge investment from the damaging effects of overweight vehicles. Information given earlier in this report indicated that current enforcement efforts have limited effectiveness. Two steps that could be taken to change this situation would be to increase the severity of the fines as well as increasing the number of portable scales in operation in the state. ODOT claims that portable scales have a citation rate in excess of 95 percent due to the fact that they are harder for the truckers to avoid.^{14/}

4. Consider Increasing Registration Fees on Farm Trucks

Information presented in this report indicates that farmers are using heavier equipment and larger trucks than ever before. These vehicles are used for the hauling of commodities to processors, elevators and terminal markets as well as for the transportation of inputs such as fuel and fertilizer from suppliers to the farms. Several county engineers in the leading grain-producing areas of the state were interviewed concerning this issue. Even though none of them were aware of any significant amount of damage being caused by semis on rural roads, because of the fact that many of Ohio's rural roads and bridges were not designed to accommodate loaded tractor-trailer units, the question arises as to how much damage farm vehicles are causing to these structures.

Farmers currently pay a truck registration fee that is lower than that paid by commercial truck owners. This would appear to be an economically equitable situation due to the fact

Table 12. Ohio's Passenger Car Registration Fees in Comparison With Other States

State	Rate Range
Ohio	\$20
California	\$11 plus 2% of market value
Illinois	\$18 - \$30 - based on horsepower
Michigan	\$20 - \$74 - based on weight
New Jersey	\$14 - \$50 - based on weight and model year
Pennsylvania	\$24
Texas	\$12 - \$30 - for vehicles up to 6,000 lbs. \$0.55 per 100 lbs. for vehicle over 6,000 lbs.
West Virginia	\$25 - \$36 - based on weight

Source: Ohio's Taxes, Ohio Department of Taxation

that a farmer will typically use his truck less often than a commercial operator. This means that the commercial operator can spread out the fixed cost burden of the registration fee over many more miles. However, if further research should indicate that farmers are indeed causing an inordinate amount of stress on the rural highway system, they should be required to pay a higher registration fee in order to pay for the costs that they are causing.

5. Consider Road Abandonment

Much of today's rural road system was fashioned during the horse and wagon days when travel times were longer and farms were smaller. Some agricultural economists claim that with larger farms and faster traveling times, many miles of rural roads could be eliminated. Not only would this decrease the strain on highway maintenance budgets, but it would also allow for the conversion of this valuable property back into productive acreage. Assuming a 33 foot right of way, farmland per square mile would be increased by 4 acres if rural roads were spaced two miles apart instead of one.^{15/} At the present time, the legal implications of road abandonment would seem to make this alternative unrealistic at least in the short-term. More detailed analysis of the costs and benefits of road and bridge abandonment in Ohio is needed.

6. Increase Federal Aid but Request More Autonomy

Federal matching highway funds have been lost in the past because Ohio could not come up with the state's required 20 per-

cent share. Efforts are being made to lower the state's share to 10 percent of total funding.

When the state accepts federal monies, it accepts the federal regulations that each road and bridge project must follow.^{16/} In adhering to federal specifications and by delaying projects until federal funds are secured, the cost of a project can increase significantly. If the federal government granted rebates to the states on federal gasoline taxes, federal funds would be received without incurring an expensive obligation to comply with federal standards.

7. Consider Revamping the Gas Tax Formula

The current fixed cents per gallon gasoline tax could be changed to a fixed percentage of the total dollar gasoline sale. This would end the current situation where road and bridge revenues are totally dependent on the level of gasoline consumption. Figure 2 of this report showed that the amount of motor vehicle fuel consumption in the state is decreasing. Assuming that the price of gasoline will continue to rise, the switch to a fixed percentage formula would ensure a more stable flow of revenue.

8. Use Present Funds More Efficiently

This argument centers around a 1962 law (Section 5543.19 (B)) which requires that all proposed bridge improvements estimated to cost more than \$40,000 to be let to contract. Inflation since 1962 means that most bridge improvements must be let to contract. In the opinion of some people, tax dollars could be saved if this restriction was relaxed and the county engineer was permitted to

perform more bridge repair work in order to use county labor and equipment to eliminate the overhead and profit which are incorporated into every contract bid.