

Trends and Patterns of Transportation Infrastructure Investment in Central Indiana

Author

Joyce Man

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342 NORTH SENATE AVENUE, 3RD FLOOR

INDIANAPOLIS, INDIANA 46204-1708

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INTRODUCTION

Recently, many researchers have established a compelling relationship between infrastructure investment and economic performance and growth. These studies (Aschauer 1989; Deno 1988; Duffy-Deno and Eberts 1991; Munnell 1990a, 1990b; Hulten and Schwab 1991; Rietveld 1989; Man and Bell 1997) suggest that infrastructure investments are highly productive and serve as stimuli to economic development. This work argues public infrastructure affects decisions to locate capital and labor, which in turn affects the growth rate of an area in three ways. First, infrastructure may provide amenities that make an area more attractive to firms and households. Second, infrastructure such as highways can be considered an input into the production process. Third, infrastructure may enhance the productivity of other inputs such as labor and private capital. These studies suggest that significantly more resources should be invested in infrastructure.

Given the importance of infrastructure capital, we need to know how limited resources are used in the state of Indiana and the Central Indiana region for infrastructure purposes. This study examines recent trends and patterns of transportation infrastructure investment in Indiana and the Central Indiana region, and discusses prospects for future investment in transportation infrastructure in the state and region. It focuses on physical transportation infrastructure including highways, streets, roads, and bridges, airports and airways, mass transit, railroads, water transport and terminals, and parking facilities, which are believed to directly impact the economic competitiveness of the state and the region. The following section compares Indiana's transportation infrastructure investment indicators with those of other states. The third section covers in more detail patterns and trends of construction of various types of transport modes in the past decade. The fourth section discusses the extent and uses of highways and roads and compares the derived congestion measure with residents' perception of road congestion and length of travel time from a household survey. The final section highlights some of the major issues the Central Indiana region faces in transportation infrastructure finance and investment.

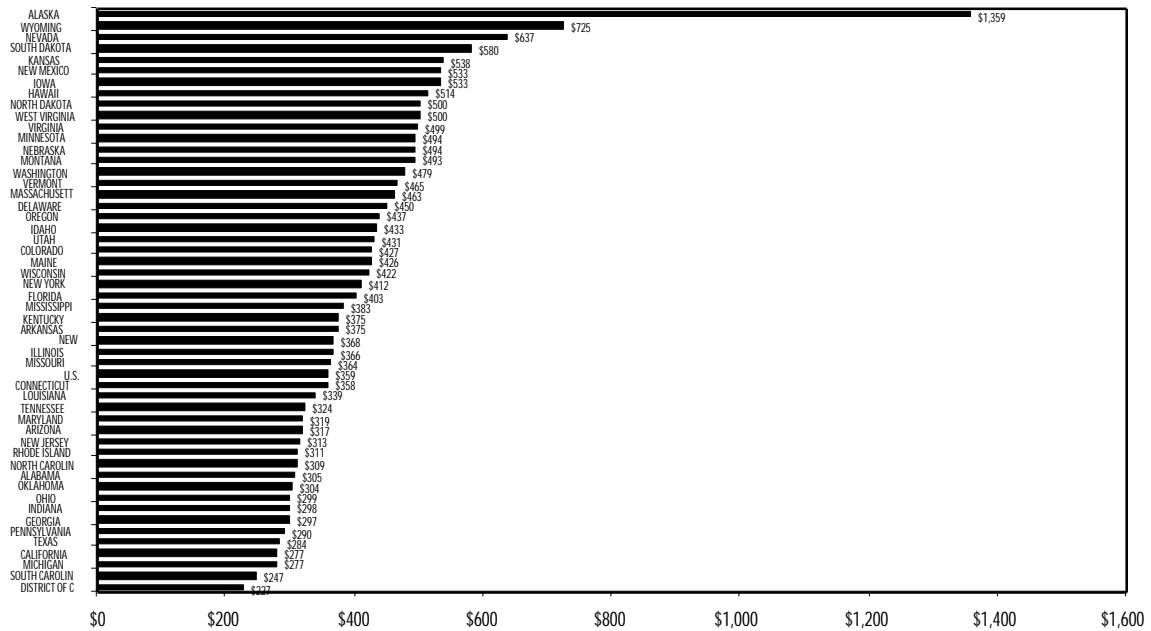
TRANSPORTATION INFRASTRUCTURE INVESTMENT IN INDIANA AND CENTRAL INDIANA: A COMPARISON WITH OTHER STATES AND REGIONS

The transportation system in the United States is funded jointly by the federal, state, and local governments and the private sector. Each year all levels of government spend billions of dollars on transportation infrastructure such as highways, roads and bridges, airports and airways, public transit, water transport and terminals, and parking facilities. In 1997, all state and local governments in the United States spent about \$96 billion on transportation. Nevertheless, transportation spending accounted for only 6.6 percent of total expenditure by U.S. state and local governments. Its relative importance measured as a share of total transportation expenditure in total public outlay has also declined from 7.5 percent in 1982 to 6.6 percent in 1997 (U.S. Bureau of Census, Government Finance 1997). Issues for examination include: How do the trends and patterns of transportation investment in Indiana compare to national trends? How important is the transportation investment in Indiana state and local government finance? Are there wide disparities in the level of transportation investment among counties in the Central Indiana?

TRANSPORTATION EXPENDITURES ARE GROWING BUT STILL LAG BEHIND NATIONAL AVERAGE

According to the U.S. Bureau of Census 1997 Census of Government, Indiana state and local governments spent \$1.75 billion on total transportation infrastructure. After adjusting for population, it amounts to \$298 per capita, which was far below the national average of \$359 per capita in 1997. As Figure 1 indicates, Indiana ranked 44th in the nation in per capita transportation expenditure in 1997. ¹

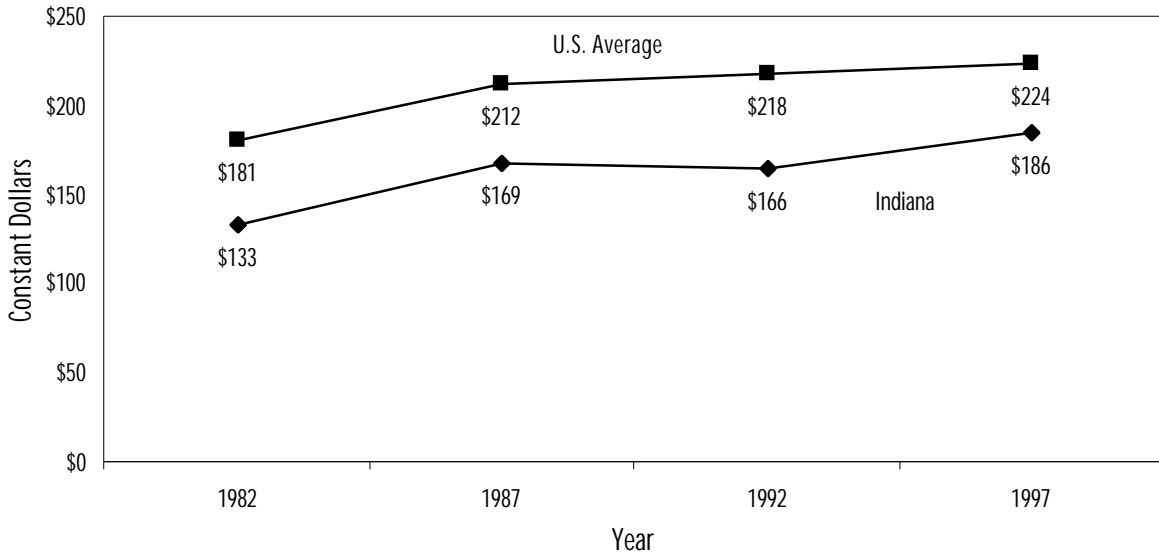
Figure 1: Per Capita Transportation Expenditure of State and Local Governments by State, 1997



Source: U.S. Bureau of Census, Census of Government, Government Finance, 1997.

¹ Indiana ranked 47th in the nation in total state and local government expenditure per capita and 39th in total capital outlay per capita in 1997.

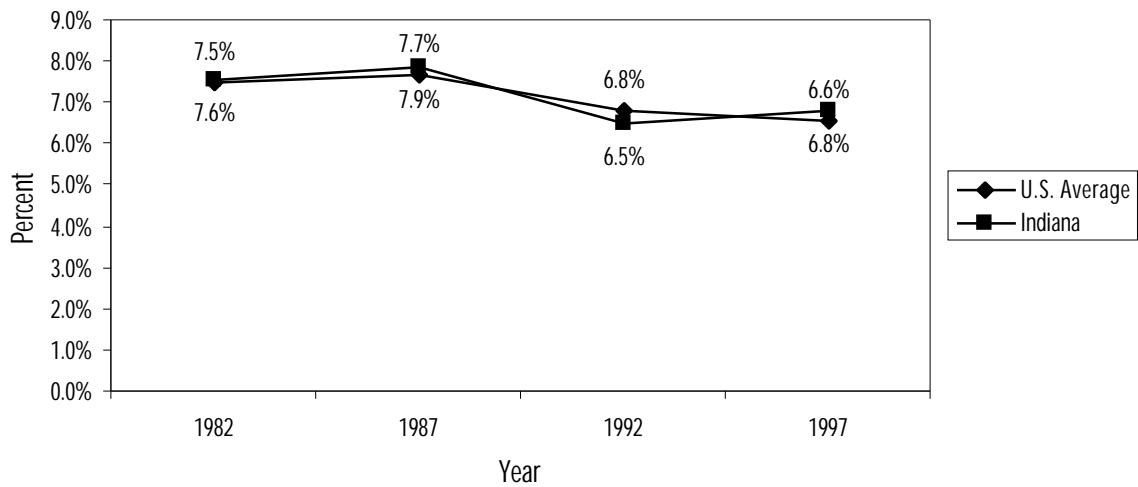
Figure 2: Trend of Per Capita Transportation Expenditure by State and Local Governments in Indiana and U.S., 1982-1997



Source: U.S. Bureau of Census, Government Finance.

Note: Expenditure data are deflated by Consumer Price Index (CPI).

Figure 3: Share of Total Transportation Expenditure in State and Local Government Outlay in Indiana and U.S., 1982-1997



Source: Same as Figure 2.

By examining the trends of total transportation expenditures from 1982 to 1997, Figure 2 shows that per capita transportation spending by Indiana state and local governments stayed below the national average in each of the years examined. It increased from \$133 per capita in 1982 to \$169 per capita in 1987, a 27 percent increase. But it declined by nearly 2 percent between 1987 and 1992 and then increased from \$166 per capita in 1992 to \$186 per capita in 1997. Between 1982 and 1997, per capita transportation spending by Indiana state and local governments went up by 40 percent, surpassing the national average growth rate of 24 percent during the same period.

Although Indiana transportation outlays per capita increased between 1982 and 1997, Figure 3 shows that transportation expenditures as a share of Indiana state and local government total outlay declined slightly during this period. This decline is consistent with the national trend. Indiana governments spent less per capita than the national average on transportation infrastructure, but nearly the same as a share of total expenditures.

SOME TYPES OF TRANSPORT EXPENDITURES ARE GROWING FASTER IN INDIANA THAN THE NATIONAL AVERAGE

As Table 1 reveals, expenditure by Indiana governments on highways and roads accounted for nearly 92 percent of total transportation outlays in 1997, higher than the 85 percent share national average. Consequently, public expenditures on airports and airways, water transportation, mass transit, and parking facilities as a share of total transportation outlay by Indiana governments were all below the national average. Such composition reflects a predominance of highways and roads in Indiana's transportation investment.

Table 1: Transportation Expenditures Per Capita by Type of Transport Mode in Indiana Compared with Other Midwestern States and National Average, 1997

State	Highways	Air Trans.	Water Trans.	Mass Transit	Parking	Total	
	-----	-----	-----	-----	-----	-----	-----
Illinois	\$316.2 (86.4%)	\$44.9 (12.3%)	\$0.7 (0.2%)	\$1.5 (0.4%)	\$2.6 (0.7%)	\$365.9 (100%)	
Indiana	\$274.0 (91.9%)	\$20.3 (6.8%)	\$1.4 (0.5%)	\$0.9 (0.3%)	\$1.6 (0.5%)	\$298.2 (100%)	
Iowa	\$497.5 (93.40%)	\$4.0 (0.8%)	\$21.5 (4.3%)	\$0.06 (0.01%)	\$7.3 (1.4%)	\$6.3 (1.2%)	\$532.6 (100%)
Michigan	\$252.4 (91.0%)	\$20.2 (7.3%)	\$0.4 (0.2%)	\$0.5 (0.2%)	\$3.8 (1.4%)	\$277.3 (100%)	
Minnesota	\$435.9 (91.0%)	\$48.5 (11.2%)	\$2.5 (0.6%)	\$0.6 (0.2%)	\$6.7 (1.8%)	\$494.3 (100%)	

	(88.2%)	(9.8%)	(0.5%)	(0.1%)	(1.4%)	(100%)
Ohio	\$278.7	\$15.2	\$1.3	\$0.1	\$4.3	\$299.5
	(93.1%)	(5.1%)	(0.4%)	(0.02%)	(1.4%)	(100%)
Wisconsin	\$397.7	\$16.8	\$2.0	\$0	\$5.1	\$421.6
	(94.3%)	(3.9%)	(0.5%)	(0%)	(1.2%)	(100%)
U.S. Average	\$306.5	\$37.8	\$10.5	\$1.3	\$3.0	\$359.2
	(85.3%)	(10.5%)	(2.9%)	(0.4%)	(0.8%)	(100%)

Source: U.S. Bureau of Census, Government Finance.

Note: Expenditure data are in current dollars. Data on percentage distribution of transportation expenditure by type of transport modes are in parentheses.

Together, all levels of government spent \$1.84 billion for highways and roads in Indiana in 1998 (Highway Statistics 1999). Approximately \$1.6 billion, or about \$274 per capita were spent by Indiana state and local governments in 1997. In 1997, Indiana ranked 42nd in the nation in expenditures per capita on highways and roads, far below the national average of \$307 per person. In addition, as Table 1 shows, Indiana expenditures per capita for airports and airways, water transport, mass transit, and parking facilities were all below the national average in 1997.

In 1997, Indiana governments spent less per capita on highway expenditures than the national average and five other Midwestern states (Illinois, Iowa, Minnesota, Ohio, and Wisconsin). Only Michigan spent less. Indiana's expenditure of \$274 per capita in current dollars was 11 percent less than the national average (\$307 per capita), 45 percent less than Iowa (\$498), 37 percent less than Minnesota (\$436), 31 percent less than Wisconsin (\$398), 13 percent less than Illinois (\$316), 2 percent less than Ohio (\$279), and 9 percent more than Michigan (\$252). Similarly, per capita spending in airports and airways by Indiana state and local governments was \$20 per capita in 1997, far below the national per capita average (\$38). In

Table 2: Per Capita Transportation Expenditure by Type In Indiana, 1982-1997

Indiana					U.S. Average				
1982	1987	1992	1997	% Change 82-97	1982	1987	1992	1997	% Change 82-97

1982	1987	1992	1997	% Change 82-97	1982	1987	1992	1997	% Change 82-97

Highways & Roads	\$121	\$155	\$152	\$171	+40.8	\$158	\$185	\$186	\$191	+20.9	
Airports & Airways	\$5.1	\$9.2	\$8.6	\$12.6	+146	\$13.1	\$17.4	\$22.9	\$23.6	+79.9	
Water Transport	\$3.9	\$1.3	\$1.1	\$0.9	-77.7	\$6.3	\$6.2	\$5.2	\$6.5	+4.1	
Mass Transit		\$2.2	\$2.5	\$2.5	\$0.6	-74.0	\$1.4	\$0.9	\$1.2	\$0.8	-39.8
Parking Facilities	\$0.7	\$0.7	\$1.3	\$1.0	+48.9	\$1.9	\$2.7	\$2.3	\$1.9	+1.6	

Total transportation

Outlay		\$133	\$169	\$166	\$186	+39.6	\$181	\$212	\$218	\$224	+23.9
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Source: U.S. Bureau of Census, *Government Finance*.

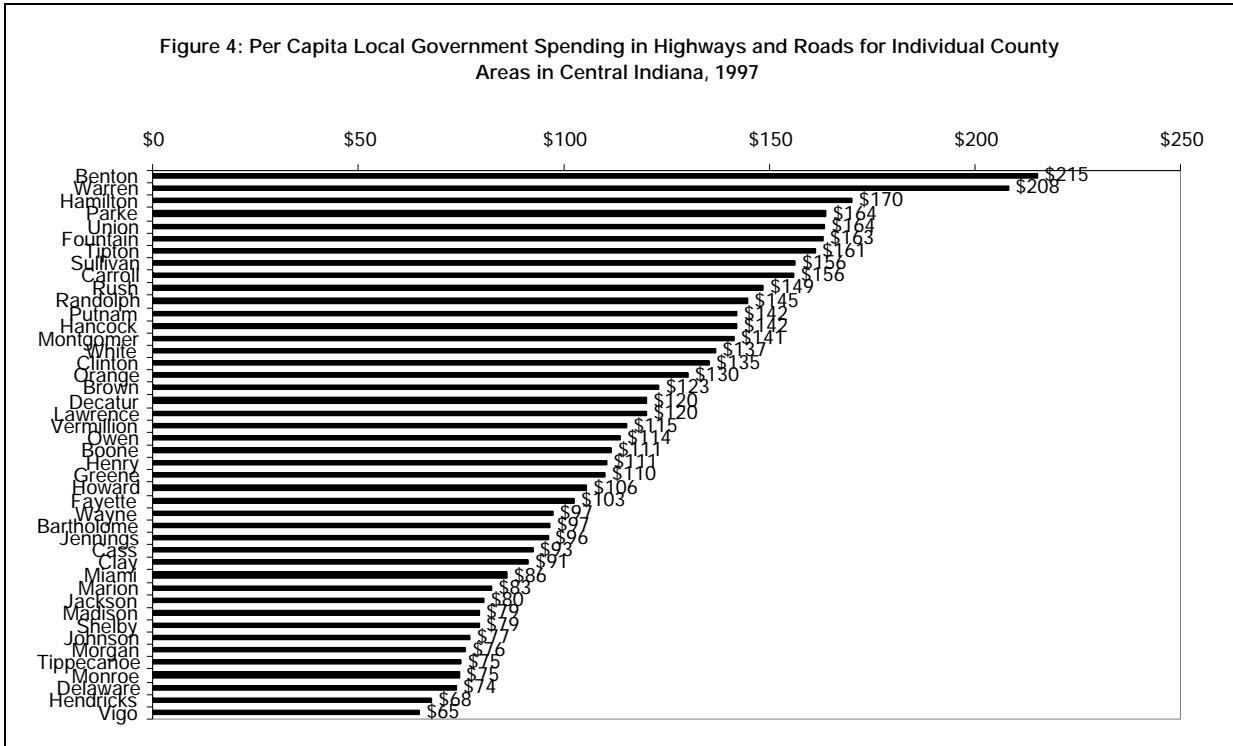
Note: Expenditure data are deflated by CPI.

addition, it was just half of the amount spent by Illinois or Minnesota state and local governments on air transportation. In the category of parking facilities, Indiana lagged behind all the other Midwestern states as well as the national average. Only Illinois and Iowa spent more per capita on mass transit than the national average among the Midwestern states, including Indiana.

As shown in Table 2, Indiana expenditures per capita on highways and roads, airports and airways, and parking facilities all grew faster than the national average between 1982 and 1997. For example, per capita spending in highways and roads by Indiana state and local governments increased by 40.8 percent in real terms between 1982 and 1997, while the national average went up by only 20.9 percent during the same period. For airports and airways, Indiana per capita expenditure grew 146 percent during this period, far exceeding the national average growth rate of 80 percent. Indiana expenditures on parking facilities increased 48.9 percent between 1982 and 1997, while the national average growth rate was a mere 1.6 percent. However, while average spending per capita by all state and local governments in water transport and terminals increased by 4.1 percent between 1982 and 1997, it decreased by nearly 78 percent in Indiana during the same period. The decline in public transit spending per capita also outpaced the national average rate. The trend suggests that in the past two decades, Indiana state and local governments increased investment in total transportation infrastructure at a faster rate than the national average, and at the same time shifted resources among transport categories from water transport and mass transit toward airports and airways, highways and roads, and parking facilities.

Per Capita Transportation Expenditures Vary among Central Indiana Counties

Local governments, counties and municipalities primarily, accounted for about 40 percent of state and local government total outlay on highways and roads. In 1997, Indiana local governments spent \$116 per capita in current dollars on highways and roads on average. In comparison, the average per capita spending by local governments in Central Indiana was \$118 in current dollars, while it was \$113 per capita among non-Central Indiana counties.



Source: U.S. Bureau of Census, Census of Government, *Government Finance*, 1997.

As Figure 4 demonstrates for Central Indiana, however, there is much more variation when comparing separate jurisdictions. Local government outlay on highways and roads ranged from \$215 per person in Benton County to \$65 in Vigo County in 1997. The five counties with the highest per capita spending were Benton, Warren (\$208), Hamilton (\$170), Parke (\$164), and Union (\$164). The five counties with the lowest per capita spending were Vigo, Hendricks (\$68), Delaware (\$74), Monroe (\$75), and Tippecanoe (\$75). It is interesting to note that none of the highest spending counties except Hamilton is part of any metropolitan areas, and all of the lowest spending counties are located in a MSA. This is probably because relatively high population density and smaller transportation investment growth in the MSA counties lowered the per capita spending figure. This pattern also indicates that local governments in many MSA counties in Central Indiana did not invest in highways and roads as much as the rest of the state and the region.

Patterns and Trends of Transportation Construction Expenditures

Although government total outlay for transportation is a commonly used indicator of transportation investment, it includes not only capital investment, but also non-capital spending such as maintenance and services outlay, administration, interest payments, and bond retirement. For example, in 1997, only 53 percent of \$1.6 billion highway spending by Indiana state and local governments were capital outlay. Highway capital outlay consists of direct expenditures associated with highway improvements. Approximately 48 percent of that amount, or about \$770 million, was spent in construction including new construction, reconstruction, resurfacing, rehabilitation, and restoration costs of roadways, bridges, and other structures, and installation of traffic service facilities.

Researchers (Aschauer 1989; Eberts 1988) argue that in general capital investment has a significant positive additive effect on economic performance. It is believed that construction costs of structures and works of transportation can be another useful indicator of infrastructure investment in a region. In this study, data from F.W. Dodge construction reports were compiled and analyzed to reveal patterns and trends of construction expenditures of transportation infrastructure in Central Indiana.

In the Central Indiana region, a total of \$3.5 billion in constant dollars was invested in the construction of transportation infrastructure by federal, state and local governments and the private sector between 1990 and 1999. As Figure 5 reveals, construction expenditure on highways, roads, and bridges accounted for 82 percent of total transportation construction cost during this period. After adjusting for inflation, all levels of governments plus the private sector spent \$2.9 billion on the construction and expansion of highways, roads, and bridges in Central Indiana in the past decade. The total spending on airports and airways such as airline terminals, aircraft service, runways, taxiways, and airport lighting was \$320 million, about 9 percent of total transport investment. A total of \$260 million, or about 7 percent, was invested in railroads and freight terminals, railroad service, lighting, and signal systems. The remaining 2 percent, about \$60 million, was spent on the construction of bus terminals and service.

Figure 5: Distribution of Construction Cost of Transport Infrastructure in Central Indiana by Type from 1990 to 1999 (Adpated from F. W. Dodge Construction Reports)

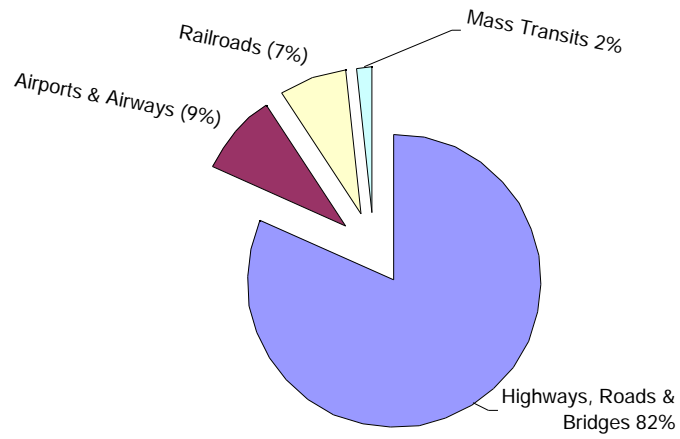
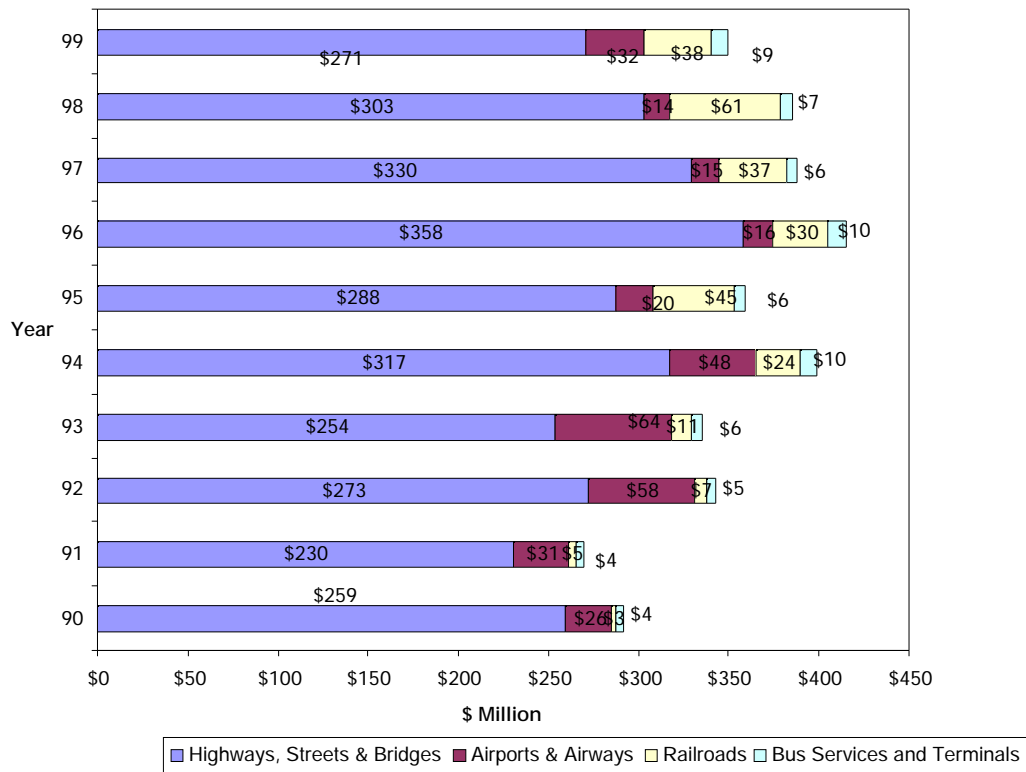


Figure 6: Trend of Transport Infrastructure Construction in Central Indiana by Type, 1990-1999



Total transportation investment in the period of 1990 to 1999 exhibited an upward trend, although construction expenditure in constant dollars fluctuated from year to year. It increased by 20 percent between 1990 and 1999. As Figure 6 shows, construction costs of highways, roads, and bridges in Central Indiana decreased from 1990 to the lowest level of \$230 million in 1991 and then climbed to the highest level of \$358 million in 1996. After reaching its peak, it declined continuously to \$271 million in 1999. Investment in other transport modes did not follow the same trend as highways, roads and bridges. Air transportation investment increased steadily from \$26 million in 1990 to \$64 million in 1993, then declined each year to \$14 million in 1998, and finally went up to \$32 million in 1999. Public investment in railroads and service rose ten times between 1990 and 1995, and then fluctuated in the following years before reaching the peak of \$61 million in 1998. The investment in bus terminals and service ranged from \$4 million to \$9 million during this time period, an increase of 125 percent between 1990 and 1999.

Figure 7 reports that total investments in highways, roads, and bridges in the 44 counties in Central Indiana amounted to \$2.93 billion during the period of 1990 to 1999. A typical county in this region invested in the construction of 59 projects and about \$40 million in highways, roads, and bridges in the past decade. Marion County accounted for 25 percent of total highway investment in Central Indiana, or about \$754 million, during this period. The ten counties with above average amounts of investment (Marion, Tippecanoe, Hamilton, Bartholomew, Delaware, Hendricks, Vigo, Madison, Wayne, and Monroe) had a total of \$1.86 billion, accounting for 62 percent of total highway investment in the Central Indiana region during the period examined. Except for Bartholomew and Wayne, all are MSA counties.

Figure 7: Total Investment in Highways, Roads, and Bridges, 1990-1999
(Constant 1992 \$000, adapted from F. W. Dodge construction reports)

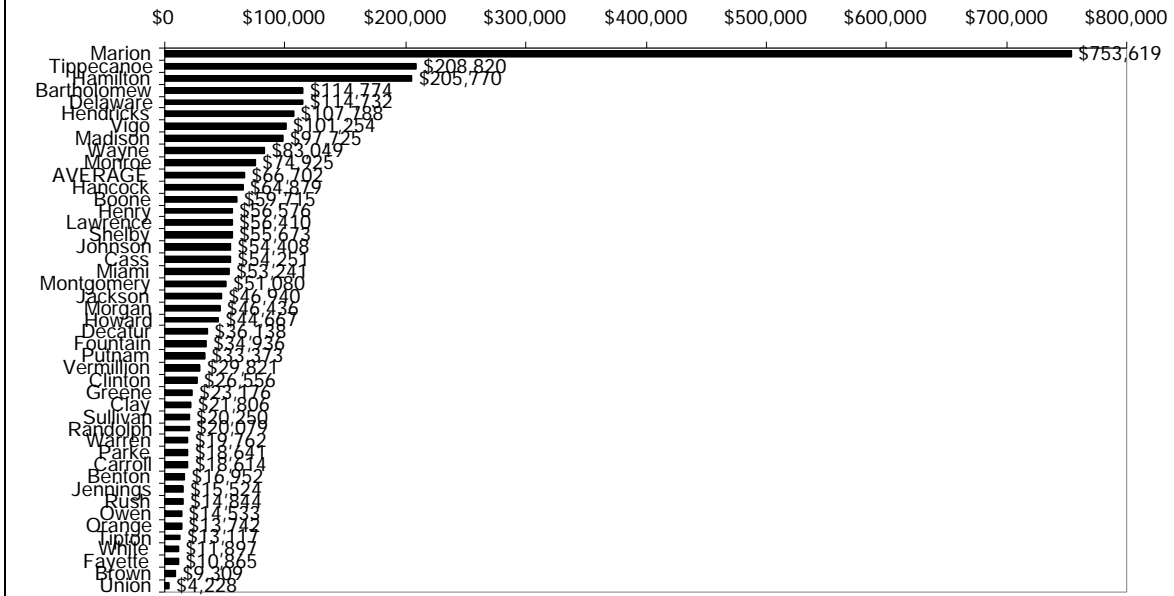
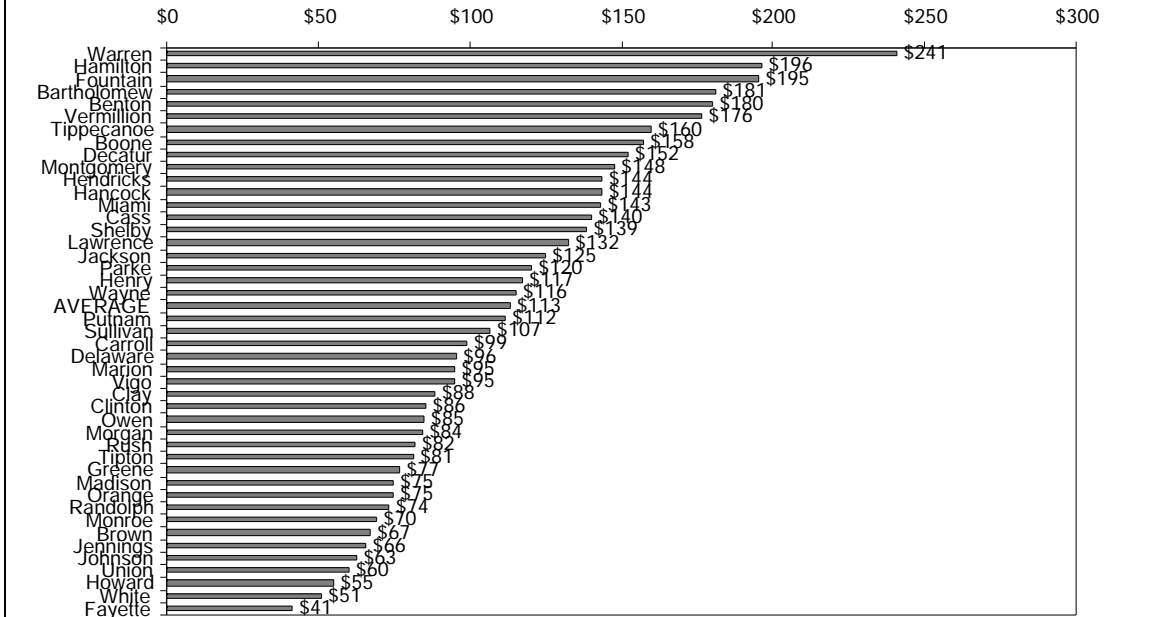
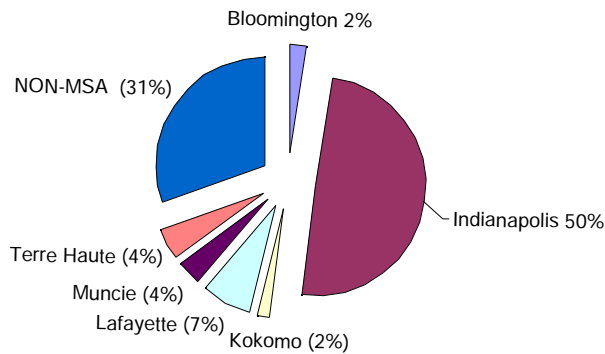


Figure 8: Per Capita Average Annual Investment in Highways, Roads, and Bridges by County, 1990-1999 (Adapted from F. W. Dodge construction reports)



When construction investment in highways, roads, and bridges is measured as per capita average annual investment from 1990 to 1999, as shown in Figure 8, Warren County moved to the top of the region with \$241 per capita, followed by Hamilton (\$196), Fountain (\$195), Bartholomew (\$181), and Benton (\$180). While Marion County was at the top of the list in terms of total highway investment, per capita average annual investment in Marion County was \$95, about \$18 less than the regional average. Average annual highway investments in Warren County and Hamilton County were 154 percent and 106 percent larger than that in Marion County, respectively. A large population size and relatively slow growth of highway investments contribute to the below average ranking of Marion County according to per capita average annual investment.

Figure 9: Distribution of Construction Expenditures in Highways, Roads, and Bridges by MSA from 1990 to 1999



The Indianapolis MSA clearly dominates highway, road, and bridge construction spending in the region. Approximately \$2 billion, or about 70 percent of the total investment in highways, roads, and bridges in the Central Indiana region was invested in its six MSA areas during this period. As shown in Figure 9, the Indianapolis MSA (Boone, Hamilton, Hancock, Hendricks, Johnson, Madison, Marion, Morgan, and Shelby counties) tops the list with \$1.43 billion, accounting for about 50 percent of the Central Indiana total investment during this period, while non-MSA areas (26 counties) had only 31 percent of total investment in this region.² This pattern suggests a predominance of MSA counties in highway and road investment in Central Indiana.

² The other five MSAs are comprised of nine counties: Bloomington (Monroe), Kokomo (Howard and Tipton), Lafayette-West Lafayette (Clinton and Tippecanoe), Muncie (Delaware), and Terre Haute (Clay, Vermillion, and Vigo).

ROAD EXTENT, USE CHARACTERISTICS AND CONGESTION

This section analyzes the extent of the existing road system and use characteristics, using data from the Indiana Department of Transportation and the Federal Department of Highway Administration. It also provides a comparison of road system characteristics to survey results on the congestion problem and travel time.

Most of Central Indiana's public roads are in rural areas, but route miles are growing faster in urban areas

Public road length reached 93,605 route miles in Indiana in 1999. About 73,664 miles were in rural areas, or 78.7 percent of total length of all Indiana roads.³ At the same time, about 11,220 miles were owned by Indiana Department of Transportation, accounting for 12 percent of Indiana's public road system. Municipalities, towns, or townships owned 15,786 miles, about 17 percent. Counties controlled the largest percentage of roads in Indiana, which amounts to 66,600 miles, or 71 percent of roads (Highway Statistics 1999). If public roads are classified by function, nearly 66 percent were local roads in Indiana in 1999. Interstate and other freeways and expressways accounted for only 1.2 percent of Indiana roads. Other principal arterial, minor arterial, and collector roads accounted for 3.5 percent, 5.0 percent, and 24.2 percent, respectively.

Compared with the Indiana statewide road system, the 44 counties in the Central Indiana region had 45,011 miles, or 48 percent of total public road length in Indiana in 1999. While about 35,047 miles (77.8 percent of total public road route miles in Central Indiana) were in rural areas, 3,088 miles (6.9 percent) were in small urban areas, and 6,876 miles (15.3 percent) were in large urban areas with populations 50,000 or above (Indiana Department of Transportation, HPMS Submittal Data report 1993-1999).⁴

Table 3: Public Road Route Miles by Type in Central Indiana, 1993-1999

Year	Rural	Small Urban	Urban Area	Total
1993	34,872	2,956	6,531	44,359
1994	34,886	2,974	6,556	44,416
1995	34,922	3,006	6,591	44,519
1996	34,912	3,034	6,715	44,660
1997	34,943	3,051	6,802	44,797
1998	34,962	3,065	6,830	44,857
1999	35,047	3,088	6,876	45,011

³ Route miles represent the mileage covered by a public road or highway route, independent of the number of lanes of the highways and roads and the number of vehicles that use that route. Route miles are also called directional route miles, meaning that they are counted for vehicles traveling in a particular direction.

⁴ According to 2000 HPMS submittal Data reports by Indiana Department of Transportation, rural miles are defined as the route mileage in the area with population below 5,000. Small urban is defined as the area with population equal or greater than 5,000 but less than 50,000. Urban area has a population equal or greater than 50,000.

Average Annual Change (miles)	29	22	58	109
Average Annual Percentage Change	0.08%	0.73%	0.86%	0.24%
% Change 1993-99	0.50	4.47	5.29	1.47

Source: Indiana Department of Transportation, HPMS Submittal Data reports, 1993-1999.

As Table 3 shows, during the period between 1993 and 1999, the Central Indiana region experienced a rapid growth in public road mileage. Total road length increased by 652 route miles, or an average of 109 miles annually during this period. About 345 route miles, or approximately 53 percent of the added miles, occurred in the urbanized areas with population above 50,000. This suggests that the growth in public road infrastructure in Central Indiana largely concentrated in the urbanized areas. At the same time, public road length in urbanized areas grew faster than other areas, up by 0.86 percent annually. Small urban areas experienced an average annual growth of 0.73 percent, but public road mileage in the rural area increased by only 0.08 percent annually during the period examined. As shown in Figure 10, route miles in rural areas barely grew from 1994 to 1999. This area even lost some route miles due to road erosion and decay.

Figure 10: Annual Rate of Change in Public Road Length in Central Indiana, 1994-1999

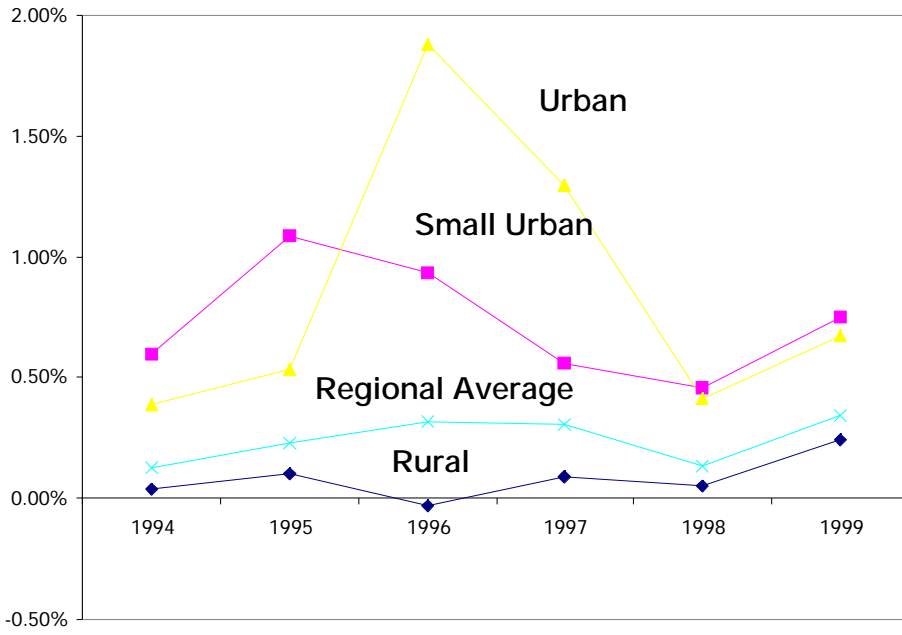
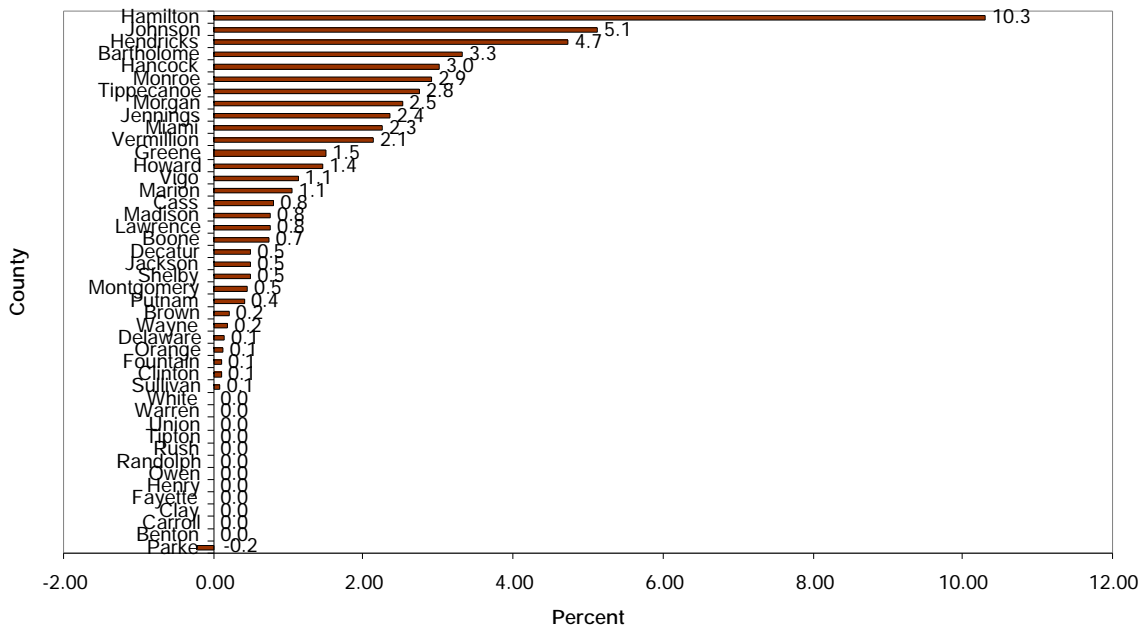


Figure 11: Percentage Change in Public Road Miles in Central Indiana by County, 1994-1999



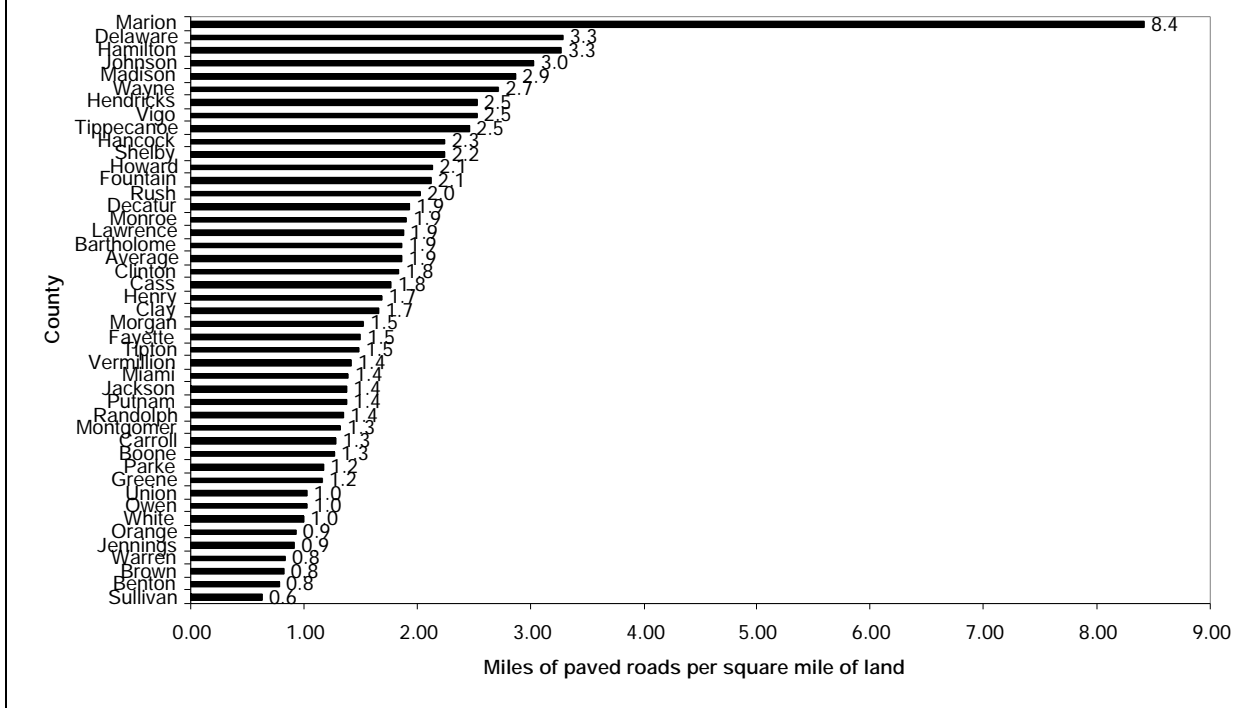
Among the 44 counties in the Central Indiana region, Hamilton County had the highest growth rate of public road miles between 1994 and 1999, up by 10.3 percent, as indicated in Figure 11, followed by Johnson (5.1 percent), Hendricks (4.7 percent), Bartholomew (3.3 percent), and Hancock (3.0 percent) counties. All but Bartholomew are counties in the Indianapolis MSA. About 12 counties experienced no change in their public road length. One county, Parke County, suffered a 0.2 percent loss of road miles.

PUBLIC ROADS INCLUDE BOTH PAVED AND NON-PAVED ROADS. ABOUT 72 PERCENT OF PUBLIC ROADS IN CENTRAL INDIANA ARE PAVED ROADS. THE STATE OF INDIANA HAD A TOTAL OF 64,727 MILES OF PAVED ROADS IN INDIANA IN 1999. APPROXIMATELY HALF OF THIS, OR ABOUT 32,284 MILES, WERE LOCATED IN THE CENTRAL INDIANA REGION.

TABLE 4. PAVED ROAD LENGTH IN CENTRAL INDIANA, 1999 (IN MILES)

	Paved Road Miles	
Largest	3,337	(Marion)
	1,301	(Hamilton)
	1,298	(Madison)
	1,296	(Delaware)
	1,234	(Tippecanoe)
Smallest	167	(Union)
	257	(Brown)
	284	(Sullivan)
	304	(Warren)
	317	(Benton)
Central Indiana Regional Total	32,284	
Indiana Statewide Total	64,727	
Average of Central Indiana Counties	734	
Average of All Indiana Counties	704	

Figure 12: Paved Road Density by County, 1999



AS TABLE 4 REPORTS, COUNTIES IN THE CENTRAL INDIANA REGION HAD ON AVERAGE 30 MILES MORE IN PAVED ROADS THAN IN THE REST OF THE STATE. AMONG THE 44 COUNTIES IN CENTRAL INDIANA, MARION, HAMILTON, MADISON, DELAWARE, AND TIPPECANOE COUNTIES HAD THE LARGEST NUMBER OF PAVED ROAD MILES, WHILE THE COUNTIES WITH THE SMALLEST NUMBER OF MILES INCLUDED UNION, BROWN, SULLIVAN, WARREN, AND BENTON COUNTIES. WHEN THE TOTAL COUNTY LAND AREA IS CONSIDERED, THE CENTRAL INDIANA REGION HAD 1.9 MILES OF PAVED ROADS PER SQUARE MILE OF LAND AREA, WHILE THE REST OF THE STATE HAD 1.8 MILES OF PAVED ROADS PER SQUARE MILE.

FIGURE 12 SHOWS THAT AMONG THE 44 COUNTIES IN THE CENTRAL INDIANA REGION, MARION HAD THE HIGHEST PAVED ROAD DENSITY, ABOUT 8.4 ROUTE MILES PER SQUARE OF LAND AREA. DELAWARE AND HAMILTON COUNTIES HELD A DISTANT SECOND PLACE WITH 3.3 ROUTE MILES PER SQUARE MILE OF LAND, FOLLOWED BY JOHNSON (3.0 MILES) AND MADISON (2.9 MILES). THE ROAD DENSITY IN EACH OF THE ABOVE FIVE COUNTIES WAS FAR ABOVE THE REGIONAL AVERAGE OF 1.9 MILES PER SQUARE MILE OF LAND AREA.

Use Characteristics

In addition to information on the extent of the road system, we also need to understand road and highway infrastructure use. Road and highway use is commonly measured by daily vehicle miles of travel (DVMT). Table 5 shows increases of vehicle miles traveled for both urban and rural

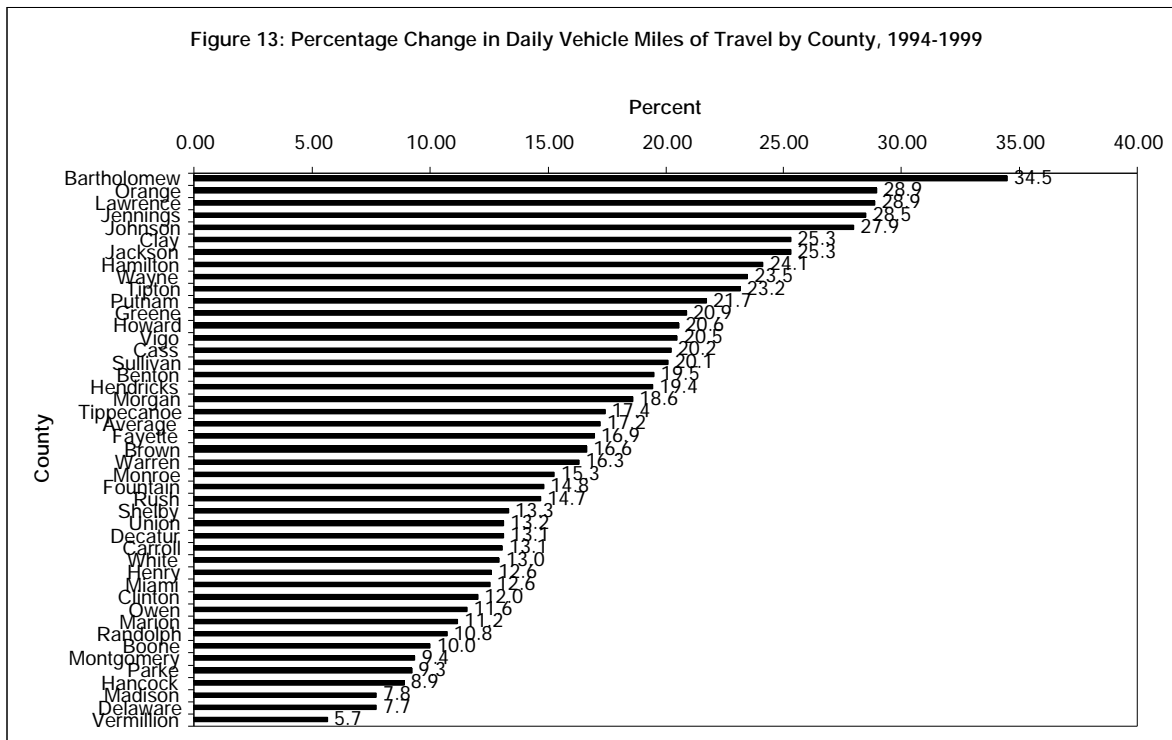
Table 5: Daily Vehicle Miles Traveled by Type in Central Indiana, 1993-1999 (1,000 miles)

Year	Rural	Small Urban	Urban Area	Total
1993	41,046	9,086	34,753	84,884
1994	42,192	9,007	35,441	86,639
1995	44,231	9,573	37,421	91,225
1996	45,013	9,702	37,961	92,676
1997	47,629	10,488	40,825	98,943
1998	48,328	10,678	39,319	98,324
1999	49,291	10,733	40,147	100,171
Average Annual Change (miles)	1,374,000	275,000	899,000	2,548,000
Average Annual Percentage Percent Change	3.1%	2.9%	2.5%	2.8%
% Change 1993-99	20.1	18.1	15.5	18.0

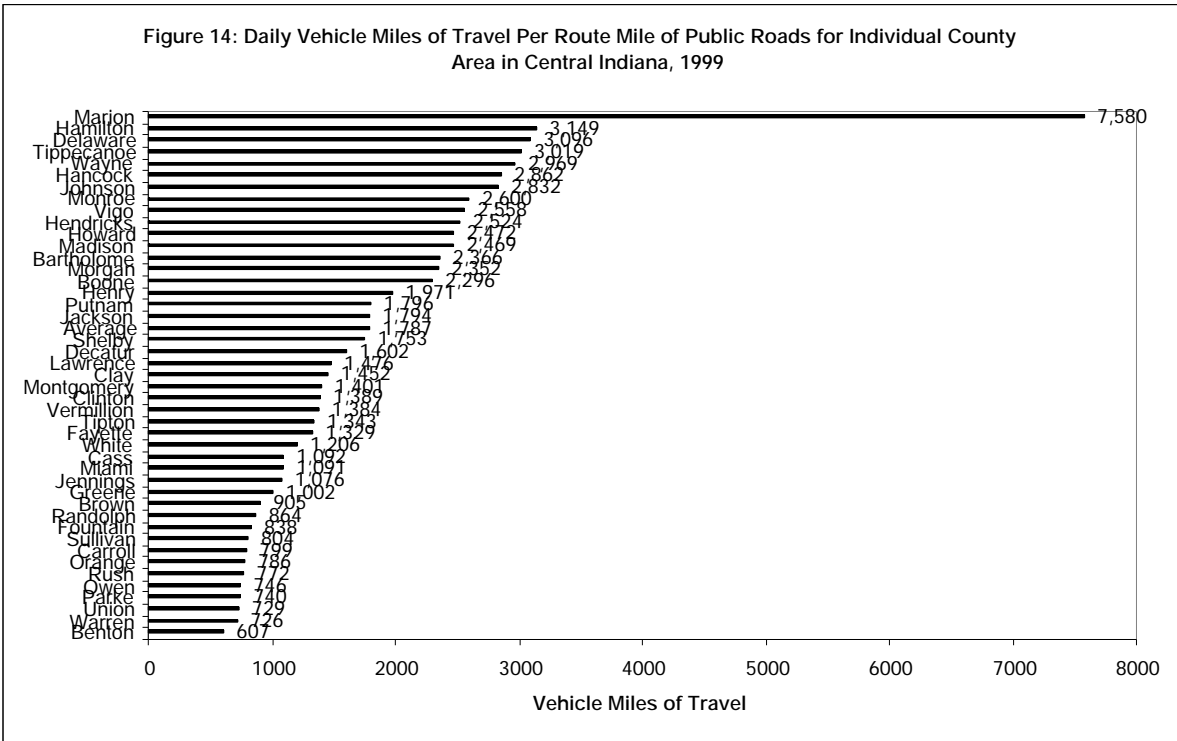
Source: Indiana Department of Transportation, HPMS Submittal Data reports, 1993-1999.

systems. Perhaps the most interesting change is the growth in DVMT on rural roads and highways. The use of highways and roads in Central Indiana measured by DVMT increased by 18 percent between 1993 and 1999. DVMT on rural highways and roads climbed from 41

million in 1993 to over 49 million in 1999, a 20 percent increase. During this time, small urban vehicle miles increased by 18 percent and urbanized area vehicle miles increased by 15.5 percent.



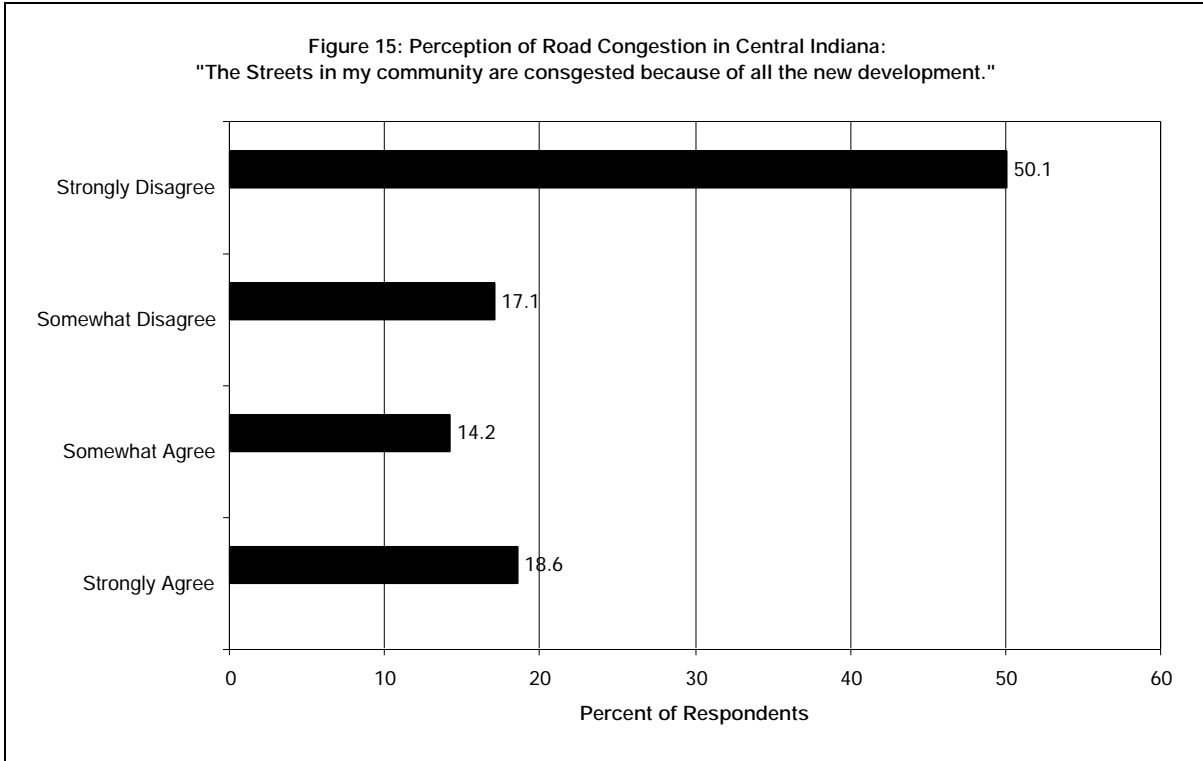
Within Central Indiana, as shown in Figure 13, vehicle miles traveled increased the most in Bartholomew County (nearly 35 percent), followed by Orange County (28.9 percent), Lawrence (28.9), Jennings (28.5 percent) and Johnson (28). Marion County increased by only 11.2 percent, which was below the regional average growth rate of 17.3 percent between 1994 and 1999.



However, when vehicle miles of travel are compared with the route miles of public roads and highways, as indicated in Figure 14, Marion County had the highest ratio among the 44 counties with 7,580 vehicle miles per route mile of roads. This result indicates that the public road system in Marion County is heavily used compared to other counties. In addition, the ten counties with the highest vehicle miles per route miles are all in a MSA area except for Wayne. It may suggest that the economic activities in MSAs in the Central Indiana increase demand for transportation infrastructure, leading to the heavy use of highways and roads in those areas.

PUBLIC PERCEPTION OF ROAD CONGESTION AND TRAVEL TIME

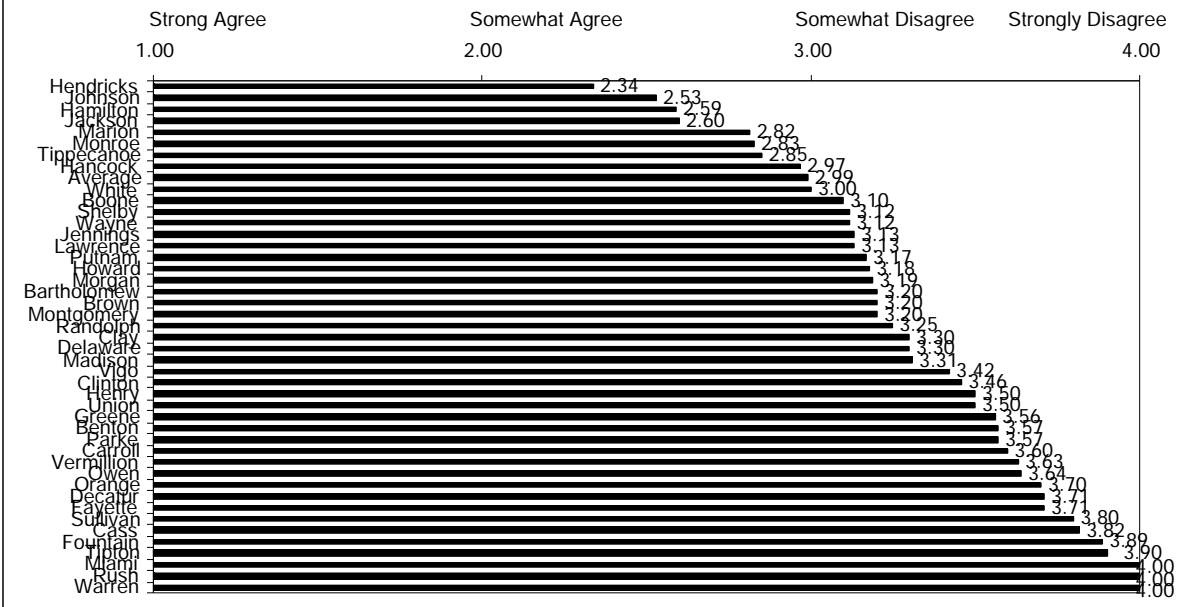
Does the high demand for public road use in Central Indiana lead to road congestion and longer travel time? According to the Central Indiana Household Survey 2000 by the Center for Urban Policy and the Environment, 50.1 percent of 6,042 valid respondents strongly disagree, 17.1 percent somewhat disagree, 14.2 percent somewhat agree with the statement, “The streets in my community are congested because of the new development” (see Figure 15). Only 18.6 percent of the respondents strongly agree.



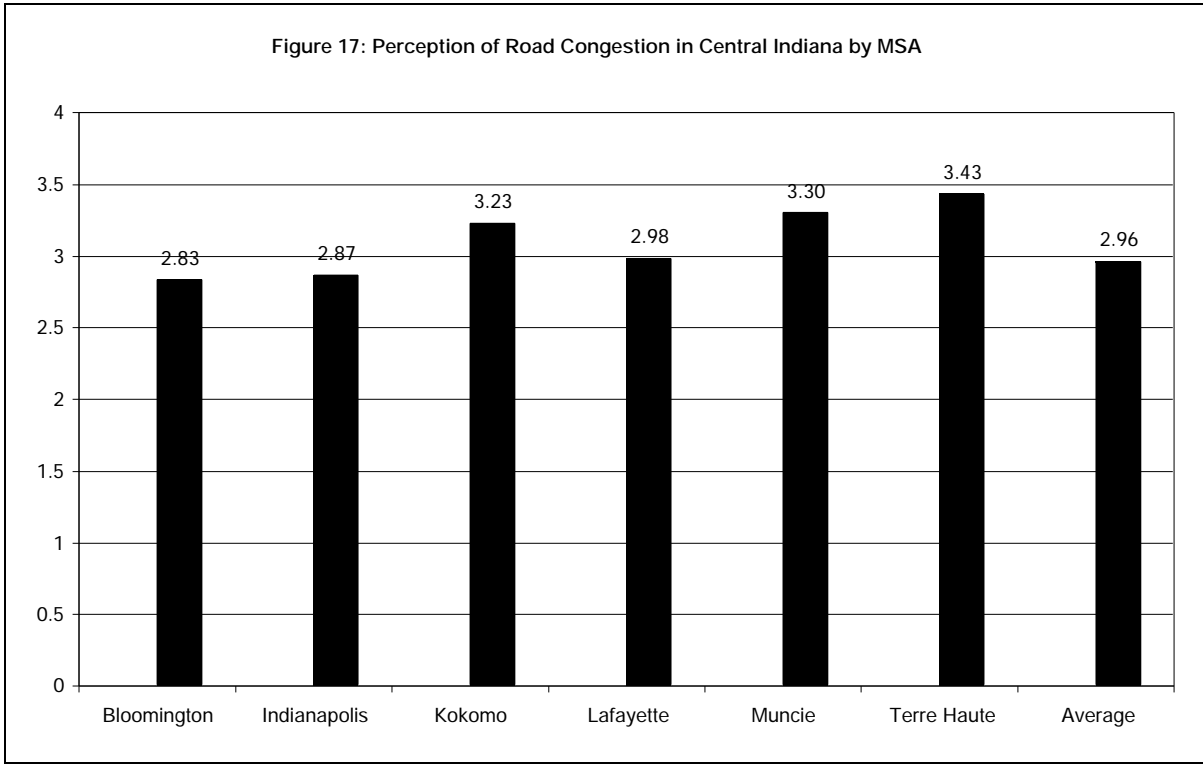
Source: Central Indiana Household Survey, 2000.

When respondents are grouped according to the county of residence, a mean level of congestion perceived by residents in each of the 44 counties in Central Indiana can be obtained. As revealed in Figure 16, the residents of the counties of Hendricks, Johnson, Hamilton, Jackson, Marion, Monroe, Tippecanoe, and Hancock are more likely than those residing in other counties to agree that their streets are somewhat congested. With the exception of Jackson, each of these counties was among the ten counties with the highest ratio of miles traveled to route miles. Jackson County is the only one of these eight counties that is not part of an MSA.

Figure 16: Perception of Road Congestion in Central Indiana by Count
"The streets in my communities are congested because of all the new development."



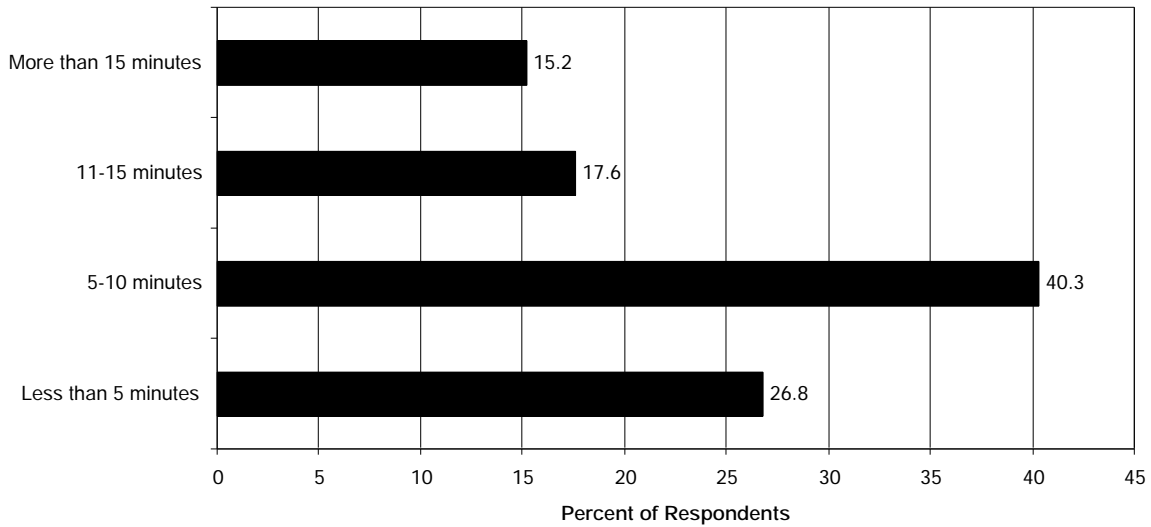
Source: Central Indiana Household Survey, 2000.



Source: Central Indiana Household Survey, 2000.

Figure 17 illustrates the perception of congestion by survey respondents who live in an MSA. The residents of Bloomington, Indianapolis, and Lafayette MSAs are more likely than those of the other MSAs to agree that the streets in their community are congested because of new development.

Figure 18: "In general, how long does it take you to go where you and your family normally shop for food? Would you say less than 5 minutes, 5-10 minutes, 11-15 minutes, or more than 15 minutes?"



Source: Central Indiana Household Survey, 2000.

Survey respondents also were asked about travel time to shop for food. The responses to this question could indicate perceptions about daily traffic and congestion. As Figure 18 shows, 26.8 percent of 6,421 respondents in Central Indiana replied that it took them less than 5 minutes. 40.3 percent said 5 to 10 minutes, and 17.6 percent answered 11 to 15 minutes. Only 15.2 percent of respondents said more than 15 minutes. These survey results suggest that most residents in Central Indiana (67 percent) do not experience traffic congestion problems since it takes less than 10 minutes to travel to shop for food.

5. Conclusion

The trends and patterns of transportation infrastructure investment in Indiana and Central Indiana suggest that historically Indiana governments have underinvested in all types of transportation infrastructure as compared with other states, but have narrowed the gap in the past two decades. Specifically, Indiana has steadily increased total transportation infrastructure investment levels. Although per capita transportation expenditure in Indiana continued to lag behind the national average and all other Midwestern states during this time period, it grew faster than the national average. For example, although Indiana ranked 42nd in the nation according to per capita state and local government capital outlay on highways and roads in 1997, Indiana state and local government spending on highways and

roads grew twice as fast as the national average. The increase in public outlay in airports and airways and parking facilities in Indiana also outpaced the national average growth rate.

Transportation construction expenditures in Central Indiana over the past decade have predominantly gone toward highway and road investments. Total transportation investment during this period exhibited an explicit upward trend. The distribution of highway and road construction expenditures was largely concentrated in the six MSAs in the Central Indiana. The Central Indiana region experienced a rapid growth in public road mileage during the period between 1993 and 1999; most of it in the large urbanized areas in Central Indiana. Survey respondents do not feel there is a street congestion problem in their communities. But the results also suggest that residents living in the Bloomington, Indianapolis, and Lafayette MSAs are more likely than those of other areas to believe that the streets in their communities are congested.

As the National Research Council (1987) pointed out, inadequate infrastructure presents a structural impediment to the development of the regional and national economic base and provides a fragile foundation on which to build a healthy and competitive economy. It requires greater commitment from the state government and the local governments in the Central Indiana region to increase investment in new infrastructure such as telecommunications and improve existing infrastructure such as roads and highways to boost productivity in the manufacturing and the growing service sector and develop new economy.

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