

Funding Minnesota roads and highways.

Thomas F. Stinson and Barry Ryan
Department of Applied Economics
University of Minnesota, Saint Paul, MN.

Prepared for the 8th Joint Conference on Food, Agriculture, and the Environment
Mikana, Wisconsin, USA, 25-28 August 2002

Abstract: Minnesota's state and local road networks generate 52 billion vehicle miles of travel each year at a cost of \$2.4 billion. The majority of state road spending is supported by state and federal motor fuels taxes, while local road networks rely more on property taxes and intergovernmental aid. Local road costs in most Minnesota counties are less than 10 cents per vehicle mile of travel. Road aid reduces the local tax burden to less than 7 cents per VMT. Local effort tends to be higher on the metropolitan fringe where traffic volumes are also high, and lower in the regions with low traffic levels. The average homeowner in the 7-county metropolitan area pays \$109 in road-related property taxes compared to \$92 for the average non-metro homeowner. Yet both groups receive more road services than they pay for directly in property taxes, due to the subsidy effect of state general-purpose aids.

Revised September 17, 2002

Introduction

Minnesota roads produce 52 billion miles of vehicle travel each year at a cost \$2.4 billion. At the heart of the public economy, state and local roads are a complex system of interstate highways, city streets, and rural roads. Equally complex is the system of taxes and intergovernmental transfers that support them. This paper examines four elements of road funding to create a baseline of information and facilitate the public debate. First, a comparison of vehicle road use illustrates how state and local networks differ from each other, as do their urban and rural components. Next, an overview of road tax revenues divides road responsibilities among national, statewide, and local interests, and helps characterize the road price signal. Third, a county-level assessment of local road costs on a VMT basis, quantifies local spending and the local tax effort with respect to network use. Finally, the value of local road service is estimated for average metro and non-metro homes to demonstrate the contribution state general-purpose aid makes to local road affordability.

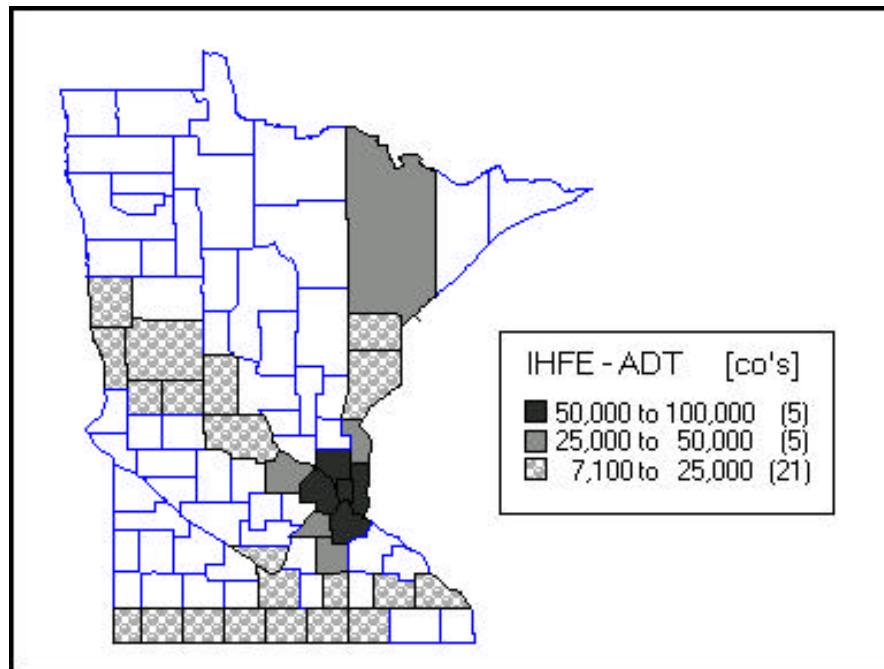
Road network use

Minnesota state and local roads produced 52 billion vehicle miles of travel on 132,000 centerline miles of road in 2000.¹ State roads are generally the major and minor arterial highways, including the federal interstate system. Three levels of local government – counties, cities, and towns, operate local roads, which include mostly neighborhood streets or collector routes. State roads account for 9% of the total road miles and 60% of all vehicle miles traveled. Local governments are responsible for 91% of the road miles, and 40% of all vehicle travel. Federal interstate highways - a special

¹ Minnesota Department of Transportation, Office of Transportation Data and Analysis, 2000.

subset of state roads - represent 1% of all road miles, yet they produced 29% of all vehicle travel (figure 1).

Figure 1. Interstate highways are a significant part of the state road network
(Average Daily Traffic on federal interstate highways by county)



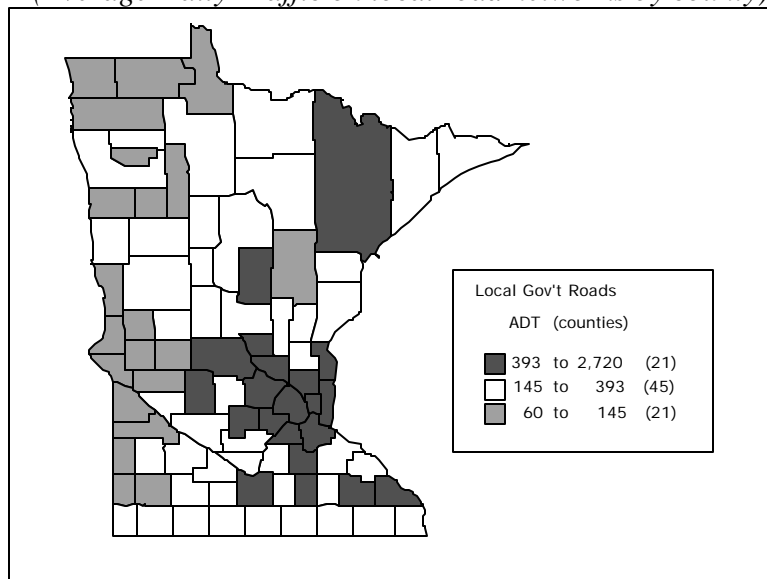
Source: Minnesota Department of Transportation, 2000

Three interstate highways cross the state, affecting 31 of the state's 87 counties. Two highways meet in the Twin Cities metropolitan area, and this intersection, along with "normal" urban traffic, generates traffic volumes in five counties that exceed 50,000 vehicles a day. By contrast, the interstate highway along Minnesota's southern border has an annual average daily traffic (ADT) closer to 15,000 vehicles. The remaining (non-interstate) state road network reaches into all 87 counties. Traffic levels on these roads are much lower than the interstates, but there is a similar regional distribution. The highest volume segments are in the metropolitan area, and the lowest volume segments are outstate. The average daily traffic on (non-interstate) state road is typically over

10,000 vehicles a day in the metropolitan area. In the 21 counties with the lowest traffic volumes – bottom quartile – the ADT falls below 3,000 vehicles a day.

The average daily traffic on local government roads is the combination of traffic on the county, city, and town road networks in each county. Local road traffic in three-quarters of all Minnesota counties is less than 393 vehicles a day (figure 2). Local road traffic is highest in the Twin Cities urban area, where network volume reaches 2,700 vehicles daily. The lowest volume local road networks are in the southwestern and northwestern counties. Statewide, 21 counties have average daily traffic on local roads of fewer than 145 vehicles a day.

Figure 2. Traffic on local government roads is higher in the metropolitan area.
(Average Daily Traffic on local road networks by county)

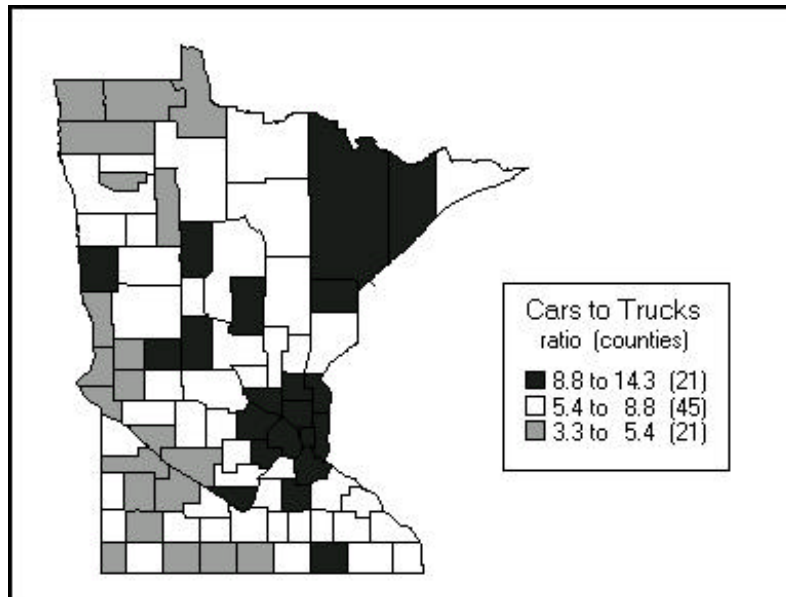


Source: Minnesota Department of Transportation, 2000

The type of vehicle using a road is as important as the road's length or traffic volume. Two user groups of particular interest are passenger vehicles (cars and light

trucks) and heavy trucks (>10,000 lbs.). One proxy for road use by these groups is the ratio of “cars” to “trucks” registered in the county (figure 3).²

Figure 3 The Twin Cities area is car-rich compared to western counties.
(ratio of car to heavy trucks registered in the county, 1998.)



Source: Minnesota Department of Public Safety, 1998.

The highest quartile of counties – most in the metropolitan area - had at least 8.8 cars registered in the county for every truck. In the lowest quartile of counties there were fewer than 5.4 cars for every truck. A preponderance of heavy trucks does not by necessity translate into higher local costs, but these truck-rich counties also tend to have low-volume roads, a combination generally unfavorable in road economics.

² Minnesota Department of Public Safety, Division of Vehicle Services, unpublished data, 1998.

Road Funding and Aid

Federal, state and local policy makers continually make decisions on the appropriate level of road spending and the way that spending is to be financed. At the federal and state level the financing decision includes how much of the cost is to be paid for by local residents and how much is to be distributed across all residents of the state or the nation. Policy makers also seek a blend of taxes that sends road users a clear signal about the true cost of the road network, yet fairly distributes the financial impact across communities and individuals.

The public finance literature highlights the conflicts between equitable and efficient taxation. For example, the Ramsey rule shows that the most efficient tax system is a system in which the tax rate on each activity is inversely related to its price elasticity of demand. But, the resulting tax rate schedule that imposes taxes at an extremely high rate on such necessities as kidney dialysis and would largely exempt items such as luxury yachts does not fit well with most perceptions of social justice. The political process leads to a compromise result, which is then modified over time as attitudes and information change.

Typically the political debate focuses on the equity issue. Since some individuals make more extensive use of the road system than others, an increase in taxes related to the use of the road network (such as the motor fuels tax) will have an uneven effect, and in many instances increases in road taxes make the system more regressive. Such a tax increase may also fall disproportionately on those living outside the metropolitan areas. Others, however, argue that households should pay for public services according to the

benefits received, and clearly, individuals who travel more receive more benefits from the road network, and should be expected to pay more.

What is often overlooked by those focusing on economic efficiency aspects of the financing decision is that road systems are natural monopolies and that much of their production is subject to continually decreasing average costs. While rush hour travel on crowded urban highways is almost certainly an increasing cost segment of production, mileage traveled outside the metropolitan area could be increased with almost no impact on the overall cost structure. Recognizing the natural monopoly nature of much of the highway system adds a further constraint on the policy decision over how much of the cost of maintaining the system should be paid by user's and how much should come from sources unrelated to each individual's actual use of the highway.

Figure 4. Natural monopolies cannot be financed solely using marginal cost pricing.

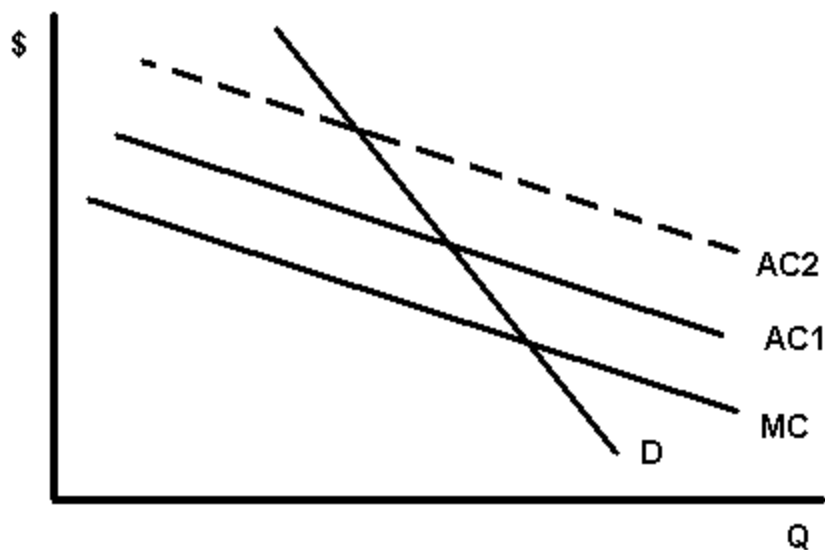


Figure 4 illustrates the problem. Marginal cost pricing is insufficient, since it generates less revenue than is necessary to provide the service, given that average cost

(AC) exceeds marginal cost (MC). But, pricing at average cost is also creates an efficiency loss since it eliminates trips whose benefits exceed their marginal cost, but are less than the average cost of an additional trip. Obviously, when the difference between average cost and marginal cost increase, as in the difference between AC2 and MC, the likely efficiency losses increase. And those differences are likely to be largest in non-metro areas.

One solution offered to this problem is marginal cost pricing, with lump sum taxes used to make up the additional revenue needed. With lump sum taxes no additional inefficiencies are created since the amount of tax collected is independent of income or consumption patterns. Unfortunately, opportunities for lump sum taxation are few, and use of income tax or sales tax revenues to make up the deficit creates other distortions which may be greater than those produced by average cost pricing. Some also object that since fairness requires consumers of a publicly provided service to pay for it, it is unfair to make up the deficit through general taxation. An offsetting argument, however, is that since the road network provides all residents of the nation or the state the option to use each particular road segment, that option has value, even if it is never exercised.

Another alternative sometimes suggested for the decreasing cost monopoly problem is a two-part tariff system, which includes both a charge for the right to use the service and a marginal cost fee. Here, auto registration fees are sometimes characterized as a fee for the right to use the road system. One problem though is that individual's with no vehicle also benefit from the road system since it provides access for deliveries, fire protection, and other essential services. The payment of the initial charge can come from

other taxes as well. For example, a portion of the property tax, or any other general-purpose levy, can be assumed to be the charge for access to the system.

In previous work we have examined the way road financing in the Twin Cities metropolitan area is distributed between variable, use related charges, auto related charges, and general revenues.³ We found that only one-third of road tax receipts came from taxes that varied with system use. As a result of this tax policy there was little incentive for households not to move to the far edge of the metropolitan area and commute to work in the central cities. This tendency for urban sprawl might be reduced if commuters got better feedback about the true cost of vehicle travel.

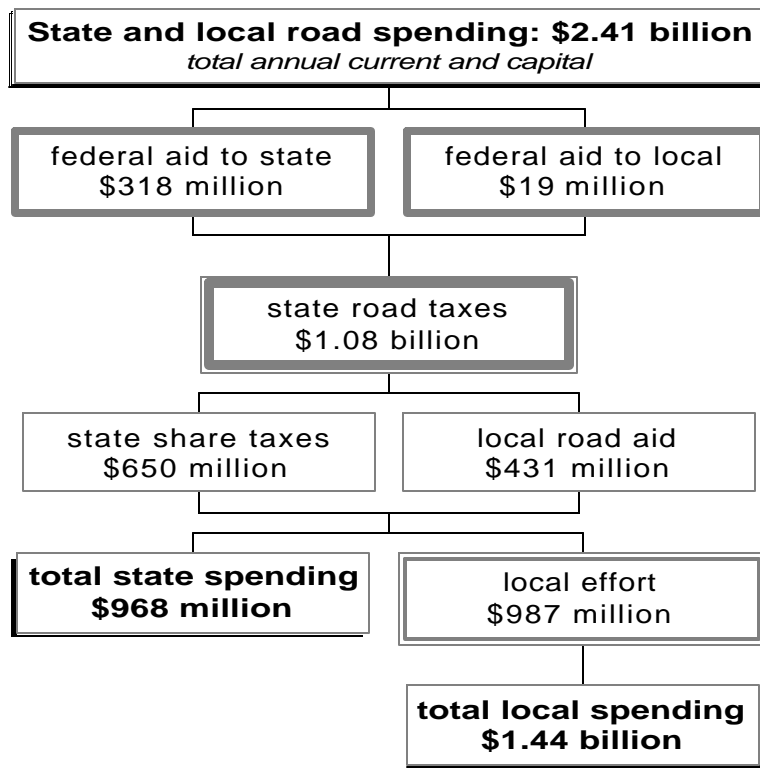
In this paper, we extend that work to cover locations beyond the Twin Cities metropolitan area, providing information on a county basis on local road spending per vehicle mile traveled, and the proportion of local road spending which comes from local resources. First however, the revenues and expenditures of multiple levels of government must be compiled, a task that is always problematic. Each level of government has a different fiscal year, and project-related revenues and expenditures often occur in different reporting periods. And roadwork by its very nature requires large capital outlays for facilities that last 10, 20, or 30 years. To smooth out these shortcomings, this analysis averages revenues and expenditures over a 3-year period, using the most recent data available, 1997 to 1999.

Total spending on state and local roads averaged \$2.41 billion annually over the 3-year period (figure 5). Federal highway planning and construction grants contributed

³ Road Finance Alternatives: an analysis of metro-area road taxes. Center for Transportation Studies, March 2002. <http://www.cts.umn.edu/trg/research/projects/financing.html>

\$337 million, or 13 percent.⁴ Federal highway grants are supported by federal motor fuel taxes, and to a lesser extent by other vehicle related fees. In return for federal aid, the state is responsible for the federal interstate highway system within its borders. Most federal aid was spent by the state, but counties also received a small share of federal grants.

Figure 5. Federal, state, and local taxes support \$2.4 billion in road spending.
Minnesota road funding and aid transfers (1997-99 average)



State government raised an additional \$1.08 billion annually from state motor fuel taxes (MFET) and vehicle registration taxes (MVRT).⁵ While Minnesota’s motor fuel tax rate stayed constant at 20 cents per gallon over the 3-year period, total receipts rose

⁴ Office of Highway Information, Federal Highway Administration, U.S. Department of Transportation.
<http://www.fhwa.dot.gov/ohim/index.html>

⁵ Comprehensive Annual Financial Report, Minnesota Department of Finance, 1999.
<http://www.finance.state.mn.us/cafr/>

on higher fuel use. MFET receipts went from \$543 million in 1997 to \$588 million in 1999. At the same time, higher priced vehicles and increased vehicle ownership pushed MVRT collections from \$487 million to \$556 million. These two taxes combined support 45% of all state and local road spending. The state constitution requires that these revenues be spent exclusively on roads, and that 38% be shared with local governments. The portion of MFET and MVRT receipts going for state roads averaged \$650 million annually. Combined with the \$318 million in federal aid, state road spending totaled \$968 million. Total spending by local governments averaged \$1.44 billion annually.⁶ State road aid (\$431 million) and federal grants (\$19 million) helped offset some costs. The remaining \$987 million came from local government general funds. This local effort represents 42% of the total \$2.4 billion in road spending.

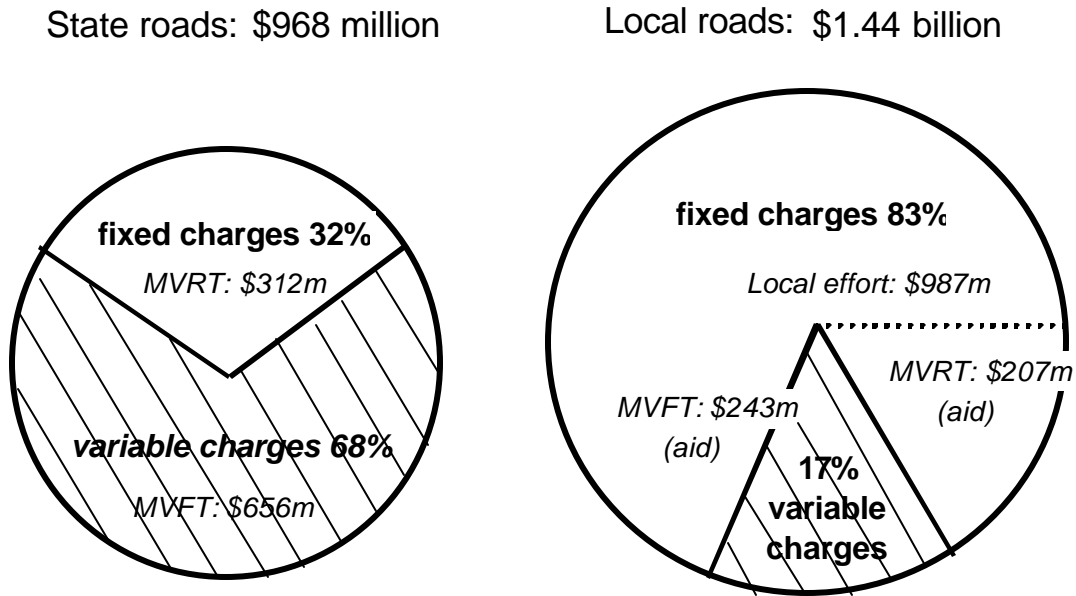
Road taxes can be characterized, with respect to road use, as either fixed or variable charges. A variable tax increases with incremental road use. The most common is the motor fuels excise tax, but other methods include VMT taxes and congestion pricing on overcrowded roads. Fixed road taxes are typically annual fees for the right to use, or have access to, public roadways. Vehicle registration taxes are levied regardless of where, when, or how much a vehicle is used each year. Property taxes are hidden charges from the road user's perspective, but maybe viewed by property owners as the price of access.

Taxes that vary with road use – the motor vehicle fuels tax (MVFT) - fund a larger share of state road spending than they do for local roads (figure 6). The combination of federal and state motor fuel taxes pay 68% state road costs, and 17% of

⁶ Revenues, Expenditures, and Debt of Counties, Cities, and Towns. 1997-1999. Minnesota Office of the State Auditor <http://www.osa.state.mn.us>

local road spending. Motor vehicle registration taxes (MVRT) support the remaining 32% of state road expenditures, and an additional 14% of local roadwork. Local general funds, principally property taxes and state general-purpose aid, fund 69% of local road spending.

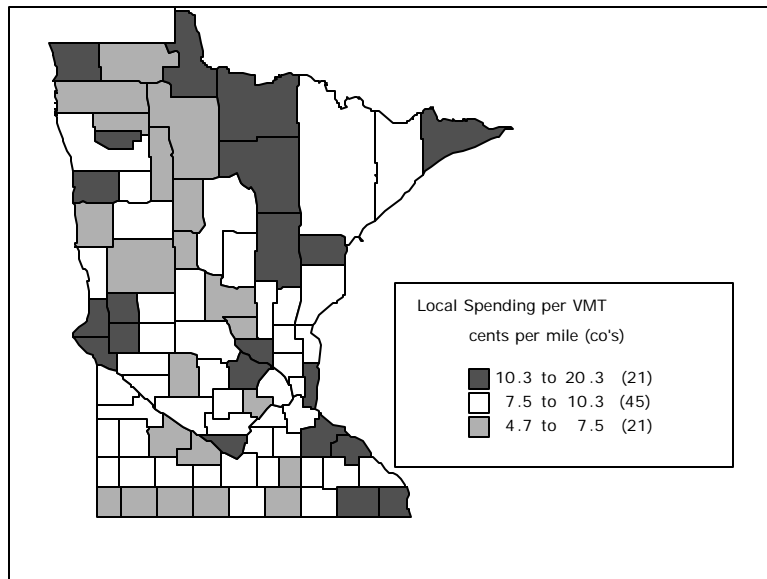
Figure 6. Local road funding relies on fixed charges and road aid.
(fixed and variable shares of road revenues 1997-99 avg.)



Local road travel costs

Local governments - counties, cities, and towns - spend \$1.4 billion a year on roads to generate 21 billion vehicle miles of travel (VMT). The statewide cost of travel on local roads averages 7 cents per vehicle mile, but calculated at the county-area level cost are higher in most counties (figure 7). Local road spending in one-quarter of Minnesota counties exceeds 10 cents per mile of travel.

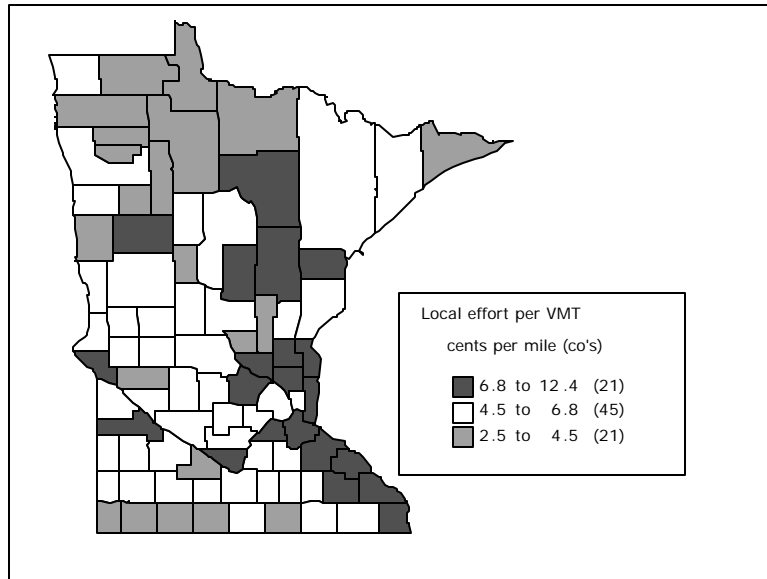
Figure 7. Statewide local road spending averages 7 cents per VMT.
(local spending per vehicle mile of travel by county)



Sources: Minnesota State Auditor 1997-99, Minnesota Department of Transportation 2000

Local governments get \$431 million in state and federal road aid, which significantly reduces the local road tax effort. Statewide the average local effort was 4.1 cents per VMT, and in most counties the local cost of a vehicle mile of travel stayed below 6.8 cents. Local road networks with the highest spending per VMT saw the most significant local cost reductions because of state road aid. While total road spending reached as high as 20.3 cents per mile (fig. 7), after road aid is subtracted the highest local cost was 12.4 cents (fig. 8).

Figure 8. Road aid reduces the local cost of roads.
(local effort per vehicle mile of travel by county)



Sources: Minnesota State Auditor 1997-99, Minnesota Department of Transportation 2000

Homeowner road benefits

The share of road spending paid from local government general funds comes primarily from property taxes and state general-purpose grants. State general-purpose aid, funded with state income and sales tax receipts, is aimed at equalizing community services through property tax relief.⁷ Both property taxes and general-purpose aid are fungible revenues in the local government general fund, so in this analysis they are allocated to road spending in relation to their local budget importance. Statewide the impact of state general aid in property tax relief is considerable, accounting for 28% of the average local government general fund. This tax relief provides a subsidy to property owners, who pay less in property taxes than the cost of the services they receive.

⁷ Two prominent examples are the Homestead and Agricultural Credit Aid program (discontinued in 2001), and the Local Government Aid program.

Taxpayers may only come to appreciate this relationship, however, when reductions in state general-purpose aid force local governments to increase property taxes or reduce service levels.

Urban and rural interests are often at odds over the fairness of the Minnesota tax system and how much the other pays for service. Policymakers are always sensitive to the affects policy changes will have on property taxes, and the most credible source of information is the Minnesota House Research property tax model.⁸ In one simulation, property taxes are calculated for the average homestead in both the 7-county (Twin Cities) metropolitan area, and the remaining 80 non-metropolitan counties. Comparing the 7-county area to the rest of the state is an increasingly narrow interpretation of the metropolitan region, but it does still serves as a good surrogate for the urban-rural divide.

As with the previous road revenue and expenditures data, the House Research results are averaged over the 3-year period 1997-99. Property tax estimates from House Research and spending data from the State Auditor are combined to estimate the road-related property tax and state general aid subsidy for services to the average value homes in metro and non-metro Minnesota (table 1).

Table 1: Homeowners get more road services than they pay for in property taxes
(*local road effort for the average valued homestead 1997-99*)

	<u>7-county metropolitan area</u>	<u>80 non-metropolitan counties</u>
Average homestead value	\$ 118,000	\$ 69,000
Property taxes - all services	\$ 1,924	\$ 816
Average cost of road service	\$ 206	\$ 148
Road-related property tax	\$ 145	\$ 92
General aid used for roads	\$ 62	\$ 56

Sources: Minnesota State Auditor 1997-99, Minnesota House Research 1997-99

⁸ Minnesota House Research Department, property tax final simulations pay 1997-1999.
<http://www.house.leg.state.mn.us/hrd/issinfo/ptxsims.htm>

The average value home in the metropolitan area for the 3-year period was \$118,000, and the homeowner paid \$1,924 in property taxes for all school, county, city or town, and special district services. By contrast, the average non-metropolitan homestead was valued at \$69,000, and had a total property tax bill of \$816. The average cost of road services to the average home in the 7-county metro was \$206. The homeowner's cost in property taxes was \$145, after allocating \$62 in funding from state tax relief. The average non-metro homeowner had road-related property taxes of \$92, but receives the equivalent of \$148 in road services. Urban homeowners pay 70% of road service costs through property taxes, while rural homeowners pay 62%.

A more in depth analysis, separating county services from city services, shows some potential fiscal vulnerability. The average metro home had road-related county property taxes of \$35, after a \$5 subsidy from state property tax relief. The average non-metro homeowner got \$66 worth of county road services, for \$53 in property taxes. City road-related property taxes were \$109 in the metropolitan area, while the average cost of road services was \$166. Non-metro cities provide \$82 in road services to the average home for just \$40 a year in property taxes. If state general-purpose aid diminishes further this latter group is most at risk. Rural cities get half of their general funds from state general-purpose aid. Rural counties are less reliant (80%) on property taxes than urban counties (88%) to fund county services. Compared to city governments, counties may consider categorical road aid a more important road funding issue than general-purpose aid for property tax relief.

Summary

State-local and urban-rural differences characterize Minnesota road use. State roads, designed for high speeds and long distance, account for 9% of statewide road miles, but generate 60% of the vehicle traffic. Local roads provide property access and neighborhood travel. They represent 91% of the total statewide road miles and 40% of vehicle travel. State roads in the Twin Cities region have daily traffic volumes three times higher than rural segments. Local roads in the metro area have five times the vehicle traffic of most non-metro systems.

Road funding responsibilities are broadly shared. Federal, state, and local taxes support \$2.4 billion in statewide road spending annually. Federal highway grants contributed 13% to overall spending, while state motor fuels and vehicle registrations taxes provide 45%. Local government general funds supply the remaining 42%.

Road taxes can illuminate or hide the true cost of road travel. State roads are financed primarily with motor fuel tax revenues. When taxes are tied to road use drivers receive feedback about the true cost of travel. Local roads are funded largely with property taxes and state general-purpose aid. Some fixed or hidden road charges are an appropriate part of the road tax mix, but over dependence on fixed sources can create network inefficiencies and road tax inequities.

The cost of local road travel varies widely across the state. Statewide, a vehicle mile of state road travel costs 3.1 cents, compared to an average 6.9 cents on local roads. At the

county-area level, however, spending on local roads can range from 5 cents per vehicle mile of travel to 20 cents per VMT.

State road aid substantially reduces the local tax effort. State and federal categorical road aid reduces the statewide average cost of local roads - to local taxpayers - to just 4.1 cents per mile. Again the local tax effort varies from 2.5 cents and 12 cents per VMT at the county-area level.

Property taxes only pay part of the local road effort. The average metro homeowner receives \$206 in local road services for just \$145 in property taxes. State general-purpose aids, designed to help equalize local government services, provide an \$62 subsidy. In rural Minnesota the average homeowner receives \$148 in road services, after paying \$92 in property taxes and getting \$56 in state tax relief. Homeowners pay about 70% of the road service value in property taxes in the metro area, and 62% in rural Minnesota. For rural homeowners, however, the road-related portion of their total tax bill is greater than for metro homeowners.

State general-purpose aid has a significant impact local road funding. Local government general funds are reliant on state aid for property tax relief. City governments are more dependent on general aid to fund local services than are counties. General-purpose aid is also relatively more important to local governments in rural Minnesota than to local governments in the Twin Cities metropolitan area.