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Report #17 in the series: *The Annualized Social Cost of Motor-Vehicle Use in
the United States, based on 1990-1991 Data*

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This report is one in a series that documents an analysis of the full social cost of motor-vehicle use in the United States. The series is entitled *The Annualized Social Cost of Motor-Vehicle Use in the United States, based on 1990-1991 Data*. Support for the social-cost analysis was provided by Pew Charitable Trusts, the Federal Highway Administration (through Battelle Columbus Laboratory), the University of California Transportation Center, the University of California Energy Research Group (now the University of California Energy Institute), and the U. S. Congress Office of Technology Assessment.

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- Report 14:** The External Damage Cost of Direct Noise from Motor Vehicles (M. Delucchi and S. Hsu) (with separate 100-page data Appendix)
- Report 15:** U.S. Military Expenditures to Protect the Use of Persian-Gulf Oil for Motor Vehicles (M. Delucchi and J. Murphy)
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- Report 17:** Tax and Fee Payments by Motor-Vehicle Users for the Use of Highways, Fuels, and Vehicles (M. Delucchi)
- Report 18:** Tax Expenditures Related to the Production and Consumption of Transportation Fuels (M. Delucchi and J. Murphy)
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LIST OF ACRONYMS AND ABBREVIATIONS AND OTHER NAMES

The following are used throughout all the reports of the series, although not necessarily in this particular report

AER = *Annual Energy Review* (Energy Information Administration)
AHS = *American Housing Survey* (Bureau of the Census and others)
ARB = Air Resources Board
BLS = Bureau of Labor Statistics (U. S. Department of Labor)
BEA = Bureau of Economic Analysis (U. S. Department of Commerce)
BTS = Bureau of Transportation Statistics (U. S. Department of Transportation)
CARB = California Air Resources Board
CMB = chemical mass-balance [model]
CO = carbon monoxide
dB = decibel
DOE = Department of Energy
DOT = Department of Transportation
EIA = Energy Information Administration (U. S. Department of Energy)
EPA = United States Environmental Protection Agency
EMFAC = California's emission-factor model
FHWA = Federal Highway Administration (U. S. Department of Transportation)
FTA = Federal Transit Administration (U. S. Department of Transportation)
GNP = Gross National Product
GSA = General Services Administration
HC = hydrocarbon
HDDT = heavy-duty diesel truck
HDDV = heavy-duty diesel vehicle
HDGT = heavy-duty gasoline truck
HDGV = heavy-duty gasoline vehicle
HDT = heavy-duty truck
HDV = heavy-duty vehicle
HU = housing unit
IEA = International Energy Agency
IMPC = Institutional and Municipal Parking Congress
LDDT = light-duty diesel truck
LDDV = light-duty diesel vehicle
LDGT = light-duty gasoline truck
LDGV = light-duty gasoline vehicle
LDT = light-duty truck
LDV = light-duty vehicle
MC = marginal cost
MOBILE5 = EPA's mobile-source emission-factor model.
MSC = marginal social cost

MV = motor vehicle
NIPA = National Income Product Accounts
NO_x = nitrogen oxides
NPTS = Nationwide Personal Transportation Survey
OECD = Organization for Economic Cooperation and Development
O₃ = ozone
OTA = Office of Technology Assessment (U. S. Congress; now defunct)
PART5 = EPA's mobile-source particulate emission-factor model
PCE = Personal Consumption Expenditures (in the National Income Product Accounts)
PM = particulate matter
PM₁₀ = particulate matter of 10 micrometers or less aerodynamic diameter
PM_{2.5} = particulate matter of 2.5 micrometers or less aerodynamic diameter
PMT = person-miles of travel
RECS = Residential Energy Consumption Survey
SIC = standard industrial classification
SO_x = sulfur oxides
TIA = *Transportation in America*
TSP = total suspended particulate matter
TIUS = *Truck Inventory and Use Survey* (U. S. Bureau of the Census)
USDOE = U. S. Department of Energy
USDOL = U. S. Department of Labor
USDOT = U. S. Department of Transportation
VMT = vehicle-miles of travel
VOC = volatile organic compound
WTP = willingness-to-pay

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17.1 INTRODUCTION

17.1.1 Background

Federal, state, and local governments spend over a hundred billion dollars per year to build and maintain roads and provide a variety of services, such as highway patrol, for motor-vehicle users (see report #7 in the UCD social-cost series). To pay for these infrastructure and service expenditures governments do *not* charge motor-vehicle users a single, explicit, comprehensive price for the use of roadways and motor-vehicle-related services, but rather collect revenue from a variety of taxes and fees ranging from road tolls to motor-fuel taxes to general-fund tax receipts. Some of these taxes and fees, such as road tolls, function like prices on the use of public motor-vehicle infrastructure and service (MVIS); some, like sales tax receipts, are purely general taxes unrelated to motor-vehicle use; and some, like fuel-excite taxes, may be said to be “in-between” a price on the use of MVIS and a general tax on all commodities.

For two reasons, many people care a great deal about the amount and kind of government-levied taxes and fees used to pay for government-provided MVIS. First, the taxes and fees affect how and how much motor vehicles and other transportation modes are used, and hence are of interest to persons who want to encourage or discourage motor-vehicle use, or maximize the economic efficiency of transportation choices, or accomplish other social objectives¹. Second, the taxes and fees affect how and how much people *pay* for MVIS, and hence are of interest to people who care about the fairness, or equity, of government patterns of taxation and expenditure. It is this concern with equity that motivates comparisons of user payments for MVIS with government expenditures for MVIS – a comparison which lies at the center of this report.

Because public MVIS is very costly, on the one hand, and because not every one uses and benefits from MVIS to the same extent, it is reasonable to feel that those who use and benefit from public MVIS should pay the government for it, perhaps in some relation to their extent of use or benefit². (Put another way, if MVIS were not very costly, or if everyone used or benefited from MVIS more or less the same, then only economists would care how exactly MVIS was paid for.) This feeling naturally leads

¹Of course, interest in motor-fuel and motor-vehicle taxes and fees in general is quite broad. Analysts have examined the optimal (second-best) gasoline tax (e.g., Parry and Small, 2001), the incidence of federal and state motor-fuel taxes (Chouinard and Perloff, 2003; Krupnick et al., 1993), the political feasibility of raising fuel taxes (Hammar et al., 2004), the history and disposition of gasoline taxes (Puentes and Prince, 2003), and the implications of financing transportation projects from general fees rather than user charges (Goldman and Wachs, 2003).

² For example, Kane (1983) notes that in cost allocation studies (which are similar in motivation and method to comparisons of costs and payments), “the two generally used measures for allocating costs are cost occasioning (those who give rise to costs should be made to bear the costs) and benefits received (those who receive the larger benefits of a road system should bear the larger cost of providing it)” (p. 93).

people to ask whether motor-vehicle users are in fact paying the government “the right amount” for government-provided MVIS.

17.1.2 Overview of the report

The objective of this report is to establish a reasonable framework for estimating motor-vehicle-user payments towards government-provided MVIS, and then to estimate those payments and compare them with government expenditures. (Government expenditures towards MVIS are estimated in Report #7 and incorporated here for comparison with user payments.) First, I argue that the purpose of estimating tax and fee payments by motor-vehicle users is to determine whether users pay governments a “fair” amount. I thus emphasize at the outset that the debate is primarily about *equity*, not directly about *economic efficiency*. I show that a simple comparison of current tax and fee payments – however defined – with current motor-vehicle-related costs (however defined) tells us little about optimal pricing, optimal revenues, optimal expenditures, or optimal use of public or private transportation resources.

Next, I classify the various taxes and fees that one might count as user payments according to the breadth (or “targetedness”) and disposition of the taxes and fees. The breadth or targetedness of the taxes concerns whether the taxes and fees apply only to motor-vehicle use, or to all commodities and services, or to something in between. The disposition of the taxes or fees concerns whether or not they are dedicated to government MVIS. With these considerations, I establish five classes of user payments (A1, A2, B, C1, and C2).

I then present four ways one might tally up user payments (and government expenditures), the differences (on the payment side) owing ultimately to different notions about how taxes and fees ought to be related to actual motor-vehicle use in order to “count” as a user-payment towards government MVIS. These four “Ways of Counting” user payments treat the five different classes of taxes and fees differently³.

After further discussing the conceptual framework outlined above, I make detailed estimates of all tax and fee payments to all levels of government in the U. S. in a base year of 1991. (I make less detailed estimates for other years from 1989 to 2002.) I begin with a list of everything that by any criteria could be considered to be a possible payment by motor-vehicle users. From this list of all (or nearly all) possible payment items I make estimates of user payments according to Way #1, Way #2, and Way #3 of Counting, and compare them with corresponding estimates of government expenditures. (Way #4 of counting requires a formal macro-economic model, which is

³ Note too that the four Ways of Counting payments all presume that the amount of the payment from any person should be related to the amount of motor-vehicle use. If instead one wishes to distinguish only between people who don’t use motor-vehicles at all and people who do, and then doesn’t care how the motor-vehicle users make their payments, then one would do a different analysis, which focuses on motor-vehicle users versus non-users. Appendix 17-A.1 presents an analysis of non-user versus user payments.

beyond my scope here). Because the list of user payments estimated here is comprehensive and detailed, the reader also can fashion his or her own tally of user payments and compare them with government expenditures. (Report #7 in the social-cost series presents detailed estimates of government expenditures for MVIS.)

17.1.3 Previous studies

U. S. national studies. Not surprisingly, there is a good deal of argument about whether motor-vehicle users in the U. S. pay fully for government-provided MVIS. Lee (1994), MacKenzie et al. (1992), and others have argued that in the U. S., payments by motor-vehicle users fall well short of outlays by the public for roads and related services. But Beshers (1994) and Lockyer and Hill (1992) claim that in the U. S. road-user tax and fee payments at least equal government expenditures related to motor-vehicle use, and Dougher (1995) argues that road-user payments exceed related government outlays by 50%. Morris and DeCicco (1996, 1997) revise Dougher's (1995) accounting, deducting general taxes from the revenue side and adding some motor-vehicle-related services to the expenditure side, and find that revenues from users fall short of government expenditures by 22%. Similarly, the most recent highway-cost allocation study by the Federal Highway Administration (FHWA) et al. (1997) indicates that "highway user fees" are about 20% below highway-related expenditures, for all levels of government and all vehicle classes in the U. S. in 2000⁴.

Studies of U. S. regions and of other countries. As one would expect, there are genuine differences in payments versus expenditures from region to region in the U. S. and from country to country, independent of differences in accounting frameworks. Cameron's (1994) accounting for Southern California in 1991 suggests that tax and fee receipts related to motor-vehicle use easily exceed public-sector expenditures (when bus and rail receipts and expenditures are excluded from both sides of the ledger), but Komanoff and Sikowitz's (1995) accounting for New Jersey indicates that there, receipts are only 77% off expenditures. Hanson's (1992) accounting for Wisconsin in the early 1980s indicates that state and federal user fees are only about half of roadway expenditures by all levels of government, and Ryan and Stinson's (2002) accounting for the seven-county Twin Cities metropolitan area of Minnesota in 1996 shows that user taxes and fees (which exclude general property taxes, general state aid, and special assessments) provide about 60% of all revenue used for highways.

Newbery shows that in Britain the ratio of road-use taxes to road costs (excluding accidents) was 1.4 in 1986 (Newbery, 1988) and 1.9 in 1996/97 (Newbery, 1998), mainly because of much higher fuel taxes in Britain than in the U. S. Booz Allen Hamilton (2005) estimate a user-payment/road-cost ratio of 0.70 for New Zealand in 2001 when interest charges on capital are treated symmetrically on the payment and expenditures side, as in this report.

⁴ The FHWA cost allocation study estimated the ratio of user payments to allocated costs for different vehicle classes in the year 2000, as follows: automobiles, 0.7, pickups and vans, 0.9, buses, 0.4, combination trucks over 80,000 lbs, 0.7, all trucks, 0.8, all vehicles, 0.8.

In the U. S., the disagreements about user payments versus expenditures result from different opinions about what should count as a “user payment” to the government, on the one hand, and what should count as a government expenditure related to MVIS, on the other. More specifically, the disagreements center around the proper treatment of non-targeted taxes and fees on the payment side and indirect government expenditures related to MVIS on the expenditure side. This report illuminates this debate by providing an original, detailed, comprehensive accounting of all possible user payments and delineating several ways of adding up and comparing them with government expenditures.

17.1.4 The contribution of this analysis

As indicated in section 17.1.3, there have been a number of analyses of motor-vehicle-user payments and government motor-vehicle-related expenditures. Our analysis of motor-vehicle-user payments and government motor-vehicle-related expenditures in the U. S. expands and improves upon this previous work in several ways:

- 1) We have a clearly delineated conceptual framework. We explain why people are interested in motor-vehicle-related payments versus government expenditures, and how the results of such analyses may be interpreted and applied. We carefully construct four different Ways of Counting “motor-vehicle user payments” and “government expenditures for MVIS” and make estimates for three of these Ways.
- 2) We have a comprehensive accounting system: we have identified and quantified all potentially relevant and significant categories of motor-vehicle-user payments and government motor-vehicle-related expenditures. On the payment side we quantify all conceivable targeted and non-targeted taxes and fees, such as severance taxes on oil production, special property taxes on motor vehicles, and general sales taxes on vehicles and fuels. On the expenditure side we quantify all conceivable direct and indirect costs such as the motor-vehicle-related costs of fire-protection services and the judicial and legal system (Report #7 in the social-cost series).
- 3) Our estimates are built on original, detailed analyses of primary data, for a base year of 1991. In all payment and expenditure categories we use primary government data as opposed to estimates derived from the work of other analysts. We use primary data for both our direct estimates of expenditures and payments and for our estimates of the motor-vehicle-related share of certain government expenditures. To estimate payments and expenditures for years other than 1991, we use a combination of primary data (for the most important payment and expenditure categories) and extrapolation.
- 4) We have a rigorous estimation method that ensures that our estimates of motor-vehicle-user payments are consistent with our estimates of government motor-vehicle-related expenditures. Where possible, we use the

same primary data sources for both payments and expenditures; we apply capital amortization principles and interest rates consistently to payments and expenditures; and we develop a careful, comprehensive, internally consistent definition of “low-cost” and “high-cost” cases, in which “low cost” means low expenditures and high payments.

17.1.5 The purpose of estimating user payments

Before we categorize and then estimate taxes and fees related to motor-vehicle use, it will be useful to emphasize again that the purpose of the exercise is to shed light on the *fairness* of patterns of government taxation and expenditure, *not* to gain insight into the economic efficiency of government taxation or expenditure. To see this more clearly, let us suppose that we estimate that motor-vehicle users pay \$X annually for public MVIS that costs \$Y annually. (Or, put in terms of marginal revenue and expenditures, suppose we estimate that government receives \$X in marginal tax and fee revenues as a result of some change in motor-vehicle use, and correspondingly spends \$Y on infrastructure and services.) The pertinent contextual question here is: what, if anything, does the difference \$X minus \$Y or the ratio of \$X to \$Y tell us? Does the difference between \$X and \$Y represent economic inefficiency in some sense? For example, if we changed user taxes and fees so that total payments equaled \$Y instead of \$X, would we have insured the most economically efficient use of the transportation system, or at least have increased the efficiency of use?

The answer to foregoing questions regarding efficiency is “no, not necessarily”. The difference between government revenues and government expenditures related to MVIS has no straightforward relevance in an analysis of social costs or efficient pricing. In the first place, it is *not* a condition of efficiency that a government recover from users revenues equal to costs. In the second place, current user taxes and fees, of which the motor-fuel tax is the largest, do not look anything like *efficient* (i.e., marginal-cost) prices, which means that changing the *magnitude* but not the *structure* of the current taxes and fees (which is all that we do when we demand simply that taxes and fees be increased to cover costs) might decrease economic welfare as soon as increase it. As discussed in Report #1 and other sources (Congressional Budget Office, 1992; Gillen, 1997; Booz Allen Hamilton, 2005), the relevant condition of economic efficiency is marginal-cost pricing, which, when applied to highways and public MVIS would result in a price and tax structure that would look nothing like the present charge structure⁵,

⁵ An efficient highway-user charge would have two components: a variable-cost charge, equal to the cost of wear of the highway per mile of travel, and a congestion charge, equal to the cost of delay imposed on all other travelers as a result of an additional mile of travel by each. (Of course, there also should be charges for environmental externalities, but I do not call these “highway user” charges.) The congestion toll can be viewed as a “capacity” charge, because the congestion creates “pressure” on highway capacity, and under certain conditions the congestion toll finances the optimal expansion of the highway.

Discussions of the relationship between optimal congestion tolls and optimal long-run capacity of roads can be found in texts on transportation economics (e.g., Mohring, 1976) or urban economics (e.g., Mills and Hamilton, 1984), and in articles on pricing of infrastructure (e.g., Keeler and Small, 1977;

and which would *not* generate user revenues sufficient to cover government expenditures.

The structure of present “user” taxes and fees. Let us examine first this question of the structure of present user taxes and fees more closely. None of the present highway user taxes and fees were set to be marginal-cost prices⁶. Consider the most prominent of the present user fees, the motor-fuel tax. The excise tax on motor fuel is a charge per gallon consumed. The public service and infrastructure putatively being charged for is highway construction and maintenance. But clearly there is little correspondence between fuel consumption and “consumption” of highway infrastructure and services, and as a result the fuel tax is not a marginal-cost price on highway use. The amount of highway that a driver “consumes” depends on the type of highway (a freeway is orders of magnitude more costly per mile than a dirt road), the amount and kind of driving, the weight and other characteristics of the vehicle (a very heavy truck causes much more road damage, and necessitates a much heavier road, than does a light-duty automobile), and other factors. There may be some correspondence between fuel consumption and wear and tear of the highways, because the weight of a vehicle affects both its fuel consumption and the damage it causes to the road, but neither relationship -- between weight and fuel economy, and between weight and road damage -- is one of strict proportion. Many factors other than total weight affect fuel economy and road damage, and as a result a heavier vehicle may have lower fuel consumption and cause less road damage than does a lighter vehicle.

The upshot, as the FHWA (1982) notes, is that “the relationship of the fuel tax to ESAL- or PCE-related costs is negligible. To impose anything approximating efficient highway user charges, new pricing instruments will need to be developed” (p. E-64) (ESAL and PCE are measures of highway “use”; see for example Hajek [1995]). The Congressional Budget Office (1992) agrees, noting that “fuel taxes...do not correlate closely with the actual costs imposed by specific users” (p. 15), a problem which has “led planners to seek taxes or charges that do” (p. 11). Finally, Button (1993) remarks that “charges levied on road users relate very little to the costs of providing and maintaining the infrastructure provided let alone to wider notions of optimizing its use either from a purely traffic perspective or from a much wider social perspective” (p. 99).

The same could be said about user fees other than the fuel tax; namely, that they certainly are not set at marginal cost. Given, then, that the structure of current taxes and fees is so different from an economically efficient structure, it is not possible to know *a priori* the effect on economic efficiency of changing the magnitude but not the structure of current taxes and fees.

Newbery, 1989; Gillen, 1997). For discussions of the related but broader issues of privatizing and pricing highways, see for example Gomez-Ibanez et al. (1991) and Fielding and Klein (1993).

⁶Some road tolls, probably by coincidence, may be efficient prices. Similarly, some fines and producer charges may be efficient (equal to marginal cost), but again most likely only by coincidence.

The relationship between total costs and total payments. Moreover, it is clear that with efficient pricing of highways and related services, price-times-quantity revenues need not cover costs. For example, an efficient variable-cost charge for wear and tear will cover the cost of highway maintenance and repair, but an optimal congestion toll may or may not cover the optimal long-run capital cost of the highway. Indeed, the congestion toll will cover the capital cost only if: a) the road is in fact congested (even at its optimal size, it need not be)⁷, and b) the cost/capacity-unit of the highway is constant or rising with additional capacity⁸. If these conditions are not met, then there will be a revenue shortfall or surplus. Ideally, any revenue shortfall will be made up by inverse elasticity pricing or lump-sum transfers from individuals to the public sector (see CBO [1992] for an accessible discussion of these measures). Importantly, from the standpoint of efficiency the individuals who make the lump-sum transfers need not be users. Thus, making payments equal to costs does not in itself necessarily improve economic efficiency.

Summary. If our objective is to have efficient use of transportation infrastructure and services, then we should set prices on the infrastructure and services equal to marginal social costs. The exercise of adding up the revenues from the currently in-place (and economically inefficient) taxes and fees on motor-vehicle use and comparing the total with total government expenditures is not by itself directly relevant to the exercise of setting efficient marginal social-cost prices⁹.

⁷The optimal capacity of the road is that at which the marginal cost of providing an additional unit of capacity is just equal to the total willingness to pay for the additional unit of capacity. If capacity can be added in infinitesimal increments starting at zero, then generally, willingness to pay for additional capacity will be greater than zero only if there is congestion. Thus, if all roads were perfectly malleable all the way down to nonexistence, all (are nearly all) optimally sized roads would have some congestion. (There still would be exceptions: an optimally sized road for one user could not be congested.) But roads are not perfectly malleable; they must be built in discrete units. The most important discrete jump is that between no road and a one-lane road. Often it will be the case that the total willingness to pay for a one-lane road will equal or exceed its cost, but that the resultant road never will be congested. In this case, a congestion toll will generate no revenues, and the road capital cost will have to be financed by other means.

⁸There has been much debate over whether cost/capacity-unit for highways increases, decreases, or remains constant with increasing capacity. Anderson and Mohring (1997) cite studies that found constant cost, but Mills and Hamilton (1984) cite studies that found increasing or decreasing costs. If the cost/capacity is decreasing, then as discussed in Appendix B of Report #1, the marginal-cost price, multiplied by quantity, will not cover total cost.

⁹If current user charges had the incidence and structure (but not magnitude) of correct marginal-cost prices, and if it were true that optimal pricing of government-provided transportation goods and services would generate user revenues at least equal to costs, then the difference between current user revenues and current government expenditures would indicate the minimum amount by which user charges would have to be increased in the aggregate. But even this would not be sufficient information, because it would not tell us how much to increase which charges.

But even though we cannot say that efficiency requires that revenues from the present tax and fee system equal government expenditures, we may say that *fairness* demands it. (Similarly, we also may demand that the government highway enterprise operate with a balanced budget.) Exactly *how* users should pay is a matter of judgment. In section 17.1, we mentioned that we will establish five different classes of taxes and fees that might be counted as “user payments,” and four different Ways of Counting payments. In the following section we elaborate on these classes of taxes and fees and Ways of Counting.

17.2 CLASSES OF TAXES AND FEES AS POTENTIAL USER PAYMENTS TOWARDS MOTOR-VEHICLE INFRASTRUCTURE AND SERVICES

Motor-vehicle products and services are subject to a wide range of taxes and fees, some of which are earmarked by the government to be spent on highways and related motor-vehicle services, some of which are not. Beyond that, persons who use motor vehicles pay general taxes, on items unrelated to motor-vehicle use (e.g., sales taxes on televisions), that provide general funds for motor vehicle infrastructure and services (MVIS). Table 17-1 lists all of the government taxes, fines, and fees that might be considered to be related to the use of motor vehicles and fuels.

As mentioned in section 17.1.3, arguments about whether motor-vehicle users “pay their way” are in part arguments about which tax and fee payments ought to be counted against government expenditures. Arguments about which taxes and fees should count depend in part on the breadth or “targetedness” of the tax or fee in question: whether it applies only to motor-vehicle use, or to all commodities and services in the national economy, or to something in between. Therefore, to begin to address this question of whether motor-vehicle users “pay their way,” we establish five classes of possible user tax and fee payments for MVIS, distinguished in part according to the extent to which they are targeted at motor-vehicle users:

- A1) special taxes and fees levied only on motor vehicles, motor fuels, drivers, and so on, and used by government for motor-vehicle-related purposes;
- A2) other taxes and fees specifically related to motor-vehicle use;
- B) selective taxes and fees levied on a limited number of commodities (broader than the category “motor-vehicles, motor fuels, drivers, etc.,” but not as broad as the category “all commodities”);
- C1) general taxes and fees on a wide range of commodities; and
- C2) general tax expenditures or subsidies.

In the following sections of this report, we discuss our five classes of user payments in more detail.

17.2.1 Classes A1 and A2: special taxes and fees targeted to vehicles and fuels

First, we distinguish special taxes and fees that are levied *only* on motor vehicles, motor fuels, driving, parking, and other motor-vehicle activities and commodities, from all other more general tax and fee revenues. In the class of special taxes and fees, which we will designate class A, are such things as gasoline excise taxes, road tolls, and motor-vehicle registration fees. These special taxes are distinguished from more general taxes such as sales taxes on motor vehicles or televisions. One important feature of the tax and fee revenues in class A is that they come from motor-vehicle users as opposed to non-users, and presumably will change in proportion to changes in motor-vehicle use, whereas the revenues from more general taxes (classes B and C) may or may not come from users and may or may not result from additional motor-vehicle use.

Within class A we may make a further distinction based on the classification of the Federal Highway Administration (FHWA). The FHWA is an important original source of data on government expenditures and receipts for highway-related purposes (e.g., FHWA, *Highway Statistics*, annual report). In its *Highway Statistics* annual report, FHWA identifies a class of taxes and fees that according to its criteria are highway-user payments for the highways (see section 17.3.1 for details). Because the FHWA data on expenditures and receipts are widely used, and because the FHWA classification of user payments for the highways is used as the basis of some studies of highway costs versus user payments, it is sensible to define here a separate class of taxes and fees that corresponds to the FHWA class of “highway user payments for the highways.” This is a subset of our class A here – class A1. This leaves a variety of taxes and fees that are specifically related to motor-vehicle use but that FHWA does not classify as highway user payments for the highways. These compose our class A2. Examples of taxes and fees in this class (A2) are portions of fuel taxes and other user fees allocated specifically for deficit reduction, mass transit, and other nonhighway purposes.

17.2.2 Class B: selective taxes

Next, we make two classes out of the broad category of taxes that are not specific to motor-vehicles and motor fuels. The first (class B) are certain taxes on the production or use of motor vehicles and fuels that are part of a selective tax structure that focuses on a limited range of commodities. The breadth of these *selective* taxes fall in between the wide breadth of the general taxes of class C and the narrow breadth of the special taxes of class A. Selective taxes include severance taxes on energy production and certain property taxes and sales taxes on motor vehicles. Because selective taxes and fees apply to commodities other than motor vehicles and motor fuels, albeit not to *all* commodities, one might decide that selective taxes and fees are meant to be more like general tax payments towards a range of government services as opposed to user payments for specific things like MVIS. And as is the case with general taxes of class C, the relationship between changes in motor-vehicle or motor-fuel use and *net* changes in revenue from selective taxes and fees is not immediately clear (this observation being pertinent to Way #4 of counting).

17.2.3 Classes C1 and C2: general taxes and general-tax subsidies

General taxes on the production and use of motor vehicles and motor fuel include: corporate and personal income taxes in businesses related to motor-vehicle and motor-fuel production and use; general sales taxes on vehicles, fuels, and related items; and property taxes on vehicles and roads. By definition the general taxes of class C are part of a broad tax structure that covers many and in some instances virtually all commodities. Because these taxes apply to most commodities, and not just to motor vehicles and fuels, they may be considered to be taxes for a wide range of general government services rather than user payments for specific things like government-provided MVIS.

In this class of general taxes we include estimates of government “tax expenditures” related to motor-vehicle use. Tax expenditures (also called “tax subsidies”) represent a loss of government tax revenue due to a particular commodity being taxed at less than a prevailing or average rate. Tax subsidies can be estimated in several categories: corporate income taxes paid in motor-fuel and motor-vehicle industries; general state and local sales taxes paid on vehicles, fuels, parts, and automotive services; and general state and local property taxes foregone on development displacement by roadways. Corporate income-tax subsidies and general sales-tax subsidies are estimated in report #18 in our social-cost series and are applied in this report. Property-tax subsidies related to roadways are estimated in this report.

17.2.4 Classes of government expenditures

On the expenditure side of the ledger, there are arguments about precisely which government expenditures ought to be attributed to motor-vehicle use and hence compared with motor-vehicle user tax-and-fee payments. Some types of expenditures (e.g., for highways) are obviously directly related to motor-vehicle use, but other types (such as judicial-system costs for prosecuting car thieves) are related to motor-vehicle use only indirectly, and hence arguably could not be counted as government expenditures on MVIS. This suggests that it is useful to make a general classification of expenditures according to how directly they are related to motor-vehicle use:

- A1. Direct expenditures (FHWA basis)
 - A1.1 Annualized cost of highways, including on-street parking and embedded private-sector contributions, but excluding collection expenses, leaking underground storage-tank (LUST) costs, extra maintenance and repair costs
 - A1.2 Highway law enforcement and safety as estimated by FHWA
- A2. Other direct expenditures (not in FHWA)
 - A2.1 Collection expenses, LUST costs, extra maintenance and repair
 - A2.2 Annualized cost of municipal and institutional offstreet parking
 - A2.3 Deduction for embedded private investment in roads
- B. Indirect expenditures
 - B.1 Other police-protection costs (not estimated by FHWA) related to MV use
 - B.2 Fire-protection costs related to MV use

- B.3 Emergency-service costs of MV accidents included in police and fire costs
- B.4 Judicial and legal-system costs related too MV use
- B.5 Legal costs of MV accidents included under judicial and legal-system costs
- B.6 Jail, prison, probation, and parole costs related to MV use
- B.7 Regulation of air, water and solid-waste pollution related to MV use
- B.8 Energy and technology research and development related to MV use
- B.9 MV-related costs of other government agencies
- B.10 Military expenditures related to the use of Persian-Gulf oil by MVs
- B.11 Annualized cost of the Strategic Petroleum Reserve

These expenditure items are discussed in detail in Report #7.

17.3 WAYS OF COUNTING TAXES AND FEES AS MOTOR-VEHICLE-USER PAYMENTS

In this section we establish four different Ways of Counting user payments and government expenditures for MVIS. The four Ways count classes of payments (A1, A2, B, C1, and C2) and classes of expenditures (A1, A2, and B) differently, to wit:

	<u>User payments</u>	<u>Government expenditures</u>
<u>Way #1,</u> Targeted taxes and fees; direct expenditures (FHWA method)	Only taxes and fees that are specifically targeted to highway users <i>and</i> are actually used by government for highways are counted as user payments. (This is similar to the method used by the FHWA.)	Only direct government expenditures on highways (e.g., capital, repair, highway patrol) are counted as government expenditures for MVIS. (This is similar to the method used by FHWA.)
	Comprises: class A1.	Comprises: class A1.
<u>Way #2</u> All targeted taxes and fees; all direct expenditures.	Same as Way #1 plus a few targeted user payments that FHWA excludes.	Same as Way #1 plus some direct expenditures related to motor-vehicle use that FHWA excludes.
	Comprises: class A1 and Class A2.	Comprises: class A1 and Class A2.
<u>Way #3, All</u> targeted and some nontargeted taxes and fees;	Same as Way #2 plus some portions of selective and general taxes and fees not targeted specifically to motor vehicles or	Same as Way #2 plus government expenditures related indirectly to the production and use of motor vehicles and motor

all direct and indirect expenditures	motor fuels Comprises: class A1, Class A2, Class B, and some of Class C.	fuels. Comprises: class A1, Class A2, and Class B.
Way #4 Marginal changes in user payments; marginal changes in expenditures	Whatever <i>net additional</i> revenues from taxes and fees the government gains as a result of some marginal change in motor-vehicle use is counted as user payments against whatever net additional expenditures the government makes as a result of the change. Not formally estimated here.	

As we discuss these ways of counting, it is important to keep in mind that our purpose here is to decide what will be included in our tally of “user payments towards MVIS,” a tally which is to be compared with our estimates of government expenditures for MVIS for the purpose of answering the question of whether motor-vehicles make “fair” contributions towards public motor-vehicle related costs. Note also that while I do discuss Way Counting #4, I do not actually make any estimates of costs under this Way.

17.3.1 Way of Counting #1: Targeted taxes and fees and direct expenditures, FHWA method

User payments. Way #1 of counting user payments adopts the FHWA’s relatively restrictive criteria for determining what counts as a user payment for government-provided MVIS. Specifically, it counts only taxes and fees that are specifically targeted towards motor-vehicle users *and* that are actually applied by government towards MVIS. Thus, it does not count anything that FHWA deems to be a “nonuser” charge or anything that is not specifically dedicated for MVIS.

The FHWA, which in the *Highway Statistics* annual report tabulates revenues and expenditures related to highway use, counts a tax or fee as a user payment for highways if it meets two criteria. First, the tax or fee must qualify as a “highway user” charge, and second, it must *not* be specifically allocated for *nonhighway* purposes. The FHWA (*Highway Taxes and Fees, How They are Collected and Distributed*, 1991) elaborates on the distinction between highway-user and nonuser charges:

In recent years, the distinction between highway-user taxes and other State taxes that are dedicated for highways has become more difficult to determine. For example, the advent of the variable motor-fuel and motor-vehicle tax (ad valorem or percentage) requires a closer look at the specific mechanics of the tax in order to classify it as a highway-user or nonuser tax. Although the language of the enabling legislation may be similar among these taxes, the classification of a tax as a highway-user tax is dependent upon the placement of the tax burden. Thus, if the tax is applied to a broad spectrum of commodities (even if a given portion is dedicated to highways), it is considered by

FHWA to be a nonuser tax...Conversely, if a tax is exclusively (or substantially) targeted to highway users, it is included [as a highway-user tax]... (p. i)

Others have suggested similar criteria. For example, the CBO (1992) suggests that “if the revenues go to a general fund, the tax should not be considered a user tax” (p. 16-17). This idea goes back at least 40 years to Zettel (1961), who noted:

Admittedly, it is not easy to devise a completely satisfactory definition of a user charge. Perhaps the best generalization is that a user charge is an impost bearing upon the ownership or use of a motor vehicle which is over and above the general tax obligations of the user. It is helpful to add that the user charge should have no clear counterpart in the general tax structure (p. 6).

With its second qualification – that a highway-user charge not be allocated specifically to nonhighway purposes – FHWA excludes as a payment for highways all highway-user revenues allocated for deficit reduction, mass transit, and other nonhighway purposes. They also do not count the cost of collecting highway-user imposts as a highway-related cost, or the payments that are allocated to cover collection expenses as a payment by highway users for highways. By contrast, under Way #2, which we discuss next, we ignore earmarking for non-highway purposes and thus count the entire highway-user tax as a user payment for MVIS.

With reference to our classes of user payments, Way #1 of counting comprises class A1 user payments.

Interest component of user payments. Note that we make one important modification to the FHWA estimates of user payments: our estimates of payments and expenditures include an interest charge, whereas the FHWA’s do not. This is discussed in detail in section 17.4.2.

Government expenditures. For consistency with Way #1 of counting user payments, our Way #1 of counting government expenditures towards MVIS also adopts FHWA’s relatively restrictive accounting. FHWA counts only what it considers to be direct expenditures related to the use of highways: highway construction, highway maintenance and repair, and the highway patrol (see Report #7).

17.3.2 Way of Counting #2: All targeted taxes and fees and direct expenditures related to motor-vehicle use

User payments. Under Way #2, we count all direct tax or fee payments that FHWA counts (class A1) plus some payments that FHWA excludes solely because they are earmarked for what FHWA considers to be nonhighway purposes. The additional taxes and fees counted under Way #2 but not Way #1 include: highway-user tax revenues and tolls tax dedicated to what the FHWA refers to as “nonhighway purposes;” some motor-vehicle license fees (such as in-lieu-of-property-tax fees) dedicated to highways; some of what the FHWA considers to be “nonuser imposts dedicated to the highways;” air-quality or emission-control fees paid with vehicle registration; some environmental excise taxes; gas-guzzler taxes, luxury taxes, and other minor charges; parking and traffic fines; and parking taxes (Table 17-1). With reference

to our classes of user payments, Way #2 of counting comprise class A1 *and* class A2 user payments.

Government expenditures. Under Way #2 of counting expenditures, we make a few adjustments to the FHWA-based estimate of expenditures that constitutes Way #1 of counting. First, we exclude certain private-sector contributions to highways, on the grounds that they are not actually government expenditures, whereas FHWA includes them. Second, we include all costs related to collecting and administering highway user taxes and fees, because they are direct costs of highways, whereas FHWA excludes them. Finally, we include costs of municipal and institutional parking, because these are related to motor-vehicle use, whereas FHWA doesn't count them as "highway" costs.

17.3.3 Way of Counting #3: All targeted and some nontargeted taxes and fees, all direct and indirect expenditures related to motor-vehicle use

User payments. Under Way #3, we count a tax or fee as a user payment towards government MIVS if it is specifically related to the production or use of motor vehicles, motor fuels, etc., and if one cannot argue convincingly that the tax or fee by its nature must be considered to be a charge for services or goods unrelated to motor-vehicle use. The "nature" of the tax or fee is determined by its relation to other taxes and fees, the presence or absence of similar taxes and fees on non-motor-vehicle goods and services, and general social conventions.

Because all of the taxes and fees in class A1 and A2 are specifically related to motor vehicle use, and because there is to my mind no convincing reason to treat them as charges for goods or services unrelated to motor-vehicle use, I count them here, under Way #3, as user payments towards MIVS. These taxes and fees include all of the payments that FHWA counts as user payments for the highways (see section 17.3.1), plus several that they do not: highway-user tax revenues and tolls tax dedicated to what the FHWA refers to as "nonhighway purposes;" some motor-vehicle license fees (such as in-lieu-of-property-tax fees) dedicated to highways; some of what the FHWA considers to be "nonuser imposts dedicated to the highways;" air-quality or emission-control fees paid with vehicle registration; some environmental excise taxes; gas-guzzler taxes, luxury taxes, and other minor charges; parking and traffic fines; and parking taxes (see Tables 17-2 and 17-3).

What is not immediately clear under this Way of counting is whether or not user payments of selective or general taxes (classes B and C), such as the sales tax on motor vehicles, should count as a payment towards expenditures on MIVS, or whether they should be disallowed on the grounds that they ought to be considered to be general payments for other government goods and services. Consider first tax and fee payments in class B: selective sales and excise taxes on motor-vehicle and related goods and services; selective property taxes on motor-vehicle goods and services; severance taxes on natural resources; and other special taxes on petroleum and motor-vehicle businesses. These taxes and fees are not targeted only to motor vehicles and motor fuels, and are not dedicated to highways, but neither are they as broad-based as the most general taxes and fees. They are in some sense related to motor-vehicle use, albeit

indirectly. Thus, one reasonably might consider them to be user payments, but just as reasonably might not. Therefore, I do the analysis both ways: in a “low-cost” (high-payment) case, I lump these payments with the specific taxes of class A, and in a “high-cost” (low-payment) case, I lump them with the general taxes of class C. (See appendix 17-A.3 for a discussion of “low” and “high” as regards user payments in this analysis.)

Next we consider class C1: general sales taxes, property taxes, and so on, that are paid on motor vehicles and fuels but that are part of a broad tax structure that covers many commodities. Because these are part of a general tax structure, it seems more reasonable to view them as supporting a wide range of government services rather than as specifically related to motor-vehicle use. However, one might argue that a small portion of the general taxes paid on vehicles and fuels ends up effectively funding MVIS in particular: namely, the portion of the general tax payment that, after being mixed into the general fund, on average goes back towards funding any government-provided MVIS costs *not* covered by specific user payments. I estimate this portion and count it as user payment for MVIS. This ends up being a very small amount because only a small portion of government-provided MVIS is not funded by specific user payments, and only a small fraction of general funds go towards government-provided MVIS¹⁰.

Finally we consider general tax expenditures or subsidies (class C2), which are tax payments that exceed or fall short of a baseline “fair” amount. It turns out that motor-vehicle users get considerable tax subsidies, mainly in the form of property taxes foregone on development displaced by public roadways (see Report #18 in the social-cost series). I think it is reasonable to do the accounting either way – to count all of these subsidies, or to count none of them, as user payments. Hence, in the high-cost (low-payments case), I count tax expenditures (subsidies) against user payments, but in the low-cost (high-payments) case, I ignore them.

Because general tax payments (and to a lesser extent tax expenditures) related to motor-vehicle use are quite large, the extent to which they are counted as a payment for motor-vehicle use has a major impact on the comparison of payments with expenditures. Indeed, a significant part of the large differences among past studies

¹⁰ In the cost spreadsheet, this method of estimating the portion of a “general tax” that ends up funding MVIS is applied to any part of any tax and fee payment of Table 17-1 that is *not* counted in the first instance as a user payment for MVIS. Put another way, every tax payment treated in this report is designated in the first instance either as a specific tax for MVIS or else as a general tax. If it is designated a general tax, then every tax or portion thereof so designated is treated according to method detailed in section 17.6.7.

Formally, the amount of any tax or fee payment counted towards MVIS is equal to the fraction counted towards MVIS in the first instance plus the portion of the remainder that, as a “general tax,” ends up funding MVIS after being mixed into general funds:

$$TFmv_i = GRmv_i \cdot (Wmv_i + (1 - Wmv_i) \cdot Tu)$$

where $TFmv_i$ is the amount of tax and fee payment type i that ends up being counted as a payment for MVIS and all of the other terms are defined for equation 17-18.

(section 17.1.3) is due to different treatment of general taxes. For this reason, we focus more closely on the treatment of general taxes in section 17.6.

Government expenditures. Under Way #3, we count any government expenditure related directly or indirectly to the use of motor vehicles. We begin by identifying every general government expenditure category that might have a component related to motor-vehicle or motor-fuel use:

- highway construction, maintenance, and administration
- municipal and institutional offstreet parking
- highway law enforcement and safety
- other police protection
- fire protection
- courts
- prison, probation, and parole
- regulation and control of pollution
- research and development of motor-vehicles and motor-fuels
- other government-agency costs
- military expenditures related to the use of Persian-Gulf oil
- the Strategic Petroleum Reserve (SPR)

The estimation objective then is to estimate the public-sector costs that would be saved in each of the above expenditure categories in the long run if motor-vehicle use and the motor-vehicle infrastructure were eliminated. I will call this saved resource cost the “motor-vehicle-related” cost, or MVC. In most public-sector expenditure categories, MVC is estimated simply as the total annualized cost in the entire expenditure category, multiplied by the fraction of the total cost that would be saved were motor-vehicle use eliminated (call this fraction ΔACM). It is necessary to estimate ΔACM because, obviously, nobody keeps separate motor-vehicle accounts in the expenditure data for fire protection, police protection, and so on. The estimation of MVC, ΔACM , and other parameters is documented fully in Report #7 in the UCD social-cost series.

17.3.4 Way of Counting #4: “Marginal Changes”

In this Way of Counting we define user payments and government expenditures related to MVIS to be the net additional (or “marginal”) tax and fee payments to government and the net additional government expenditures that are generated by some additional (marginal) production and use of motor vehicles and fuels, relative to some base-case scenario. Underlying this Way of Counting is the notion that marginal changes in public MVIS should be self-financing. Suppose, for example, that some policy or investment results in an increase in miles of roadway, vehicles, vehicle-miles of travel, fuel-use, highway-related services, and so on. We can in principle estimate the additional governmental expenditures for this additional MVIS. But we also can estimate (in principle) the net additional governmental tax and fee revenue that actually results from the macroeconomic changes engendered by the additional production and use of vehicles, fuels, roads, parts, services, and so on. We then might consider it fair if the net additional revenue – which is additional with respect to some counterfactual or baseline scenario and net of changes in tax revenue from all sectors – is approximately equal to the additional government expenditures on MVIS.

Put another way, under Way #4 we believe that the production and use of motor vehicles and fuels should generate marginal net revenues that cover marginal government MVIS costs, regardless of what marginal-cost pricing would dictate, so that society does not “distort” mode choice by “subsidizing” some choices more than others¹¹. From this perspective, we argue that it is not fair if the net additional tax-and-fee revenue generated by the additional use of mode M equal or exceeds the additional governmental expenditures related to mode M, but the net additional revenue from the additional use of motor vehicles is less than the additional government expenditures on MVIS.

In the following paragraphs we discuss qualitatively how one might estimate marginal tax revenues from motor-vehicle production and use. However, we do not actually develop or apply any formal macroeconomic models that would allow us to estimate changes in marginal revenues associated with particular changes in motor-vehicle use.

Estimating marginal tax revenues from motor-vehicle production and use. In order to estimate marginal revenues and compare them with marginal expenditures, one must determine the relationship between changes in motor-vehicle use and changes in government revenue from different kinds of taxes and fees. To do this, one would compare tax and fee revenues given one level of vehicle use, fuel use, roadway, etc., with tax and fee revenues at some baseline (lesser) level. At both levels, the tax and fee rates and incidences would be assumed to be the same, as would be incomes,

¹¹ Although this might look like a misguided argument about efficient pricing, it need not be; it can be offered solely as one’s view of what is fair, regardless of what is efficient. I put the terms “distort” and “subsidies” in quotes because they are borrowed from the language of economic efficiency but are used in the context of equity, not efficiency. There is no rule (apart from the rule of avoiding confusion!) that says that equity criteria must not borrow any ideas from economic efficiency.

employment, and general economic indicators, but not necessarily specific patterns of expenditures. In the following elaboration, let us designate the baseline level of motor-vehicle use "I", and the higher level of motor-vehicle use (more vehicles, fuels, roads, drivers, etc.) "II".

It is immediately clear that at level II we would have more revenue from the taxes and fees levied only on vehicles, fuels, etc. (the class-A items from above) than we would have at level I. This is because these taxes and fees are levied *only* on motor-vehicle goods and services, and hence would change in proportion to the change in motor-vehicle use. Thus, if one assumed that the policy or investment that led us from level I to level II affected only motor-vehicle and motor-fuel production and use, then it would be relatively straightforward to estimate the marginal revenues, because only taxes and fee receipts related to the production and use of motor vehicles and motor fuels would change. However, if one took a more realistic macro-economic view, in which changes in economic activity in one sector (such as motor-vehicle use) could affect economic activity in other sectors, then a policy or investment aimed at motor-vehicle use would end up affecting tax and fee receipts from other sectors as well.

In this broader, more realistic macro-economic view, we know that if people bought more motor vehicles and motor fuel at level II than at level I, yet still had the same income and consumption patterns, then they might buy *less* of something else at level II than at level I. Hence, if the policy or investment that took us from motor-vehicle-use level I to level II resulted in more revenue from sales taxes and property taxes on motor vehicles, and more revenue from income taxes on motor-vehicle production, then it probably would result in less tax revenue due to the reduced purchases in other sectors.

Would the increased revenue from taxes on motor vehicles be more or less than the decreased revenue from taxes on the items that would have been bought? The answer depends on what exactly would have been bought, and how these other items would have been taxed compared with how motor-vehicles would have been taxed. Without further analysis, no generalizations are possible. For example, it is possible that the additional purchases of motor vehicles would displace the purchase of items for which there was no sales tax, but it also is possible that they would displace the purchase of items taxed at a higher rate on average than would be motor-vehicle sales.

In sum, changes in motor-vehicle use would change receipts of general taxes on the production and use vehicles and fuels, but also might have countervailing effects on receipts of general taxes on other commodities. The net effect cannot be determined by first principles; it must be modeled. I do not attempt such modeling here, and hence do not make a formal estimate of user payments under Way #4.

17.3.5 Tabulation of taxes and fees and ways of counting them

We now can present the classes of tax and fee payments in this analysis and the different Ways of counting taxes and fees as user payments towards MVIS in a table that shows whether or not and how each class of tax and fee payment is counted as a motor-vehicle user payment under each Way of counting. Each cell in the following table answers the key question pertaining to each Way of counting of tax and fee payments, for each of class of tax and fee payment:

Way of counting ---->	#1 Targeted taxes and fees, FHWA basis	#2 All targeted tax and fee payments	#3 Targeted and non-targeted payments	#4 Marginal Changes in payments
Key question	Are these revenues from targeted users and actually used for MVIS?	Are these directly targeted to motor-vehicle users?	Are these reasonably counted as payments for MVIS?	How do net tax revenues change when motor-vehicle use changes?
Class of taxes and fees↓				
A1. Special taxes and fees levied <i>only</i> on highway users <i>and</i> used by government for MVIS	Yes	Yes	Yes	Assume net revenues proportional to changes in MV use
A2. Other special taxes and fees related to motor-vehicle use but not counted by FHWA as highway-user charges	No, either because not actually used for MVIS	Yes, directly targeted to motor-vehicle users, even though the revenues might not actually be applied to highways	Yes, because directly related to motor-vehicle use, even though the revenues might not actually be applied to highways	Assume disposition of revenues is irrelevant; hence, assume net revenues proportional to changes in MV use
B. Selective taxes and fees levied on	No, because not targeted to users or not used for	No, because not targeted directly or	Maybe; treat like class A in one case, and like	Unclear a priori; depends on economic

fuels, vehicles, drivers, etc.	MVIS, or both	specifically enough to motor-vehicle users	class C1 in another	activity in the baseline vs. the motor-vehicle-change scenario
C1. General (broad-based) taxes and fees of fuels, vehicles, etc.	No, because not targeted to users and not used for MVIS	No, because not targeted to motor-vehicle users	No, except for very small portion of general taxes that on average make up any funding shortfall	Unclear a priori; depends on economic activity in the baseline vs. the motor-vehicle-change scenario
C2. General corporate-income tax, sales tax, and property-tax expenditures or subsidies	No, because not targeted to users and not used for MVIS	No, because not targeted to motor-vehicle users	Maybe; count in high-cost (low-payments) case, ignore in low-cost (high-payments) case	Unclear a priori; depends on economic activity in the baseline vs. the motor-vehicle-change scenario

All four Ways count special tax and fee payments that are levied only on motor fuels, vehicles, etc. and that are actually used for highways (class A1). The most restrictive Way, #1, counts *only* this class of tax and fee payments. By contrast, Way #3 counts several additional specific taxes and fees as user payments for MVIS, and in its low-cost scenario even counts selective taxes and fees as user payments for MVIS. Neither Way #3 nor Way #1 count general taxes and fees (class C), with a minor exception in the case of Way #3 (see section 17.3.3). Way #4, “Marginal Revenues,” requires macro-economic modeling or assumptions about economic activity in order to determine how marginal revenues from selective and general taxes change with changes in motor-vehicle use.

As mentioned in section 17.1.1, our four Ways of Counting payments presume that the amount of the payment from any person should be related to the amount of motor-vehicle use by the person. In Appendix 17-A.1 we present analysis of user payments when we relax this assumption and distinguish only between people who don’t use motor-vehicles at all and people who do, with no concern for *how* the motor-vehicle users make their payments.

17.3.6 Mapping the payment categories used here into the FHWA classification (Way #1 of counting)

Because the FHWA’s classification and estimates of user payments are widely used in this report and by many other researchers, it is useful to map the payment categories used in this report into the FHWA schema, which is the same as our Way #1

of counting. This mapping also will help readers understand that the payment categories are mutually exclusive, exhaustive, and internally consistent.

As discussed in section 17.3.1, the FHWA considers two criteria in its classification of taxes and fees: whether the charge is targeted specifically to highway users, and whether it is dedicated specifically to highways. We combine these two criteria combine to create four logical possibilities for classifying a tax or fee:

- i) targeted to highway users and dedicated to highways;
- ii) targeted to highway users but not dedicated to highways;
- iii) not targeted to highway users but dedicated to highways;
- iv) not targeted to highway users and not dedicated to highways;

These categories can be used as a basis for organizing the tax and fee payment categories used in this report:

FHWA category →	i) Targeted to users and dedicated to hwys		ii) Targeted to users, not dedicated to hwys	iii) Not targeted to users, dedicated to hwys	iv) Not targeted to users, not dedicated to hwys		
Payment category	road tolls, user imposts for highways, interest	Interest on payments	user taxes and fees dedicated to nonhighway purposes	other imposts	environ- mental taxes, fines, etc.	selective taxes and fees	general taxes and fees
Section in this analysis	17.4.1	17.4.2	17.4.3, 17.4.4, 17.4.5	17.4.13	17.4.8 to 17.4.12	17.5	17.6
Table in this analysis showing FHWA classification	17-2, cols. b, c	17-2, col. l	17-3	Table 17- 2, col. f	Table 17- 2, cols. g, j,k	Table 17- 2, col. d	Table 17-2, col. e
Table in this analysis showing our treatment	17-2, cols. b, c	17-3, col. j	17-3 (17-4 for background)	Table 17- 2, col. f	Tables 17-5 to 17-10	17-11 to 17-13	Tables 17-14 to 17-21

Note that these categories follow the FHWA's definitions of what is "targeted to highway users" or "dedicated to highways."

We now turn to our actual estimates of user payments. In the following sections I present estimates of receipts and user payments for highways. After estimating individual payments we tally the payments according to Way #1, Way #2, and Way #3 of counting and compare the payment tally with government expenditures.

17.4 SPECIAL TAXES AND FEES LEVIED ONLY ON MOTOR FUELS, MOTOR VEHICLES, DRIVERS, AND SO ON

17.4.1 FHWA-estimated federal, state, and local tax, license, and toll payments by highway users

User payments in this category are the sum of FHWA-estimated “road tolls” (column c of Table 17-2) and “highway user imposts for highways” (column b of Table 17-2). In 1990 these road tolls and highway user imposts for highways were about \$44 billion, which was about 59% of the total \$75 billion in receipts for highways from all sources (Table 17-2).

17.4.2 Interest earnings on payments invested to cover highway and other capital

The FHWA includes investment income from the highway trust fund under “miscellaneous receipts” in *Highway Statistics* Table HF-1 and under “investment income and other receipts” in its Table HF-10. Recently, the trust fund, including the portion dedicated to mass transit, has been earning about \$1.5/billion per year in interest on investments (FHWA, *Highway Statistics* 1991, 1992). In general, investment income should be counted as a payment by highway users, because the investment *principal* -- including the principal dedicated to mass transit -- comes mainly from charges on highway users (Table 17-2). However, because I am using a different accounting method than is FHWA (annualization of capital [me] versus current annual expenditures [FHWA]), I estimate investment income -- or, what is the same, interest -- differently. The difference is that I impute interest to all user payments invested in highway capital, whereas the FHWA counts only interest actually earned by investing funds before they are used to pay for highway capital. Put another way, I treat user payments as if they were an investment in highway capital, whereas the FHWA treats them as if they were an annual expenditure.

The FHWA method is appropriate for its accounting method, which reports annual capital expenditures as opposed to the annualized cost of the entire capital stock. (The difference between these two is that the latter includes an interest charge whereas the former doesn't.) Since FHWA reports annual capital expenditures without an interest component, it is appropriate for it report annual user payments without an interest component. By contrast, I estimate the annualized capital cost of the entire capital stock. With this method, the total capital value of the infrastructure is amortized over its life at an appropriate interest rate, and then, in turn, user payments are properly viewed as being invested in the highway infrastructure, and hence as earning a rate of return equal to the interest rate at which the capital value of the stock is amortized (see Booz Allen Hamilton [2005] for a similar discussion).

In sum, we may compare annual expenditures on highways with annual receipts from highway users, or we may compare the annualized value of the capital stock with the annualized value of the user payments that go towards capital expenses. If annual user payments cover annual capital expenditures, then the annualized portion of user payments towards capital must equal the annualized cost of the capital covered by the payments¹².

Our method of annualizing user payments is to multiply payments toward capital outlays by an annualization factor. The annualization factor (AF) is the ratio of payments with an interest component to payments without an interest component. The AF used here is the same one used to annualize capital expenditures in Report #7. The use of the same AF in the capital-cost analysis of Report #7 and the user-payments analysis here makes our estimate of annualized payments towards capital expenditures equal to annualized capital expenditures.

We estimate annualized user payments in two parts: the actual annual payment plus the interest component, where the interest component is equal to equal to the annual payment multiplied by the annualization factor minus one.

To derive the AF, we begin with the standard formula for amortizing (annualizing) the value of capital stock. Amortization converts a current capital value into a stream of annual amounts whose present value equals the current capital value of the stock for particular assumptions about the interest rate and the life of the capital. (By example, mortgage payments annualize the value of a house.) Formally:

$$AC = RV \cdot \frac{i}{1 - (1 + i)^{-t}}$$

where:

AC = annualized cost of capital stock (\$/year)

¹² Newbery (1998) compares annual road-user taxes with the annual interest on the capital value of the roadway. I do not think that this method is right: it omits the depreciation of the actual stock itself on the one hand, and the parallel investment interest that should be imputed to user payments on the other.

RV = current replacement value of capital stock (\$)

i = the discount rate (%/year)

t = the life of the capital: the number of periods that the capital provides services without major reinvestment (years)

For a system, like the highway system, that is constantly being worn out and replaced, we estimate the replacement value on the basis of annual capital expenditures and the life of an expenditure. If the system is neither losing nor gaining capital stock over time, we can assume:

$$RV = \frac{ACE}{ARF} \text{ and } ARF = \frac{1}{t}$$

where:

ACE = annual capital expenditures (\$/year)

ARF = annual capital replacement factor: the fraction of the total capital stock that is replaced each year by the annual capital expenditure ACE

In other words, if a capital expenditure has a life of t, then in steady state every year $1/t$ of the system is replaced at a capital expenditure of ACE. With this, we have:

Therefore :

$$AC = ACE \cdot t \cdot \frac{i}{1 - (1 + i)^{-t}}$$

Now we can define the annualization factor AF:

$$AF = \frac{AC}{ACE}$$

$$AF = t \cdot \frac{i}{1 - (1 + i)^{-t}}$$

where:

AF = the annualization factor

The annualized cost also can be expressed as an annual “principal” payment component plus an annual interest component. Using the nomenclature above:

$$AC = ACE + AIC$$

where:

AIC = annual interest on annual capital (\$/year)

We now express the interest component, AIC, in terms of the known parameters. From the definition of the annualization factor we know:

$$AF \cdot ACE = AC$$

With this, we set up and solve for AIC:

$$ACE + AIC = AC = AF \cdot ACE$$

$$AIC = AF \cdot ACE - ACE$$

$$AIC = ACE \cdot (AF - 1) \quad \text{eq. [17-1]}$$

I use equation 17-1 to estimate interest payments (AIC) accruing to user payments that go towards capital expenditures. The annualization factor (AF) and the annual capital expenditures (ACE) are as estimated in Report #7. For the calculation here, our estimate of ACE includes the motor-vehicle-related portion of government capital expenditures for highways, police protection, fire protection, corrections, the judicial and legal system, pollution control and regulation, and energy R &. (However, it does not cover interest on government capital expenditures on military equipment related to motor-vehicle use.) On the basis of data presented in Report #7, I assume that these other capital expenditures are 4% to 6% of capital expenditures for highways¹³.

¹³ In the cost model, the value of ACE used is the *lower* of: total user payments that could be applied towards capital expenditures, and actual estimated capital expenditures. This is done in order to account for the theoretical possibility (which turns out not to obtain in any year) that total annual user payments might be less than annual capital expenditures. In this context, I have somewhat arbitrarily designated “total user payments that could be applied towards capital” to be all motor-vehicle tax and fee receipts counted by the FHWA (e.g., in Table HF-10 of *Highway Statistics*) less C & A expenses and amounts placed in the LUST fund: columns b and c of Table 17-2 plus columns b through i of Table 17-3 less collection expenses and LUST fund amounts estimated in Report #7. I exclude collection expenses and LUST fund amounts because I assume that user payments must be used to cover these before they can be used to cover capital costs.

An objection to this method? One might argue that for the purposes of calculating AIC for user payments the term ACE in equation 17-1 should exclude the value of any capital currently in place that was not paid for by user fees. In this historical rather than prospective view, one would point out that even though present payments cover present capital expenditures, there must have been a time when current capital outlays exceeded current user payments, if only because parts of the system had to be built before there were any users at all to pay for it.

It is true that there was a time when capital expenditures exceeded user payments, but that was over 60 years ago. In almost every year since 1940, total highway-user payments, as defined narrowly by FHWA¹⁴, have exceeded total Federal, state, and local capital outlays, and recently by a large margin (FHWA, *Highway Statistics Summary to 1995, 1997*; FHWA, *Highway Statistics*, annual)¹⁵. From 1921 to 1940, current capital outlays did exceed current user payments. However, capital outlays for highways after 1940 swamped outlays before. In constant 1991 dollars, annual capital outlays for highways, and payments by highway users, look something like this¹⁶:

Note that the use of annual capital expenditures (ACE) in equation 17-1 ensures consistency in our treatment of interest on capital expenditures and interest on payments towards capital expenditures: the same quantity, ACE, is used in the interest-on-expenditures calculation in Report #7 and the interest-on-payments calculation here. Note too that the quantity ACE does not include private contributions to highways; it is public-sector investment only.

¹⁴Note that here we compare expenditures on highway capital with receipts from highway users; we do not compare all public capital related to motor-vehicle use with all payments related to motor-vehicle use. For this purpose, highway-user receipts are FHWA net receipts of motor-fuel and motor-vehicle taxes and fees excluding amounts devoted to collection expenses (as reported in Table HF-10 in the FHWA *Highway Statistics* series) - columns b and c of Table 17-2 and columns c through h of Table 17-3. (Here we do not count imposts used to cover collection costs on the grounds that only user imposts left over after C & A costs have been covered may be considered to be available to be applied to highway capital.) Highway-user receipts here do *not* include air-quality and other environmental fees on motor vehicles, environmental excise taxes on petroleum, gas-guzzler taxes, luxury taxes, traffic fines or parking fines, parking taxes, other special taxes and fees, severance taxes paid on oil and gas, special property taxes, selective sales taxes, potential revenues from better collection efforts, or any portion of any general tax used for highways.

On the capital-expenditures side of the ledger, we count only highway capital; we do not include expenditures for police, fire, judicial, legal, correctional, regulatory, or other public capital related to motor-vehicle use. Data and analysis in Report #7 indicate that all of this other motor-vehicle-related capital expenditure is 5-10% of the outlay for highway capital.

A comparison of expenditures for all public capital related to motor-vehicle use with all user payments would be similar to the comparison of highway capital with highway-user payments.

¹⁵In 1954, highway-user payments were 93% of capital outlays, and in 1955, they were 97% of capital outlays.

¹⁶Current dollars from 1959 to 2003 were converted to 1991 dollars using the GDP implicit price deflators (available on the Bureau of Economic Analysis web site, <http://www.bea.doc.gov>). Current dollars from 1921 to 1959 converted to 1991 dollars assuming 3.06%/year change in the GDP implicit price deflator.

	<u>1921-1940</u>	<u>1921-2003</u>	<u>1941-2003</u>	<u>1971-2003</u>
Total constant-dollar capital outlays for highways over period (10 ⁹ 1991 \$)	235	2,060	1,830	1,220
Total constant-dollar user payments for highways over period (10 ⁹ 1991 \$)	137	2,820	2,700	1,920
Ratio of payments to capital outlays	0.59	1.37	1.47	1.56

It is clear, then, that the bulk of all highway capital ever put in place, and essentially all of the present capital, was paid for in the same year that it was put into place.

In conclusion:

- Today, highway-user payments easily exceed capital outlay for the highways.
- The present highway system was in fact financed out of current revenues over the past six decades.

17.4.3 Highway-user revenue and road tolls dedicated to nonhighway purposes

The FHWA does *not* count as highway-user payments the portions of motor-fuel excise taxes, motor-vehicle taxes, and road tolls that are dedicated to mass transit (including the Mass Transportation Account of the Highway Trust Fund), reducing the federal deficit, the Leaking Underground Storage Tank Trust Fund, and other nonhighway purposes. (Table 17-4 shows Federal motor-fuel taxes dedicated to nonhighway purposes, in \$/gallon.) Under Way #1 of counting, I follow this convention. However, under Way #3 of counting I *do* count these as payments for motor-vehicle use. Table 17-3 shows the user payments that are excluded from Way #1 of counting but included in Way #3 of counting.

My reasons for counting the payments in Table 17-3 under Way #3 are as follows. To the motor-vehicle user, the portions of the motor-fuel tax that are earmarked for deficit reduction, the leaking-storage-tank fund, mass-transit, and other nonhighway purposes are indistinguishable from the portions dedicated to highways. Indeed, to the motor-vehicle user, the entire price of gasoline is a cost of motor-vehicle use. Moreover, I do not know of another commodity that is federally taxed specifically to provide revenue to reduce the deficit or support mass transit, and I see no way in which motor-vehicle users have a special obligation to reduce the deficit or finance mass transit. (Federal expenditures on highways do contribute to the deficit, because expenditures exceed user revenues dedicated to the highways, but this actually is a *reason* to count the deficit tax on gasoline as essentially a user charge for the highways.) For these reasons, under Way #3 of counting, I treat highway-user revenue dedicated to nonhighway purposes the same as highway-user revenue dedicated to the highways. Consequently, I count the entire gasoline tax (except that most of the sales tax is excluded; see below) as a payment by motor-vehicle users for motor-vehicle use (Table 17-3).

These amounts, which as noted above add to the amounts that FHWA counts as user payments, are estimated on the basis of data in FHWA's *Highway Statistics* (various years) and *Highway Statistics, Summary to 1995* (1997). Details are provided in the notes to Table 17-3.

As a check on the estimates of Table 17-3, we have used different FHWA data (i.e., data other than that reported in Tables HF-10 and HF-210) to make an alternative estimate of highway-user payments dedicated to non-highway purposes. This alternative estimate is discussed in Appendix 17-A.5. In most cases the alternative estimate is within 10% of the Table 17-3 estimate.

17.4.4 Payments that go towards the cost of collecting and administering motor-fuel taxes.

Public agencies incur costs to collect and administer funds related to the use of motor vehicles. These collection and administration (C & A) costs are real resource costs of motor-vehicle use, and as such are estimated in Report #7. However, C & A costs also are relevant in our analysis here of user payments because the FHWA's accounting convention is different from ours: what the FHWA reports as receipts for highways (shown in Table 17-2 here) is equal to total receipts *less* C & A costs, whereas what *we* wish to know is total receipts including any amounts applied towards C & A costs. Thus, our estimate of motor-vehicle-user payments *here* will be equal to FHWA's estimate of receipts net of C & A costs (as shown in Table 17-2) *plus* whatever C & A costs the FHWA has excluded from its estimates of highway-user receipts¹⁷.

¹⁷ Note that our method ensures a comprehensive and symmetrical accounting: on the one hand we estimate all user payments, without any exclusion of payments applied towards C & A costs, and on the other we estimate all C & A costs, including some that the FHWA does not estimate [Report #7].

Our task, then, is to estimate and report in Table 17-3 the highway-user receipts that the FHWA has excluded from its estimates of receipts for the highways (in Table 17-2). Information on the collection and administration (C & A) costs excluded is provided in FHWA's Table HF-10 (*Highway Statistics*, various years) and HF-210 (*Highway Statistics: Summary to 1995, 1997*) (available at www.fhwa.dot.gov/policy/ohpi/hss/index.htm). The FHWA information, and my treatment of it, is as follows:

	Federal government	State government	Local governments
Total receipts (including any amounts applied to C & A costs)	Reported in Tables HF-210 and HF-10.	Reported in Tables HF-210 and HF-10.	Not reported. See cells below.
Receipts applied to C & A costs	Zero: a footnote to Tables HF-210 and HF-10 says that federal C & A costs are paid out of general funds.	Reported in Tables HF-210 and HF-10.	Not reported. A footnote to the “collection expenses” line in Table HF-10 says that “local motor-fuel and motor-vehicle tax data are reported net of collection expenses” ¹⁸
Highway-user receipts (net of amounts applied to C & A costs)	Reported in Tables HF-210 and HF-10; equal to total receipts less amounts applied to C & A costs	Reported in Tables HF-210 and HF-10; equal to total receipts less amounts applied to C & A costs	Reported in Tables HF-210 and HF-10.
Treatment in this analysis	Since highway-user receipts (in Table 17-2) equal total receipts, no adjustment to Table 17-2 data is necessary	Add FHWA-reported amounts applied to C & A costs (see column b of Table 17-3), to arrive at total receipts	Estimate receipts applied to C & A costs (see column i of Table 17-3 and discussion below); add to reported net highway-user receipts to arrive at total receipts

To estimate the C & A costs that local agencies deduct from the receipts reported to FHWA, I simply multiply reported net local receipts by an estimated $(\$-C \& A)/(\$-\text{receipts})$ factor, the factor being estimated on the basis of the reported state receipt and C & A costs:

¹⁸ This is what the footnote to Table HF-10 says from 1996 on. Prior to 1996, the Table HF-210 footnote says that “data for local government expenses are not available.”

$$CA_{LOCAL,Y} = \frac{CAF_Y \cdot NREC_{LOCAL,Y}}{1 - CAF_Y}$$

$$CAF_Y = \frac{CA_{STATE,Y}}{TREC_{STATE,Y}}$$

where:

$CA_{LOCAL,Y}$ = motor-vehicle-revenue collection and administration costs of local governments paid for out of local motor-vehicle-user revenues, in year Y (\$)

CAF_Y = dollars of C & A cost per dollar of total receipts, in year Y (about 0.06 in most years)

$NREC_{LOCAL,Y}$ = local motor-vehicle-user revenues net of C & A costs, in year Y (\$) (HF-10 of *Highway Statistics* and HF-210 of *Highway Statistics: Summary to 1995, 1997*)

$CA_{STATE,Y}$ = motor-vehicle-revenue collection and administration costs of state governments paid for out of local motor-vehicle-user revenues, in year Y (\$) (Table HF-10 or Table DF of *Highway Statistics* and HF-210 of *Highway Statistics: Summary to 1995, 1997*)

$TREC_{STATE,Y}$ = total state motor-vehicle-user revenues available for distribution, including amounts used for C & A costs, in year Y (\$) (Table DF of *Highway Statistics*)

Note that we use the form with $1-CAF$ in the denominator because CAF is defined with respect to total revenues including amounts used for C & A but is being applied to local revenues net of amounts used for C & A.

17.4.5 Property-tax-like fees specifically related to motor-vehicle use.

As indicated in section 17.3, there are a variety of taxes and fees that are specifically related to motor-vehicle use and that one might reasonably count as payments by users for MVIS, but that FHWA does not. These are discussed in sections 17.4.3 to 17.4.13 of this report. In this subsection we focus on a particular subcategory, property-tax like fees on motor vehicles. All of these are assessed at the state level, and have different forms and names from state to state. In this subsection I discuss several different kinds of property-tax fees in several states:

- i) license fees assessed “in-lieu” of a property tax on motor vehicles (California, Washington, Arizona, Massachusetts);
- ii) motor-vehicle “impact” registration fee (Florida);
- iii) specific ownership tax (Colorado);
- iv) personal property tax (many states, but focus on Virginia here).

Information on these property tax-like fees comes from several sources, including FHWA's *Highway Statistics*, Table S-106 of FHWA's *Highway Taxes and Fees 1991*, "Provisions Governing the Allocation for Highway Purposes of Certain State Taxes, Fees, and Appropriations (Other Than Highway user Revenue)," and the Census' *State Government Tax Collections 1991* (1992).

i) In-lieu fees. In California, a motor-vehicle owner pays several fees at the time of registration: a flat registration fee of \$27, a \$1 fee for the California Highway Patrol (statewide), a \$1 abandoned-vehicle fee (statewide), a \$1 auto-theft fee (statewide), a \$1 SAFE fee (in most counties), an air quality fee of \$1 to \$6 (the amount varies from county to county), and a vehicle-license fee (in lieu of property taxes) of 2% of the value of the vehicle. All these fees are billed on one form (the vehicle license fee is separately identified), and paid in one lump-sum payment to the Department of Motor Vehicles (California Department of Motor Vehicles, 1993). I assume that FHWA counts all of these fees except the vehicle license fee as highway-user payments for highways. Regarding the license fee, FHWA counts this as a highway-user payment, but one that is allocated for nonhighway purposes, not highway purposes (FHWA, *Highway Statistics 1991, 1992*; FHWA, *Highway Taxes and Fees 1991, 1991*)¹⁹. Therefore, under Way #3 of counting in this analysis, the California vehicle license fee (which amounts to more than \$2 billion annually [Table 17-12] -- nearly half of the total nonhighway allocation of all state highway user fees) is already included in our estimate of highway user revenue dedicated to nonhighway purposes (estimated in section 17.4.3 and shown in Table 17-3).

In Washington, a "vehicle excise tax" is collected annually in lieu of a property tax on motor vehicles. The tax is 2.22% of the value of the vehicle, which is taken to be the Manufacturer's Suggested Retail Price when the vehicle is new, and some depreciated value in subsequent years. There also is a flat annual registration fee of \$23.85 (Washington Department of Motor Vehicles, 1993). The vehicle excise tax and the registration fee are billed on the same form and paid together in a lump-sum payment. The FHWA counts the Washington vehicle excise tax as highway-user payment, but one that is allocated for nonhighway purposes, not highway purposes (FHWA, *Highway Statistics 1991, 1992*; FHWA, *Highway Taxes and Fees 1991, 1991*). Therefore, under Way #3 of counting in this analysis, the Washington vehicle excise tax is already included in our estimate of highway user revenue dedicated to nonhighway purposes (estimated in section 17.4.3 and shown in Table 17-3).

¹⁹The FHWA includes the in-lieu fees paid in California and Washington as "state registration fees" in Table MV-2 of *Highway Statistics*, but writes in the notes to Table MV-3 that these fees are allocated for nonhighway purposes. (However, the total in-lieu amount collected in Washington, shown in Table MV-2, exceeds the amount of money allocated in Washington for nonhighway purposes.) The "highway-user tax revenues" of summary Table HF-1 in *Highway Statistics* specifically exclude amounts allocated for nonhighway purposes; hence, the in-lieu fees are not counted as highway-user tax revenues in HF-1.

Arizona charges a flat annual registration fee of \$8.25, plus a \$1.50 air quality fee (statewide), plus a motor-vehicle license tax of 4% of the assessed value of the vehicle²⁰. In the first year, when the vehicle is new, the assessed value of the vehicle is 60% of the factory list price. This assessed value is then reduced by 15% per year. The fees and the license tax are billed on the same renewal form (Arizona Department of Motor Vehicles, 1993).

The FHWA does not count the Arizona license tax as highway-user revenue. Although the FHWA lists a “vehicle license fee (in lieu tax) in Arizona” in Table MV-106 (which shows motor-vehicle and motor-carrier receipts for the highways) in the 1991 version of *Highway Taxes and Fees*, it also shows a “motor-vehicle license tax” in Arizona in Table S-106, which shows “other than highway-users revenue” (FHWA, *Highway Taxes and Fees* 1991, 1991) (Table 17-12 here). For three reasons, I believe that the FHWA does not classify the Arizona license tax as a user charge, and hence does not count receipts from the tax among the highway-user revenues reported in *Highway Statistics*. First, the description of tax in Table S-106 matches the description of the tax provided by the Arizona Department of Motor Vehicles (1993). Second, the tax is not listed in Table MV-106 in the corrected 1995 version of *Highway Taxes and Fees*. Third, my comparison of the receipts reported by the Bureau of the Census (*State Government Tax Collections* 1991, 1992) with the user payments counted by the FHWA (*Highway Statistics* 1991, 1992) suggest that the FHWA does not count the Arizona special property tax as a user payment²¹.

A separate question is whether the Census’ “special property tax” shown in Table 17-12 for Arizona is in fact the Arizona in-lieu license fee. The Census describes this tax as applying to “public utilities – motor carriers” (Table 17-12), which certainly does not seem to be the same thing as an annual motor-vehicle license tax. Also, the amount shown by the Census (about \$100 million – Table 17-12) is considerably less than one would calculate based on the information presented above (e.g., \$100/vehicle multiplied by nearly 3 million vehicles is almost \$300 million/year). I assume that the Census’ special property tax shown in Table 17-12 is *not* the same as the vehicle license in-lieu fee, and so count them *both*: the special property tax shown by the Census (Table 17-12 here) is counted in section 17.5.3 as a selective property tax, *and* the nearly \$300 million/year estimate for the in-lieu fee is counted in this subsection as an in-lieu fee.

²⁰ A portion (31.5%) of the license tax is dedicated to the state’s Highway-User Revenue Fund (FHWA, *Highway Taxes and Fees, How They Are Collected and Distributed* 1991, 1991). The portion of the license tax that is dedicated to highways presumably is included in the FHWA’s estimates of receipts for highways, most likely under the “property tax” column, but possibly under the “other imposts” column of *Highway Statistics* (see Table 17-2 here). In any event, because I do not count as user payments any of the property taxes or “other imposts” reported by FHWA, there is no possibility of double counting when I add in the Arizona license tax as user payment.

²¹I do not understand why FHWA considers the Arizona fee to be “nonuser” when it is functionally identical to the California and Washington fees. All of them are a value-based motor-vehicle registration fee in lieu of a property tax.

Massachusetts charges a 5% sales tax at the time of purchase, and afterwards an annual excise tax -- in lieu of a property tax -- of 2.5% of the National Auto Dealers Association Blue-Book trade-in value (for light-duty vehicles). The excise tax is charged on motor vehicles only, and is collected independently of the vehicle registration, which is collected by the states. The tax revenues go to municipalities, which may use them as they wish. The excise tax is not included in FHWA's *Highway Statistics* or Table S-106 of *Highway Taxes and Fees 1991* (FHWA, 1991), which suggests that it is not included in Tables 17-2 or 17-3 of this report. Now, the Census' *State Government Tax Collections* does report a vehicle excise tax as a special property tax in Massachusetts, but the amount of revenue it shows as being collected from this tax (about \$400,000/year; see Table 17-12) seems at least two orders of magnitude smaller than what one would expect given a rate of 2.5% of trade-in value. (For example, 2.5% multiplied by, say, \$2,000/vehicle and about 3.5 million LDVs in Massachusetts results in \$175 million/year.) Nevertheless, I assume that the vehicle excise tax/special property tax reported by the Census and shown in Table 17-12 here is the *only* such property-tax or property-tax-like fee on motor vehicles in Massachusetts, and count it as a "special property tax" (section 17.5.3., Table 17-12, item B2 in Table 17-22) and *not* as an in-lieu tax here.

ii) "Impact fee" in Florida. The first time an owner registers a vehicle in Florida, she pays a \$100 registration fee and a \$35 dollar title fee. Every year, including the first year, the owner pays a license fee, which is a function of the weight of the vehicle, and in some counties an emissions fee or air-pollution-control fee (about \$1.00) (Florida Department of Motor Vehicles, 1993). The registration fee, title fee, and license fee are included in the revenues reported in FHWA's *Highway Statistics*. However, if an immigrant to Florida brings a vehicle into the state, he or she also pays a \$295 "impact fee" or "road-user fee" the first time he or she registers the vehicle in the state of Florida. This fee does not apply to vehicles bought from Florida car dealers. The FHWA believes that the intent of the fee is to reduce the number of vehicles in the state. This fee is not included in *Highway Statistics* or in Table S-106 of *Highway Taxes and Fees 1991*, 1991).

Because the impact fee is specifically aimed at motor-vehicle use, I think that it should be counted as a payment by motor-vehicle users for motor-vehicle use under "Way #3" of counting. Because the Census' *State Government Tax Collections 1991* (1992) does not identify an "impact fee" or "road-user fee," I must estimate it in this section. According to the *Statistical Abstract of the United States 1992* (Bureau of the Census, 1992), annual immigration to the South is about 4% of the total population in the South. Florida probably receives the lion's share of Southern immigration -- probably 5 to 7% of the state population annually. However, many of the immigrants are retirees who do not bring a vehicle into the state. Based on this, I assume that the Florida impact fee applies to 5% of the total registered fleet, and thus generated about \$160 million in 1991.

iii) Specific ownership tax (Colorado). Colorado charges a specific ownership tax of \$0.50/personal vehicle, for the operation of a statewide distributive data processing system for processing motor-vehicle registration and title documents (FWHA, *Highway Taxes and Fees 1991*, 1991). Because this ownership tax listed in FHWA's Table S-106

(*Highway Taxes and Fees* 1991), which shows what FHWA considers to be *nonuser* charges dedicated to highways, it probably is included as a property-tax or “other-impost” receipt in FHWA’s *Highway Statistics* (see Table 17-2 here). Because the tax is not shown as a special property tax in the Census *State Government Tax Collections* 1991 (1992), I must estimate it here. At \$0.50/vehicle, the tax probably amounts to around \$1 million (compared, for example, to over \$2 billion for the California in-lieu tax), which is insignificant in my accounting. I ignore it.

iv) Personal property taxes. In many states motor-vehicles are assessed a personal property tax. Where these are clearly general property taxes, they are discussed in section 17.6.5. Here, I discuss one specific personal property tax for which I obtained data from state authorities.

Virginia charges a \$10 title fee and 3% sales tax on new vehicles, an annual weight-based registration fee, and an annual personal property tax. The personal property tax is assessed on boats and planes as well as on motor vehicles. The rate varies from county to county. Importantly, this tax is not billed with the state with registration fee; it is billed separately by, and paid to, the counties (Virginia Department of Motor Vehicles, 1993). The personal property tax apparently is not dedicated to highways, because it is not included in *Highway Statistics* or in Table S-106 of *Highway Taxes and Fees* 1991, 1991). The Census’ *State Government Tax Collections* 1991 (1992) also does not show a special motor-vehicle property tax in Virginia. On the other hand, the Census’ *Census of Governments* does show a general property tax on motor vehicles in Virginia (Table 17-21). Because the Virginia tax is a normal property tax, not an in-lieu tax charged with the vehicle registration or even a “special” property tax in the Census’ accounting, I do not count it here and instead treat it as a general property tax and assume that it is included with the amounts estimated for Virginia in Table 17-21.

Summary of treatment of property-tax-like fees.

California in-lieu fee: included already in Table 17-3 amounts, so not added here.

Washington in-lieu fee: included already in Table 17-3 amounts, so not added here.

Arizona in-lieu fee: not included in Table 17-3 or Table 17-2, so estimate separately here: assume \$100 dollars/vehicle in 1991, increasing at 2% per year, multiplied by FHWA-reported vehicle registrations in Arizona (Table MV-2 of *Highway Statistics*; use actual registrations for 1991 and 2003, interpolate for other years). Additional special property tax on motor carriers shown in Table 17-12 and counted separately in section 17.5.3.

Massachusetts vehicle excise (in-lieu) tax: probably not included in Table 17-3 or Table 17-2; count as a “special property tax” (section 17.5.3, Table 17-12, item B2 of Table 17-22) and *not* as an in-lieu fee here.

Florida impact fee: not included in Table 17-3 or Table 17-2, so estimate separately here: assume \$295 dollars/vehicle in 1991, increasing at 2% per year, multiplied by FHWA-reported vehicle registrations in Florida (Table MV-2 of *Highway Statistics*; use actual registrations for 1991 and 2003, interpolate for other years).

Colorado specific ownership tax: not included in Table 17-3 or Table 17-2, but estimated to be trivial; ignored.

Virginal personal property tax: count as general property tax included with estimates of Table 17-21.

17.4.6 The amount extra that highway users would have paid in 1991 had the October 1993 \$0.043/gallon increase in the Federal excise tax, and other increases in state and local excise taxes, been in effect

This amount no longer is counted. See Appendix 17-A.4.

17.4.7 The amount extra that would have been collected had there been less, or no, tax evasion

This amount no longer is counted. See Appendix 17-A.4.

17.4.8 Air-quality and other environmental fees on motor vehicles

Some states assess a small fee with the vehicle registration, to fund air-quality planning and control activities. Others charge fees for emissions inspections, disposal of tires, and other environmental impacts or programs. Clearly, these fees are viewed as a price of motor-vehicle use -- often, they are paid with the annual vehicle registration fee -- and in my view are reasonably attributable to motor-vehicle use. I count them as user payments for MVIS under Way #3 of counting.

It appears that some but not all of these fees are counted as highway-user revenue in the FHWA's *Highway Statistics*. My task is to estimate the fees that FHWA does not but in my judgment should include as highway-user revenue -- payments by motor-vehicle users (under Way #3 of counting) -- for 1991.

Table MV-106 of *Highway Taxes and Fees 1991* (1991) and *Highway Taxes and Fees 1995* (1995) lists the disposition of state motor-vehicle and motor-carrier receipts considered to be highway-user revenue. Table 17-5 shows all of the environmental fees listed in the 1995 version of *Highway Taxes and Fees*, and indicates with an asterisk (*) those that are not listed in the 1991 version of MV-106. It is likely that at least some of the fees not listed in 1991 simply did not exist in 1991. However, the California fees, at least, did exist in 1991, and in my view should have been counted as highway-user revenue. (The FHWA now agrees, and includes the California fees in the 1995 version of Table MV-106 in *Highway Taxes and Fees*.) I suspect that some of the other fees not listed in 1991 actually did exist in 1991 and should have been counted as payments by motor-vehicle users. I assume that in 1991, 20% of the 188 million vehicles registered in the U. S. paid an environmental fee that I would consider a user payment under Way #3 of counting but that FHWA does not. If the average fee in 1991 was \$1.50, then the total additional receipts were \$60 million, a quite minor amount nationally. I assume that the average fee per vehicle increased by 2%/year from the 1991 value, but that the fraction of vehicles subject to an air quality fee that I would count as a user payment but that FHWA doesn't remains at 20%.

17.4.9 Environmental excise taxes on petroleum

Environmental excise taxes are taxes on petroleum products and certain chemicals to finance the Hazardous Substances Trust Fund (Superfund) and the Oil Spill Liability Trust Fund (Boroshok, 1993). Superfund was established to accumulate funds to clean up the worst abandoned hazardous substance and toxic waste sites in the country. The Oil Spill Fund was established to prevent and clean up oil spills, and to compensate individuals for damages caused by oil spills. These taxes were imposed on domestically produced crude oil (including crude oil condensates and natural gasoline) upon receipt at the refinery (or when it is used or exported, if it does not go to a refinery) and on imported petroleum products (including crude oil) when they enter the United States for consumption, use, or warehousing (Internal Revenue Service, *Excise Taxes for 1994*, 1993). Environmental excise taxes in petroleum were embedded in the price of motor-vehicle fuels, and eventually paid by motor-vehicle users.

Environmental excise taxes are reported by the Internal Revenue Service (IRS) (Boroshok, 1993; IRS, 1994; these two sources use slightly different reporting conventions). In calendar year 1991, the IRS collected \$825 million in environmental excise taxes on petroleum (Boroshok, 1993)²². Total excise taxes in 1991, and the amounts allocated to motor vehicles, are shown in Table 17-6.

Part of the \$0.184/gallon tax on gasoline is dedicated to the Leaking Underground Storage Tank Trust Fund. However, I already have counted payments into the Leaking Underground Storage Trust (LUST) Fund, in Table 17-3.

The \$0.05/bbl oil-spill tax was suspended on July 1, 1993, because the fund had accumulated the mandated \$1 billion. The Superfund tax expired in 1996 (www.irs.gov/taxstats/article/0,,id=96565,00.html). Consequently, we estimate no environmental excise taxes on petroleum after 1995.

There is an environmental excise tax on ozone-depleting chemicals (Barthold, 1994), and it applies to the chlorofluorocarbon, CFC-12, that is the working fluid in the air conditioning system of most automobiles on the road today. However, since 1993, the air-conditioning systems in new vehicles have been built to use a less destructive compound that is not subject to the tax on ozone-depleting chemicals. Therefore, I ignore this tax.

²²Boroshok (1993) reports excise taxes for the calendar year before adjustments and credits. The IRS' other source (IRS, 1994) reports \$800 million for fiscal year 1991, after adjustments. There are other differences in conventions between the two sources.

17.4.10 Gas-guzzler taxes, luxury taxes, CAFE fines, and other minor taxes

As shown in Table 17-1, the federal government charges an excise tax on vehicles with relatively low fuel economy, and a luxury tax on relatively expensive automobiles. The gas-guzzler tax ranges from \$1000 to \$7,700, depending on fuel economy. The luxury tax is 10% of the amount that the sales price exceeds \$30,000. In addition, some motor-vehicle manufacturers have been fined for failing to meet Corporate Average Fuel Economy (CAFE) standards; the EPA charges motor-vehicle manufacturers to cover the cost of its emissions-certification testing program; and pipeline operators are charged user fees for the Pipeline Safety Fund.

These taxes and fines become part of the price of motor vehicles and motor-vehicle fuels. I treat these taxes as payments specifically for motor vehicle use because they are unique to motor-vehicles: no other commodity is charged a “fuel guzzler” fee, and no other commodity is charged a luxury tax²³. I do not know whether the FHWA counts the gas-guzzler tax or the luxury tax as a user payment for the highway. Because I could not find any mention of them in FHWA’s *Highway Taxes and Fees 1991* (1991), *Highway Statistics* (various years), or *A Guide to Reporting Highway Statistics* (1990), I assume that they are not included among the highway-user receipts reported by FHWA²⁴. The U.S. Internal Revenue Service (1994) reports that in the fiscal year ended September 1991 it received \$118.4 million in gas-guzzler taxes and \$88 million as luxury taxes. (The IRS web site www.irs.gov/taxstats/article/0,,id=96565,00.html also provides data through fiscal year 2004; Table 17-7 shows FY 2003 data.) Davis (1995) reports that the U.S. collected \$42.2 million in CAFE fines on the 1991 model year. I count these amounts as additional user payments for motor-vehicle use.

Of course, one could argue that the gas-guzzler tax should offset environmental externalities, rather than government expenditures. If the tax were a true Pigouvian tax (which it is not), I would agree. In any case, the revenues are so minor that it doesn’t matter how they are classified.

The EIA (*Federal Energy Subsidies*, 1992) reports that the Pipeline Safety Fund received \$14 million in fiscal year 1992. I estimate that about \$4 million of this should be allocated to oil pipelines, of which in turn roughly \$2 million should be allocated to oil use in transportation.

I do not know how much the EPA collects for its emissions certification testing. However, the EPA tests only a small number of vehicles, and unless they charge a huge

²³The luxury tax on boats, planes, furs, and jewelry was repealed effective for sales or uses occurring after December 31, 1992 (IRS, *Excise Taxes for 1994, 1993*). Only the passenger-car luxury tax remains.

²⁴If the FHWA does not include them, it is because the FHWA’s scope is more limited than mine -- they are interested only in payments for highways per se, whereas I am interested in payments for motor-vehicle use in general -- not because they believe that they are not costs of motor-vehicle use. These costs are attributable to motor-vehicle use but not to highway construction, maintenance, administration, or patrol.

amount per test, the total amount collected cannot be large compared to the other payments estimated in this report. I assume \$10 million.

The total, \$261 million in 1991, is tabulated in Table 17-7. The spreadsheet also contains estimates for all years between 1991 and 2004; Table 17-7 shows estimates for 2003.

17.4.11 Traffic fines and parking fines

Every year motorists in the U. S. pay billions of dollars in fines for traffic violations and parking violations. I count these traffic fines and parking fines as payments for motor-vehicle use, because they satisfy both of the criteria, outlined in the introduction to this Report, that determine whether or not a payment should count: the fine is *perceived* to be a price of motor-vehicle use, and is *not*, by its nature, *necessarily* a charge for goods and services unrelated to motor-vehicle use. In fact, fines reasonably can be viewed as charges for improper motor-vehicle use. Although most fines apparently are not earmarked specifically for highways, I believe that how the fines are spent by governments is irrelevant²⁵.

I make three independent estimates of national payments of traffic and parking fines, using three different data sources: 1) the total amount of fines and forfeits of all kinds (not just parking and traffic fines) collected by cities, counties, and states (Table 17-8) traffic fines and parking fines collected in major states or cities (Tables 17-9 and 17-10); and 3) payments of fines of all kinds reported by households. Although none of the extrapolations are perfect, they do yield similar results.

1. Fines and forfeits collected by cities, counties, and states, in fiscal year 1991.

City and County governments. As part of its annual survey of government finances, the U. S. Bureau of the Census asks cities of 300,000 people or more and counties of 500,00 people or more to report the amount of fines and forfeits that they receive (Bureau of the Census, *City Government Finances: 1990-1991, 1993*; Bureau of the Census, *County Government Finances: 1990-1991, 1993*). Smaller cities and counties do not report fines and forfeits separately, but include them as part of a larger category of receipts called "other and unallocable," which in turn is part of a still larger category, "miscellaneous general revenue". Fines and forfeits include penalties imposed for violations of law, civil penalties, some kinds of court fees, court-ordered victim restitution collected by government, and forfeits; they do not include penalties relating to tax delinquency, library fines, and sale of confiscated property (Bureau of the Census, *Government Finance and Employment classification Manual* (1992)).

²⁵These fines are spent for a variety of purposes, many and probably most of which do not relate to motor-vehicle use. The situation varies considerably from locality to locality. In New York, traffic fines are used to pay the costs (capital and facilities costs as well as operating costs) of traffic courts and adjudication *and* for other local purposes (Conley, 1993). In New York City, parking fines are used for the city operations, including but not limited to parking and police operations (Spitzer, 1993). In California, cities may do what they want with revenues from fines, unless they have special legislation or charters that earmark the money for particular purposes (Office of Local Governments Fiscal Affairs, 1993).

To estimate national payments of traffic fines and parking fines from the Census data on fines and forfeits received in large cities and counties, I first must extrapolate from the fine-and-forfeiture data for large cities and counties to all cities and counties, and then estimate the fraction of fines and forfeits that are traffic fines and parking fines specifically. As shown in Table 17-8, I extrapolated fines and forfeitures in large cities and counties to all cities and counties in four different ways: on the basis of population; on the basis of motor-vehicle-related expenditures (on highways, police protection, and parking facilities); on the basis of miscellaneous revenue; and on the basis of the fraction of "other and unallocable receipts" that is "fines and forfeitures".

The four different extrapolation bases provide broadly similar results. I believe that the last basis, the fraction of "other and unallocable receipts" that is "fines and forfeitures", is the best, because as noted above, fines and forfeitures are classified as "other and unallocable" in the small cities for which fines and forfeitures are not reported separately.

The next step is to determine the fraction of total fines and forfeitures that is parking and traffic fines specifically. As documented in Tables 17-8 and 17-10, my comparison of parking and traffic fines received in Los Angeles and New York City, and parking fines received in seven other cities, with total "fines and forfeits" reported by those cities to the Bureau of the Census, indicates that in cities, about 90% of the total fines and forfeitures are parking and traffic fines (mainly parking fines), and in counties, about 50% of total fines and forfeitures are parking or traffic fines.

Thus, the estimates of Table 17-8 suggest that all city and county governments in the U. S. received \$3 to 4 billion in traffic fines and parking fines in fiscal year 1991.

State governments. In fiscal year 1991, state governments received \$1.5 billion in fines and forfeits of all kinds (Bureau of the Census, *State Government Finances: 1991, 1992*). Some of these fines were for violations of motor-vehicle regulations (pertaining to registration, licensing, weight-distance taxes, and the like -- everything except traffic and parking regulations); some were for traffic (moving) and parking violations; and some were unrelated to motor-vehicle use²⁶. As discussed below, the FHWA's estimate of "user imposts" received for highways (*Highway Statistics*, various years) definitely includes fines related to violations of motor-vehicle regulations, but probably does not include fines for traffic and parking violations. I assume that the FWHHA statistics do not include traffic fines and parking fines, and estimate them separately here and count them as additional user payments for motor-vehicle use.

What fraction of total "fines and forfeits" received by states was traffic fines and parking fines? In fiscal year 1991, the state of California received \$107 million in "penalties on traffic violations" (which may or may not include a small amount of parking fines) (California State Controller, *Annual Report of the State of California Budgetary Basis, Fiscal Year 1990-1991, 1992*), and \$293 million in "fines and forfeits"

²⁶Generally, fines for violations of motor-vehicle laws (as opposed to traffic and parking laws) go to state government. Fines for violations of traffic and parking laws can go to state or local government; the disposition is different for each violation, and is determined by legislation.

(Bureau of the Census, *State Government Finances: 1991, 1992*). The Department of Motor Vehicles of the state of New York received \$55 million for “traffic adjudication” in fiscal year 1992 (New York State Comptroller, 1992), and \$119 million in “fines and forfeits” in fiscal year 1991 (Bureau of the Census, *State Government Finances: 1991, 1992*). These statistics suggest that about 40% of the “fines and forfeits” reported by the Census are traffic fines and parking fines.

With this assumption, I estimate that states received about \$0.6 billion in traffic (and perhaps parking) fines in fiscal year 1991.

The total parking and traffic fines collected by all levels of government are then \$3.6 to \$4.6 billion²⁷, out of an estimated \$5.5 to \$6.7 billion in total fines and forfeits²⁸.

In the next two sections I present two other approaches to estimating parking fines and traffic fines, both of which produce roughly similar estimates.

2. Traffic fines and parking fines. In this section I estimate national traffic fines and parking fines based on traffic fines reported in three large states, and parking fines reported by several cities (Tables 17-9 and 17-10 of Report #17 of this social-cost series [see the list at the beginning of this report]). The advantage of this approach is that it begins with data on parking or traffic fines specifically. The difficulty, of course, is the uncertainty in extrapolating to the whole country from a few cities or states.

The extrapolation is more problematic with parking fines than with traffic fines, because parking fines are reported at the city level only, whereas traffic fines are reported at the state level. Parking fines are reported at the city level only because cities, not states or counties, set and enforce parking regulations, and have most of the

²⁷I assume that the Federal government receives very little traffic fines and parking fines.

²⁸The Bureau of Economic Analysis also uses the Bureau of Census’s Government Finance data to estimate national government receipts of fines, as part of the National Income Product Accounts. The BEA estimates that in calendar year 1991, state and local governments received \$10.1 billion in fines (“Personal Tax and Nontax Receipts” and “Indirect Business Tax and Nontax accruals,” *Survey of Current Business*, July 1992) (cf. my estimate of \$5.5 to \$6.7 billion in fiscal year 1991 [Table 17-8]). According to the BEA’s (1988) description of its method for estimating government receipts and expenditures in the NIPA, “fines” in the NIPA are equal to the Census’ estimate of “fines and forfeits” received by state governments (e.g., Bureau of the Census, *State Government Finances: 1991, 1992*), plus the BEA’s estimate of fines and forfeits received by local governments. The BEA estimates local-government fines and forfeits based on “underlying unpublished details” from the Bureau of the Census surveys of local-government finances (BEA, 1988, p. 109). The BEA methodology paper gives no more detail than this. However, according to an analyst in the BEA’s Government Division, many years ago the BEA used unpublished data from the Census’ government finance surveys, and other data, to estimate what fraction of “miscellaneous general revenue,” as reported by the Census, was “fines and forfeits” (Sullivan, 1994). (“Fines” in the NIPA apparently are the same as “fines and forfeits” in the Census’ accounting of government finances.) This apparently is similar to the approach used here. Although the BEA probably had access to better data than I have, the BEA’ estimate of the fraction of miscellaneous revenue that was fines and forfeits was done at least 12 years ago, and has not been updated since. I suspect that the fractions estimated so long ago are no longer valid, and hence that the BEA’s estimate of \$10.1 billion in fines is not accurate, and probably too high. I use my estimate of \$5.5 to \$6.7 billion instead.

regulated parking spaces. On the other hand, all traffic fines, including those levied by cities and counties, usually are reported at the state level, because states, not cities or counties, set the traffic laws and license and monitor drivers.

Traffic fines. Table 17-9 details my estimate of total traffic fines in the three most populous states: New York, California, and Texas. With each state, I extrapolate to the national level on the basis of the ratio of vehicle-miles of travel (VMT) in the state to total national VMT, on the grounds that the amount of fines are related to the amount of driving. All three extrapolations yield very similar results, and indicate that all U. S. motorists (including truck drivers) paid \$2 to \$4 billion dollars in traffic fines in 1990, with a best estimate of around \$3.5 billion.

Parking fines. I collected data on parking fines in nine large cities, one small city in California, and towns and villages in New York (Table 17-10). I then extrapolated fines from the city to the national level on the basis of:

- i) revenues received by city-run parking facilities in the city relative to revenues received by city-run parking facilities in all municipalities;
- ii) parking fines as a fraction of total fines and forfeitures in the city relative to total fines and forfeitures in all cities;
- iii) the population of the city relative to the total population in all cities;
- iv) the population of the city relative to the total population in all cities with 300,000 or more people.

Note that all of these extrapolations are with respect to city totals: city parking revenues, city fines and forfeitures collected, city population. This is because virtually all parking fines are collected by cities; few if any are collected by counties or states.

For the nine large cities as a group, the extrapolation based on parking revenues (parking revenues can be thought of as an indicator of parking activity), and the extrapolation based on fines and forfeitures, result in about \$2.5 billion in parking fines nationally. The extrapolations based on population indicate a national total of more than \$1.5 billion, and less than \$5.5 billion: the extrapolation based on big-city population is a lower bound, because it counts fines only in cities with 300,000 or more people, and the extrapolation based on total city population is an upper bound, because it assumes, contrary to the population-based extrapolations for the small cities shown in the table (Davis, California, and towns and villages in New York State), that the average fine-per-capita rate is the same in very small cities as in large cities.

These extrapolations suggest that nationally, cities collected about \$2 to \$3 billion in parking fines in fiscal year 1991.

The total of traffic fines and parking fines, based on extrapolations from state traffic fines and city parking fines, is \$4 to \$7 billion, with a best estimate of \$6 billion.

3. Fines paid by households. The Bureau of Labor Statistics, of the U.S. Department of Labor, conducts an annual survey of household expenditures, called the "Consumer Expenditure Survey" (e.g., Bureau of Labor Statistics, *Consumer Expenditures in 1991, 1992*). The Consumer Expenditure Survey asks households to record in a diary their payments for "miscellaneous personal services" (among other things) (Division of Consumer Expenditure Surveys, February 1, 1993). Although traffic fines and parking

finances are not the only components of miscellaneous personal services (Reise, 1993), they probably are one of the larger ones²⁹. Households reported spending \$1.65 billion on miscellaneous personal services in 1990, and \$3.00 billion in 1991 (Division of Consumer Expenditure Surveys, 1993). However, I suspect that total national payments for miscellaneous personal services actually were much greater than the amount reported by households, both because households probably underreport, and because businesses (including trucking) and institutions, which are not covered in the Consumer Expenditure Survey, also pay for miscellaneous personal services. I suspect this discrepancy because I know that there is a great discrepancy between reported household payments for road tolls and total national toll receipts, and a great discrepancy between reported household payments for parking and total national receipts for parking³⁰. Consequently, if traffic fines and parking fines constitute, say, 50% of the payments for miscellaneous personal services, and if actual total national payments for miscellaneous services are 2 to 3 times reported household payments (based on the discrepancy between reported household payments for road tolls and parking, and actual national receipts from road tolls and parking), then the Consumer Expenditure Survey data indicate total national payments for traffic fines and parking fines of about \$2 billion in 1990, and \$4 billion in 1991.

4. Fines and penalties in the financial statistics of FHWA's Highway Statistics reports. The FHWA's estimates of "miscellaneous receipts" for highways, reported in *Highway Statistics* (various years) (see Table 17-2 here) apparently includes a small amount traffic and parking fines – whatever fines are collected by local government and dedicated to street and highway purposes. Appendix 17-A.2 discusses the categorization of fines and penalties in the FHWA statistics. Even though the amount included in the FHWA estimates of "miscellaneous receipts" probably is very small, I have attempted to separate them so that I can assign them a zero weight (Table 17-2) and hence avoid double counting them with my own comprehensive estimates made in this section.

Summary of analysis of traffic and parking fines. My analysis of several different data sources suggests that traffic and parking fines amount to not less than \$4 billion, and not more than \$6 or \$7 billion. I assume a range of \$4 to \$6 billion for the year 1991.

²⁹ I believe that traffic fines and parking fines must constitute the bulk of payments for "miscellaneous personal services," because things like legal fees, home services, funeral and cemetery expenses, all banking fees, accounting fees, interest fees, parimutuel losses, property-related fees, hobbies, moving expenses, pet services, and alimony and child support definitely are not included in this category (BLS, *Quarterly Interview Survey*, 1991).

³⁰ Households reported spending \$1.1 billion dollars for road tolls in 1990, and \$1.2 billion in 1991 (Division of Consumer Expenditure Surveys, February 1, 1993; most of these payments were recorded in the daily diary), but the FHWA *received* \$2.7 billion in tolls in 1990 and \$3.0 billion in 1991 (FHWA, *Highway Statistics* 1991, 1992). Similarly, household reported paying \$2.2 billion for parking in 1990 (Division of Consumer Expenditure Surveys, 1993), but parking facilities nationally received at least \$5 billion, and perhaps as much as \$10 billion

The data and estimates discussed above apply to the year 1991. To estimate fines for other years, I assume that fines are proportional to vehicle miles of travel and to the average amount (or price) of fines. Specifically, I estimate fines for any year Y by scaling the 1991 estimates by the ratio of total U. S. VMT in year Y to VMT in 1991 (FHWA, *Highway Statistics*, various years) and by the ratio of the year-Y to year-1991 Consumer Price Index for automobile insurance, which I use as a proxy for the price of fines (data from Bureau of Labor Statistics, www.bls.gov).

17.4.12 Public parking fees and all parking taxes

Parking fees. Because in Report #7 I count municipal and institutional parking as a motor-vehicle related cost of the public sector, I must count payments for that same parking as a tax and fee payment by motor-vehicle users. In Report #7 I estimate that motor-vehicle users paid \$3.6 to \$4.6 billion for parking at municipalities, hospitals, universities, and other public institutions (see also the table immediately below). According to the Census, this amount excludes parking taxes (Hirsch, 1993), which I estimate next.

Parking taxes. Many local governments charge a tax on parking receipts. I count this parking tax as a payment towards government expenditures on motor-vehicle related services, even though it is not related in any obvious way to “consumption” of government-provided motor-vehicle-related services, because this sort of tax is not part of the general tax structure.

Parking-tax payments can be calculated as the average tax rate multiplied by total pre-tax revenues received by parking operators. In other reports in this social-cost series, I estimate parking revenues as follows:

Private commercial parking facilities ³¹	\$3.3 billion	Report #5
Local government parking facilities	\$1.0 to \$2.0 billion	Report #7
Hospitals, universities, airports, sporting facilities	\$2.6 billion	Report #7
Total	\$6.9 to \$7.9 billion	

Parking Technology (1992) lists the following parking tax rates: Los Angeles, 10%; Washington, D. C., 12%; Newark, 15%; Philadelphia, 15%; Manhattan, 18.25%; other four boroughs of New York City, 10.25%; San Francisco, 20%; Pittsburgh, 26%; Chicago, \$1 charge on parking transactions; Baltimore, 45 cents on parking transactions. However, the article mentions that some cities do not charge a parking tax. According to institutional and municipal parking operators surveyed by the Institutional and Municipal Parking Congress in 1992, the revenue that municipal parking operators

³¹This is revenues to commercial (mainly non-residential) establishments only; it does not include revenue to persons who provide private offstreet residential parking, because such revenue presumably is not subject to parking taxes.

receive from parking taxes is 4% of the revenue that they receive from meter collections plus surface-lot income plus garage income (IMPC, 1993).

I assume that a greater percentage of large cities than small cities assess a tax, and that the tax rate is higher in large cities. Thus, I assume a national average tax rate of 12% in large cities, 5% in medium cities, and 2% in small cities and outside of cities. With these and other assumptions, I calculate a weighted-national average parking tax rate of 7.1% to 7.6%, in Table 6-5 of Report #6.

If all parking operators, including municipalities, were subject to this 7.1% to 7.6% tax, then the total parking-tax payment was around \$0.5 to \$0.6 billion.

Estimates for other years. The data and estimates discussed above apply to the year 1991. To estimate payments for other years, I assume that payments are proportional to the number of vehicles and to the cost of parking spaces. Specifically, I estimate parking-fee payments including taxes for any year Y by scaling the 1991 estimates by the ratio of total U. S. vehicle registrations in year Y to registrations in 1991 (FHWA, *Highway Statistics*, various years) and by the ratio of the year-Y to year-1991 Producer Price Index for highway and street construction (data from Bureau of Labor Statistics, www.bls.gov).

17.4.13 Miscellaneous taxes and fees that I might count as user payments for MVIS but that FHWA does not.

FHWA classifies miscellaneous tax and fee receipts as either “other imposts” (column f of Table 17-2 here) or “miscellaneous receipts” (column g of Table 17-2 here). Because neither “other imposts” nor “miscellaneous receipts” are specifically targeted to motor-vehicle users *and* used by government for MVIS, neither category is counted under Way #1 of counting here. However, some of the other imposts and miscellaneous receipts may count as user payments under Way #3 of counting here (“anything specifically related to motor-vehicle use”). In this subsection, I estimate the fraction of the “other impost” category and the fraction of the “miscellaneous receipts” category that we ought to count as a user payment under Way #3 *and* that we don’t count already as user payment elsewhere.

Taxes and fees classified by FHWA as “other imposts.” The FHWA’s “other imposts” category includes various nonuser charges dedicated to the highways: various sales, use, and excise taxes on fuels and vehicles; various severance taxes on natural resources; various license and inspection fees, and various lease charges. According to FHWA: “All, or portions of the proceeds of many other State and local taxes, such as oil royalties, severance taxes on natural resources, and sales and use taxes, are allocated or drawn on for highways. When miscellaneous State taxes and appropriations are specifically allocated for highways, these provisions are shown in table S-106, which appears in *Highway Taxes and Fees, How They Are Collected and Distributed*” (FHWA, *Highway Statistics* 1991, 1992). Thus, certain FHWA-classified nonuser charges dedicated to the highways are named in Table S-106 of FHWA’s *Highway Taxes and Fees* 1991, “Provisions Governing the Allocation for Highway Purposes of Certain State Taxes, Fees, and Appropriations (Other Than Highway user Revenue),” and included as

“other imposts” in Table HF-1 and “other taxes and fees” in Table HF-10 of the FHWA’s *Highway Statistics* annual.

Now, in other sections of this report I make independent estimates of most of the individual items listed in FHWA’s Table S-106 and classified as “other imposts”. (For example, in section 17.5.2 I estimate severance taxes related to motor-vehicle use.) However, I was not able to examine explicitly *every* “other impost” item in Table S-106³², and hence must account for the possibility that there remain certain taxes and fees that the FHWA counts as “other imposts” (non-user charges dedicated to the highways) and that I have not independently estimated. Thus the following question: What fraction of the “other imposts” shown in Table 17-2, column f, are not already counted *and* should be classifiable as user payment for MVIS under Way #3 of counting?

I believe that this fraction is tiny, because it is my judgment that I would count as user payments very few of the remaining, unexamined taxes and fees were I able to examine them. Specifically, I suspect that I would reclassify only a few of the inspection fees and license fees that FHWA considers to be nonuser charges, and that all such items account for no more than 1.0% of the total revenue from “other imposts” in the FHWA classification. I assume that this percentage applies to all years.

Taxes and fees classified by FHWA as “miscellaneous receipts.” The FHWA’s “miscellaneous receipts” category comprises investment income, private investment in highways, insurance recoveries, a variety of permit fees, some parking fees, and some fines and penalties, including traffic fines (see Appendix 17-A.2 for a discussion of fines and penalties). Now, in this analysis, I make independent estimates of traffic fines, parking fees, and interest on capital, and as discussed below I don’t count private-developer contributions as an MV-user payment, so as a result only the “insurance recoveries” and “permit fees” components of “miscellaneous receipts” are potentially includable in my accounting of user payments.

In order to isolate permit fees and insurance recoveries, I break the category “miscellaneous receipts” into five parts: “dedicated parking fees,” “dedicated traffic fines,” “highway fund investments,” “private contributions,” and “other miscellaneous receipts,” the last category comprising the two components of possible relevance, insurance recoveries and permit fees. This breakout is presented as the right half of Table 17-2, and is explained in notes i, j, k, m, and n to Table 17-2. Given this breakout, the question before us now is: What fraction of the “other miscellaneous receipts” shown in Table 17-2, column n, are not already counted *and* should be classifiable as

³²Ideally, I would review each of the taxes and fees in Table S-106, along with the “miscellaneous receipts” reported in *Highway Statistics*, and if I disagreed with any FHWA determination that a particular tax or fee should *not* be considered a highway-user charge, I would reclassify the amount in question (subtract it from “other imposts” or “other taxes and fees” and add it to “imposts on highway users” or “road-use tax revenues” in *Highway Statistics*). However, Table S-106 shows only tax and fee rates and allocation provisions, and not total dollar amounts dedicated to highways in a particular year, and so to reclassify dollar amounts, one must use other data.

user payment for MVIS under Way #3 of counting? Without doing a formal analysis, I assume that only 10% of the insurance recoveries and permit fees under “other miscellaneous receipts” are not counted elsewhere in this analysis and ought to be considered user payments under Way #3. I assume that this percentage applies to all years.

Private contributions to (or private investment in) highways. The FHWA nominally includes in its estimate of receipts for and expenditures on highways the value of privately donated land and highway facilities and fees levied on private developers for their impact on traffic. Private donations and fees levied on developers are referred to as “private investment” in or “private contributions” to highways. On the receipts side of the ledger, FHWA includes such private contributions under “miscellaneous receipts” (Table 17-2 here); on the expenditure side of the ledger, FHWA includes private contributions under “capital outlay.” In Table 17-2 I have estimated and broken out the “private-contributions” portion of FHWA’s “miscellaneous receipts” because as explained next I do not count private contributions as a user payment for government MVIS³³.

For two reasons, I do not count private contributions as a user payment for government MVIS. First, privately donated land, facilities, and services are not user payments to the government but rather simply private-sector provision of goods and services. Second, the private sector recoups the value of its investment in highways *not* via user fees on MVIS, but rather via receipts from the sale of larger “bundled” commodities (e.g., as part of the price of a home or a lease). The payments for these bundled commodities are not specifically related to the use of motor vehicles. Since the payments for the bundled commodities (e.g., a home) are not payments to the government and cannot be said to be specifically related to the use of MVIS, such payments can not qualify as user payments for government MVIS under Way #3 of counting here. (Moreover, even if the private sector were to recover its road-development costs by charging drivers private tolls, such tolls would be included under private-sector motor-vehicle-related goods and services, not as user payments to the government for government MVIS.)

The bottom line is that in this analysis, *all* private investment in the highways is classified as a “motor-vehicle good or service bundled in the private sector” (see Report #6 in the social-cost series). We exclude “private contributions” from our estimates of receipts here and from our estimates of capital outlay for highways by government in Report #7.

³³ As discussed in Report #6 of this social-cost series, the FHWA’s estimates of private contributions is incomplete. This incompleteness matters when I estimate total *expenditures* on highways, because on the expenditure side I am interested in the value of all resources, public and private, devoted to highways. We account for this incompleteness in Report #6 by adding estimates of the amount of private expenditure not reported to FHWA. However, the incompleteness is not relevant to my estimates here of *user payments*, because none of the value of private investment in highways, whether reported to FHWA or not, represents a payment by motor-vehicle users for motor-vehicle use.

17.5 SELECTIVE TAXES AND FEES ON SOME COMMODITIES AND ACTIVITIES, INCLUDING SOME RELATED TO MOTOR-VEHICLE USE

17.5.1 Background

As discussed in section 17.2 and elsewhere, some taxes neither are applied to virtually all products or services (as general sales taxes are), nor targeted exclusively at motor vehicles or fuels (as the fuel excise tax is). Because of this, it is difficult to decide whether these selective taxes should be counted as payments for general government services (as broad-based taxes are counted), or rather as payments for MVIS specifically (as specific taxes are counted). Because this is a matter of judgment, I have opted, under Way #3 of counting (section 17.3), to treat them as user payments in my low-cost, high-payment case, but to treat them as general taxes (class C1 in the classification used in this report) in my high-cost, low-payment case. (Recall that under Way #1 of counting selective taxes and fees are not counted, and that Way #4 of counting is not formally represented in this analysis.)

In the following sections we consider three kinds of selective taxes and fees:

- i) severance taxes on natural resources;
- ii) special (as opposed to general) sales and property taxes on motor vehicles and motor fuels; and
- iii) other selective taxes and fees.

17.5.2 Severance taxes

Many states tax a portion of the value of natural resources (usually oil, gas, coal, or timber) extracted, or “severed”. Usually the tax is a percentage of the value of the resource removed or sold; less often, the tax is levied per physical unit (EIA, *State Energy Severance Taxes 1985-1993*, 1995). Table 17-11 shows state receipts from severance taxes in fiscal year 1991.

Because severance taxes are levied on “raw” resources, and not on finished products such as motor fuels and vehicles, we will have to calculate how much of each raw resource subject to the tax is “embedded” in motor vehicles, motor fuels, motor-vehicle services, and so on. Keep in mind that I do not estimate how much the embedded severance taxes raised the final prices of vehicles, fuels, and services; rather, I simply estimate total government revenues from the taxes. My purpose is to estimate how much tax and fee revenue governments receive as a result of motor-vehicle use, not how much more or less users would be paying were taxes eliminated.

Severance taxes on oil. The severance tax is collected only on domestically produced oil; it is not collected on foreign oil. Thus, in order to estimate the severance taxes embedded in the price of motor fuels, we must estimate the fraction of domestically produced crude oil that is used to make transportation fuels. This task is not as straightforward as it might seem, because the U.S. imports about half of the

crude that it uses, and transportation fuels might come disproportionately from domestic or crude oil. My assumptions and estimates are developed in Report #10 and shown in Table 10-14 of that report.

Severance taxes on gas. I calculate the motor-vehicle share of severance taxes on natural gas on the basis of the amount of natural gas used in industrial activities related to the production and use of motor fuels and motor vehicles:

$$\text{motor-vehicle share} = \frac{\sum_i G_i \times M_i}{G_t} \quad \text{eq. [17-3]}$$

where:

G_i = gas consumed in industry i ; estimated as follows:

- SICs 55, 517, and 75 (automotive dealers and gasoline service stations; petroleum and petroleum products; automotive repair, services, and parking): estimated on the basis of SCF/gallon and SCF/mi factors calculated in Report #10 of this social-cost series (see the list at the beginning of this report)
- SIC 371 (motor vehicles and motor-vehicle equipment): 90 BCF (my estimate, on the basis of data in the EIA, *Manufacturing Consumption of Energy* 1991, 1994)
- SIC 2911 (petroleum refining): 699 BCF (EIA, *Petroleum Supply Annual* 1991, 1992)
- SIC 4911 (electricity generation): about 300 BCF in 1991, including non-utility generators (EIA, *Annual Energy Review* 1994, 1995)
- SIC 1311 (oil production): DeLuchi (1991) estimates that oil production consumes 0.0125 BTUs of natural gas per BTU of final oil output. This multiplied by 16 quadrillion BTUs of highway fuels consumed in 1991 (Davis and Strang, 1993) results in about 200 BCF of natural gas consumed.

M_i = of total energy use in industry i , the fraction that is related to motor-vehicle use:

- SICs 55, 517, and 75 (automotive dealers and gasoline service stations; petroleum and petroleum products; automotive repair, services, and parking): accounted for in the SCF/gallon and SCF/mi natural-gas use factors estimated in Report #10
- SIC 371 (motor vehicles and motor-vehicle equipment): I assume that all of the energy used in the manufacture and assembly of motor-vehicle use is related to motor-vehicle use (!)
- SIC 2911 (petroleum refining): I assume that 70% of the energy use at petroleum refineries is related to the production of motor fuels (DeLuchi, 1993)

SIC 4911 (electricity generation): In Report #10 of this social-cost series, I estimate that motor-vehicle-related industries (including petroleum refineries) consume 4% of all electricity output

SIC 1311 (oil production) Here, I assume that half of all oil produced, and hence of the energy used to produce oil, is for highway fuels

G_t = the total amount of gas consumed in the U.S. in 1991 (17.7 TCF; EIA, *Annual Energy Review* 1994, 1995)

Severance taxes on oil and gas combined. I estimate the motor-vehicle share of severance taxes on oil and gas *combined* as follows;

$$\text{motor-vehicle share} = M_o \times \frac{V_o}{V_o + V_g} + M_g \times \frac{V_g}{V_o + V_g} \quad \text{eq. [17-4]}$$

where:

M_o = the motor-vehicle share of oil severance taxes (see above and Report #10)

V_o = the total value of oil production in the U.S. (\$45 billion dollars; EIA, *Annual Energy Review* 1994, 1995)

V_g = the total value of gas production in the U.S. in 1991 (\$30 billion dollars; EIA, *Annual Energy Review* 1994, 1995)

M_g = the motor-vehicle share of gas severance taxes (see above)

This calculation assumes that all severance taxes on oil and gas are collected on the basis of value (the EIA, *State Energy Severance Taxes 1985-1993* (1995), says that “States generally levy energy severance taxes in the form of a percent of the value of the resources removed or sold” (p. 1)), and that where oil and gas severance taxes are collected, the ratio of oil value to gas value is equal to the national-average ratio.

Severance taxes on coal. I calculate the motor-vehicle share of severance taxes on coal on the basis of the amount of coal used in power generation and other industrial activities related to the production and use of motor fuels and motor vehicles:

$$\text{motor-vehicle share} = \frac{F_{em} \times C_e \times F_{om}}{C_t} \quad \text{eq. [17-5]}$$

where:

F_{em} = electricity use in motor-vehicle related industries divided by total electricity use (0.04; see Report #10)

C_e = the amount of coal used by electric utilities in 1991 (772 million short tons; EIA, *Annual Energy Review* 1994, 1995)

F_{om} = factor to account for other motor-vehicle related uses of coal (I assume 1.2)

C_t = the amount of coal used in all sectors in 1991 (888 million short tons; EIA, *Annual Energy Review* 1994, 1995)

This calculation assumes that the electricity used by motor-vehicle related industries is generated from the national average mix of fossil fuels.

Other severance taxes. Most of the others are severance taxes on forestry products, and I assume that the motor-vehicle system does not use an appreciable amount of forestry products.

The possibility of double-counting severance taxes. Severance taxes are not included in any of the other estimates counted in this analysis. In the FHWA's accounting for *Highway Statistics*, some severance taxes are classified as "non-user charges dedicated to highways," and are included under the general financial category "other imposts," which is column f of Table 17-2. However, I have separately estimated all of the major items (including any severance taxes) under the FHWA's "other imposts" category, so there is no possibility of counting severance taxes or any other "other imposts."

Estimates for other years. The data and estimates discussed above are for 1991. To estimate motor-vehicle-user severance-tax payments for any other year Y, I multiply the estimated user payments in 1991 by the ratio of total state severance-tax receipts in year Y to total state severance-tax receipts in 1991 (using total severance taxes for the United States, as reported in the State Government Tax collections spreadsheets provided by the U. S. Census at www.census.gov/govs/www/statetax.html). This method assumes that the motor-vehicle-related fraction of all severance taxes is the same in every year.

17.5.3 Selective property taxes on motor vehicles

In this section and the next we estimate *selective* property and sales taxes on motor vehicles, motor fuels, garages, and so on. These special taxes are distinguished from *general* sales and property taxes on motor vehicles and motor fuels, and also from property-tax-like fees specifically related to motor-vehicle use. A "special" property or sales tax applies only to select class of items, as opposed to the broadest class of items, and at a rate different from that which applies to the broadest class of items. General taxes on motor-vehicles are estimated in section 17.6.

The distinction between special property taxes (estimated in this section) and property-tax-like fees specifically related to motor-vehicle use (section 17.4.5) is somewhat arbitrary, but does have a practical consequence. As a bit of background, several states assess property-tax like fees on motor vehicles. For example, California, Washington, and Arizona collect "vehicle license fees" with the vehicle registration, in lieu of a property tax on motor vehicles, because of statutory limitations on property taxation. Although the Bureau of the Census, *State Government Tax Collections 1992* (1994) does classify some of these property-tax-like fees as "special" or "selective" property taxes, I have treated them separately as fees specifically targeted towards motor-vehicle users, in section 17.4.5. The practical consequence of this somewhat arbitrary distinction between a selective property tax (treated in this section) and a property-tax-like fee counted as being specifically related to motor-vehicle use (section

17.4.5) is that under Way #3 of counting the latter (a property-tax-like fee) is counted as a payment by users for MVIS in both the low-cost and the high cost case, whereas a selective property tax is counted as a user payment for MVIS under the low-cost but not the high-cost case (still under Way #3 of counting).

Table 17-12 summarizes special property and sales taxes related to motor-vehicle use. Note that Table 17-12 presents *special* (or *selective*) property taxes on motor vehicles, whereas Table 17-21 presents *general* property taxes on motor vehicles, and that Table 17-13 presents selective taxes and fees *other* than special property and sales taxes. Also, Table 17-3 counts some property-tax-like fees specifically related to motor-vehicle use. There is no double counting between Tables 17-3, 17-12, 17-13, and 17-21.

Table 17-12 shows estimates of special property taxes from two sources: the Bureau of the Census' *State Government Tax Collections* report, and FHWA's *Highway Statistics* and *Highway Taxes and Fees* (see the notes to Table 17-12 for details). The Census' data generally are more comprehensive, because FHWA reports only those amounts that it counts as user payments towards the highways, whereas the Census reports all selective taxes and fees. I report the FHWA data, even though it generally is less comprehensive than the Census data, partly as a check on the Census data (the two sources agree on every item they both estimate), but mainly because the items estimated by FHWA already are counted as user payments in this analysis (Table 17-2 or 17-3) and so should not be counted again here.

Note that my low-cost case here counts all of the special property taxes listed in Table 17-12 *except* the property-tax-like fees in California and Washington, which as discussed in section 17.4.5 are included in amounts in Table 17-3. (See notes to Table 17-12 for further explanation of the "weighting" of the amounts in Table 17-12.)

Estimates for other years. The data and estimates discussed above are for 1991. To estimate motor-vehicle-user special-property-tax payments for any other year Y, I multiply the estimated user payments in 1991 by the ratio of total state property-tax receipts in year Y to total state property-tax receipts in 1991 (using total property taxes for the United States, as reported in the State Government Tax collections spreadsheet provided by the U. S. Census at www.census.gov/govs/www/statetax.html). This method assumes that the motor-vehicle-related fraction of all property taxes is the same in every year.

17.5.4 Selective sales taxes on motor vehicles

Several states charge selective sales or use taxes on motor-vehicles in addition to or instead of state-wide all-commodity general sales taxes. Table 17-12 lists these taxes as reported by the Census and FHWA. (See section 17.5.3. for a general discussion of Table 17-12.)

Several of the special sales taxes listed in Table 17-12 are actually counted by FHWA as user imposts for highways, and hence are already included in the amounts shown in Table 17-2 here. These amounts are not counted again in Table 17-12. Also, some of the special sales taxes in Table 17-12 may be counted as retail sales taxes in Table 17-14. This latter possibility is discussed later in this subsection.

The possibility of double counting selective sales taxes. Some of the selective sales taxes counted in Table 17-12 may be double-counted as retail sales taxes in Table 17-14. In *State Government Tax Collections*, which serves as the data source for the estimates of selective sales taxes in Table 17-12, the Census reports state receipts of “selective” sales taxes on motor vehicles. In the annual *Retail Trade* series, which serves as a data source for estimates of retail sales taxes in Table 17-14, the Census reports receipts of all sales taxes on retail sales in SICs 551, 552, 553, and 554. Given this, the question is: are any of the “selective sales taxes” reported in *State Government Tax Collections* included in the retail-sales taxes reported in *Retail Trade*? To answer this question, we must look more closely at the data in *Retail Trade* and *State Government Tax Collections*.

The data in *Retail Trade*, on sales taxes paid on retail sales, come from a survey that the Census sends to retailers. The survey asks: “Did your firm collect sales or other taxes which were forwarded directly to taxing authorities?” (D. Engleking, 1995). The Census is interested here in sales taxes on retail sales: taxes collected from the buyer by the retailer. The Census instructs respondents to count “excise” taxes -- by which the Census means taxes paid at the wholesale level -- as part of the retail sales *price*, not as a retail sales tax. However, there apparently is no distinction in this survey between “general” and “selective” retail sales taxes. This leaves open the possibility of double counting.

The data in *State Government Tax Collections* come from a mail canvas of State agencies (the actual survey form is available at <http://ftp.census.gov/govs/forms/2000/f5.pdf>). The survey form instructs respondents to arrange tax sources “according to the standard classification applied in Census Bureau reporting.” This reference to the “standard classification” presumably is to the Bureau of the Census *Government Finance and Employment classification Manual* (1992), which distinguishes clearly between “general” and “selective” sales taxes. This distinction also is made in the *State Government Tax Collections* report, which shows receipts of general sales taxes from all commodities taxed at the “general” state rate, and receipts from any “selective” taxes on commodities that are taxed under distinct legislation or at a different rate than the general rate (Wulf, 1995). Receipts of “selective” sales taxes are shown for several commodity groups: motor fuels, alcoholic beverages, tobacco products, insurance, public utilities, amusements, and other. Individual commodities are listed under each of these groups; any selective taxes on motor vehicles are listed under “other”. The Census identifies any “other” selective sales tax on motor vehicles by the label actually used in the state (e.g., motor vehicle sales and use tax; motor-vehicle excise tax). Some states refer to their selective sales taxes as “excise” taxes.

Given the information in the *State Government Tax Collections* report and associated survey form and in the *Government Finance and Employment classification Manual* (Census, 1992), we may be reasonably sure that the “selective” taxes and fees reported in *State Government Tax Collections* and used as the basis of our estimates in Table 17-12 are not “general” taxes as defined here. However, it is possible that some of

the taxes on retail trade reported in the Census' *Retail Trade* and used as the basis of our estimates in Table 17-14 are what the Census would consider "selective" taxes, in which case some of the sales tax revenue in Table 17-14 would double count some of the selective sales taxes of Table 17-12.

I handle this as follows. In the low-cost (high-payments) case, in which all selective taxes and fees are counted as user payments for MVIS, I assume that there is no double counting, and hence no adjustments to be made to the estimates of Table 17-12 or 17-14. This results in the lowest possible net cost, which is appropriate for the low-cost case. In the high-cost (low-payments) case, the selective sales taxes are treated as general taxes, which means that they are given such a low weight (see section 17.6.7) that any minor double counting is trivial. Hence, I do not make any adjustments at all for the possibility of double counting.

Estimates for other years. The data and estimates discussed above are for 1991. To estimate motor-vehicle-user special-sales-tax payments for any other year Y, I multiply the estimated user payments in 1991 by the ratio of total state selective-sales-tax receipts in year Y to total state selective-sales-tax receipts in 1991 (using total selective sales taxes for the United States, as reported in the State Government Tax collections spreadsheet provided by the U. S. Census at www.census.gov/govs/www/statetax.html). This method assumes that the motor-vehicle-related fraction of all selective sales taxes is the same in every year.

17.5.5 Other selective taxes and fees related to the use of motor vehicles or motor fuels

Besides severance taxes (Table 17-11) and special property and sales taxes (Table 17-12), other selective taxes and fees related to the use of motor vehicles or motor fuels include miscellaneous motor-vehicle license fees and miscellaneous oil taxes and license fees. Although these fees are not part of general tax structure, neither are they unique to motor vehicles and motor fuels. For example, license fees are applied to goods other than motor vehicles, but not to *all* or even *most* other goods. Therefore, I classify them as "selective" taxes and fees.

Table 17-13 presents these miscellaneous selective license fees. These license fees are fairly clearly not severance taxes, special sales taxes, special property taxes, or general sales taxes, and hence almost certainly are not double counted by the payments in Tables 17-11, 17-12, or 17-15. It also is likely that none of them are counted as "highway user" payments by FHWA³⁴, and hence that none of them are included in the amounts in Table 17-2 or 17-3.

In the low-cost (high-payment case), I count the motor-vehicle-related portion of these taxes fully as motor-vehicle user payments, under Way #3 of counting (see section 17.3). In the high-cost, low-payments case, I treat them as general taxes, which means

³⁴Two of the taxes in Table 17-13 – the lubricating-oil tax in Alabama, and the special petroleum tax in Tennessee – are listed in Table S-106 of FHWA's *Highway Taxes and Fees 1991* (1991), which shows *nonhighway* user fees in the FHWA accounting.

that I count as a user payment only the portion of the tax that, after being mixed into general funds, ends up on average funding public motor-vehicle-related infrastructure and services. This turns out to be a very small fraction of the tax (see section 17.6).

Estimates for other years. The data and estimates discussed above are for 1991. To estimate other motor-vehicle-user selective tax and fee payments for any other year Y, I multiply the estimated user payments in 1991 by the ratio of total state motor-vehicle-operator license receipts in year Y to total state motor-vehicle-operator license receipts in 1991 (using total motor-vehicle-operator license receipts for the United States, as reported in the State Government Tax collections spreadsheet provided by the U. S. Census at www.census.gov/govs/www/statetax.html). This method assumes that the ratio of other motor-vehicle-user selective tax and fee payments (as estimated in detail for 1991) to motor-vehicle-operator license payments is constant.

17.6 GENERAL SALES, INCOME, AND PROPERTY TAXES LEVIED ON A WIDE RANGE OF COMMODITIES AND ACTIVITIES, INCLUDING THOSE RELATED TO MOTOR-VEHICLE USE

17.6.1 Theoretical background

Motor-vehicle users typically pay a sales tax on sales of motor-vehicles, automotive parts, and fuels and lubricants. They also pay, if only indirectly, corporate-income taxes levied on motor-vehicle and related corporations, personal income taxes levied on employees of motor-vehicle and related corporations, and property taxes on motor vehicles and other property related to motor-vehicle use.

Although these general sales, income, and property taxes are related to motor-vehicle use and – to the extent that they are incorporated into prices – are perceived by users to be part of the price of motor-vehicle use, they nevertheless are more reasonably viewed as meant to support a wide range of government services, most of which are not related to motor-vehicle use. There are two reasons for this. First, general taxes typically are deposited into the general-fund accounts of governments and used for general purposes. (Although some general taxes are earmarked for transportation purposes³⁵, in my view and in the view of FHWA this earmarking does not mean that the taxes

³⁵Some states dedicate a portion of general sales taxes, or a portion or all of motor-vehicle-related sales taxes, to transportation (FHWA, *Highway Taxes and Fees, How They Are Collected and Distributed 1991*, 1991). For example, in California net revenue from the 4.75% sales and use tax on motor-vehicle fuels is dedicated to state and local transportation planning and transit support. In Hawaii, all of the 4% sales tax on motor fuel is dedicated to the State Highway Fund (effective through FY 1991). In Missouri, a portion of the 4% use tax on the purchase price of motor vehicles is allocated to the construction, reconstruction, and maintenance of the State highway system. In Michigan, a portion of the 4% sales tax on motor fuel, motor vehicles, and auto parts is allocated to the Comprehensive Transportation Fund. In Texas, all of the 6.25% sales tax on lube oil used in motor vehicles goes to the State Highway Fund. Many other states have similar provisions (see *Highway Taxes and Fees, How They Are Collected and Distributed 1991*, for a complete listing).

should be considered payments by motor-vehicle users for motor-vehicle use.) Second, and more importantly, most products – not just those bought for motor-vehicle use – are assessed a sales tax; most corporations – not just those involved in motor-vehicle-related businesses – pay an income tax; most workers – not just those in motor-vehicle and related industries – pay an income tax; and many forms of property – not just those related to motor-vehicle use – are assessed a property tax. For these reasons, the bulk of general taxes paid directly or indirectly by motor-vehicle users should be viewed as general payments that support a wide variety of government services rather than as a charge for government MVIS.

An alternative, less restrictive view is that if a tax looks like a price and acts like a price to motor-vehicle users, then it should count as a payment for highways, regardless of whether or not it is part of a general tax structure. By this criterion, the sales tax paid on motor-vehicles, gasoline and motor-vehicle parts and services would count as user payments and go towards offsetting public expenditures related to motor-vehicle use. However, I feel that this criterion is too loose, because it does not allow that some taxes might more reasonably be viewed as required payments for government services other than those related to motor-vehicle use.

However, whenever specific, targeted user payments do not fully fund government expenditures on MVIS, the difference between expenditures and receipts from users is made up from the general fund, with the result that a small portion of all general tax revenue does, in effect, necessarily get spent on government MVIS. This small portion that ends up being spent on government MVIS reasonably can be counted as a payment by motor-vehicle users for motor-vehicle use. This indeed is our approach under Way of Counting #3 (section 17.3.3). (Recall that under Way of Counting #1 and #2, these general taxes are not counted at all, and that we do not formally estimate Way of Counting #4 [section 17.3.4].)

Tax expenditures. If one counts as a motor-vehicle user payment the portion of a general motor-vehicle-related tax that, after being mixed in with general funds, ends up funding government MVIS, then one may want to take a broader look at general taxes paid on motor vehicles and fuels and ask whether they are contributing fairly towards *all* of the government goods and services that general taxes are supposed to fund. That is, it might be considered unfair to credit motor-vehicle users with general tax payments towards government MVIS if in general motor-vehicle users are paying less general tax than are consumers of other goods and services.

If a particular commodity or activity is subject to general taxes, such as sales taxes, at less than the average rate for all commodities or activities, then the resultant reduction in tax revenues to the government (compared with what the government would get were the particular commodity or activity in question taxed at the average rate) is called a “tax expenditure” or “tax subsidy”. It turns out that motor-vehicles and fuels do indeed get general tax subsidies. We estimate these tax expenditures in this section. As mentioned in section 17.3, we ignore tax expenditures under Way of Counting #1 and #2, but do count them under Way of Counting #3. (We do not formally estimate Way of Counting #4 [section 17.3.4].)

17.6.2. General sales taxes on retail sales of vehicles, fuels, and parts; wholesale of vehicles and parts; and automotive services

Many state and local governments tax the sale of motor vehicles, motor fuels, automotive parts, automotive services, and other goods and services related to motor-vehicle use. These sales taxes amount to billions of dollars per year. In this section, I use primary data on sales and sales-tax receipts to estimate general sales taxes related to motor-vehicle use.

The basic method is straightforward. First, I distinguish five kinds of transactions related to motor-vehicle use and subject to sales taxes:

- retail of motor-vehicles (including recreational vehicles, but not trailers, campers, or mobile homes);
- retail of automotive supplies (including trailers and campers);
- retail of fuels and lubricants;
- wholesale of motor vehicles and motor-vehicle parts and supplies
- automotive services

These are the motor-vehicle related categories for which there are primary data, from the Bureau of the Census, on sales and sales taxes paid. In each category, total motor-vehicle-related sales tax payments in a given year are equal to total sales (or receipts, in the case of the service sector) in the year multiplied by the sales-tax fraction for the year. The sales-tax fraction (which is what the Census actually reports) is equal to sales taxes actually paid divided by total pre-tax sales. I emphasize that the sales-tax fraction is based on sales taxes actually paid (which is the correct basis), and not on posted all-commodity sales tax rates. For any particular commodity, the actual sales-tax fraction might differ from the posted general tax rate because of exempt sales, refunds, misreporting, and other reasons.

Note that the Census reports sales-tax fractions by SIC (Standard Industrial Classification; Office of Management and Budget, 1987) category, not by merchandise lines. Now, the SIC classifies by type of *establishment*, such as motor-vehicle dealership or food store, and not by type of good or service, such as motor vehicle or food. To begin, then, I must identify the kinds of establishments in the SIC that deal mainly (or, ideally, exclusively) in the five kinds of motor-vehicle goods and services identified above:

<u>SIC</u>	<u>Sector</u>	<u>Name</u>	<u>Goods and services</u>
551	retail	Motor-vehicle dealers (new and used)	<u>Primary:</u> new and used cars and trucks <u>Secondary:</u> parts, tires, batteries, automotive accessories, automotive services
552	retail	Motor vehicle dealers (used)	used automobiles, used pick-up trucks, used vans

553	retail	Auto and home supply stores	<u>Primary:</u> automobile parts, tires, batteries, accessories <u>Secondary:</u> home appliances, radios, and televisions
554	retail	Gasoline service stations	<u>Primary:</u> motor fuels and lubricants <u>Secondary:</u> automobile parts and repair, and sometimes minor amounts of groceries and other items
556	retail	Recreational Vehicle dealers	campers, motor homes, recreational vehicles, travel trailers
557	retail	Motorcycle dealers	motorcycles, mopeds, motor scooters, all-terrain vehicles, bicycles
559	retail	Automobile dealers, n.e.c.	aircraft, dunebuggies, gocarts, snowmobiles, utility trailers
501	wholesale	Motor vehicles and motor vehicle parts and supplies	cars, trucks, campers, vans, buses, taxis, snowmobiles, tractor trailers, engine testing equipment, batteries, automotive supplies, automotive tools and hardware, service station equipment, automotive stampings, wheels, used parts, and more
75	services	Automotive repair, services, and parking	car leasing and rental, parking, automotive repair, tire retreading, automotive glass replacement, general repair shops, carwashes, emissions testing, rust proofing, road services, and more

Note that the establishments within an SIC are defined by a primary merchandise line (e.g., gasoline service stations, SIC 554, sell gasoline) or commodity line, but may sell goods and services unrelated to the SIC designation or primary merchandise line (e.g., some gasoline service stations [SIC 554] sell food). Note too that some motor-vehicle goods and services are sold, as secondary items, in SICs other than those listed above (e.g., some general merchandise stores [SIC 53] sell automotive supplies, and some food stores [SIC 54] sell gasoline). Thus, in order to use the Census data on sales-tax fraction by SIC to estimate sales-tax fractions for motor-vehicle goods and services, one must account for non-motor-vehicle goods and services in the motor-vehicle SICs, and motor-vehicle goods and services in non-motor-vehicle SICs. It turns out that this is necessary only for the retail sector, because in the wholesale and service sectors the establishments are much less diversified.

Retails sales of motor vehicles, automotive supplies, and fuels and lubricants.
The Bureau of the Census published annual retail sales by SIC (*Combined Annual and Revised Monthly Retail Trade*, 1994, 1996), and annual sales-tax fractions by SIC (*Retail*

Trade, annual; Key, 1997). Because, as discussed above, most SICs in the retail sector cover more than one merchandise line, and most retail merchandise lines are sold in more than one SIC, we need to derive from the original sales and sales-tax fractions by SIC estimates of sales and sales-tax fractions by major merchandise line (motor vehicles, automotive supplies, and fuels and lubricants).

Sales by merchandise line. Every five years, the Bureau of the Census reports sales by merchandise line (data for 1987 are in the *1987 Census of Retail Trade, Merchandise Line Sales*, 1990). In the intervening years, the Census does not estimate total sales by merchandise line; it estimates only total sales by SIC. I use the quinquennial data on SIC sales and merchandise-line sales to estimate a relationship between SIC sales and merchandise line sales, and then apply this estimated relationship to annual SIC sales. Formally:

$$R_{ML,Y} = R_{SIC \rightarrow ML,Y} \cdot \frac{R_{ML,87}}{R_{SIC \rightarrow ML,87}} \quad \text{eq. [17-6]}$$

where:

subscript ML = motor-vehicle-related merchandise line (motor vehicles and RVs; automotive parts; fuels and lubricants; see Table 17-14)

subscript SIC→ML = the retail SIC that sells mainly merchandise line ML:

<i>SIC</i>	<i>main merchandise line</i>
551 and 552	motor vehicles and RVs
553	automotive parts
554	fuels and lubricants

$R_{ML,Y}$ = estimated retail sales of merchandise line ML in year Y

$R_{SIC \rightarrow ML,Y}$ = Census-reported retail sales in year Y in the SIC that sells mainly merchandise line ML (total sales in each SIC from 1986 to 1994 are from the Bureau of the Census *Combined Annual and Revised Monthly Retail Trade*, 1996; sales in 1984 and 1985 are from the Census *Combined Annual and Revised Monthly Retail Trade*, 1994)³⁶

$R_{ML,87}$ = Census-reported retail sales of merchandise line ML in 1987 (Table 17-14)

$R_{SIC \rightarrow ML,87}$ = Census-reported retail sales in the SIC that sells mainly merchandise line ML, in 1987 (Table 17-14)

³⁶The data in the *Combined Annual and Revised Monthly Retail Trade* for 1987 are slightly different than the data in the *1987 Census of Retail Trade*, because the Census periodically revises its estimates.

Note that the ratio $\frac{R_{ML,87}}{R_{SIC \rightarrow ML,87}}$ is based on data from the 1987 *Census of Retail Trade, Merchandise Line Sales*, and is applied to every year. The data of Table 17-14 result in the following values for this ratio:

<i>SIC</i>	<i>ML</i>	$\frac{R_{ML,87}}{R_{SIC \rightarrow ML,87}}$
551 and 552	motor vehicles and RVs	0.878
553	automotive parts	2.084
554	fuels and lubricants	0.887

Sales-tax fraction by merchandise line. The Bureau of the Census reports total state and local sales taxes paid as a fraction of total pre-tax retail sales, in various SICs. However, the Census does not collect data on sales-tax fractions for automotive merchandise lines. The task, then, is to estimate the sales-tax fraction for automotive merchandise lines, given the fraction in SICs. My estimates of sales-tax fractions by merchandise line in 1987, shown in Table 17-14.

Given an estimate of sales-tax fractions by merchandise line in 1987, and reported sales-tax fractions by SIC in 1987, one can estimate a relationship between SIC sales-tax fractions and merchandise-line sales-tax fractions in 1987, and then apply this estimated relationship to annual SIC sales-tax fractions, just as was done above for merchandise-line and SIC retail sales. Thus:

$$SF_{ML,Y} = SF_{SIC \rightarrow ML,Y} \cdot \frac{SF_{ML,87}}{SF_{SIC \rightarrow ML,87}} \quad \text{eq. [17-7]}$$

where SF stands for “sales-tax fraction” instead of “retail sales” (R) in equation 17-6. The results of this exercise are:

<i>SIC</i>	<i>ML</i>	$\frac{SF_{ML,87}}{SF_{SIC \rightarrow ML,87}}$
551 and 552	motor vehicles and RVs	0.926
553	automotive parts	1.028
554	fuels and lubricants	0.842

Note that for some of the merchandise lines shown here, the estimated sales-tax fractions (Table 17-14) are less than posted general sales tax rates, which typically are in the range of 4% to 7% (Loper, 1994). (The income-weighted average rate in the U. S. is about 6% [Loper, 1994].) Most likely, the main reason for this is that the posted rates do not apply to every merchandise line; in most if not all states, some merchandise lines are exempt from the sales tax. (If the sales-tax fraction includes some sales that are

exempt from the sales tax, then the sales-tax fraction will be less than the tax rate because the denominator will be larger). This at least partly explains the low sales-tax fractions for some automotive-merchandise lines. For example, as of July 1, 1993, only a fraction of states taxed highway fuels:

<i>State</i>	<i>State and local sales tax, % of retail fuel price including excise taxes</i>
Arkansas	0.4
California	7.5
Georgia	5.3
Hawaii	4.0
Illinois	8.6
Indiana	5.0
Michigan	4.0*
New York	7.4
Rhode Island	7.0 (diesel fuel)*
Virginia	0.2

* *From FHWA's Highway Statistics 1993 (1994); all others from Loper (1994)*

This explains why the average national sales tax rate on automotive fuels is only around 2%. It also must be the case that in some states, motor-vehicle and automotive-supply merchandise lines are exempt from sales taxes, or else charged a lower-than-average rate.

Of course, if sales taxes are under-reported to the Census, then the sales tax fraction will be less than the average tax rate. Below, I evaluate this possibility generally, by comparing total sales taxes reportedly paid to governments with an independent Census estimate of sales taxes received by governments.

Annual sales taxes from retail sales. With the estimates of annual merchandise-line sales and annual sales-tax fractions, discussed above, I calculate annual sales-taxes paid on retail sales of motor vehicles, automotive supplies, and fuels and lubricants. Table 17-15 shows $R_{ML,Y}$ (estimated retail sales of merchandise line ML in year Y), $SF_{ML,Y}$ (estimated sales taxes as a fraction of retail sales of merchandise line ML in year Y), and total sales taxes paid in year Y.

Wholesale of motor vehicles and motor-vehicle parts and supplies. Every five years, the Bureau of the Census' Annual Survey of Wholesale Trade asks wholesale establishments to report the amount of "sales, excise and other taxes collected directly from customers and paid directly to a local, state or federal tax agency". The Census passes the data to the Bureau of Economic Analysis, which uses them in its National Income Product Accounts. (Neither the Census nor the BEA publish the data.) In the

three recent most quinquennial censuses, these sales and other taxes, as a fraction of sales, have been as follows (Key, 1997):

	1992	1987	1982
Wholesale Trade Division (major SIC groups 50 & 51)	0.009	0.008	0.008
Motor vehicles and motor vehicle parts and supplies (SIC 501)	0.005	0.005	0.006

Note that, as one would expect, the overall average tax rate of 0.9% in 1992 was much less than the overall average of 3.7% for the retail trade sector.

Because these Census data pertain to kinds of establishments (SICs), and not to commodity lines, and we are interested in sales of motor vehicles and related commodity lines (analogous to merchandise lines in the retail sector), and not necessarily sales by establishments that handle mainly motor-vehicle and related commodity lines, we must account for non-motor-vehicle commodity lines in SIC 501, and motor-vehicle commodity lines sold outside of SIC 501. It turns out, however, that sales in SIC 501 are essentially the same as sales of motor-vehicles and related commodity lines. Less than 2% of the sales in SIC 501 are not related to motor-vehicle use (e. g., sales of snowmobiles, farm equipment, and metal scrap) , and only 1% of motor vehicles and related commodity lines are sold outside of SIC 501 (e.g., in SIC 5084, industrial machinery and equipment) (Bureau of the Census, *1992 Census of Wholesale Trade, Subject Series, Commodity Line Sales, United States*, 1995). Thus, we may presume that the data by SIC, without adjustment, represent data for motor-vehicle and related commodity lines.

It is possible that some motor vehicle sales are taxed twice: once at the wholesale level, and once again at the retail level. The accounting shown here will capture this correctly. Conversely, there is no possibility here of incorrectly double counting a single sales tax, by virtue of a single sale being counted as both a retail sale and wholesale transaction, because the Census collects sales and tax data from individual establishments, and the data for each establishment are classified in one sector only (e.g., retail or wholesale).

Finally, we must consider that the tax-fractions reported for the wholesale SICs might include “excise and other” taxes collected from customers, as well as sales taxes. (The tax-fractions for the retail sector are sales taxes only.) The issue is that any “excise and other” taxes might include taxes, such as the state and federal motor-fuel excise tax, that I count elsewhere. However, it does not appear that sales in SIC 501 are subject to any excise or special taxes counted elsewhere in this analysis, and as a result, I assume that the entire tax-fraction reported by the Census represents general sales or use taxes.

For a discussion of the possibility that the sales-tax fractions of Table 17-14 double-count some selective sales taxes in Table 17-12, see section 17.5.4.

Table 17-15 shows the use of these Census data to calculate sales taxes paid in SIC 501.

Automotive services. Every five years, the Bureau of the Census *Service Annual Survey* asks service establishments to report the amount of “sales taxes and other taxes (i.e., amusement, occupancy, use, etc.) collected from customers and forwarded directly to taxing authorities” (The Bureau of the Census *Service Annual Survey*: 1992 , 1994, p. D-22). In 1992, these sales and “other taxes” were 3.4% of total receipts in SIC 75, Automotive Services (Bureau of the Census *Service Annual Survey*: 1992, 1994). In 1987, they were 3.0% (Bureau of the Census *Service Annual Survey*: 1987, 1989). (The sales-tax data have been collected and published in 1987 and 1992 only.)

Some undoubtedly minor fraction of the total receipts in SIC 75 are not related to motor-vehicle use. I ignore this, and assume that all of the receipts are related to motor-vehicle use. Similarly, I assume that there are no taxed automotive services outside of SICs 55 or 75.

Because here I am estimating general sales taxes, I would in principle like to distinguish the sales taxes from the other taxes collected in SIC 75. Particularly, I would like to avoid counting motor-fuel taxes collected on any sales of fuel in SIC 75. Unfortunately, this is not entirely possible, because the survey form itself asks only for the total amount of taxes of any kind collected from customers. However, because the excise taxes on gasoline are levied mainly on distributors (FHWA, *Highway Taxes and Fees*, 1995), one can assume that at least motor-fuel excise taxes are not included in the tax fraction for SIC 75. I will assume that any “other” taxes included in the Census-reported tax-fractions are similar to sales taxes.

Table 17-15 shows the use of these Census data to calculate sales taxes paid in SIC 501.

Adjustment for underreporting. It is possible that sales tax payments are underreported to the Census. One way to check this possibility is to compare the reported payments of general sales taxes in the retail, wholesale, and service sectors (which payments serve as the basis of my estimates above), with the total amount of general sales taxes that governments actually collected. In 1991, governments received about \$124 billion in general sales and gross receipts taxes (Bureau of the Census, *Quarterly Summary of Federal State, and Local Tax Revenue* , 1993). In the separate surveys discussed above, the retail trade sector reported paying \$67 billion in sales taxes (Key, 1997), the wholesale trade sector reported paying \$23 billion in sales taxes (Key, 1997; Bureau of the Census, *1992 Census of Wholesale Trade*, 1995), and some SICs in the service sector reported paying \$9 billion in sales and other taxes (The Bureau of the Census *Service Annual Survey*: 1992 , 1994)³⁷, making a total of \$99 billion. Thus, there is a difference of at least \$25 billion (25% of reported payments) between what government reported it collected, and what retailers, wholesalers, and some service industries reported they paid. (I say “at least” \$25 billion, because some of the \$9 billion from the

³⁷The Census reports sales and other taxes as a fraction of receipts in SICs 70 (except 704) (hotels and other lodging), 72 (personal services), 75 (automotive services), 76 (miscellaneous repair services), and 79 (amusement and recreation services). It does not report tax fractions for business services, legal services, health services, social services, and other services.

service sector might be from “other” taxes not counted as sales taxes in the government receipts.) But the universe of sales-tax payers includes more than the retail sector, the wholesale sector, and part of the service sector. Some or perhaps all of this \$25-plus-billion difference might have come from sales taxes in other major divisions of the SIC, such as transportation and communications, or other SICs within the service sector, such as business services (SIC 73; includes such businesses as photocopying, interior design, equipment rental). In the final analysis, then, it is not likely that sales tax payments are seriously underreported to the Census. In the low-payment case, I assume that there is no underreporting. In the high-payment case, I assume 20% underreporting.

Results and discussion. Table 17-15 shows total sales and use taxes paid on sales of motor vehicles, parts, fuels, and services. Note that this is total sales taxes paid, not just the amount dedicated to highways³⁸.

Dougher (1995) also estimates motor-vehicle-related sales taxes, but her estimate is considerably higher, mainly because she assumes a higher sales tax rate³⁹. Dougher (1995) uses the posted all-commodity tax rates in each state, whereas I, as discussed above, use the rates that correspond to sales taxes actually paid by each establishment and industry. Given that we wish to know the sales taxes actually paid on particular kinds of transactions, and not necessarily the posted general tax rates -- which might not apply to specific commodities or transactions, or which for other reasons might not be levied -- the Census data in principle are superior.

Should the sales-tax payments count? Above, I argue that we should not count motor-vehicle-related sales taxes as a payment by motor-vehicle users for MVIS. There is, however, considerable disagreement on this point. For example, Beshers (1994) asserts that the sales tax “certainly ought to be” counted (p. 10), although he does not develop his argument. Dougher (1995) argues that the sales tax actually is selective, because it is not applied to all sales, and that therefore, sales taxes on motor vehicles and fuels can be counted as user taxes. But her argument may be challenged on five grounds. First, if the mere existence of exemptions disqualified a tax as “general,” then there would be no general taxes at all. Personal income taxes do not tax all personal income, and corporate income taxes do not tax all corporate income, yet usually we conceive of these as general taxes. Second, in the retail trade sector (SIC 5--) in 1990, state and local sales tax receipts were 3.6% of sales (Bureau of the Census, *Retail Trade: 1990, 1991*). Given that state and local sales tax *rates* averaged 5.9% in 1992 (Dougher, 1995), we may conclude that the bulk of transactions *in the retail trade sector* are in fact subject to the tax. (I stick to the retail trade sector because sales taxes are targeted at that

³⁸Note also that sales taxes are not included in the Bureau of the Census estimates of retail sales of motor vehicles, automotive supplies, or fuel, or in the Bureau of Economic Analysis estimates of personal consumption expenditures.

³⁹Also, Dougher (1995) applies the tax rates to sales in each SIC, rather than sales in each merchandise line.

sector, not at all transactions in the economy.) Third, and perhaps most tellingly, government received far, far more from sales taxes than it did from any unarguably “selective” or “user” tax (Table 17-16). In fact, in 1991, government sales-tax receipts were 3 times greater than the receipts from the single largest user tax (the gasoline tax), and even larger than receipts of corporate income tax (Table 17-16), which would few would call anything other than a general tax. Fourth, receipts from sales taxes on vehicles, fuels, and parts were only 11% of all sales-tax receipts -- similar to the percent contribution of these items to the GNP. This suggests that motor vehicles and fuels are being subjected to a broad-based tax. Fifth, and perhaps least compelling, most people probably do view the sales tax as a broad-based tax for general government purposes.

Extension of the analysis for the years 1995 to 2003. Table 17-15 present results through the year 1994. To extend the analysis through the year 2003, we updated and extended the various data series on retail sales by SIC, wholesale sales by SIC, service-sector-receipts by SIC, sales -tax factions, and so on. This updating and extension is discussed in the section on “sales-tax expenditures” in section 17.6.6.

17.6.3. Corporate income taxes paid by motor-vehicle related industries

Corporations in the automobile industry, the motor-fuel industry, the motor-vehicle-service industry, and other motor-vehicle-related industries pay billions of dollars in corporate income taxes every year. In each of these industries, corporate income taxes related to motor-vehicle use can be estimated by multiplying total taxes paid by the fraction of income that is earned in activities related to motor-vehicle use. Data on corporate federal income taxes paid in income-year 1990 are from the Internal Revenue Service (*Source Book 1990, Statistics of Income, Corporation Income Tax Returns*, 1993). The fraction of income that is earned in activities related to motor-vehicle use is estimated and discussed in the next section of this report.

Table 17-17 shows the data for and results of this calculation for total corporate income-taxes paid in motor-vehicle-related industries in income-year 1990, which refers to corporate accounting periods ending between July 1 1990 and June 30 1991. Note that Table 17-17 estimates total corporate income taxes (federal plus state and local) by multiplying the detailed results calculated for federal corporate income taxes by the ratio of total corporate income taxes (federal plus state and local) to federal corporate income taxes in income-year 1990. This assumes that the motor-vehicle-related fraction of state and local corporate income taxes is the same as the calculated fraction of federal income taxes.

The Table 17-17 result is for income year 1990. To estimate total corporate income taxes (federal plus state and local) paid in motor-vehicle-related industries in any income-year Y, we multiply the Table 17-17 result by the ratio of:

- total corporate income taxes paid in the petroleum, motor-vehicle-manufacturing, trucking, and automotive-services industries in income-year Y, to

- total corporate income taxes paid in those industries in income year 1990 (Table 6.18 of the NIPA, Taxes on Corporate Income by Industry, www.bea.gov/bea/dn/nipaweb/index.asp)⁴⁰.

17.6.4. Personal income taxes paid by employees in motor-vehicle related industries

Persons who work the automobile industry, fuel industry, motor-vehicle service industry, and other motor-vehicle-related industries pay billions of dollars in personal income taxes every year. In each of these industries, personal income taxes related to motor-vehicle use can be estimated by multiplying total wages by the average income tax rate and the fraction of income that is earned in activities related to motor-vehicle use:

$$PIT_{SIC} = W_{SIC} \cdot IT \cdot F_{SIC} \quad \text{eq. [17-8]}$$

where:

PIT_{SIC} = motor-vehicle related personal income taxes in each SIC (results for 1990 shown in Table 17-18)

W_{SIC} = wages earned by workers in each SIC (Bureau of Labor Statistics, *Employment and Wages Annual Averages*, 1990, 1991; 1990 data shown in Table 17-18)

IT = total Federal + State income taxes paid nationally divided by total wages earned nationally (0.21 in 1990; *Survey of Current Business*, July 1992)

F_{SIC} = of total production or output in each SIC, the fraction that is related to motor-vehicle use (discussed below; estimates shown in Table 17-18)

The difficulty is estimating for each SIC the fraction of income that is earned from production related to motor-vehicle use (F_{SIC}). These fractions are estimated as follows:

SICs 1311, 1381, 1382, 1389. From Table 17-11.

SICs 1321, 1611, 1622, 2810, 302, 305, 3465, 3550, 3560, 3751, 3799, 4212 through 4231, 4619, 4720 through 4789, 5172, 7033. The fractions are my estimates, based on the detailed description of the SIC in the Office of Management and Budget (1987).

SICs 2820, 2951, 301, 3312 through 3390, 3711 through 3716, 3792, 4612, 4613, 4911, 5013 through 5015, 7513 through 7549. From Table 10-8 of Report #10 in this social-cost series.

SIC 3533. I assume the same fraction as for SIC 1330.

⁴⁰ In essence, we use the BEA NIPA data to do a simplified calculation of corporate income-tax payments in motor-vehicle-related industries from 1987 to 2000 or 2003, and then use these estimated simplified statistics to scale our detailed calculation for 1990. We use BEA NIPA data rather than the original IRS data because the BEA data is derived from the IRS data and is available in a long and easy-to-access time series. Note that in some cases the relevant BEA NIPA data stopped at year 2000; in these cases, we estimated data for years 2001 to 2003.

SIC 3731. About 95% of all expenditures on ship building and repair are for U.S. Navy vessels (Bureau of the Census, *Statistical Abstract of the United States* 1992, 1992). Of the 5% that is for commercial vessels, I assume, on the basis of data in Table 10-8 (Report #10), that 19% is motor-vehicle related.

SICs 4412 through 4492. From data in Table 10-10 of Report #10 in this social-cost series, and in Army Corps of Engineers (1991).

SIC 5012. According to the 1992 *Census of Wholesale Trade* (Bureau of the Census, 1995), sales of cars and trucks accounted for about 99% of the total sales in this SIC (recreational vehicles accounted for the remainder).

SICs 5511, 5512, 5541, and 5531 through 5599. In each SIC, the fraction is equal to $(MLMV + MLAP + MLAS + MLFL)/TOTALSIC$, where MLMV is merchandise-line sales of RVs and motor vehicles in the SIC, MLAP is merchandise-line sales of automotive parts in the SIC, MLAS is merchandise-line sales of automotive service in the SIC, MLFL is merchandise-line sales of fuels and lubricants in the SIC, and TOTALSIC is total sales in the SIC (all data from Table 17-14). In the case of SIC 5541, the MLFL figure includes merchandise-line sales of fuels and lubricants in SICs 52, 53, 54, 57, 58, 59, and “other” (from Table 17-14), because these are not included anywhere else in this table. In the case of SIC 5531, the MLAP figure includes merchandise-line sales of automotive parts in SICs 52, 53, 54, 57, 58, 59, and “other” (from Table 17-14), because these are not included anywhere else in this table.

SICs 632 and 6351 through 6399. Presumably, a minor amount of the insurance in these SICs is held by motor-vehicle related industries.

SIC 7310. Table 17-17.

SIC 2911. The fraction is calculated as follows:

$$F_{2911} = \frac{\sum_p P_p \times V_p \times F_p}{\sum_p P_p \times V_p} \quad \text{eq. [17-9]}$$

where:

F_{2911} = the fraction of sales (and hence personal income taxes) in SIC 2911 that should be allocated to motor-fuel use

P_p = the average wholesale price of product P from refineries in 1992 (\$/gallon; EIA, *Petroleum Marketing Annual* 1992, 1993)

V_p = the wholesale volume of product P from refineries in 1992 (gallons/day EIA, *Petroleum Marketing Annual* 1992, 1993)

F_p = the fraction of product P that was used by motor vehicles in 1992 (0.966 for motor gasoline [FHWA, *Highway Statistics* 1992, 1993], 0.467 for distillate fuel [EIA, *Annual Energy Review* 1994, 1995]; and 0.0 for all other products)

SIC 5171. The fraction is calculated as follows:

$$F_{5171} = \frac{(Gs \times F_g + Ds \times F_d)}{Ts} \quad \text{eq. [17-10]}$$

where:

F_{5171} = the fraction of sales (and hence personal income taxes) in SIC 517 that should be allocated to motor-fuel use

G_s = dollar sales of motor gasoline in SIC 5171 in 1987 (\$60.414 billion; Bureau of the Census, *1987 Census of Wholesale Trade*, 1991)

F_g = fraction of motor gasoline used by highway vehicles in 1987 (0.964; FWHA, *Highway Statistics 1987*, 1988)

D_s = dollar sales of distillate fuel oil in SIC 5171 in 1987 (\$24.672 billion; Bureau of the Census, *1987 Census of Wholesale Trade*, 1991)

F_d = fraction of distillate fuel used by highway vehicles in 1987 (0.398; EIA, *Annual Energy Review 1994*, 1995)

T_s = Total dollar sales in SIC 5171 in 1987 (\$103.309 billion; Bureau of the Census, *1987 Census of Wholesale Trade*, 1991)

SIC 6331 and 6411. I assume that the motor-vehicle related fraction of corporate-income taxes paid in SIC 6331 is equal to the ratio of net premiums earned for motor-vehicle insurance to net insurance premiums earned by all firms in SIC 6331. (Motor-vehicle insurance comprises premiums for liability insurance and physical damage, for private passenger vehicles and commercial vehicles.) I assume that the motor-vehicle related fraction of corporate income taxes paid in SIC 6411 is the same as the motor-vehicle related fraction of corporate income taxes paid in SIC 63, and estimate the latter fraction in the same way that I estimate the fraction for SIC 6331. (I can estimate motor-vehicle fraction of total premiums in SIC 63, but not in SIC 6411.) Formally:

$$MVF_{6331} = \frac{NP_{MV}}{NP_{6331}}$$

$$MVF_{63} = \frac{NP_{MV}}{NP_{63}} \quad \text{eq. [17-11]}$$

$$NP_{MV} = NP_{PPV} + NP_{CV}$$

where:

MVF_{6331} = the motor-vehicle related fraction of corporate income taxes in SIC 6331 in 1992

MVF_{63} = the motor-vehicle related fraction of corporate income taxes in SIC 63 in 1992

NP_{MV} = net premiums earned for liability insurance and physical damage insurance for motor vehicles in 1992

NP_{63} = net insurance premiums earned in SIC 63 in 1992 (\$487 billion; revenue lines 300 (life insurance), 310 (reinsurance premiums assumed), 320 (accident and health insurance), 330 (premiums earned for other hospital and medical services), 340 (property and casualty insurance), 350 (other insurance), 360 (title insurance), and 380 (surety insurance) for SIC 63 in Table 1 of Bureau of the Census, *1992 Census of Financial, Insurance, and Real Estate Industries*, 1996)

NP_{6331} = net insurance premiums earned in SIC 6331 in 1992 (\$211 billion; revenue lines 300, 310, 320, 340, 350, and 380 for SIC 6331 in Table 1 of Bureau of the Census, *1992 Census of Financial, Insurance, and Real Estate Industries*, 1996)

NP_{PPV} = net premiums earned for liability insurance and physical damage insurance for private passenger vehicles in 1992 (\$87 billion; A. M. Best Company 1997)

NP_{CV} = net premiums earned for liability insurance and physical damage insurance for commercial vehicles in 1992 (\$16 billion; equal to net premiums written in 1992 (\$16; A. M. Best Company, 1997)

Note that this calculation assumes that corporate taxes are proportional to revenues, and that private companies do not insure government vehicles (the calculation of automobile insurance premiums is equal to premiums received for private passenger vehicles, plus premiums received for commercial vehicles

The calculation in Table 17-18 is for the year 1990. I update these results to 1991 using the ratio of wages in 1991 to 1990 for selected industries (about 1.03, overall; BLS, 2004), and the actual ratio of income taxes to wages for 1991 (about 0.96; BEA, 2004). The total personal income-tax payments in motor-vehicle related industries in 1991 are virtually identical to the total payments in 1991, shown in Table 17-18.

Estimate of personal-income-tax payments for other years. The foregoing documents our estimate of the personal-income-tax payment for the year 1991. To estimate the payment for any other year Y, we multiply the estimated 1991 payment by the ratio of total federal, state, and local personal income taxes paid in year Y to the total paid in 1991. Data on federal, state, and local personal income taxes is from Table 3.4 of the NIPA, "Personal Current Tax Receipts" (www.bea.gov/bea/dn/nipaweb/). This method assumes that the motor-vehicle-related fraction of total personal income taxes is the same in every year.

Should the income-tax payments count? Interestingly, I have not seen any argument that the corporate income taxes paid by motor-vehicle related businesses, or the personal income taxes paid by persons working in motor-vehicle related industries, should be counted as a payment towards the cost of government infrastructure and services. I suspect that this is because income taxes are: a) so obviously general, and b) not levied directly on a finished product such as a car or fuel.

17.6.5. General property taxes paid on motor vehicles and motor-vehicle garages, and by motor-vehicle related industries

Property taxes are the second largest source of government revenue, and the largest source for local governments. In 1991, all governments in the U.S. received \$171 billion in property taxes (Table 17-16), assessed on property with a taxable value of \$6,681 billion dollars (Bureau of the Census, *1992 Census of Governments*, 1994?). Almost 90% of this nearly \$7 trillion tax base was real property; only 9% was personal property, such motor vehicles, household personal property, and business property) (Bureau of the Census, *1992 Census of Governments*, 1994?). As summarized in Table 17-19, most states exempt most forms of personal property from the general property tax. However, the states that do tax motor vehicles as personal property collect a non-trivial amount of money from these taxes. Moreover, a non-trivial part of the taxes on real property (e.g., taxes related to the value of household garages) can be attributable to motor-vehicle use.

In this section, I estimate the portion of this total that is derived from general taxes on motor vehicles or other property (e.g., garages, property of motor-vehicle manufacturers) that is related to motor-vehicle use. Note that here I estimate *general* property taxes on motor vehicles, garages, and so on, as distinguished from *special* property taxes on motor vehicles. A “special” property tax applies only to select items, and at a rate different from the general property-tax rate. Special property taxes on motor-vehicles are estimated above. The estimates presented here of special and general property taxes are mutually exclusive and exhaustive.

Motor vehicles. To estimate general property taxes paid on motor vehicles, I assume that the motor-vehicle-generated fraction of total property tax revenues to governments is equal to the motor-vehicle fraction of the total property-tax assessment base. To estimate the assessed value of motor vehicles subject to property tax, I use state-level data on assessments rates and vehicle registrations, and national data on car values and registration rates by age. Formally:

$$PTMV_{USA,Yr} = PTTotal_{USA,Yr} \cdot GPT / PTTotal_{USA,Yr} \cdot \frac{AVMV_{USA,Yr}}{AVTotal_{USA,Yr}} \quad \text{eq. [17-12]}$$

$$AVMV_{USA,Yr} = \sum_{State} AVMV_{State,Yr} \quad \text{eq. [17-13]}$$

$$AVMV_{State,Yr} = \frac{RV_{Yr} \cdot REG_{State,Yr} \cdot AF_{State,Yr} \cdot FRA_{State,Yr}}{1 + ST_{Yr}} \quad \text{eq. [17-14]}$$

$$RV_{Yr} = VTotal / VLDA \cdot \sum_{MY:Yr} VLDA_{MY:Yr} \cdot REGF_{MY:Yr} \quad \text{eq. [17-15]}$$

$$VLDA_{MY:Yr} = VLDA92\$_{MY:Yr} \cdot \left\{ \begin{array}{l} \text{if MY=Yr then } \frac{CPINA_{Yr}}{CPINA_{1992}} \\ \text{otherwise } \frac{CPIUA_{Yr}}{CPIUA_{1992}} \end{array} \right. \quad \text{eq. [17-16]}$$

where:

subscript USA = the entire United States

subscript Yr = calendar year

subscript state = states in which motor vehicles are subject to a general property tax (see Tables 17-19 and 17-21)

subscript MY:Yr = motor-vehicle model-year MY in calendar Yr

$PTMV_{USA,Yr}$ = general property taxes paid on motor vehicles in the U. S. in year Yr (\$)

$PTTotal_{USA,Yr}$ = total property taxes received by all levels of government in the U. S. in year yr (includes special as well as general property taxes) (Table 17-16 shows the total for 1991; the Bureau of the Census *Quarterly Summary of Federal, State, and Local Tax Revenue*, quarterly, provides time series data)

$GPT/PTTotal_{USA,Yr}$ = the general-property-tax fraction of total property taxes (i.e., of total property taxes receipts, the fraction that is from general rather than special property taxation) (on the basis of data on special property

taxes, presented in the Census' *State Government Tax Collections: 1992, 1994*, I estimate this to be about 0.95)

$AVMV_{USA,Yr}$ = the total gross assessed value of motor-vehicles subject to property tax in the U. S. in year Yr (\$)

$AVTotal_{USA,Yr}$ = the total gross assessed value of all property subject to property tax in the U. S. in year Yr (\$) (Table 17-20; this is available only in the quinquennial *Census of Governments*)

$AVMV_{State,Yr}$ = the total gross assessed value of motor-vehicles subject to property tax in *State* in year Yr (\$)

RV_{Yr} = the registration-weighted average retail value (including sales taxes) of motor vehicles in calendar year Y

$REG_{State,Yr}$ = the number of motor vehicles registered in *State* in year Yr (I assume that only and all registered vehicles are subject to the property tax) (FHWA, *Highway Statistics*, annual)

$AF_{State,Yr}$ = the assessed fraction of the market value of motor vehicles (i.o.w., of the total market value of a vehicle, the fraction which is subject to the property tax) (Table 17-21)

$FRA_{State,Yr}$ = of all registered motor vehicles in *State* in year Yr, the fraction that are assessed for property taxes (I assume that this is 1.00 in every state except Alaska and Texas, in which the assessments are optional [Table 17-19]; I assume 0.50 in Alaska, and 0.01 in Texas, because the actual assessed value of motor vehicles in Texas [Table 17-21] implies that virtually no vehicles are assessed)

ST_{Yr} = the sales tax, as a fraction of the pre-tax retail value of motor vehicles, in year (Table 17-15)

$VLDA_{MY:Yr}$ = the retail value (including sales taxes) of light-duty automobile model year MY in calendar year Yr, in current dollars (trucks, minivans, jeeps, etc., not included) (\$)

$REGF_{MY:Yr}$ = the registration fraction for passenger-car model-year MY in calendar year Yr; equal to total registrations of passenger-car model year MY in calendar year Yr divided by total registrations in calendar Yr (data for 1970 and 1994 from R. L. Polk, as reported by Davis and McFarlin, 1996, and shown below; data for other years estimated by linear interpolation between 1970 and 1994 values)⁴¹

⁴¹Data from the EIA's Residential Transportation Energy Consumption Survey are consistent with the trends implied by the Polk data for 1970 and 1994 (EIA, *Household Vehicles Energy Consumption 1991, 1993*; EIA, *Household Vehicles Energy Consumption 1988, 1990*).

Age	Registration fraction		
	1970	1994	Δ/year
less than 1	0.078	0.046	-0.001
1	0.116	0.067	-0.002
2	0.110	0.063	-0.002
3	0.098	0.066	-0.001
4	0.106	0.067	-0.002
5	0.106	0.075	-0.001
6	0.088	0.077	-0.000
7	0.078	0.075	-0.000
8	0.063	0.075	0.001
9	0.041	0.069	0.001
10	0.035	0.062	0.001
11 over	0.082	0.259	0.007

$V_{\text{Total}}/V_{\text{LDA}}$ = the ratio of the per-vehicle value averaged over the entire fleet to the average per-vehicle value of light-duty passenger automobiles (on the basis of data presented in Report #5, I estimate this to be about 1.05)
 $V_{\text{LDA}92\$_{\text{MY:Yr}}}$ = the retail value (including sales taxes) of light-duty automobile model year MY in calendar year Yr, in constant 1992\$ (trucks, minivans, jeeps, sport utility vehicles, and the like not included) (1992\$) (Johnson, 1997; data for 1986, 1991, and 1994 shown below)⁴²

Age	Retail value of cars in 1992\$ in year:		
	1986	1991	1994
less than 1	14,606	16,574	17,720
1	8,296	9,458	9,963
2	6,827	7,600	8,264
3	5,320	6,039	6,464
4	4,398	5,067	5,553
5	3,003	3,642	3,895
6	1,829	2,688	2,880
7	1,324	1,963	2,075
8	876	1,241	1,347
9	407	561	621
10	204	267	313
11 over	99	108	150

⁴²These data, which are based on actual transactions in the used-car market, are used in the National Income Product Accounts of the United States. See also the slightly different depreciation schedule in the Bureau of Economic Analysis (1990).

$CPINA_{Yr}$ = the consumer price index for new autos in year Yr (Bureau of Labor Statistics web site, www.bls.gov; see below)

$CPINA_{1992}$ = the consumer price index for new autos in 1992 (Bureau of Labor Statistics web site, www.bls.gov; see below)

$CPIUA_{Yr}$ = the consumer price index for used autos in year Yr (Bureau of Labor Statistics web site, www.bls.gov; see below)

$CPIUA_{1992}$ = the consumer price index for used autos in 1992 (Bureau of Labor Statistics web site, www.bls.gov; see below)

<i>Yr</i>	<i>CPIUA</i>	<i>CPINA</i>
1972	33.1	54.7
1973	35.2	54.8
1974	36.7	57.9
1975	43.8	62.9
1976	50.3	66.9
1977	54.7	70.4
1978	55.8	75.8
1979	60.2	81.8
1980	62.3	88.4
1981	76.9	93.7
1982	88.8	97.4
1983	98.7	99.9
1984	112.5	102.8
1985	113.7	106.1
1986	108.8	110.6
1987	113.1	114.6
1988	118.0	116.9
1989	120.4	119.2
1990	117.6	121.0
1991	118.1	125.3
1992	123.2	128.4
1993	133.9	131.5
1994	141.7	136.0
1995	156.5	139.0
1996	157.0	141.4

Table 17-21 presents some of the data used in the calculation of AVMV for 1986 and 1991, and compares my estimates of the assessed value in 1986 with the actual assessed values reported to the Census in 1986. All except two of the estimated state values in 1986 are within 10% of the actual values, and the total is within 10%. This indicates that my estimate of the assessed value of motor-vehicles subject to general property taxation are accurate. With the additional key assumption that the motor-vehicle-generated fraction of total property tax revenues is equal to the motor-vehicle

fraction of the total property-tax assessment base (i.e., that motor vehicles are taxed at the overall average rate), I estimate that $PTMV_{USA,1991} = \$2$ billion, and $PTMV_{USA,1986} = \$1.5$ billion.

Comparison with Dougher (1985). In 1987, the FHWA estimated the property tax paid per car and truck in every state in the U. S. Dougher (1995) multiplies the FHWA's per-vehicle estimates by the number of registered vehicles in 1992, and then by the 1992/1987 CPI for all items, to estimate that personal property taxes on motor vehicles generated \$12.1 billion in 1992. (The in-lieu license taxes in California and Washington, which I count already as user payments, are not included in the FHWA/Dougher estimates.) However, FHWA and Dougher includes special as well as general property taxes; excluding the special property taxes (which I estimate elsewhere in this report) leaves \$10.1 billion. Dougher also includes \$1.9 billion in motor-vehicle property-tax revenue in four states which according to the Census Bureau had neither special nor general property taxes on motor vehicles in 1986 and 1991. On the assumption that this \$1.9 billion should not be classified as a general property tax, and is counted elsewhere in my analysis, I exclude it, and end up with \$8.2 billion in Dougher's (1995) account -- still about 4 times larger than my estimate for 1991. As explained next, this factor of 4 difference most likely is due to FHWA and Dougher (1985) having overestimated property-tax payments several-fold.

The FHWA and Dougher assume that property taxes are assessed on the full value of motor vehicles, and moreover, that vehicles are assessed at their value when *new*.⁴³ Both of these assumptions are substantially in error. (Dougher acknowledges one of them.) As shown in Table 17-21, many states assess property taxes on a fraction of the full market value, with the result that, in all states that levy general property taxes on motor vehicles, the registration-weighted assessment basis, shown in Table 17-21, is a little more than half of the full value⁴⁴. Furthermore, the market value of a vehicle (about half of which, on average is the assessed value) declines rapidly with age, such that the registration or age-weighted market value of all vehicles on the road in a particular year is a fraction of the value of new vehicles in the year. The best available data on depreciation and registration with age (Johnson, 1997; Davis and McFarlin, 1996; see formulae above) indicate that the registration-weighted average market value in a given year is about 20% of the value of new vehicles and 40% of the value of 2-year-old vehicles. Thus, the average assessed value of vehicles in a given year is on the order of 10-25% of the full value of new vehicles -- which means that FHWA and Dougher

⁴³It is not clear from Dougher's report whether the FHWA estimated the tax for brand-new vehicles, or for 2-year old vehicles.

⁴⁴The Government of the District of Columbia examined property tax rates and assessment bases nationwide, and found that the unweighted average assessment basis was 55% of the full market value (Bureau of the Census, *Statistical Abstract of the United States* 1996, 1996, Table 491) -- virtually identical to the weighed-average basis estimated here.

(1995) overestimate the assessed value, and therefore the property tax levied, by at least a factor of four.

Note also that Dougher (1985) multiplies FHWA's 1987 estimates by the ratio of the 1992 CPI for all items to the 1987 CPI for all items (1.23), rather than by the correct (and lower) ratio of the 1992 CPI for used cars to the 1987 CPI for used cars (1.12). On the other hand, Dougher assumes that the average tax rate in 1992 was the same as the average in 1987; if the 1992 average actually was higher, then Dougher has underestimated payments on this account.⁴⁵

Alternatively, it is possible that motor vehicles are taxed at higher than the overall average property tax rate of about 2.6% in 1991 (total state and local revenues from property taxes [Table 17-16] divided by the total net assessed value subject to tax [Table 17-20]). Dougher cites one county where this is the case.

Property taxes paid on motor-vehicle garages, and by motor-vehicle related businesses. Formally:

$$P_{mv} = T \cdot (F_b \cdot MV_b + F_p \cdot MV_p) \quad \text{eq. [17-17]}$$

where:

P_{mv} = total property taxes paid on motor-vehicle garages, and by motor- vehicle related businesses (excluding taxes on vehicles, estimated separately above)

T = total property taxes received by all governments in 1991 (\$171 billion; U. S. Census, *Quarterly Summary of Federal, State, and Local Tax Revenue*, 1993)

F_b = the fraction of the total property-tax receipts from levies on commercial and industrial (business) property rather than personal property (assume 0.272, which is the ratio of the taxable value of commercial and industrial property to the taxable value of all property, in Table 17-20)

F_p = the fraction of the total property-tax receipts from levies on residential property (except vacant lots and farms) (assume 0.518, which is the ratio of the taxable value of residential property to the taxable value of all property, in Table 17-20)

⁴⁵The method used here avoids this problem, because in essence it uses the actual average rate.

MV_b = of property taxes paid by commerce and industry, the fraction that is paid by motor-vehicle related businesses (excluding taxes paid on vehicles, which are estimated separately) (I assume 0.10, because, by analogy, slightly less than 10% of all corporate income taxes are paid by motor-vehicle related industries (Table 17-17))

MV_p = of property taxes paid on residential property except farms and vacant lots, the fraction that is in effect the tax on the value of the motor-vehicle garage (I assume 0.03 to 0.07 -- an average of \$3,000 to \$7,000 of garage out of a total of \$100,000 of taxable property).

Results. The above calculations give the following results for 1991:

	Low	High
Property taxes on motor vehicles	2.05	2.05
Property taxes paid by motor-vehicle related businesses	4.39	4.39
Property taxes on residential garages	2.54	5.92
<i>Total motor-vehicle related property taxes (billion dollars)</i>	<i>8.97</i>	<i>12.35</i>

Estimate of general property-tax payments for other years. The foregoing documents our estimate of the general property-tax payment for the year 1991. To estimate the payment for any other year Y, we multiply the estimated 1991 payment by the ratio of total state and local general property taxes paid in year Y to the total paid in 1991. Data on state and local general property taxes from FY 1992 to FY 2003 are from www.census.gov/govs/www/estimate.html. (To convert the Census fiscal-year data to calendar-year estimates, I assumed that $CY_Y = 0.6FY_Y + 0.4CY_{Y+1}$.) This method assumes that the motor-vehicle-related fraction of general property taxes is the same in every year.

Should the property-tax payment count? Dougher (1995) counts the property-tax payment, but does not explain why it should not be considered to be a general payment for general government services instead of a payment specifically for government-provided motor-vehicle infrastructure and services. In defense of treating the property tax as a general tax, we may muster most of the arguments presented with respect to the sales tax. For example, the property tax is an enormous sources of government revenue (in fact, only the personal income tax provides more revenue), and is widely considered to be a general tax. And property taxes related to motor-vehicle use are a small fraction of all property taxes: as estimated above, about 10%, which is similar to the contribution of motor-vehicle use to the GNP. Thus, again, property taxes appear to be a fairly assessed broad-based tax on motor vehicles.

17.6.6 Tax expenditures

As mentioned in the introduction to this major section (section 17.61.), general income- and sales-tax rates on motor-vehicle and motor-fuel industries typically are less

than the average rates for all industries and commodities. The difference between the amount of general taxes actually paid and the amount that would have been paid had the rates been at the national averages can be viewed as a tax subsidy, perhaps to be counted (depending on one's point of view) against user payments for MVIS.

Sales-tax expenditure, 1991. Report #18 in the UCD social-cost series provides a comprehensive review and analysis of tax expenditures related to motor fuels and motor vehicles. In that report, we estimate tax expenditures resulting from lower-than-average corporate income taxes on oil and motor fuels and lower-than-average sales taxes on fuels, vehicles, parts, and other motor-vehicle related commodities. The results of that analysis indicate that in 1991 the sales-tax subsidy to motor vehicles, fuels, parts, and services probably was in the range of \$2 to \$5 billion, depending on the tax-baseline with respect to which the tax baseline is calculated. Here, we will assume that the appropriate baseline is sales taxes paid in retail, wholesale, and service sectors actually subject to sales taxes. This results in a tax expenditure in motor-vehicle-related industries of about \$2 billion in 1991.

Sales-tax expenditure, years other than 1991. Report #18 contains the complete calculation of sales-tax expenditures from 1984 to 1995. That calculation required several sets of data: sales in motor-vehicle related retail and wholesale industries and in all retail and wholesale trade; receipts in automotive-related service industries and in all service industries; sales taxes paid as a fraction of sales or receipts; total general taxes collected by governments, and total final sales to domestic consumers. To estimate sales-tax expenditures for 1996 to 2003, we extended the data series used in Report #18, as follows. (Note that these data extensions apply to the analysis of general sales taxes paid by motor-vehicle-related industries, section 17.6.2.)

Sales in retail and wholesale sectors: SICs 551-559, 52-59, 501, 50, and 51. I estimated sales in 1997 by multiplying the original estimates for 1992 (Report #18) by the ratio of sales in 1997 to sales in 1992 as reported in the 1997 Economic Census (www.census.gov/epcd/ec97sic/E97SUS.HTM). I scaled the 1992 data by the 1997/1992 ratios rather than use the absolute values for 1997 because in 1997 the Census revised the historical data series, making the new 1997 data inconsistent with the old 1992 data, but not, presumably, changing the relationship between 1997 and 1992.

I estimated sales in 1996 by applying to 1995 sales (in Report #18) the annual rate of change (in sales) calculated on the basis of the 1997/1992 change. To estimate sales for 1998 to 2003, I started with the estimates for 1997 (as described above) and applied an annual rate of change estimated on the basis of the total change in sales from 1997 to 2002. The change in sales from 1997 to 2002 was based on data in the 2002 Economic Census (<http://factfinder.census.gov/>) and in the most recent retail-trade or wholesale-trade annual surveys (www.census.gov/svsd/www). I used the annual rate of change reported in the 2002 Census, rather than the absolute values from the 2002 Census, because after 1997 the Census stopped using the SIC framework and started using the "North American Industry Classification System" (NAICS), which is similar but not identical to the SIC system that the original data series (Report #18) was based on. The fact that the 2002 NAICS-based categories are not the same as the 1997 SIC-

based categories means that we cannot use the absolute data from 2002 for our 1984 to 2003 time series. However, we *can* apply percentage changes from 1997 to 2002, based on NAICS categories, to the similar 1997 SIC categories

Receipts in SICs 70, 72, 75, 76, 79, and 70-89. I estimated receipts from 1996 to 2003 by applying an annual rate of change beginning with 1995. The annual rate of change was estimated on the basis of the change in receipts from 1993 to 1998, as reported in the last Service Annual Survey that used SICs (www.census.gov/svsd/www).

Sales-tax fractions, general sales taxes, and final sales to domestic consumers. To extend the original 1984-1995 time series for sales-tax fractions, I applied the rate of change estimated from the original 1987 to 1992 data (Report #18). To continue the series of general sales and use taxes paid nationally, from 1996 to 2003, I used absolute sales-tax data from the Census state and local government finances (www.census.gov/govs/www/estimate.html), the same source used for the original data. (To convert the Census fiscal-year data to calendar-year estimates, I assumed that $CY_Y = 0.6FY_Y + 0.4CY_{Y+1}$.) Finally, I updated the entire series of final sales to domestic purchasers (1984 to 2004) using Table 1.4.5. "Relation of Gross Domestic Product, Gross Domestic Purchases, and Final Sales to Domestic Purchasers," from the NIPA accounts (www.bea.gov/beam/nipaweb/index.asp).

Corporate income taxes. The corporate-income tax subsidy to motor fuels and motor vehicles was \$1.4 to \$2.7 billion and \$1 to \$7 billion in the year 2000⁴⁶. I assume a value of \$ 2.5 billion in 1991. There is no simple way to estimate actual values for other years, because income, income tax laws, and other relevant factors do not change in a predictable way from year to year. Therefore, I simply scale the 1991 estimate by GDP price deflators to get values in other-year dollars. This method does result in an estimate for the year 2000 that is in the middle of the range actually estimated for the year 2000.

Property taxes. It also can be argued that the use of land for public roadways results in property-tax expenditure, because the public roadway is displacing property-tax-paying uses of the land. The amount of foregone property tax in 1991 can be calculated on the basis of an estimate of the value of the land currently taken up by road right-of-ways. This calculation accounts for the amount of developable land actually displaced by roadways (an amount which exceeds the roadbed itself), the extent to which roadways displace development rather than an alternative transportation infrastructure, variations in land value by type of road, the relationship between land values and total property values, and the relationship between market values and

⁴⁶ Note that these estimates do not account for the decrease in consumption and production and hence in taxes paid that would have occurred had tax rates actually been at the national averages; rather, they simply apply the assumed higher tax rate to the original actual income or sales. (See Report #18 for further discussion.) To the extent that production and consumption would have been depressed by the higher tax rates, we have overestimated the amount of tax revenue the government would have received and hence have overestimated the tax expenditure.

assessed values:

$$FPT = \cdot AVDD \cdot PTR \cdot NDF$$

$$AVDD = \frac{AVDL}{LFDD}$$

$$AVDL = MVDL \cdot AVF$$

$$MVDL = \sum_R LADR_R \cdot PL_R$$

eq. [17-18]

where:

FPT = the foregone property tax on development displaced by public roads
(billion \$ in 1991)

AVDD = the assessed value of development (real property) displaced by public roads (billion \$ in 1991)

PTR = the average property tax rate (2.55% in 1991; equal to total state and local revenues from property taxes [Table 17-16] divided by the total net assessed value subject to tax [Table 17-20])

NDF = for every foot of right-of-way width, the fraction that actually displaces development rather than an alternative form of transportation infrastructure, such a walkways (discussed below)

AVDL = the assessed value of displaced land currently in road right-of-ways (billion \$ in 1991)

LFDD = the assessed value of land as a fraction of the total assessed value of development (real property) (I assume 0.37 for urban areas, based on data for cities in 18 states plus the District of Columbia that reported assessed values of land and assessed values of improvements for 1991 [Bureau of the Census, 1992 *Census of Governments*, 1994]; 0.90 for rural areas, because there are relatively few improvements to land [especially agricultural land] in rural areas)

MVDL = the market value of displaced land currently in road right-of-ways (billion \$ in 1991)

AVF = the assessed value of land as a fraction of the market value (discussed below)

LADR_R = the area of land displaced by roadway right-of-way, by type of road R (calculated from data in Table 7-5, Report #7)

PL_R = the price of land devoted to roadways, by type of road R (Table 7-5, Report #7)

Displacement factor (NDF). The factor NDF tells us what fraction of every foot of road right-of-way width actually displaces some sort of *taxable land or development* as

opposed to undevelopable public open space or an alternative transportation infrastructure, such as sidewalks or paths or perhaps public rail transport. I assume that in urban areas the space provided for basic circulation or public open space in the absence of an expanded roadway would be 40% of space taken up by the road ROW, and hence that the factor NDF would be 0.60. I assume that in rural areas less land would be devoted to public open space or circulation, and hence that NDF would be 0.70.

Ratio of assessed value of land to market value (AVF). For its 1982 *Census of Governments*, the Bureau of the Census (1984) surveyed assessed property values and actual property sales prices in some of the major counties of most states in the U. S. (Vermont, Texas, Massachusetts, Indiana, and Delaware were not covered)⁴⁷. In Table 22 of Volume 2 of the 1982 *Census* the Census reports the ratio of the assessed value to the actual sales price in 1981 (Bureau of the Census, 1984) for these properties. Unfortunately, the Census does not report national or state averages. Therefore, I have used the Census data to estimate rough averages by state.

The 1992 *Census of Governments* (Bureau of the Census, 1994?) reports the gross assessed value of real property (land + improvements) in every state in 1991. Assuming that the assessed-value/sales-price ratio from 1981 (from the 1982 *Census of Governments* cited above) applies to 1991 (from the 1992 *Census of Governments*), I calculate a national-average value for the parameter AVF as follows:

$$AVF = \frac{\sum_s GAVRP_s}{\sum_s \frac{GAVRP_s}{AVF_s}}$$

where:

$GAVRP_s$ = the gross assessed value of real property (land + improvements) in State s in 1991 (Bureau of the Census, 1992 *Census of Governments*, 1994?) (billion \$ in 1991)

$GAVRP_s$ = the ratio of assessed value to sales price in State s in 1981 (based on data reported in the 1982 *Census of Governments* [Bureau of the Census, 1984], as discussed above)

The result of this calculation is a national-average ratio of assessed value to sales price of 0.38 in 1991, which seems reasonable. On the basis of this analysis, I assume that a ratio of 0.40 for both urban and rural property in the U. S. in 1991.

⁴⁷ The Census scheduled but never actually expected surveys of assessed value and sales prices in 1987 and 1992. After 1992 the Census no longer even scheduled the survey. Thus, 1982 is the last Census year for which assessed-value/sales-price data are available (Hirsch, 2004).

With these assumptions, the value of the foregone property tax on development displaced by roads is about \$6 billion in 1991.

Estimate of property-tax expenditure for other years. The data and estimates above are for the year 1991. To estimate the foregone property tax on development displaced by roads in other years, I scale the 1991 results by changes in three key parameters in the calculation: the nominal price of land, the area of urban and rural roads, and the property tax as a fraction of the assessed value (the average property tax rate, parameter PTR in equation 17-18). I assume that the nominal price of land increases at 3% per year. I assume that the change in the area of roads is equal to the change in total lane-miles, which I estimate using FHWA *Highway Statistics* data on total urban lane miles and total rural lane miles (available at www.fhwa.dot.gov/policy/ohpi/hss/index.htm). To estimate the change in the average property tax rate (PTR in equation 17-18), I used the data of Table 17-20 and the Bureau of the Census' estimate of \$111.7 billion in property taxes to calculate that PTR was 2.42% in 1986, versus 2.55% in 1991 (equation 17-18), which gives an annual rate of increase of 1.1%.

This method assumes that all other parameters in the calculation (equation 17-18) are the same for all years.

17.6.7 The portion of sales-tax, corporate-income-tax , and personal-income-tax payments that go towards motor-vehicle related transportation services

This analysis counts as a payment by motor-vehicle users for motor-vehicle use the portion of general taxes that, on average, is taken out of government general funds and used to cover any motor-vehicle related expenditure that is *not* already covered by tax and fee payments that are counted specifically towards MVIS. In effect, we assume that sales taxes, corporate income taxes, personal income taxes, and property taxes, from all sectors of the economy, are mixed randomly in a "general fund" pot, and then spent on a wide range of general goods and services, including those related to MVIS. In this method, "tax and fee payments that are counted specifically towards MVIS," are equal to the amount of any payment that *might* be related to motor-vehicle use (any item listed in Table 17-1) multiplied by the fraction that is in fact counted in this analysis as a payment toward MVIS (see e.g. section 17.3). Formally:

$$Tu = \frac{\left(GEmv - \sum_i GRmv_i \cdot Wmv_i \right)}{Ft} \cdot (St + Ct + Pt + Pr) \quad \text{eq. [17-18]}$$

where:

Tu = the amount of direct and indirect *general*-tax payments by motor-vehicle users that, after being mixed in with all general funds, end up on average being spent on MVIS

$GEmv$ = total government expenditures for MVIS (Report #7 of this social-cost series)

$GRmv_i$ = the full amount of any government tax or fee of type i that might be related to MVIS (this report; all of the individual items in 17-22)

Wmv_i = the “weight” on government tax or fee of type i : for each quantity

$GRmv_i$, the fraction that is counted as a user payment specifically for MVIS (discussed in section 17.3 and in individual sections pertaining to each cost, and summarized here as follows):

<u>class of item</u>	<u>Wmv_i, low-cost</u>	<u>Wmv_i, in high-cost</u>
A1	1.0	0.0
A2	1.0	0.0
B	1.0	0.0
C1	0.0	0.0
C2	0.0	1.0

Ft = total government receipts of general taxes (discussed below)

St = sales taxes paid on motor-vehicles, motor-vehicle parts and services, and motor-vehicle fuels (Table 17-15)

Ct = corporate-income taxes paid by motor-vehicle and related corporations (Table 17-17)

Pt = personal-income taxes paid by employees of motor-vehicle and related corporations (Table 17-18)

Pr = general property taxes paid on motor vehicles and by motor-vehicle related industries (section 17.6.5)

Thus, with this method, if highway spending accounts for $Y\%$ of disbursements of sales taxes on all commodities, then $Y\%$ of the sales taxes on motor vehicles, automotive parts, and automotive fuel are counted towards MVIS. (Note that in Table 17-22 the parameter Tu is broken out into individual sales-tax, corporate-income-tax, personal-income-tax, and general-property-tax components.)

Total government receipts of general taxes. Table 17-16 shows tax receipts of all levels of government in 1991. In order to estimate the parameter Ft in eq. 17-18, we have to determine the portion of total tax revenue shown in Table 17-16 that is general tax revenue. Now, recall that this part of the analysis turns on the distinction between tax payments for a *particular* purpose, which are meant to cover a particular kind of government expenditure, and tax payments towards general government services. Ideally, one would examine each type of government tax and determine whether it was a specific tax or a general tax. To make this determination one would use the same subjective criteria used to determine whether or not a tax payment by motor-vehicle users was a payment specifically *for* motor vehicle use: one would consider the

relationship of each type of tax to other taxes and fees; the presence or absence of similar taxes and fees on other goods, services, or activities; general social conventions; judgments of social obligations; and legislative directions regarding the use of each tax or fee. (Note, again, that legislative direction regarding the use of a tax is but one of several factors in my determination, and is not necessarily decisive.) One then would have a list of specific taxes for specific government goods and services, and general taxes for general government services. One would add up all of the receipts from what were determined to be “general” taxes, and this would be the estimate of variable Ft in equation 17-18.

I have done this here, but only informally. A detailed, formal analysis is not necessary because it seems reasonably clear that nearly all if not all general sales taxes, income taxes, and property taxes should be considered to be general taxes for the purposes of our analysis here, even if they are earmarked legislatively for specific purposes. Custom duties and death and gift taxes also probably should be counted as general taxes. Accepting this, then to this point we count as general taxes the bulk of total tax receipts in Table 17-16 -- around \$1 trillion dollars. Because the classification of the remaining types of taxes in Table 17-16 makes little difference analytically, I do not bother. I assume that Ft in equation 17-18 above equals \$950 billion in the low-cost case and \$1,100 billion in the high cost-case, in 1991. To estimate Ft for any other year Y , I multiply the 1991 estimate by the ratio of total current tax receipts (all levels of government) in year Y to the total in 1991, using data from Table 3.1 (“Government Current Receipts and Expenditures” of the NIPA (www.bea.gov/bea/dn/nipaweb/)). The “current tax receipts” line of Table 3.1 includes general income taxes, general sales taxes, general property taxes, and certain selective taxes and fees and miscellaneous charges, and hence includes slightly more than the general taxes that we are estimating (e.g., in 1991, “current tax receipts” were \$1,180 billion, slightly more than our estimate of general taxes for 1991). However, year-to-year changes in “current tax receipts” likely are very close to year-to-year changes in general tax receipts.

With these assumptions for Ft , and with estimates of the other parameters in equation 17-18 made as outlined above, it turns out that general-fund expenditures related to motor-vehicle use are 2% to 6% of total government general tax receipts in most years.

17.7 SUMMARY OF RESULTS AND CONCLUSION

17.7.1 Review

A “fair” comparison of MV-user payments with government expenditures depends in part on how one defines what is “fair”, how one treats general sales, income, and property taxes and to what extent one counts “indirect” government expenditures. As regards equity, or fairness, one important question is this: do we care only that people who use motor vehicles should pay for the government expenditures, in any way, and that people who don’t use motor vehicles should not pay, or do we also care

how the users pay? If our concern is only that non-users should not pay, then all but a minuscule amount of the total government expenditures will be covered by user payments, because virtually everybody uses motor vehicles in one way or another. The tiny portion that will not be covered will be the very small contribution of non-users, via general taxes, to the minor fraction of infrastructure and service expenditure that is financed out of general taxes rather than special user charges such as the gasoline tax (Appendix 17-A.1)

We might, however, feel that it is not fair enough to require only that users pay and non-users don't, and that we should require further that users pay through their actual use. Put another way, we might feel that the net revenues generated by taxes and fees on vehicles, fuels, drivers, etc. should cover the net government expenditures on motor-vehicle infrastructure and services. (The core of this view might be that a "fair" treatment of all transportation modes requires that each mode recover its full costs through direct user charges.) With this view, we will not count any general tax and fee payments that are made by persons who use motor vehicles but that are unrelated to the actual use.

In either view of fairness, the tally of revenues versus expenditures depends in part how one treats certain sales, income, and property taxes on vehicles, fuels, and so on. There are two ways to put the issue here. One is: Are these general taxes reasonably counted as payments towards government expenditures on motor-vehicle infrastructure and services, or should they be counted as payments for other general government services? This is the question asked in "Way #3" of counting in this analysis. The other way to put it, which I prefer, in principle can be answered formally: If vehicle ownership, fuel use, roadway mileage, and so on, increased, what *on balance* would happen to general tax revenues to government? (This is Way #4 of counting, which is not formally represented here.) On the assumption that the money spent on the additional vehicle use would have been spent on something else, the government would receive more general-tax revenue from the motor-vehicle sector, but less general-tax revenue from other sectors. How this would balance would depend on how much of which goods and services would be used in the two scenarios ("more motor-vehicle use" versus "the same motor-vehicle use and more use of something else"), and on the tax rates on the various goods and services. (See section 17.3.4 for a further qualitative discussion.)

I believe that it is most reasonable to treat general tax payments as payments for all general government services – which include motor-vehicle-related services, but also much more (health, education, welfare, defense, and so on) – rather than as payments for government motor-vehicle infrastructure and services exclusively. Similarly, in my estimation, it is not likely that the government would get more general tax revenue from increased use of vehicles, fuels, and so on than from increased use of other goods and services. As a result, I prefer not to count general sales taxes, income taxes, or property taxes as payments towards government expenditures on motor-vehicle infrastructure and services.

Therefore, the accounting of Table 17-22 includes only those tax and fee payments that are levied on or embedded in the cost of motor vehicles, motor fuels, and related goods and services. This does include a portion -- albeit a fairly small portion -- of general sales, income, and property taxes levied on or embedded in the cost of motor vehicles, motor fuels, and related goods and services. The portion that I count is the portion of general taxes that *on the average* end up funding government motor-vehicle infrastructure and services as opposed to other general government services. In any case, this report and Table 17-22 part C (for the year 2002) present the full amount of most if not all conceivable tax and fee payments for motor-vehicle infrastructure and services, so that readers may make their own estimates of “fair” payments.

17.7.2 The results

Table 17-22 presents estimates of user payments counted according to Way #1 (section 17.3.1) Way, #2 (section 17.3.2), and Way #3 (section 17.3.3), for the base year of 1991 (part A of the table) and the most current estimate year of 2002 (parts B and C of the table). (Recall that I do not estimate payments under Way #4 of counting.) Table 17-23 summarizes the results and compares the total estimated user payments for governments MVIS with estimates of government expenditures on MVIS, again for 1991 and 2002. The estimates of government expenditures on MVIS are taken from the analysis in Report #7.

Focus on year 2002 results. The itemized user payments for the year 2002 are presented in two parts (Table 17-22B and 17-22C). Table 17-22B shows the amounts actually estimated under Way #1, Way #2, and Way #3 of counting. These amounts are equal to an unweighted amount, shown in Table 17-22C, multiplied by weights that represent the fraction of the unweighted amount that is counted as a user payment (also shown in Table 17-22C). These weights are pertinent mainly to the treatment of selective and general taxes (payment classes B and C).

Direct or specifically targeted payments, as estimated under Way #1 of counting account for the bulk of all potential motor-vehicle user payments (Tables 17-22B and 17-23). Payments under Way #3 of counting are about \$20 (high-case) to \$50 (low-cost case) higher than under Way #1, and payments under Way #2 of counting are about \$40 billion higher than under Way #1. (Recall that “low cost” here means a low difference between expenditures and payments, and hence incorporates the numerically low expenditures estimate and the numerically high payments estimates, where the two are independent.) Most of the payments counted under Way #3 and Way #2 but not Way #1 are for collection expenses, traffic and parking fines, parking fees, and (in the case of Way #3) tax expenditures (Table 17-22B). Note that unweighted general tax payments are large (section C1 of Table 17-22C), but that the weights, which represent the portion that we count under Way #3, are quite small, so that weighted general tax payments end up being small (section C1 of Table 17-22B). However, since we show the unweighted estimates, readers may apply their own weights and come up with their own accounting.

Similarly, the bulk of all potential government motor-vehicle-related expenditures are direct expenditures for highways as estimated by FHWA (Table 17-23). Other direct expenditures, counted under Way #2 but not Way #1 (mainly the cost of public off-street parking), amount to only about \$20 billion (Report #7). However, under Way #3 of counting we also estimate significant “indirect” government expenditures for police and fire protection, the judicial and prison system, environmental regulation, and military expenditures related to the use of Persian-Gulf oil by motor vehicles (Report #7). All told, the indirect expenditures counted under Way #3 but not under Way #1 are about \$40 to \$100 billion in 2002, or 25% to 30% of the FHWA-based “Way #1” total. As a result, which “indirect” items are included on the expenditure side of the ledger can have a significant impact on the comparison of user payments with government expenditures.

Under the broadest Way of Counting, #3, payments by motor-vehicle users are about 80% of government expenditures on MVIS in 2002 (Table 17-23). Under Way #2 of counting (all direct payments and expenditures), payments are about 90% of expenditures. The shortfall of payments corresponds to about 15 to 60 cents per gallon of motor fuel taxed in 2002 (Table 17-23).

17.7.3 Payments versus expenditures, 1989 to 2002

Figure 1 shows low and high user payments and government expenditures and the cents-per-gallon user-payment shortfall for Way #1, Way #2, and Way #3 of Counting from 1989 to 2002. As expected, payments and expenditures rise continuously over the period, but at slightly different rates at different times. These differences, combined with the pattern of fuel consumption over time (also shown in Figure 1), result in the cents-per-gallon user-payment shortfall – equal to the difference between expenditures and payments divided by the amount of gallons of all motor fuel taxed – being constant or slightly declining through the mid-to-late 1990s, then rising through 2002. If the rate of increase in the cents-per-gallon payment shortfall in the post-data period (2003 to present) has been the same as the rate at the end of the data period (about 1998 to 2002), then the cents-per-gallon user payment shortfall today probably is between 30 and 70 cents per gallon, if one takes the broadest Way of Counting (#3), but only about 20 cents per gallon if one counts only direct payments and expenditures (Way of Counting #2).

17.7.4 Summary of results

Recalling, once more, that a comparison of payments with government expenditures is not directly relevant to an economic analysis of efficient pricing or investment, but does matter in discussions of equity and government budget-balancing, I offer the following summary observations. First, current user payments probably are on the order of 80 to 90% of the associated government expenditures on MVIS. The low end of this range is similar to that estimated by Morris and DeCicco (1997) and FHWA et al. (1997). Second, as suggested by extrapolating Figure 1 to the present, the fuel tax would have to be increased by about 20 cents to 70 cents per gallon to make up the

present shortfall between motor-vehicle-user payments and motor-vehicle-related government expenditures⁴⁸. Third, the most important and uncertain components on the “payment” side of the ledger are general taxes, which we have argued should not be included under any Way of Counting. The most important and uncertain components on the expenditure side are what we have called indirect expenditures, which we *do* count in Way #3 of counting. Indeed, the bulk of the difference between the cents per gallon shortfall under Way #2 versus the shortfall under Way #3 is due to the inclusion of indirect expenditures in Way #3 but not in Way #2. Hence, in our accounting, the answer to the question “Do motor-vehicle users pay their way?” depends in large part on whether such things as judicial-system costs and military expenditures related to motor-vehicle use are counted as government expenditures for MVIS.

17.7.5 Conclusion

Our analysis indicates that current (ca. 2005) tax and fee payments to the government by motor-vehicle users may fall short of present government expenditures related to motor-vehicle use by approximately 20 to 70 cents per gallon of all motor fuel. As we have emphasized above, while this significant shortfall certainly is pertinent to discussions of the equity of transportation financing, and even to concerns about balancing the budget of the government highway enterprise, it is not necessarily the amount of motor-fuel-tax increase that would ensure the most efficient provision and use of government motor-vehicle-related infrastructure and services. Nevertheless, a 20 to 70 cent per gallon shortfall is large, especially compared with current state and federal fuel taxes (averaging about 38 cents per gallon total federal+state in 2003 [www.fhwa.dot.gov/policy/ohim/hs03/htm/mf121t.htm]). If the upper end of this 20 to 70 cent-per-gallon range were added to the price of motor fuel, it likely would have a noticeable effect on fuel consumption and motor-vehicle use. (Moreover, as noted above, an initial increase in the motor-fuel tax likely would reduce demand for motor-fuel and thereby necessitate a further tax increase to compensate for the reduced volume of fuel subject to the tax.) Furthermore, our estimate here is only of the difference between user tax and fee payments to government and actual government monetary outlays for motor-vehicle infrastructure and services; it does *not* include the cents-per-gallon-value of any non-monetary environmental or oil-use externalities such as global warming or the macroeconomic costs of oil disruptions. Incorporation of these and other external costs could *further* raise the price of fuel by on the order of a \$1

⁴⁸ Any increase in the price of motor fuel would reduce demand for fuel and therefore reduce the total volume of motor fuel subject to the tax. To account for this loss of tax revenue due to the higher price the motor-fuel tax increase would have to be greater than that calculated without consideration of this demand-dampening effect. If the effective price elasticity of demand for motor fuel (the percentage change in demand for fuel per 1% change in the price of fuel) is relatively large (in absolute value), and if the initial cents-per-gallon tax shortfall (before consideration of the demand-dampening effect) was a relatively large fraction of the starting fuel price, then the additional tax required to offset the loss of revenue due the dampening of demand would be large relative to the initial cents-per-gallon user-tax-payment shortfall.

per gallon of motor fuel (Parry and Small, 2001; Delucchi, 2000; Delucchi, 1997). We may conclude, then, that motor-vehicle users do not “pay their way.”

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TABLE 17-1. GOVERNMENT TAXES, FINES, AND FEES RELATED TO MVIS IN THIS REPORT

Federal government	State and local governments ^a
<i>A1. Special taxes and fees levied on vehicles and fuels and actually used by government for MVIS:</i> • Motor fuels: portions of federal gasoline and diesel-fuel tax dedicated to highways* • Trucks of GVW over 33,000 lbs, trailers of GVW over 26,000 lbs: 12% of sales price at first retail* • Tires: charge per pound for tires over 40 lbs (charge depends on weight), when tires are delivered to retail stores* • Use of heavy vehicles : annual charge per pound for trucks of GVW over 55,000 lbs (charge depends on weight; goes from \$100 to \$550/year for 75,000 lbs and over)*	<i>A1. Special taxes and fees levied on vehicles and fuels and actually used by government for MVIS:</i> • Motor fuels* • MV registration* • Weight-distance travel* • Oversize and overweight permits* • Road use* • MV and motor-carrier licenses* • MV operators' licenses* • Special vehicles (e.g., taxis and limousines)* • Title* • Inspection of MVs* • Inspection of motor fuels* • Wholesalers, distributors, and retailers of fuels*
<i>A2. Other taxes and fees specifically related to motor-vehicle use:</i> • Motor-fuels: portions of fuel taxes dedicated to non-highway purposes^{b,c} • Domestic crude oil: \$0.05/barrel for the Oil Spill Liability Trust Fund^d and \$0.097/barrel for the Hazardous Substances Superfund, imposed upon receipt at the refinery • Imported petroleum (products& crude): \$0.05/barrel for the Oil Spill Liability Trust Fund^d, \$0.097/barrel for the Hazardous Substances Superfund, imposed on entry to the U.S. • Gas guzzlers: tax on automobiles with an unloaded GVW of 6000 lbs or less and an EPA fuel economy rating of less than 22.5 mpg, imposed upon sale by manufacturer^e • Luxury automobiles: 10% of the amount that the sales price exceeds \$30,000 (for automobiles of unloaded GVW of 6000 lbs or less) • CAFE fines: levied on manufacturers who not meet Federal fuel economy standards	<i>A2. Other taxes and fees specifically related to motor-vehicle use:</i> • Property-tax-like fees • Air quality and pollution control • Traffic fines and parking fines • Public parking fees and all parking taxes
<i>C1. General taxes and fees levied on a wide range of commodities and activities</i> • Corporate-income taxes, MV-related industries • Personal-income taxes paid by employees in MV related industries	<i>B. Selective taxes and fees, on a limited number of commodities and activities</i> • Severance taxes on petroleum • Special property taxes on MVs • Selective sales taxes on MVs • Other selective taxes on oil, MV businesses
<i>C2. Tax expenditures: corporate income taxes, sales taxes, and property taxes on highways</i>	<i>C1. General taxes and fees levied on a wide range of commodities and activities</i> • Sales taxes on MVs, MV fuels, and MV parts • General property taxes paid on MVs and MV garages, and by MV related industries • Corporate-income taxes, MV-related industries • Personal-income taxes paid by employees in MV related industries <i>C2. Tax expenditures: corporate income taxes, sales taxes, and property taxes on highways</i>

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*Classified by the FHWA as a user impost for the highways, except as noted. (See text for discussion.)

^aTax rates, names, and coverage vary from state to state and locality to locality.

^bPortions of the fuel tax that are dedicated to deficit reduction, mass transit, tax collection, and other nonhighway purposes.

^cIncludes \$0.001/gallon dedicated to the Leaking Underground Storage Tank (LUST) Trust Fund. The LUST tax, which applies to all petroleum fuels except propane, expires after December 31, 1995.

^dThe tax was to be suspended when the fund accumulated \$1 billion, which occurred on July 1, 1993 (Barthold, 1994).

^eThe tax depends on fuel economy; it goes from \$1000 to \$7,700 for fuel economy less than 12.5 mpg.

TABLE 17-2. RECEIPTS FOR HIGHWAYS, AS REPORTED BY FHWA, 1971-2003 (10⁶ CURRENT \$)

Year	Hwy-user imposts	Road tolls	Property taxes	General funds	Other imposts	Miscellaneous receipts	Bond proceeds	FHWA-reported total	My breakout of FHWA's "Miscellaneous receipts"				
a	b	c	d	e	f	g	h	i	Parking fees j	Traffic fines k	Hwy fund invest. l	Private \$\$ m	Other misc. n
2003	73,630	6,230	6,902	21,430	7,824	7,943	14,425	138,384	100	359	2	4,150	3,332
2002	73,054	6,583	6,488	20,347	7,518	8,078	12,747	134,815	100	351	1	3,875	3,751
2001	71,934	5,785	6,399	20,370	7,421	7,749	12,665	132,324	100	343	1	3,600	3,705
2000	75,604	5,732	6,115	19,284	5,738	7,342	11,301	131,115	100	335	0	3,350	3,557
1999	69,090	5,132	5,809	17,190	6,381	6,774	11,274	121,650	100	327	2	3,125	3,220
1998	64,253	4,698	5,805	14,486	5,104	8,187	9,048	111,581	100	319	1,166	2,900	3,702
1997	61,598	4,668	5,259	15,119	5,046	6,977	8,754	107,421	100	311	805	2,700	3,061
1996	59,656	4,396	5,135	14,733	3,962	7,090	7,799	102,771	100	303	658	2,500	3,529
1995	55,503	4,059	5,150	12,142	4,098	6,742	7,619	95,313	100	295	548	2,325	3,474
1994	51,547	3,840	4,832	12,433	4,333	7,032	7,295	91,312	100	287	754	2,150	3,741
1993	50,794	3,607	4,703	10,625	4,047	6,834	7,770	88,380	100	279	817	2,000	3,638
1992	47,439	3,450	4,644	12,404	2,885	6,582	9,299	86,703	100	272	908	1,875	3,427
1991	45,927	3,116	4,439	11,952	2,686	5,990	6,927	81,037	100	264	908	1,750	2,968
1990	41,621	2,725	4,511	12,341	2,975	5,707	5,564	75,444	100	256	981	1,675	2,695
1989	41,378	2,869	4,303	10,824	2,860	5,451	5,152	72,837	100	248	776	1,600	2,727
1988	38,592	2,934	4,162	11,102	2,755	4,259	4,645	68,449	100	240	809	1,550	1,560
1987	36,927	2,895	4,122	10,812	2,623	4,172	3,802	65,353	100	232	934	1,500	1,406
1986	35,144	2,387	3,672	10,885	2,343	4,570	6,937	65,938	100	224	1,054	1,450	1,742
1985	33,578	2,190	3,473	9,875	1,883	4,298	6,076	61,373	100	216	1,106	1,375	1,501
1984	30,328	2,054	3,160	9,467	1,813	3,711	3,151	53,684	100	208	1,026	1,300	1,077
1983	25,324	1,864	2,978	9,359	1,653	3,660	2,566	47,404	100	200	1,076	1,225	1,059
1982	22,641	1,745	2,723	8,678	1,653	3,758	2,915	44,113	100	192	1,078	1,150	1,238
1981	21,824	1,831	2,515	8,760	1,371	3,669	2,574	42,544	100	184	1,129	1,050	1,206
1980	20,993	1,654	2,407	8,344	1,253	3,072	2,111	39,834	85	174	1,027	950	836
1979	21,241	1,518	2,117	7,706	853	2,731	1,904	38,070	94	168	857	800	812
1978	20,627	1,496	2,095	6,242	747	2,195	1,883	35,285	107	162	662	625	639
1977	19,628	1,421	1,837	5,362	783	1,750	2,230	33,011	82	154	593	450	471
1976	19,457	1,355	1,762	4,859	586	1,673	2,221	31,913	59	148	600	250	616
1975	17,689	1,252	1,652	4,572	505	1,703	2,239	29,612	106	132	586	250	629
1974	17,675	1,165	1,592	3,591	498	1,457	1,657	27,635	107		415	250	685
1973	17,003	1,206	1,497	2,998	413	1,147	1,954	26,218	93		247	250	557
1972	15,719	1,127	1,386	2,409	374	941	2,459	24,415	82		206	250	403
1971	14,863	1,009	1,401	2,286	374	868	3,341	24,142	62		184	250	372

Source: estimates for 1971 to 1995 are from Table HF-210 of *Highway Statistics: Summary to 1995* (1997). Estimates for 1996 to 2003 are from Table HF-10 of *Highway Statistics* (various years; available on the web at www.fhwa.dot.gov/policy/ohpi/hss/index.htm). (Similar data are available in Table HF-1 of the *Highway Statistics* series.) “Receipts” include all sources of money used for highways, not just payments by highway users for the use of the highways. The column letters a through n are also footnotes. n.a. = not available. Amounts shown are in current-year (not constant) dollars.

^a According to the FHWA’s *Highway Statistics* series (various years), *Highway Statistics, Summary to 1995* (1997), and *A Guide to Reporting Highway Statistics* (2004), some financial statistics are reported for fiscal years (ending at various times) and some are reported for calendar years (see www.fhwa.dot.gov/policy/ohpi/hss/index.htm). Because FHWA does not actually specify the accounting period for each statistic, it is not possible to put all of the data on a calendar-year basis. However, *A Guide to Reporting Highway Statistics* (2004) does instruct reporting agencies to report expenditure data and receipts data for the same accounting period, which means that our comparison of expenditures (Report #7) with receipts (this report) is internally consistent.

^b See the text for a discussion of the FHWA’s definition of a highway-user payment for the highways. Included here are: motor-fuel taxes, motor-vehicle registration fees, driver-license fees, dealer fees, weight-distance taxes on trucks, titling fees, fines and penalties for registration violations and vehicle size and weight violations, and other fees, *net* of collection and administration costs. State receipts of traffic fines probably are not included here (see section 17.4.11).

I include these estimates of highway-user imposts for highways as a type A1 payment in my accounting system (section 17.2.1, section 17.4.1, and Table 17-1).

^c The FHWA reports receipts from State and local and “quasi” State and local toll facilities (FHWA, *Highway Statistics*, annual). Thus, the amounts shown apparently do not include any private tolls levied on privately owned and operated roads. I assume that private tolls on private roads are tiny, and do not include them anywhere in my analysis.

I include estimates of road-toll payments as a type A1 payment in my accounting system (section 17.2.1, section 17.4.1, and Table 17-1).

^d These are property taxes (including property taxes on vehicles) and related taxes and fees, such as special assessment taxes, that are specifically levied for the purpose of highways. General as well as special (or “selective”) property taxes may be included here, so long as they are levied *specifically* for highway purposes. General property taxes that are not levied specifically for highways, but which end up being co-mingled with other funds that are spent on highways, are included under “general funds” (column e).

Some states assess a registration fee on motor-vehicles in-lieu of a property tax; these in-lieu fees are discussed along with other property-tax-like fees in section 17.4.5.

Note that in this accounting I distinguish property taxes on the basis of their incidence – whether they are general or selective – rather than on the basis of their disposition – whether they are dedicated to highways. Hence, I do not count as a user payment for MVIS any of the property taxes reported as such in this table. Instead, I estimate and treat separately property-tax-

like fees in section 17.4.5, special property taxes in section 17.5.3, and general property taxes in section 17.6.5. The property tax amounts shown in this table are thus for information only.

- ^e All receipts that are not from highway-user imposts and are not allocated specifically for highways are included in here. Note that I make a separate accounting of general taxes paid on MVIS (section 17.6); hence, the amounts shown here are for information only and are not used anywhere in this analysis
- ^f These are other imposts levied specifically for the purpose of highways. As explained in the text, I count virtually none of this amount as a user payment because I have my own separate, detailed enumeration of special tax and fee payments by motor-vehicle users. See section 17.4.13.
- ^g A variety of miscellaneous tax and fee receipts for highways. In the right side of this table I break this category into five components, three of which I estimate independently (parking fees, traffic fines, and investment), one of which I don't count as a user payment (private contributions), and one of which I count partially as a user payment (other miscellaneous). See the discussion in section 17.4.13 for details.
- ^h Income from the sale of bonds and notes, as reported by FHWA. Short-term note issues (a maturity of 2 years or less) are not included (FHWA, *Highway Statistics* 1991, 1992). However, I do *not* count these as additional payments by users because if the bond originally was bought with user revenues, then the proceeds from the sale double count the original receipt of revenues, and if the bond was bought with non-user revenues, it is irrelevant to an estimate of user payments for motor-vehicle use. Thus, the amounts shown here are for information only.
- ⁱ Total receipts for highways, as reported by FHWA. Equal to the sum of the values in columns b through h. Excludes funds drawn from or placed in reserves.
- ^j Parking fees dedicated to highway purposes. Prior to 1981 local governments reported to FHWA the amount of parking fees received for highway purposes, and the FHWA published the amount in Table HF-211 of *Highway Statistics, Summary to 1985* (1987). However, since 1981 local governments have not reported parking fees separately, but rather have included them among miscellaneous receipts, if they have included them at all (see Table UF-201, *Highway Statistics, Summary to 1985*, 1987). The amounts shown in this table for 1971 to 1981 are from FHWA's Table HF-211; the amounts shown in this table for 1981 to 2003 are my estimates of what was included in the FHWA-reported miscellaneous receipts.
I do not count the parking-fee estimates in this column because I make an independent estimate of all municipal parking fees received in section 17.4.12.
- ^k Traffic fines dedicated to highway purposes. From 1975 to 1980 municipalities reported to FHWA the amount of traffic fines received for highway purposes, and the FHWA published the amount in Table UF-201 of *Highway Statistics, Summary to 1985* (1987). However, since 1981 municipalities have not reported traffic fines separately, but rather have included them among miscellaneous receipts, if they have included them at all. The amounts shown in this

table for 1975 to 1980 are from FHWA's Table UF-201; the amounts shown in this table for 1981 to 2003 are estimates of what was included in the FHWA-reported miscellaneous receipts. The 1981 to 2003 estimates are from a regression equation relating fines to years, based on the 1975 to 1981 data.

I do not count the traffic-fine estimates in this column because I make an independent estimate of all traffic fines in section 17.4.11. See also Appendix 17-A.2.

^l The FHWA includes "investment income" under its "miscellaneous receipts" category of Table HF-1 and its "investment income and other receipts" category of Table HF-10 of *Highway Statistics*. I assume that the amount of highway fund investment income included in FHWA's "miscellaneous receipts" is the amount of interest earned on the highway portion of the Highway Trust Fund, as shown in FHWA Table FE-10 (FHWA, *Highway Statistics*, various years) and in *Highway Statistics: Summary to 1985* (FHWA, 1987). According to the FHWA's *Highway Statistics*, the Highway Trust Fund ceased earning interest effective October 1, 1998. (The small amounts shown from 1999 on are "Interest under Cash Management Improvement Act".)

I do not count the highway-fund investment income in this column because I make an independent estimate of investment earnings on all user payments for capital in section 17.4.2.

^m Private contributions to roads. According to FHWA's *A Guide to Reporting Highway Statistics* (1990, p. 8-7), "Private -sector participation in financing highway projects takes the form of cash contributions and other donations, transfers of real property, construction of facilities, and services such as engineering." FHWA counts the value of this private-sector contribution on both the receipts ledger *and* the expenditures ledger (see Reports #6 and #7 in the social-cost series for a bit more information). Hu et al. (1991) estimate that in 1989 the value of the private contributions reported to and by FHWA was \$1.6 billion. I assume that FHWA included this amount under "miscellaneous receipts" for 1989. I then use my judgment to estimate amounts for other years.

As explained in section 17.4.13, I do not consider private-developer contributions to be an MV-user payment under any of the four Ways of counting payments.

ⁿ The other (remaining) miscellaneous receipts are insurance recoveries and unspecified "permit fees". The amount here is estimated as total miscellaneous receipts (column g) less parking fees (column j), traffic fines (column k), highway fund investments (column l), and private contributions (column m). See section 17.4.13 for an explanation of my treatment of receipts in this category.

TABLE 17-3. ADDITIONAL PAYMENTS FOR MOTOR-VEHICLE USE, NOT COUNTED BY FHWA, 1971-2003 (10⁶ CURRENT \$)

Year	State coll. expense	Federal hwy \$ to transit	State hwy \$ to transit	Local hwy \$ to transit	Federal hwy \$ to other	State hwy \$ to other	Local hwy \$ to other	Local coll. expense	Interest on capital investment of receipts	
a	b	c	d	e	f	g	h	i	j (low)	j (high)
2003	3,145	5,790	3,826	599	1,559	9,196	130	3,145	5,790	3,826
2002	3,457	5,594	3,217	549	1,410	6,511	133	3,457	5,594	3,217
2001	3,538	4,959	2,182	716	2,539	7,576	121	3,538	4,959	2,182
2000	2,992	5,111	2,030	687	168	7,467	85	2,992	5,111	2,030
1999	3,199	5,987	2,059	717	8,717	7,902	123	3,199	5,987	2,059
1998	3,075	4,233	2,476	818	835	8,601	173	3,075	4,233	2,476
1997	2,869	3,290	2,119	553	8,892	5,893	138	2,869	3,290	2,119
1996	2,947	3,128	3,278	476	5,711	6,811	111	2,947	3,128	3,278
1995	2,969	2,598	2,469	567	9,477	6,290	211	2,969	2,598	2,469
1994	2,912	2,303	3,095	555	11,304	6,365	160	2,912	2,303	3,095
1993	2,655	2,042	2,630	608	3,953	4,944	144	2,655	2,042	2,630
1992	2,531	1,370	3,749	538	3,860	4,883	181	2,531	1,370	3,749
1991	2,138	2,485	1,772	513	2,890	4,033	308	2,138	2,485	1,772
1990	2,376	1,395	1,054	722	196	4,500	190	2,376	1,395	1,054
1989	2,150	1,269	1,116	386	196	4,617	333	2,150	1,269	1,116
1988	2,068	1,277	910	192	198	3,601	330	2,068	1,277	910
1987	2,001	1,239	560	385	155	3,335	174	2,001	1,239	560
1986	1,877	1,113	787	255	53	2,702	115	1,877	1,113	787
1985	1,703	1,214	711	266	64	2,371	108	1,703	1,214	711
1984	1,532	1,236	659	237	44	1,971	31	1,532	1,236	659
1983	1,416	520	627	181	30	1,617	61	1,416	520	627
1982	1,261	0	668	182	34	1,534	59	1,261	0	668
1981	1,122	0	368	204	34	1,000	152	1,122	0	368
1980	1,061	0	740	162	32	1,243	118	1,061	0	740
1979	981	0	675	118	45	1,613	62	981	0	675
1978	961	0	529	0	28	1,612	0	961	0	529
1977	895	0	529	0	19	1,537	0	895	0	529
1976	831	0	433	0	34	1,532	0	831	0	433
1975	783	0	251	0	20	1,138	0	783	0	251
1974	712	0	134	0	8	1,322	0	712	0	134
1973	654	0	0	0	8	1,484	0	654	0	0
1972	566	0	0	0	7	1,418	0	566	0	0
1971	533	0	0	0	6	1,319	0	533	0	0

Source: Table HF-210 of *Highway Statistics: Summary to 1995* (1997), Table HF-10 of *Highway Statistics* (various years; available at www.fhwa.dot.gov/policy/ohpi/hss/index.htm), and other sources, as discussed in the text and the notes below.

Column letters a through j are also table footnotes. n.a. = not applicable. Amounts shown are in current-year (not constant) dollars.

- ^a See note to Table 17-2, which is pertinent to the use of FHWA statistics in this table.
- ^b State collection expenses funded by motor-vehicle-user receipts, as shown in the “Amount for Collection Expenses” line and “State Agencies and D.C.” column of the “Disposition of Highway User Revenue by Collecting Agencies” portion of Table HF-210 of *Highway Statistics: Summary to 1995* (1997) and Table HF-10 of *Highway Statistics*.
- ^c Federal highway-user payments dedicated to mass transit, as shown in the “Amount for Mass Transportation” line and “Total Federal” column of the “Disposition of Highway User Revenue by Collecting Agencies” portion of Table HF-210 of *Highway Statistics: Summary to 1995* (1997) and Table HF-10 of *Highway Statistics*.
- ^d State highway-user payments dedicated to mass transit, as shown in the “Amount for Mass Transportation” line and “State Agencies and D.C.” column of the “Disposition of Highway User Revenue by Collecting Agencies” portion of Table HF-210 of *Highway Statistics: Summary to 1995* (1997) and Table HF-10 of *Highway Statistics*. (As indicated in the text, the FHWA does not report collection-expense amounts for the federal government or for local governments.)
- ^e Local highway-user payments dedicated to mass transit, as shown in the “Amount for Mass Transportation” line and “Local Governments” column of the “Disposition of Highway User Revenue by Collecting Agencies” portion of Table HF-210 of *Highway Statistics: Summary to 1995* (1997) and Table HF-10 of *Highway Statistics*.
- ^f Federal highway-user payments dedicated to non-highway purposes other than mass transit (such as reducing the federal deficit), as shown in the “Amount for Nonhighway Purposes” and “Amount for Territories” lines and “Total Federal” column of the “Disposition of Highway User Revenue by Collecting Agencies” portion of Table HF-210 of *Highway Statistics: Summary to 1995* (1997) and Table HF-10 of *Highway Statistics*.
- ^g State highway-user payments dedicated to non-highway purposes other than mass transit, as shown in the “Amount for Nonhighway Purposes” line and “State Agencies and D.C.” column of the “Disposition of Highway User Revenue by Collecting Agencies” portion of Table HF-210 of *Highway Statistics: Summary to 1995* (1997) and Table HF-10 of *Highway Statistics*. (Note that no state or local revenues are diverted to U. S. Territories.)
- ^h Local highway-user payments dedicated to non-highway purposes other than mass transit, as shown in the “Amount for Nonhighway Purposes” line and “Local Governments” column of the “Disposition of Highway User Revenue by Collecting Agencies” portion of Table HF-210 of *Highway Statistics: Summary to 1995* (1997) and Table HF-10 of *Highway Statistics*. (Note that no state or local revenues are diverted to Territories.)

i Local collection expenses funded by motor-vehicle-user receipts. See section 17.4.4

j The interest that is earned on the investment of the payments that go towards capital expenditures for the highways. See section 17.4.2.

TABLE 17-4. FEDERAL TAXES ON MOTOR FUELS DEDICATED TO NONHIGHWAY PURPOSES (CENTS/GALLON)

Date	to mass transit account	to leaking underground storage tank trust fund	to general fund for deficit reduction
January 1, 1983	1.0	0.0	0.0
January 1, 1987	1.0	0.1	0.0
December 1, 1990	1.5	0.1 ^a	2.5
October 1, 1993	1.5	0.1	6.8
October 1, 1995	2.0	0.1	4.3
January 1, 1996	2.0	0.0 ^b	4.3
October 1, 1997	2.86	0.1	0.0

From FHWA's *Highway Statistics 1995* (1996), *Highway Statistics 2003* (2003), Table FE-21B. Tax rates shown apply to gasoline and diesel fuel; slightly different rates apply to special fuels such as propane, alcohols, and gasohol.

^aThe tax was not collected from September 1, 1990 to December 31, 1990.

^bThe tax expired January 1, 1996, but as indicated was re-instated later.

TABLE 17-5. ENVIRONMENTAL FEES ON MOTOR VEHICLES IN 1995

State	Amount (* = not in 1991)	Purpose
Arizona	\$1.50 per registration in attainment areas, \$2.00 in nonattainment areas	statewide air quality program
Arizona	Emissions inspection fee	motor-vehicle emissions inspection program
California	optional fee of up to \$4 per registration in nonattainment areas*	air pollution enforcement, planning, monitoring, research
California	\$300 smog impact fee, on vehicles previously registered in another state, and not certified to California emissions standards*	for environmental purposes
Colorado	\$1.00 per waste tire*	to finance waste diversion and recycling strategies
Colorado	\$0.50 per registration	direct costs of motor-vehicle emissions regulatory activities in nonattainment areas
Florida	\$1.00 per registration	air pollution control
Michigan	\$3.00 inspection fee*	administration and oversight
New Hampshire	\$2.50 per inspection*	construction and operation of emissions tests stations
New Hampshire	\$0.50 per emissions inspection*	air quality monitoring
New York	\$0.05 per registration	inspection, regulation, and research in the control of motor-vehicle exhaust emissions
Oklahoma	0.03% of Wildlife Conservation Fund	wildlife conservation
South Dakota	\$0.25/tire, \$1.00 maximum per vehicle*	waste reduction, recycling, and management
Virginia	\$2.10 per inspection*	costs of inspection program
Washington	\$2.00 per registration*	implement provisions of the Clean Air Act

From FHWA's *Highway Taxes and Fees* (1991, 1995).

TABLE 17-6. ENVIRONMENTAL EXCISE TAXES ON PETROLEUM, 1991

	Total (10 ⁶ \$) ^a	Motor vehicle share (fraction) ^b		Motor-vehicle share (10 ⁶ \$) ^c	
		<i>low cost</i>	<i>high cost</i>	<i>low cost</i>	<i>high cost</i>
Imported petroleum Superfund (crude oil and products)	259.7	0.330	0.580	85.7	150.7
Domestic petroleum Superfund (crude oil and natural gasoline)	290.4	0.611	0.357	177.4	103.6
Imported petroleum Oil Spill Liability Trust Fund (crude oil and products)	131.3	0.330	0.580	43.3	76.2
Domestic petroleum Oil Spill Liability Trust Fund (crude oil and natural gasoline)	143.6	0.611	0.357	87.7	51.2
<i>Totals</i>	825.0			394.2	381.6

^aBoroshok (1993).

^bEstimated in Table 10-14 of Report #10.

^cEqual to the total cost multiplied by the low or high motor-vehicle share fraction.

TABLE 17-7. GAS-GUZZLER TAXES, LUXURY TAXES, CAFE FINES, AND OTHER MINOR TAXES, 1991 AND 2003 (10⁶ \$)

Tax or fine	1991^a	2003^b
Luxury taxes, fiscal year	88.0	65.2
Gas-guzzler taxes, fiscal year	118.4	126.7
Pipeline safety fund, fiscal year	2.0	2,536
Motor-vehicle emissions certification tests, calendar year	10.0	12.7
CAFE fines, model year	42.2	56.8
<i>Total luxury , gas-guzzler, other</i>	<i>260.6</i>	<i>263.9</i>

^a See the discussion in the text. Pipeline safety fund 1991 is for fiscal year 1992.

^b Luxury tax: www.irs.gov/taxstats/article/0,,id=96565,00.html. The luxury tax on automobiles expired in 2003.
Gas-guzzler tax: IRS tax data available at www.irs.gov/taxstats/article/0,,id=96565,00.html.
Pipeline safety: Assume increases 2%/year from 1991.
Motor-vehicle emissions: Assume increases 2%/year from 1991.
CAFE fines: Assume increases 2.5%/year from 1991.

TABLE 17-8. AN ESTIMATE OF NATIONAL TRAFFIC AND PARKING FINES, BASED ON FINES AND FORFEITS RECEIVED IN LARGE CITIES AND COUNTIES (FISCAL YEAR 1991)

	<i>Cities</i>	<i>Counties</i>
Total fines and forfeits received by large cities (population of 300,000 or more) and large counties (population of 500,000 or more) (billion \$) ^a	1.00	0.57
<i>Ratio used to extrapolate from large cities and counties to all cities and counties^a</i>	<i>Cities</i>	<i>Counties</i>
Population of all large cities or counties to population of all cities or counties	0.27	0.39
Expenditures on highways, police, and parking facilities in large cities or counties to expenditures in all cities or counties	0.36	0.36
"Miscellaneous revenues" in large cities or counties to "miscellaneous revenues" in all cities or counties	0.37	0.46
Fines and forfeits in large cities and counties to total "other and unallocable receipts" in large cities or counties	0.44	0.42
<i>Extrapolated total fines and forfeits (billion \$)^b</i>	<i>Cities</i>	<i>Counties</i>
• based on population	3.7	1.5
• based on expenditures on highways, police, etc.	2.8	1.6
• based on miscellaneous receipts	2.7	1.3
• based on "other and unallocable" receipts ^c	2.6	1.5
<i>Fraction of city and county fines and forfeits that are traffic fines and parking fines^d</i>	0.9	0.5
<i>Extrapolated total traffic and parking fines, all cities and counties (billion \$)^e</i>	<i>Total U.S.</i>	
• based on population	4.03	
• based on expenditures	3.30	
• based on miscellaneous receipts	3.04	
• based on "other and unallocable" receipts	3.07	
<i>Estimated traffic fines received by state governments (billion \$)^f</i>	0.6	

^aCalculated from data reported by the Bureau of the Census (*City Government Finances: 1990-1991, 1993; County Government Finances: 1990-1991, 1993*).

^bEqual to the amount received by large cities or counties divided by the relevant ratio from the previous section of rows, except as noted.

^cEqual to total “other and unallocable” receipts in all cities or counties (as reported by the Census) multiplied by the ratio of fines and forfeits in large cities and counties to total “other and unallocable receipts” in large cities or counties. This probably is the most accurate extrapolation.

^dNew York City received \$370 million in fines and forfeits generally (Bureau of the Census, *City Government Finances: 1990-1991*, 1993), \$295 million in parking fines (Table 17-10), and an unknown portion of the \$45 million in traffic fines that it generated (Roelofs and Komanoff, 1994). I estimate that in California counties, traffic fines and parking fines were about half of “fines, forfeitures, and penalties” as defined by California (California State Controller, *Annual Report of Financial Transactions Concerning Counties of California, Fiscal Year 1990-1991*, 1992), and that in California cities, traffic fines and parking fines were about 90% of “fines and forfeitures” (California State Controller, *Annual Report of Financial Transactions Concerning Cities of California, Fiscal Year 1990-1991*, 1992). However, the California definitions of “fines and forfeitures” might not be the same as the Census definition. In any case, it appears that parking fines and traffic fines are about 90% of municipal fines and forfeits (as defined by the Census), and 50% of county fines and forfeits. The data of Table 17-10, which indicate that parking fines alone are about 90% of total fines and forfeits reported by the Bureau of the Census, support this assumption.

I caution, though, that there are problems with the data. For example, the Census reports that in fiscal year 1991, Los Angeles City received \$89 million in fines and forfeits generally (Bureau of the Census, *City Government Finances: 1990-1991*, 1993), but the state of California reports that Los Angeles received \$89 million in “vehicle code fines” alone (which are supposed to exclude parking fines) in fiscal year 1991 (California State Controller, *Annual Report of Financial Transactions Concerning Cities of California, Fiscal Year 1990-1991*, 1992), and the City of Los Angeles reports that it received \$75 million in parking fines alone (Table 17-10). I suspect that parking fines were inappropriately included in the “vehicle code fines” reported to the State of California.

^eEqual to extrapolated city fines and forfeits multiplied by the traffic and parking-fine fraction, plus extrapolated county fines and forfeits multiplied by the traffic and parking-fine fraction

^fState governments received \$1.5 billion in “fines and forfeits” (Bureau of the Census, *State Government Finances: 1991, 1992*). As discussed in the text, I assume that 40% of these fines and forfeits were traffic fines and parking fines.

TABLE 17-9. ESTIMATE OF NATIONAL PAYMENTS OF TRAFFIC FINES (EXCLUDING PARKING FINES), BASED ON FINES RECEIVED IN NEW YORK, CALIFORNIA, AND TEXAS, 1990-1991 (BILLION \$)

<i>New York</i> (calendar year 1990)	Fines received in local courts ^a	Fines received by administrative tribunals ^a	Fines received by state courts ^b	Total fines in New York State	New York share of U. S. VMT, 1990 ^c	Estimate of national payments of fines, based on VMT ^d
	0.0966	0.0573	0.019	0.173	0.0498	3.47
<i>California</i> (fiscal year 1991)	Fines received by cities ^e	Fines received by counties ^f	Fines received by the State ^g	Total fines in California	California share of U. S. VMT, 1990 ^c	Estimate of national payments of fines, based on VMT ^d
	0.240	0.116	0.107	0.463	0.1206	3.84
<i>Texas</i> (calendar year 1991)	Fines from arrests by county & city police in Texas ^h		Fines by Highway Patrol in Texas ⁱ	Total fines in Texas	Texas share of U. S. VMT, 1990 ^c	Estimate of national payments of fines, based on VMT ^d
	0.11-0.16		0.0548	0.16-0.22	0.0730	2.25-3.75

^aTotal fines and surcharges received by local courts and administrative tribunals for moving traffic violations, according to the records of the Department of Motor Vehicles (Conley, 1993). (Receipts from administrative adjudication by administrative tribunals also are reported in the New York State Comptroller's *State of New York Comptroller's Annual Report, Fiscal Year Ended March 31, 1992, 1992*.) Fines are the amounts specified in law for the particular offense; surcharges are amounts in addition to the fines, specified by other legislation, usually as a means to raise revenue. Parking fines are not included. (These usually are handled by "parking violations tribunals". I estimate them separately, below.) If the amounts shown really are for moving violations only, then fines pertaining to violations of vehicle registration and the like are appropriately excluded here -- "appropriately" because such fines already are counted as "user imposts" in the FHWA's *Highway Statistics*.

Administrative tribunals for traffic offenses were established in New York City, Buffalo, Rochester, and in the more densely populated part of Suffolk County to relieve the local courts there of the considerable burden of handling traffic offenses. These tribunals are staffed by administrative law judges, rather than by elected judges, and are administered by the Department of Motor vehicles. The State of New York collects revenues from administrative adjudication, deducts the cost of the tribunals, and returns the remaining funds to the localities, which might earmark the funds for specific purposes. (Sometime in the 1980s, the state took over the cost of administering the court system, so that the state pays the cost of

operating the local traffic-court systems.) Fines collected from alcohol-related offenses are returned to the Counties for the operation of “Stop-DWI” programs.

^bRoelofs and Komanoff (1993) report that state courts collected about \$19 million in vehicle and traffic fines in fiscal year 1992. I assume that the same amount was collected in calendar year 1990. I have excluded parking fines, which I estimate separately, and equipment violation surcharges, which presumably are included in the FHWA financial statistics.

^cThis is the ratio of total vehicle-miles traveled (VMT) in the state to total VMT in the U. S., in 1990 (FHWA, 1991, *Highway Statistics*).

^dThis is equal to total fines in the state divided by the state’s share of U. S. VMT in 1990. This estimation method assumes that the amount of fines and surcharges for moving violations is proportional to the amount of vehicle travel. If traffic laws, the tendency (per mile) to break traffic laws, and enforcement of traffic laws are similar across the country, then this assumption is reasonable. VMT = vehicle miles traveled.

^eFrom the California State Controller (*Annual Report of Financial Transactions Concerning Cities of California, Fiscal Year 1990-1991, 1992*). The amount shown is revenues for “vehicle code fines”, and is supposed to exclude parking fines and such things as late charges for renewal of motor-vehicle registration.

^fFrom the California State Controller (*Annual Report of Financial Transactions Concerning Counties of California, Fiscal Year 1990-1991, 1992*). The amount shown is revenues for “vehicle code fines”, and is supposed to exclude parking fines and such things as late charges for renewal of motor-vehicle registration.

^gThe State of California received \$107 million from local governments for “penalties on traffic violations” in fiscal year 1991 (California State Controller, *Annual Report of the State of California Budgetary Basis, Fiscal Year 1990-1991, 1992*). I assume that this amount does not include any parking fines, which I estimate separately. According to the Office of the State Controller, the amount received by the state should be in addition to the amounts received by the cities and counties, not a transfer, so that total traffic fines received by all levels of governments in California is equal to the sum of the amounts shown here for cities, counties, and the state (Edwards, 1994).

^hWe assume that city and county police combined issued two to four times more fines than did the State Highway Patrol.

ⁱFrom McClelland (1994). The amount shown is fines collected from arrests made by the State Highway Patrol in calendar year 1991. In 1992, \$0.0529 billion was collected.

TABLE 17-10. ESTIMATE OF NATIONAL PAYMENTS OF PARKING FINES, BASED ON FINES RECEIVED IN LOS ANGELES CITY AND NEW YORK CITY, FISCAL YEAR 1991 (BILLION \$)

City	Parking fines ^a (billion \$)	Ratio of city's: ^b				National parking fines based on: ^c (billion \$)			
		<i>parking revenues to parking revenues in all cities</i>	<i>parking fines to city's fines and forfeitures</i>	<i>population to total population in all cities</i>	<i>population to total population in cities with 300,000+</i>	<i>parking revenues</i>	<i>fines and forfeitures</i>	<i>city population</i>	<i>cities with 300,000 or more people</i>
New York City	0.295	0.072	0.798	0.048	0.174	4.094	2.206	6.160	1.692
Los Angeles	0.075	0.051	0.837	0.023	0.083	1.473	2.313	3.284	0.902
Chicago	0.071	0.013	1.536	0.018	0.066	5.336	4.243	3.913	1.075
Washington, D. C.	0.046	0.018	0.860	0.004	0.014	2.541	2.376	11.486	3.155
Boston	0.045	0.018	0.895	0.004	0.014	2.546	2.473	11.894	3.267
San Francisco	0.045	0.020	1.040	0.005	0.017	2.279	2.873	9.430	2.590
Sacramento	0.003	0.016	0.944	0.002	0.009	0.192	2.609	1.243	0.341
Buffalo	0.005	0.008	0.949	0.002	0.008	0.633	2.622	2.331	0.640
Newark	0.009	0.001	1.239	0.002	0.007	10.342	3.422	4.726	1.298
<i>All nine cities above</i>	<i>0.593</i>	<i>0.216</i>	<i>0.889</i>	<i>0.108</i>	<i>0.392</i>	<i>2.748</i>	<i>2.455</i>	<i>5.501</i>	<i>1.511</i>
Towns and villages in New York state	0.016	n.a	n.a.	0.066	n.a.	n.a.	n.a.	0.242	n.a.
Davis, California	0.000216	0.000008	n.a.	0.000324	n.a.	27.508	n.a.	0.665	n.a.

Notes: see next page.

^a**New York:** The City of New York (1992) received \$0.327 billion in parking fines in fiscal year 1992. The amount for fiscal year 1991 was not reported. However, the City did report total revenue from all fines -- the bulk of which is revenue from parking fines -- from 1983 to 1992. I scaled parking-fine revenue in FY 1992 by the ratio of total fine revenue in FY 1991 to total fine revenue in 1992, to obtain an estimate of parking-fine revenue in FY 1991.

Los Angeles: City of Los Angeles (1993), for fiscal year 1991.

Chicago, Washington D. C., Boston, and San Francisco: Evans (1995) surveyed these cities, along with New York and Los Angeles, and reported total revenues from parking fines. The estimates probably pertain to fiscal year 1993 or 1994. The estimates that she reports for New York and Los Angeles are 5-7% higher than the estimates that I received for FY 1991 -- implying something like 2%/year growth in fines, which seems reasonable. Therefore, I have multiplied her estimates for Chicago, Washington D.C., Boston, and San Francisco by 0.95, to approximate fiscal-year 1991 values.

Sacramento: The city of Sacramento received million in parking fines in fiscal year 1991 (City of Sacramento, 1995).

Buffalo: The city of Buffalo received \$5.3 million in parking fines in fiscal year 1994 (City of Buffalo, 1995). I assume \$5.0 million in fiscal year 1991.

Newark: The city of Newark received "about" \$9 million in parking fines in fiscal year 1994 (City of Newark, 1995). I assume \$8.5 million in fiscal year 1991.

Towns and villages in the state of New York: Towns and villages in the state of New York. In 1991 villages received \$624,733 in parking fines, and towns received \$14,966,719; in 1990 villages received \$792,475 and towns received \$14,745,203 (New York State Comptroller, data transmittal, 1993).

Davis, California: City of Davis (1991), for fiscal year 1991.

Los Angeles: City of Los Angeles (1993), for fiscal year 1991.

^bThe sources of data used to calculate the ratios are:

Revenues from parking facilities:

New York, Los Angeles, Chicago, Washington, D. C., Boston, San Francisco, Sacramento, Buffalo, and Newark: Bureau of the Census, *City Government Finances: 1990-1991* (1993). (The Census estimates exclude all taxes.)

Towns and villages in New York State: I could not find data.

Davis, California: The City of Davis reports that it received \$7240 in parking revenues in fiscal year 1991 (City of Davis, 1991)

Total revenues from all city-run parking facilities in the United States: \$730 million in fiscal year 1991; (Bureau of the Census, *Government Finances: 1990-1991*, 1993). The Census estimates exclude all taxes.

Fines and forfeitures: Bureau of the Census, *City Government Finances: 1990-1991* (1993). These are all fines and forfeitures, not just parking or motor-vehicle-related fines. However, parking fines are the bulk of them.

Population:

New York, Los Angeles, Chicago, Washington, D. C., Boston, San Francisco, Sacramento, Buffalo, and Newark: Bureau of the Census, *Statistical Abstract of the United States 1992* (1992). The same figures are given in the Bureau of the Census, *City Government Finances: 1990-1991* (1993).

Towns and villages in New York State: Towns and villages in New York State had a population of 10.112 million (New York State Comptroller, 1991). (The group of towns and villages to which the population data pertain appear to be the same as the group to which the parking-fine data pertain.)

Davis, California: The City of Davis, California had a population of 49,590 at the 1990 Census

Total population in all U.S. cities: 152.9 million people, according to the 1990 Census (Bureau of the Census, *Statistical Abstract of the United States 1992*, 1992).

Total population in all U.S. cities with 300,000 or more people: 42.0 million people, according to the 1990 Census (Bureau of the Census, *City Government Finances: 1990-1991*, 1993).

^CI estimate total parking fines by extrapolating from the fines reported for the cities on this table. I try four different extrapolations from reported fines Rf_i to total fines Tf_i :

$$\begin{aligned}Tf_i &= Rf_i / Sp_i \\Tf &= Sf_i \times Tfbc / 0.362 \\Tf_i &= Rf_i / Sc_i \\Tf_i &= Rf_i / Sbc_i\end{aligned}$$

where:

Tf_i = estimated total national parking fines, on the basis of fines in city or city-group i

Rf_i = parking fines reported for city or city-group i (column 2 of this table)

Sp_i = parking-facility revenues in city or city-group i divided by total parking-facility revenues from all cities (column 3 of this table)

Sf_i = parking fines in city or city-group i (Rf_i) divided by total fines and forfeitures in city or city-group i (column 4 of this table)

$Tfbc$ = total fines and forfeitures received in all cities with 300,000 or more people (1.0015 billion dollars, in fiscal year 1991; Bureau of the Census, *City Government Finances: 1990-1991*, 1993)

0.362 = the average of the four different "Ratios used to extrapolate from large cities to all cities," from Table 17-8. This is needed to extrapolate the estimate from the domain of cities with 300,000 or more people to all cities

Sc_i = population of city or city-group i divided by the population in all cities (column 5 of this table)

Sbc_i = population of city or city-group i divided by the total population of all cities with 300,000 or more people (column 6 of this table)

TABLE 17-11. SEVERANCE TAXES PAID ON OIL, GAS, AND COAL, AND OTHER RESOURCES, FISCAL YEAR 1991 (EXCEPT AS NOTED) (MILLION \$)

State	Oil	Gas	Oil & gas	Coal	Other ^a	Total
Alabama			57.6	8.9	5.3	71.7
Alaska			1,256.8 ^b		28.0	1,284.7
Arkansas			13.3 ^c		3.4	16.7
California			9.4		26.3	35.7
Colorado			15.6	5.9	0.5	22.0
Florida			9.3		62.6 ^d	71.9
Idaho				0.5	0.2 ^e	0.7
Indiana	0.8					0.8
Kansas	37.9	61.7		0.0		99.6
Kentucky	5.8		7.9 ^f	191.0	7.8	212.6
Louisiana	412.3	152.3 ^g			13.8	578.4
Michigan			48.9			48.9
Minnesota					2.2	2.2
Mississippi	33.1	14.4			3.7	51.2
Missouri					0.0	0.0
Montana	18.9	1.3		50.5	54.0	124.6
Nebraska			3.2 ^h			3.2
Nevada					24.0 ⁱ	24.0
New Mexico		5.0	216.0	24.2 ^k	11.3	256.4
North Carolina					1.6	1.6
North Dakota	38.3		47.5	22.2		108.0
Ohio	0.8	3.1		2.9	2.6	9.5
Oklahoma	5.4	2.0	408.2 ^h			415.5
Oregon					63.1	63.1
South Dakota			1.6 ^k		6.4	8.1
Tennessee			0.4	1.0		1.4
Texas	687.8	662.6	1.4		3.3	1,355.1
Utah			23.8		16.1 ^l	39.9
Virginia					1.5	1.5
Washington					70.1	70.1
West Virginia			20.8 ^h	150.1 ^m	2.1 ⁿ	173.0
Wisconsin					0.9 ^o	0.9
Wyoming			173.1 ^p	93.4		266.5
<i>Totals</i>	<i>1,241.1</i>	<i>902.2</i>	<i>2,314.8</i>	<i>550.7</i>	<i>410.8</i>	<i>5,419.6</i>
1991 CY/1991 FY^q	0.93	0.93	0.93	0.93	0.93	n.a.
MV fraction low ^r	0.61	0.05	0.39	0.04	0.00	n.a.
MV fraction high ^r	0.36	0.05	0.23	0.04	0.00	n.a.
<i>MV share low (CY)</i> <i>(10⁶ \$)^s</i>	<i>704.1</i>	<i>44.8</i>	<i>828.6</i>	<i>21.3</i>	<i>0.0</i>	<i>1,598.8</i>
<i>MV share low (CY)</i> <i>(10⁶ \$)^s</i>	<i>411.1</i>	<i>44.8</i>	<i>503.1</i>	<i>21.3</i>	<i>0.0</i>	<i>980.4</i>

Source: the Bureau of the Census, *State Government Tax Collections: 1992* (1994), supplemented by data from the EIA, *State Energy Severance Taxes 1985-1993* (1995), as noted. The EIA data are from the Census, except that in some cases the EIA has contacted the states to see if amounts that the Census did not classify specifically in fact can be classified as oil and gas or coal severance taxes. I note such cases below. Data (except last two rows) are for fiscal year 1991, which in most states ended June 30th 1991.

MV = motor-vehicle; TCF = trillion cubic feet; BCF = billion cubic feet; SCF = standard cubic foot; SIC = standard industrial classification; FY = fiscal year; CY = calendar year

^aMainly timber.

^bSeverance tax on oil and gas production and oil and gas conservation.

^cThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) classifies this amount as a "general" severance tax, but the EIA, *State Energy Severance Taxes 1985-1993* (1995) classifies it as an "oil and gas" severance tax.

^dThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) classifies this amount as a "solid mineral" severance tax, and the EIA *State Energy Severance Taxes 1985-1993* (1995) and the EIA, *State Energy Severance Taxes 1985-1993* (1995) does not classify it as "coal".

^e"Mining privilege" severance tax.

^fEqual to the oil and gas severance tax shown in the EIA, *State Energy Severance Taxes 1985-1993* (1995), minus the oil-only severance tax shown in the Bureau of the Census, *State Government Tax Collections: 1992* (1994) and here.

^gIncludes severance tax on gasoline.

^hThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) does not specify the kind of severance tax, but the EIA, *State Energy Severance Taxes 1985-1993* (1995) classifies it as an "oil and gas" severance tax.

ⁱ"Mineral Proceeds".

^jThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) shows \$25.9 million in "other" severance taxes; the EIA, *State Energy Severance Taxes 1985-1993* (1995) shows \$24.2 million in "coal" severance taxes.

^kThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) classifies this amount as an "energy minerals" severance tax, but the EIA, *State Energy Severance Taxes 1985-1993* (1995) classifies it as an "oil and gas" severance tax.

^lThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) classifies this amount as a “mine occupation” severance tax, and the EIA *State Energy Severance Taxes 1985-1993* (1995) and the EIA, *State Energy Severance Taxes 1985-1993* (1995) does not classify it as “coal”.

^mThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) does not specify the kind of severance tax, but the EIA, *State Energy Severance Taxes 1985-1993* (1995) classifies it as an “coal” severance tax.

ⁿEqual to the difference between the total shown by the Bureau of the Census, *State Government Tax Collections: 1992* (1994), and the coal and oil and gas amounts shown by the EIA, *State Energy Severance Taxes 1985-1993* (1995).

^oThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) does not specify the kind of severance tax, and the EIA, *State Energy Severance Taxes 1985-1993* (1995) does not include any amount for this state.

^pThe Bureau of the Census, *State Government Tax Collections: 1992* (1994) classifies this amount as a “mineral excise” severance tax, but the EIA, *State Energy Severance Taxes 1985-1993* (1995) classifies it as an “oil and gas” severance tax.

^qTo estimate calendar-year totals given fiscal-year 1991 data, I multiply the fiscal-year estimates by the ratio of my estimate of total 1991 calendar-year collections of all severance taxes in all states to reported total 1991 fiscal-year collections of all severance taxes in all states. I estimate 1991 calendar-year collections of all severance taxes in all states as the average of reported fiscal-year 1991 and fiscal-year 1992 collections of all severance taxes (Bureau of the Census, *State Government Tax Collections*, 1994).

^rOf the total cost in the column, the fraction that I allocate to motor-vehicle use. See the discussion in the text.

^sEqual to the total severance tax in the column multiplied by the low or high motor-vehicle fraction and the CY 1991/FY 1991 ratio.

TABLE 17-12. DESCRIPTION AND AMOUNT OF SPECIAL TAXES ON MOTOR VEHICLES, CALENDAR YEAR 1991 (THOUSANDS OF DOLLARS)

<i>State</i>	Census data 1991^a			FHWA data 1991^b				Comments
	<i>special property taxes</i>	<i>selective sales taxes</i>	<i>the tax is on:</i>	<i>amount shown in Table MV-2</i>	<i>name of tax in Table MV-2</i>	<i>"special taxes" noted in Table MV-106</i>	<i>"non-highway user revenue" in Table S-106</i>	
Arizona	99,152	98,231	SPT: public utilities -- motor carriers SST: motor vehicles and private car lines	0	fn 8 says "registration fees now exclude license taxes"	1991: Vehicle license fee (in lieu tax) ^d 1995: not mentioned	motor-vehicle license tax	See section 17.4.5.
Arkansas	4,001	0	bus and truck lines	0				
California	2,249,947	0	motor vehicles, house trailers, private car companies	2,202,537	Vehicle license fee in lieu of property tax	Vehicle license fee (in lieu tax)		In the notes to Table MV-2, the FHWA lists the amount of vehicle license fees in California received in lieu of property taxes. As discussed in section 17.4.5, the FHWA classifies the in-lieu tax as a highway-user fee diverted to non-highway purposes, which I have counted as a user payment already in Table 17-3.
Delaware	0	19,812	motor vehicle	18,754	special title taxes	titling tax		I assume that the selective sales tax on motor vehicles reported by the Census is the same as the special titling tax reported by FHWA, and hence is included already in Table 17-2 here.

Florida	0	150,988	pollutant excise tax, motor-vehicle car-rental surcharge	0			rental-car surcharge	The rental-car surcharge is explicitly listed as “non-highway user revenue” in FHWA’s Table S-106, which means that is not included in FHWA’s MV-2, which in turn means that it is not included in my Table 17-2. Thus, Census’ estimate of revenue from this source is counted here as a selective tax.
Washington, D. C.	0	22,832	motor vehicles and trailers	23,555	special title taxes	titling tax		I assume that the selective sales tax on motor vehicles and trailers reported by the Census is the same as the special titling tax reported by FHWA, and hence is included already in Table 17-2 here.
Idaho	56	0	car companies	0				
Illinois	0	43,853	motor vehicle use tax	0		1995: use tax	6.25% sales tax	
Indiana	0	0		0		1991: excise tax (in lieu tax) 1995: not mentioned		In Table MV-106 in its 1991 report the FHWA mentions a motor-vehicle excise tax in Indiana, but there is no amount for this tax in Table MV-2. Moreover, the Census report does not show any such tax for Indiana. Hence, no excise tax in Indiana is counted here as a selective sales tax here.
Iowa	0	0		2,021	special title taxes		4% sales tax on new and used motor vehicles	FHWA’s Table S-106 also includes “charges on the use of the highway right-of-way” in Iowa. Because this amount is not reported in the Census data I am unable to estimate it.

Kansas	9,559	393	SPT: motor carriers SST: public utilities -- express and private car lines	0			property tax fund; 4% sales tax on new and used motor vehicles	
Kentucky	0	215,580	motor-vehicle usage	211,493	special title taxes (est. by FHWA)	use tax		
Maryland	0	292,013	motor-vehicle titling	282,600	special title taxes	titling tax		I assume that the FHWA and the Census titling taxes are the same, and are already included in my Table 17-2.
Massachusetts	406	0	motor-vehicle excise	0				See the discussion in section 17.4.5.
Michigan	3,460	0	car-loaning companies	0				The Census' <i>State Government Tax Collections 1991</i> shows \$1,974 thousand collected from "car loaning companies" in FY 1991; <i>State Government Tax Collections 1992</i> (Bureau of the Census, 1994) shows \$1,9740 thousand in FY 1991 and \$4,946 thousand in FY 1992 collected from "other." I assume that "other" in the 1992 report is "car-loaning companies" in the 1991 report.
Minnesota	0	260,509	motor-vehicle excise	0			motor-vehicle excise tax (6%)	

Missouri	0	819	public utilities -- private car	0			4% use tax on purchase price of motor vehicles (only applies when sales tax is not applicable)	
Montana	0	0		0		sales tax		In Table MV-106 in its 1991 report the FHWA mentions a motor-vehicle sales tax in Montana, but there is no amount for this tax in Table MV-2. Moreover, the Census report does not show any such tax for Montana. Hence, no motor-vehicle sales tax in Montana is counted here as a selective tax here.
Nebraska	1,045	0	fleet vehicles	0			sales excise tax on motor vehicles	
Nevada	4,133	0	motor-vehicle privilege	0		1995: privilege tax (ad valorem property tax)		
New Mexico	0	52,312	motor vehicles excise, leased vehicle tax	50,594	special title taxes	1991: excise tax (in-lieu tax) 1995: excise tax		

New York	0	19,808	automobile rentals	0				
North Dakota	0	28,971	motor-vehicle excise tax	0		titling tax		The FHWA shows a "titling tax" in its Table MV-106, which may be the same as the special motor-vehicle excise tax shown by the Census, but since the FHWA reports a zero amount for this tax in its Table MV-2 (which I use for my Table 17-2), I can count the amount reported by the Census as a selective sales tax here.
Oklahoma	0	113,300	motor-vehicle excise	0			motor vehicle excise and rental tax	The motor-vehicle excises tax is explicitly listed as "non-highway user revenue" in FHWA's Table S-106, which means that it is not included in Table 17-2 or 17-3, and so may be counted as a selective tax here.
Oregon	139	0	private car companies	0				
South Carolina	1,461	10,737	SPT: private car lines SST: casual sales of motor vehicles	0				
South Dakota	0	23,136	auto registration -- 3 percent	0			3% excise tax on new and used motor vehicles	The 3% excise tax is explicitly listed as "non-highway user revenue" in FHWA's Table S-106, which means that it is not included in Table 17-2 or 17-3, and so may be counted as a selective tax here.

Texas	0	1,142,617	motor-vehicle sales and use, motor-vehicle rental, motor carrier	1,010,692	special title taxes			FHWA's Table MV-2 shows \$1 billion in "special titling taxes" collected in Texas, in addition to nearly \$1 billion in other motor-vehicle tax receipts. The Census shows \$1 billion in motor-vehicle sales and use tax, and nearly \$1 billion in other motor-vehicle taxes. Therefore, I assume that FHWA's "special titling tax," which already is included in my Table 17-2, is the Census' "motor-vehicle sales and use tax" for Texas, and hence should not be counted here.
Vermont	0	28,136	motor-vehicles sales and use	29,361	special title taxes	titling tax		I assume that the selective motor-vehicles sales and use tax reported by the Census is the same as the special titling tax reported by FHWA, and hence is included already in Table 17-2 here.
Virginia	1,308	250,506	SPT: motor carriers, car line companies SST: auto excise, motor-vehicle rental	205,977	special title taxes	titling tax		I assume that the selective auto excise tax reported by the Census is the same as the special titling tax reported by FHWA, and hence is included already in Table 17-2 here.

Washington	522,065	0	motor-vehicle and aircraft excise	503,437	motor-vehicle excise tax in lieu of property tax	excise tax (in-lieu tax)		In the notes to Table MV-2, the FHWA lists the amount of vehicle excise taxes in Washington received in lieu of property taxes. As discussed in section 17.4.5, the FHWA classifies the in-lieu tax as a highway-user fee diverted to non-highway purposes, which I have counted as a user payment already in Table 17-3.
West Virginia	0	90,248	auto titling privilege	86,869	special title taxes	titling tax		I assume that the FHWA and the Census titling taxes are the same, and are already included in my Table 17-2.
Wyoming	801	0	private car companies	0				
<i>Total, all cells (10³ \$)</i>	2,897,530	2,864,798						
<i>Total counted here (10³ \$)</i>	125,518	750,743						

Notes: see next page.

The amounts in lightly shaded cells are user imposts in the FHWA's *Highway Statistics 1991*.

These amounts are already included in Table 17-2 or Table 17-3, and so are not counted again here as user payments. The amounts in darkly shaded cells are not user imposts in the FHWA's *Highway Statistics 1991*.

None of the special property taxes in this table are counted as general property taxes in Table 17-21, and none of the special property taxes or special sales taxes in this table are counted as other selective taxes and fees in Table 17-13. However, it is possible that some of the selective sales taxes in this table are counted as retail sales taxes in Table 17-15. See the discussion in section 17.5.4.

SPT = special property tax, SST = selective sales tax.

^aThe Bureau of the Census reports special property taxes and selective sales taxes on motor vehicles in fiscal year 1991 (*State Government Tax Collections 1991, 1992*) and fiscal year 1992 (*State Government Tax Collections 1992, 1994*). In 46 states, the fiscal year ends on June 30th. Consequently, to estimate special property taxes and selective sales taxes on motor vehicles in calendar year 1991, I simply have averaged the fiscal-year 1991 and fiscal-year 1992 values.

^bIn Table MV-2 of *Highway Statistics 1991* (FHWA, 1992), the FHWA reports state motor-vehicle and motor-carrier tax receipts for calendar year 1991. Table MV-2 has a column called "special title taxes," which as indicated here includes some of the taxes that the Census (*State Government Tax Collections*) refers to as "selective sales taxes". Also, fn. 4 (of Table MV-2), which pertains to the "special title taxes" column of MV-2, states that "special titling taxes imposed under general sales tax levies are not included".

Table MV-2 of *Highway Statistics* also has a column called "carrier gross receipts taxes." Footnote 6 pertaining to this column of MV-2 states: "Numerous states impose taxes on the gross receipts of motor carriers in connection with general state sales taxes or taxes on all transportation companies or public utilities. This column includes only the proceeds of gross receipts taxes reported by the states as special taxes on motor carriers". To compare the Census estimates with the FHWA estimates on the same basis, I have included in the Census estimates only special taxes on motor carriers.

In the notes to Table MV-106 of *Highway Taxes and Fees 1991* (FHWA, 1991) and *Highway Taxes and Fees 1995* (FHWA, 1995), the FHWA identifies state "special taxes" on motor vehicles and motor carriers. These generally are the special title taxes or in-lieu taxes listed in Table MV-2 of *Highway Statistics 1991* (FHWA, 1992).

In Table S-106 of *Highway Taxes and Fees 1991* (FHWA, 1991) and *Highway Taxes and Fees 1995* (FHWA, 1995), the FHWA lists state taxes and fees that are allocated for highway purposes but that the FHWA does not consider to be "user imposts".

Thus, we have up to four different sources describing a single tax: Tables MV-2, MV-106, and S-106 from the FHWA reports, and the Bureau of the Census' *State Government Tax Collections*. Unfortunately, the descriptions and names of the taxes generally vary from source to source.

^c The "total, all cells" is the sum of all the amounts shown in the columns, counting the lightly shaded as well as the darkly shaded cells. The "total counted here" is the sum of the amounts in the darkly shaded cells only. The "total counted here" is reported in the final results of Table 17-22.

TABLE 17-13. OTHER SELECTIVE TAXES RELATED TO THE USE OF OIL AND MOTOR VEHICLES, FISCAL YEAR 1991 (EXCEPT AS NOTED) (MILLION \$)

State	MV lic. fees	Oil taxes and fees	Total	Description of tax or license
Alabama		4.2	4.2	selective sales tax on lubricating oil, license tax on oil companies
Alaska		85.0	85.0	property tax on oil and gas properties
Hawaii	0.4		0.4	motor-carrier certification
Indiana		1.3	1.3	license fees for oil inspection
Kansas		0.7	0.7	license fees for oil-well plugging
Louisiana		1.1	1.1	drill and renewal permits
Maine	0.5		0.5	highway permits
Michigan	4.1		4.1	auto-repair facilities
Mississippi		1.9	1.9	license fee for drilling
Missouri	0.9	0.9	1.8	license fee for motor-vehicle and boat manufacturers and dealer; license fee for oil inspection
Montana	0.9		0.9	motor-vehicle disposal
Nevada		0.4	0.4	license fee for petroleum inspection
New Hampshire		0.7	0.7	license fee for oil-pollution control
New Jersey	5.2	24.5	29.7	selective sales tax on motor-vehicle liability, responsibility, and unsatisfied assessments; selective sales tax on petroleum clean-up compensation
New Mexico		0.3	0.3	special property tax on oil-and gas-production equipment
New York		491.0	491.0	selective sales taxes on petroleum businesses, on petroleum products, and on lubricating oils
Pennsylvania	1.8	304.6	306.4	motor-vehicle salesmen; selective sales tax on oil- company franchises
South Carolina		6.2	6.2	license fee for petroleum inspection

Table continued on next page.

Table 17-13, continued.

Tennessee	0.7	55.6	56.3	motor-vehicle commissions; selective sales tax on petroleum products
Texas		11.9	11.9	selective sales tax on oil and gas well-servicing, and license fee for above and underground storage tanks
Virginia	2.0	0.0	2.0	selective sales tax on tire retail; selective sales tax on oil companies
West Virginia	0.4		0.4	motor-vehicle instruction
Wyoming	0.0		0.0	motor-vehicle dealers
<i>FY totals^a</i>	<i>16.9</i>	<i>990.3</i>	<i>1,007.2</i>	
<i>1991 CY/1991 FY^b</i>	<i>1.05</i>	<i>1.05</i>		
MV fraction low ^c	1.00	0.61	n.a.	
MV fraction high ^c	1.00	0.36	n.a.	
<i>MV share low (CY) (10⁶ \$)^d</i>	<i>17.8</i>	<i>636.7</i>	<i>654.5</i>	
<i>MV share high (CY) (10⁶ \$)^d</i>	<i>17.8</i>	<i>371.8</i>	<i>389.5</i>	

Source: the Bureau of the Census, *State Government Tax Collections: 1992* (1994). The amounts shown are actual amounts collected for the specific tax or fee in each state in fiscal year 1991 (which in most states ends on June 30th). I have included here only taxes and fees that are explicitly related to motor vehicles, motor-fuels, or oil. I have not included other taxes and fees, such as on shipping, hazardous wastes, and insurance, that might be partly or indirectly related to motor-vehicle use.

None of these duplicate any taxes in Table 17-11, 17-12, or 17-15. It appears also none of them duplicate any amounts included in Tables 17-2 or 17-3.

MV = motor-vehicle; MV lic. fees = motor-vehicle license fees; "Total" = the sum of motor-vehicle license fees and oil taxes and fees; FY = fiscal year; CY = calendar year.

^aThe sum of the fiscal-year values in each column.

^bTo estimate calendar-year totals given fiscal-year 1991 data, I multiply the fiscal-year estimates by the ratio of my estimate of total 1991 calendar-year collections of license taxes in all states to reported total 1991 fiscal-year collections of license taxes in all states. I estimate 1991 calendar-year collections of license taxes in all states as the average of reported fiscal-year

1991 and fiscal-year 1992 collections (Bureau of the Census, *State Government Tax Collections*, 1994).

^cOf the total cost in the column, the fraction that I allocate to motor-vehicle use. The motor-vehicle allocation factor for “motor-vehicle license fees” of course is 1.00. The motor-vehicle allocation factor for “oil taxes and fees” is the value from Table 17-11 (which in turn ultimately comes from Report #10 in the social-cost series).

^dEqual to the total tax or fee (“FY totals”) multiplied by the low or high motor-vehicle allocation fraction (“MV fraction low” or “MV fraction high”) and the ratio of 1991 calendar-year totals to 1991 fiscal-year totals (“1991 CY/1991 FY”).

TABLE 17-14. ESTIMATION OF TOTAL SALES OF MOTOR VEHICLES, AUTOMOTIVE PARTS, AND FUELS AND LUBRICANTS, 1987^a

SIC	SIC description	Sales by merchandise line or combinations of lines, 1987 (million \$)								Sales-tax fraction 1987^h
		RVs and motor vehicles^b	Auto parts and supplies^c	Auto service (not taxed)^d	Auto fuels and lubricants	Food and other non-auto tax-exempt^e	Other non-auto sales (taxed)^e	Other, uncl., and misc.^f	Total sales in SIC in 1987^g	
551	New cars	238,601	21,061	17,267	483	2,649	0	469	280,529	0.027
552	Used cars	10,359	103	324	32	0	6	25	10,849	0.025
553	Auto parts	41	21,485	1,726	712	0	1,359	137	25,460	0.036
554	Gas stations	0	3,634	2,526	82,117	5,037	7,665	1,019	101,997	0.019
555	Boats	58	12 ⁱ	0	12	324	6,367	50	6,824	0.044
556	RVs	3,739	1,451	203	6	24	91	23	5,538	0.044
557	Motorcycles	2,870	194	200	6	11	161	32	3,475	0.030
559	Sport Auto	n.e.	n.e.	n.e.	n.e.	n.e.	n.e.	n.e.	744	0.020
52	Building and garden	41	192	n.e.	112	0	n.e.	n.e.	81,487	0.046
53	General sales	5	4,293	n.e.	817	7,778	n.e.	n.e.	181,147	0.050
54	Food	0	n.e.	n.e.	4,764	227,346	n.e.	n.e.	301,847	0.022
57	Furniture	0	30	n.e.	0	0	n.e.	n.e.	74,783	0.046
58	Eating	0	n.e.	n.e.	67	484	n.e.	n.e.	148,776	0.052
59	Miscellaneous	69	591	n.e.	1,275	6,606	n.e.	n.e.	261,429	n.e.
	Other	138	11	n.e.	50	160	n.e.	n.e.	n.e.	n.e.
Totals^g		255,921	53,057	22,246	90,453	250,419	15,649	1,755	1,484,885	
<i>Sales-tax fraction^j</i>		0.025	0.037	0.030	0.017	0.015	0.042	0.045	n.e.	

Notes: see next page.

n.e. = not estimated; SIC = standard industrial classification; uncl. = unclassified.

^aFrom the Bureau of the Census (1987 *Census Of Retail Trade, Merchandise Line Sales*, 1990). The sales estimates do not include sales taxes.

^bIncludes recreational vehicles, all motor vehicles (trucks and passenger cars) and motor cycles, but not mobile homes, trailers, or campers.

^cParts and supplies include tires, batteries, accessories, retail parts, wholesale parts, miscellaneous merchandise categorized under "auto tires, batteries, and accessories" in the Census tables, parts installed as repair (under "nonmerchandise receipts" in the Census tables), utility trailers sold at RV and motorcycle dealers, campers, and camping trailers.

^dIncludes all sales under "nonmerchandise receipts" except sales of "parts installed in repair," "credit life insurance and financing commissions," and "miscellaneous merchandise". (Includes "other nonmerchandise receipts".)

^eFood and "credit life insurance and financing commissions".

^fIncludes "miscellaneous merchandise," "unclassified merchandise," and "all other merchandise," except for miscellaneous merchandise listed under "nonmerchandise receipts," utility trailers listed under "all other merchandise," and sales that I could identify as belonging to a specific automotive merchandise line, based on information in "Kinds of Business by Broad Merchandise Line".

^gWith these totals, one can calculate the ratio of merchandise-line sales of motor vehicles to total sales in SICs 551 and 552 (0.878), the ratio of merchandise-line sales of automotive supplies (including parts installed in repair) to total sales in SIC 553 (2.084), and the ratio of merchandise-line sales of fuels and lubricants to total sales in SIC 554 (0.887). These ratios are used in Table 17-15 to calculate total sales taxes paid.

^hSales-tax fractions for SICs 551, 553, 554, 52, 53, 54, 57, and 58 are from the Bureau of the Census *Retail Trade: 1987* (1988). Sales-tax fractions for SICs 552, 555, 556, 557, and 559 are my estimates based on sales-fractions in these SICs in 1992 (Key, 1997).

ⁱWe assume that all parts and services except camping trailers and travel trailers are for boats, not motor vehicles.

^jMy estimates. For each merchandise line, I estimated sales-tax fractions that: A) were consistent with the fractions reported for SICs that sold only or mainly the merchandise line in questions; and B) when aggregated to the SIC level (by multiplying the estimated merchandise-line sales-tax fractions by reported merchandise line sales in each SIC, and dividing by total sales in the SIC), were consistent with the sales-tax fractions reported by SIC (Bureau of the Census, *Retail Trade*, annual; Key, 1997).

TABLE 17-15. SALES TAX PAID ON MOTOR VEHICLES, AUTOMOTIVE SUPPLIES, AND MOTOR-VEHICLE FUEL AND LUBRICANTS, UNITED STATES, 1984-1994

Year	R_{ML,Y}: retail sales of motor-vehicle merchandise lines^a (10 ⁶ \$)			SF_{ML,Y}: sales taxes as a fraction of merchandise-line retail sales^b			Total sales tax^c	
	<i>RVs & motor vehicles</i>	<i>Auto-motive supplies</i>	<i>Fuels and lubes</i>	<i>RVs & motor vehicles</i>	<i>Auto-motive supplies</i>	<i>Fuels and lubes</i>	(10 ⁶ \$)	% of retail sales
1994	407,310	68,810	126,293	0.0244	0.0436	0.0190	15,345	2.5
1993	356,323	64,242	122,646	0.0240	0.0414	0.0192	13,567	2.5
1992	315,588	62,137	121,449	0.0249	0.0419	0.0178	12,611	2.5
1991	285,604	61,745	121,755	0.0259	0.0401	0.0179 ^d	12,040	2.6
1990	297,496	64,271	122,827	0.0250	0.0391	0.0165	11,974	2.5
1989	296,637	61,531	108,974	0.0250	0.0370	0.0165	11,491	2.5
1988	285,377	61,170	97,852	0.0250	0.0360	0.0174	11,034	2.5
1987	262,461	55,479	92,911	0.0250	0.0370	0.0165	10,147	2.5
1986	249,858	52,213	90,538	0.0259	0.0360	0.0174	9,929	2.5
1985	231,120	52,524	100,601	0.0250	0.0370	0.0156	9,294	2.4
1984	207,920	48,195	95,390	0.0241	0.0370	0.0148	8,197	2.3

^aSee the discussion in the text.

^bSee the discussion in the text.

^cEqual to the retail sales multiplied by the sales-tax fraction, for each merchandise line, and summed for all three merchandise lines.

^dLoper (1994) estimates that state and local general sales taxes on highway gasoline generated \$2.17 billion in 1991, which was 1.8% of the \$123 billion in expenditures (including excise taxes but excluding general sales taxes) on motor gasoline (EIA, *State Energy Price and Expenditure Report 1992, 1994*).

TABLE 17-16. SUMMARY OF FEDERAL, STATE, AND LOCAL TAX REVENUE, 1991 (BILLION DOLLARS)

Individual income (federal, state, and local)	\$576.9
Corporation net income (federal, state, and local)	\$120.0
General sales and gross receipts (state and local)	\$123.8
Property (state and local) ^a	\$170.7
Motor fuel sales (federal, state, and local)	\$39.7
Tobacco and alcohol sales (federal, state, and local)	\$22.7
Custom duties (federal)	\$16.3
Motor vehicle and operator's licenses (state and local)	\$12.0
Death and gift (federal)	\$11.2
Public utilities (federal)	\$7.4
Other selective sales or gross receipts (federal)	\$6.9
All other (federal, state, and local)	\$64.8
<i>Total</i>	<i>\$1,172.4</i>

From the Bureau of the Census, *Quarterly Summary of Federal State, and Local Tax Revenue* (1993).

^aIncludes revenue from special property taxes, such as shown in Table 17-12, as well as revenue from general property taxes (Bureau of the Census, *Government Finance and Employment Classification Manual*, 1992).

TABLE 17-17. FEDERAL CORPORATE-INCOME TAXES PAID IN MOTOR-VEHICLE AND RELATED INDUSTRIES, INCOME-YEAR 1990

ESIC ^d	Industry	IRS returns ^a	IRS total receipts ^a (10 ⁶ \$)	Tax after credits ^a (10 ⁶ \$)	Allocated to motor vehicles			
					Fraction ^b		10 ⁶ dollars ^c	
					Low	High	Low	High
1330*	Crude petroleum, natural gas extraction	17,781	47,368	594	0.38	0.23	225	137
1380	Oil & gas field services	13,635	18,509	135	0.39	0.23	52	32
1600	Heavy construction contractors	24,610	81,708	529	0.38	0.38	199	199
2815*	Chemicals, plastic materials	5,206	184,642	2,221	0.11	0.11	244	244
2910	Petroleum refining	488	537,652	5,565	0.78	0.78	4,313	4,313
2998*	Petroleum and coal products, NEC	954	5,458	29	0.10	0.05	3	1
3050*	Rubber and miscellaneous plastics	1,642	29,387	233	0.58	0.58	136	136
3370*	Ferrous metal industries	2,268	70,924	413	0.17	0.17	71	71
3460	Metal forgings and stampings	4,231	22,614	138	0.51	0.51	70	70
3530	Construction & related machinery	1,506	33,629	205	0.07	0.04	15	9
3550	Special Industry machinery	4,185	24,740	231	0.10	0.05	23	12
3560	General industry machinery	3,781	32,304	398	0.20	0.10	80	40
3710	Motor vehicles and equipment	2,342	290,951	1,303	1.00	1.00	1,303	1,303
3730	Ship, boat building, repair	2,801	9,334	29	0.01	0.01	0	0

4200	Trucking and warehousing	62,298	117,434	624	0.94	0.92	584	574
4400	Water transportation	8,065	22,284	199	0.13	0.13	26	26
4600	Pipelines, exc. natural gas	112	1,837	216	0.54	0.54	117	117
4700	Transportation services	38,047	57,874	202	0.32	0.21	65	42
4910	Electric services	330	123,465	3,322	0.05	0.05	155	155
5010	Motor vehicles and automotive equipment	22,557	139,103	686	1.00	1.00	684	684
5170	Petroleum and petrol products	13,195	155,541	219	0.62	0.51	137	111
5515*	Motor vehicle dealers	42,667	315,404	208	0.99	0.99	205	205
5541	Gasoline service stations	22,612	54,427	60	0.93	0.93	56	56
5598*	Other automotive dealers	29,796	39,230	121	0.99	0.99	119	119
6359	Other insurance companies	5,354	237,344	2,237	0.32	0.32	724	724
6411	Insurance agents, brokers, service	68,645	39,633	461	0.21	0.21	97	97
7000	Hotels and other lodging places	25,308	42,363	222	0.01	0.01	2	1
7310	Advertising	32,641	41,230	121	0.11	0.11	14	14
7500	Auto repair and services	72,404	54,857	219	1.00	1.00	219	219
<i>Total for listed industries</i>		529,461	2,831,249	21,138			9,937	9,710
Total for all industries		3,716,650	11,409,520	96,403				
MV corporate taxes/all corporate taxes ^e							1.23	1.23
<i>Total MV corporate tax^f</i>							12,186	11,908

^aFrom the Internal Revenue Service, *Source Book 1990, Statistics of Income, Corporation Income Tax Returns* (1993). The values shown are from the income tax returns of active corporations with accounting periods ending July 1990 through June 1991, which the IRS refers to as income-year 1990. In Report #18 we estimate the corporate-income tax “tax expenditure” for income-year 1991 (July 1 1991 to June 30 1992). Petroleum and motor-vehicle industries paid substantially less corporate income tax in income-year 1991 than in income-year 1990, and as a result the figures presented in report #18 are different from those presented in this table.

^bAll of the fractions except those for SIC 2998, Petroleum products n.e.c., and SIC 7310, Advertising, are from Table 17-18. The fractions for SIC 2998 are my estimates, made on the basis of the description of the SIC in the Office of Management and Budget (1987). For SIC 7310, the motor-vehicle-related fraction is equal to:

$$\frac{\sum_i A_i \times F_i}{\sum_i A_i}$$

where:

A_i = advertising expenditures in industry i (Internal Revenue Service, *Source Book 1990, Statistics of Income, Corporation Income Tax Returns*, 1993; not shown here)

F_i = fraction of advertising expenditures, in industry i , related to motor-vehicle use (assumed to be the same as the fractions shown in this table)

The “low” case has the higher numbers here because the “low” means “low net cost,” and high payments result in low net costs. (See the discussion of the determination of “low” and “high” payments in appendix 17-A.3.)

^cEqual to income tax after credits multiplied by the fraction allocated to motor vehicles.

^dESIC = establishment standard industrial classification system. For most industries, the ESIC code is the same as the Standard Industrial Classification (SIC) code (Office of Management and Budget, 1987). The ESICs marked with an asterisk subsume several SICs (see Table 17-18).

^eThis is the ratio of corporate income taxes received by all levels of government (\$120.3 billion) to corporate income taxes received by the Federal Government (\$98.1 billion), in fiscal year 1991 (Bureau of the Census, *Government Finances: 1990-91*, 1993). Note that the Census’ estimate of Federal corporate income taxes is very close to the IRS’ reported receipts for fiscal year 1991, shown in this table.

^fEqual to the total amount of motor-vehicle-related corporate income tax paid to the IRS, multiplied by the ratio of corporate income taxes received by all levels of government to corporate income taxes received by the Federal Government. This is the bottom-line total corporate income tax related to motor-vehicle use. This amount included in “payments by users for motor-vehicle use” in Report #1 of this social cost series (see the list at the beginning of this report).

TABLE 17-18. PERSONAL INCOME TAXES PAID IN MOTOR-VEHICLE AND RELATED INDUSTRIES, 1990

<i>SIC^a</i>	<i>Name of Industry^b</i>	Total wages^c (10 ⁶ \$)	Personal income taxes^d (10 ⁶ \$)	Fraction to MV use^e		Personal income taxes to MV use (10 ⁶ \$) ^f	
				<i>Low</i>	<i>High</i>	<i>Low</i>	<i>High</i>
1330*	CRUDE PETROLEUM, NATURAL GAS, AND NATURAL GAS LIQUIDS	9,587	1,946	0.38	0.23	736	448
1311	Crude petroleum and natural gas extraction	9,383	1,905	0.39	0.23	734	446
1321	Natural gas Liquids	204	41	0.05	0.05	2	2
1380	OIL AND GAS FIELD SERVICES	5,723	1,162	0.39	0.23	448	272
1381	Drilling oil and gas wells	1,475	299	0.39	0.23	115	70
1382	Oil and gas exploration services	861	175	0.39	0.23	67	41
1389	Oil and gas field services, n.e.c.	3,387	687	0.39	0.23	265	161
1600	HEAVY CONSTRUCTION, EXCEPT BUILDING	23,161	4,701	0.38	0.38	1,770	1,770
1611	Highway and street construction	7,032	1,427	1.00	1.00	1,427	1,427
1622	Bridge, tunnel, elevated highway construction	1,687	343	1.00	1.00	343	343
2815*	INDUSTRIAL CHEMICALS AND PLASTICS	13,308	2,701	0.11	0.11	296	296
2810	Industrial inorganic chemicals	6,001	1,218	0.02	0.02	24	24
2820	Plastic materials and resins	7,307	1,483	0.18	0.18	272	272
2911	PETROLEUM REFINING	5,715	1,160	0.78	0.78	899	899
2951	Asphalt paving mixtures and blocks	497	101	0.95	0.95	96	96

Table continued on next page

3050*	RUBBER PRODUCTS, PLASTIC FOOTWEAR	4,997	1,014	0.58	0.58	591	591
301	Tires and tubes	3,240	658	0.85	0.85	559	559
302	Rubber and plastic footwear	194	39	0.00	0.00	0	0
305	Gaskets, packing, etc.	1,563	317	0.10	0.10	32	32
3370*	FERROUS METAL INDUSTRIES	15,245	3,094	0.17	0.17	529	529
3312	Blast furnaces and steel mills	8,437	1,713	0.17	0.17	293	293
3313	Electrometallurgical products	214	43	0.17	0.17	7	7
3315	Steel wire and related products	493	100	0.17	0.17	17	17
3316	Cold finishing of steel shapes	609	124	0.17	0.17	21	21
3317	Steel pipes and tubes	804	163	0.17	0.17	28	28
3321	Gray and ductile iron foundries	2,417	491	0.17	0.17	84	84
3322	Malleable iron foundries	283	58	0.17	0.17	10	10
3324	Steel investment foundries	404	82	0.17	0.17	14	14
3325	Steel foundries, n.e.c.	758	154	0.17	0.17	26	26
3390	Miscellaneous primary metal products	824	167	0.17	0.17	29	29
3460	METAL FORGINGS AND STAMPINGS	7,327	1,487	0.51	0.51	754	754
3465	Automotive stampings	3,716	754	1.00	1.00	754	754
3530	CONSTRUCTION AND RELATED MACHINERY	7,437	1,510	0.07	0.04	111	68
3533	Oil and Gas Field Machinery	1,421	288	0.39	0.23	111	68
3550	SPECIAL INDUSTRY MACHINERY	5,194	1,054	0.10	0.05	105	53
3560	GENERAL INDUSTRY MACHINERY	7,676	1,558	0.20	0.10	312	156

Table continued on next page.

3710	MOTOR VEHICLES AND EQUIPMENT	32,863	6,670	1.00	1.00	6,670	6,670
3711	Motor vehicles and car bodies	16,216	3,291	1.00	1.00	3,291	3,291
3713	Truck and bus bodies	1,206	245	1.00	1.00	245	245
3714	Motor vehicle parts and accessories	14,359	2,915	1.00	1.00	2,915	2,915
3715	Truck trailers	641	130	1.00	1.00	130	130
3716	Motor Homes	441	90	1.00	1.00	90	90
3730	SHIP AND BOAT REPAIRING AND BUILDING	5,071	1,029	0.01	0.01	8	8
3731	Ship Building and Repairing	3,826	777	0.01	0.01	8	8
3751	Motorcycles, bicycles and parts	409	83	0.50	0.50	41	41
3792	Travel trailers and camper equipment	367	75	1.00	1.00	75	75
3799	Transportation equipment, n.e.c. *	327	66	0.50	0.30	33	20
4200	TRUCKING AND WAREHOUSING	38,990	7,914	0.94	0.92	7,404	7,279
4212	Local trucking without storage	10,744	2,181	1.00	1.00	2,181	2,181
4213	Trucking, except local	19,455	3,949	1.00	1.00	3,949	3,949
4214	Local trucking with storage	1,599	325	1.00	0.90	325	292
4215	Courier services, except air	4,573	928	1.00	0.90	928	835
4222	Refrigerated storage and warehousing	458	93	0.00	0.00	0	0
4225	General storage and warehousing	1,349	274	0.00	0.00	0	0
4226	Special warehousing and storage	524	106	0.00	0.00	0	0
4231	Trucking terminal facilities	107	22	1.00	1.00	22	22

Table continued on next page.

4400	WATER	38,990	7,914	0.94	0.92	7,404	7,279
	TRANSPORTATION						
4412	Deep sea foreign transport of freight	10,744	2,181	1	1	2,181	2,181
4424	Deep sea domestic transport of freight	19,455	3,949	1	1	3,949	3,949
4491	Marine cargo handling	1,599	325	1	0.9	325	292
4492	Tugboat and towing service	4,573	928	1	0.9	928	835
		458	93	0	0	0	0
4600	PIPELINES, EXCEPT NATURAL GAS	1,349	274	0	0	0	0
4612	Crude petroleum pipelines	524	106	0	0	0	0
4613	Refined petroleum pipelines	107	22	1	1	22	22
4619	Pipelines, n.e.c.						
		5,667	1,150	0.13	0.13	149	149
4700	TRANSPORTATION SERVICES	930	189	0.19	0.19	36	36
4720	Passenger transportation arrangement	550	112	0.2	0.2	22	22
4730	Freight transportation arrangement	1,762	358	0.19	0.19	69	69
4783	Packing and crating	560	114	0.19	0.19	22	22
4785	Inspection and fixed facilities for motor vehicles						
4789	Transportation services, n.e.c.	839	170	0.54	0.54	92	92
		554	112	0.51	0.51	57	57
4911	ELECTRIC SERVICES	276	56	0.63	0.63	35	35
		9	2	0	0	0	0
5010	MOTOR VEHICLES, PARTS AND SUPPLIES						
5012	Automobiles and other motor vehicles	8,106	1,645	0.32	0.21	529	339
5013	Motor-vehicle supplies and new parts	3,751	761	0.05	0.01	38	8
5014	Motor-vehicle tires and tubes	3,796	770	0.6	0.4	462	308
5015	Motor-vehicle parts, used	121	25	0.6	0.4	15	10
		68	14	1	1	14	14
5170	PETROLEUM AND PETROLEUM PRODUCTS	261	53	0	0	0	0
5171	Bulk stations and terminals					0	0
5172	Petroleum products, n.e.c.	18,289	3,712	0.05	0.05	173	173

Table continued on next page.

5515*	MOTOR VEHICLE DEALERS	26,710	5,421	0.99	0.99	5,363	5,363
5511	New and used car dealers	25,545	5,185	0.99	0.99	5,127	5,127
5521	Used car dealers	1,165	236	1.00	1.00	236	236
5541	GASOLINE SERVICE STATIONS	7,907	1,605	0.93	0.93	1,501	1,501
5598*	OTHER AUTOMOTIVE DEALERS	8,127	1,649	0.99	0.99	1,629	1,629
5531	Auto and home supply stores	6,263	1,271	1.14	1.14	1,452	1,452
5551	Boat dealers	729	148	0.01	0.01	2	2
5561	Recreation vehicle dealers	456	93	0.97	0.97	90	90
5571	Motorcycle dealers	443	90	0.94	0.94	85	85
5599	Automotive dealers, n.e.c. **	235	48	0.00	0.00	0	0
6359*	OTHER INSURANCE COMPANIES	29,880	6,065	0.32	0.32	1,963	1,963
632	Medical and health insurance^^	6,989	1,419	0.04	0.04	57	57
6331	Fire, marine, and casualty insurance	19,184	3,894	0.48	0.48	1,887	1,887
6351	Surety insurance^^	569	115	0.04	0.04	5	5
6361	Title insurance^^	1,820	369	0.04	0.04	15	15
6371	Pension, health and welfare funds^^	1,263	256	0.04	0.04	10	10
6399	Insurance carriers, n.e.c.^^	56	11	0.04	0.04	0	0
6411	INSURANCE AGENTS, BROKERS, SERVICE	21,100	4,283	0.21	0.21	901	901
7000	HOTELS AND OTHER LODGING PLACES	22,159	4,498	0.01	0.01	41	23
7033	Trailer parks and campsites	225	46	0.90	0.50	41	23
7310	ADVERTISING	8,822	1,791	0.11	0.11	204	203

Table continued on next page.

7500	AUTO REPAIR, SERVICES AND PARKING	17,125	3,476	1.00	1.00	3,476	3,476
7513	Truck rental and leasing, no drivers	1,401	284	1.00	1.00	284	284
7514	Passenger car rental	1,861	378	1.00	1.00	378	378
7515	Passenger car leasing	333	68	1.00	1.00	68	68
7519	Utility trailer rental	164	33	1.00	1.00	33	33
7521	Automobile parking	829	168	1.00	1.00	168	168
7532	Top and body repair and paint shops	3,542	719	1.00	1.00	719	719
7533	Auto exhaust system repair shops	472	96	1.00	1.00	96	96
7534	Tire retreading and repair shops	312	63	1.00	1.00	63	63
7536	Automotive glass replacement shops	468	95	1.00	1.00	95	95
7537	Automotive transmission shops	471	96	1.00	1.00	96	96
7538	General auto repair shops	4,300	873	1.00	1.00	873	873
7539	Auto repair shops, n.e.c.	1,062	216	1.00	1.00	216	216
7542	Car washes	975	198	1.00	1.00	198	198
7549	Automotive services, n.e.c.	936	190	1.00	1.00	190	190
	Total	627,121	127,290			40,075	38,879

n.e.c. = not elsewhere classified; MV= motor vehicle; SIC = Standard Industrial Classification.

^aAll of the codes except those marked with an asterisk (*) are from the Standard Industrial Classification (Office of Management and Budget, 1987). The asterisked codes are the establishment codes used by the Internal Revenue Service in its accounting of corporate income taxes (IRS, *A General Description of the Corporation Source Book of Statistics of Income*, 1995). These codes subsume the SICs listed below them.

^bThe capitalized headings are categories used in the analysis of corporate income taxes (Table 17-17).

^cFrom the Bureau of Labor Statistics, *Employment and Wages Annual Averages*, 1990 (1991). The Bureau of Labor Statistics' *Employment and Wages Annual Averages* reports annual average gross wages from the Covered Employment and Wages Program, commonly called the ES-202 program. The ES-202 program collects employment and wage data from the payrolls of all establishments that have employees who are covered by state unemployment insurance, which amounts to virtually all establishments and employees except the self employed. The data are reported by detailed 4-digit SIC (Standard Industrial Classification) industry

category. In the ES-202, wages include wages and salaries before payroll tax deductions, the cash value of lodging and meals, tips, bonuses, employer contributions to deferred compensation, and overtime pay, but not employer contributions to Old-age, Survivors', and Disability Insurance, health insurance, unemployment insurance, workers' compensation, and private pension and welfare funds. These data are used in the estimation of employee wages in the National Income Product Accounts.

^dEqual to the annual wages multiplied by the ratio of total Federal + State income taxes paid nationally to total wages earned nationally in 1990 (0.21; from NIPA tables [BEA, 2004]).

^eThis is the estimated fraction of wages earned from production related to motor-vehicle use. Note that the "low" corresponds to "low *net* cost," and hence *high* tax payments (because net cost is equal to total cost minus payments; the higher the payments, the lower the net cost). (See the discussion of the determination of "low" and "high" payments in appendix 17-A.3.)

In each grouping, the fractions for the highest level, indicated in capital letters (e.g., SIC 1330, SIC 7500), are (unless indicated otherwise below) equal to calculated motor-vehicle-related personal income taxes divided by total personal income taxes in the SIC. In all of the other (lower level) SICs (e.g., 7313), the fractions are estimated as described section 17.6.4.

^fIn each grouping, motor-vehicle related personal income taxes for the highest level, indicated in capital letters (e.g., SIC 1330, SIC 7500), is equal to the sum of motor-vehicle related personal income taxes for the lower levels (e.g., SIC 7313). Motor-vehicle related personal income taxes for the lower level SICs are equal to personal income taxes multiplied by the low or high motor-vehicle use fraction.

TABLE 17-19. NUMBER OF STATES IN WHICH PERSONAL PROPERTY IS SUBJECT TO LOCAL GENERAL PROPERTY TAX

	Tangible personal property					Intan- gible ^a
	Bus.	Other bus.	Ag.	HH	MVs	
Locally taxable	12	24	11	2	13	2
Taxable but subject to partial exemptions either as to specified types or specified value levels	3	16	17	4	3	7
Taxable only if used in production of income	0	0	0	8	0	0
Subject to special, rather than general ad valorem taxation ^b	0	0	0	0	1 ^c	11
Local option; option to exempt affected items exercised in most jurisdictions	3	2	3	3	2	0
Exempt from taxation	33	9	20	34	32 ^d	31

Source: Bureau of the Census, *1992 Census of Governments* (1994?), Appendix F. Includes the District of Columbia. Bus. = business inventories; Other bus. = other commercial and industrial; Ag = agricultural; HH = household personal property; MVs = motor vehicles; Intangible = intangible personal property.

^aIntangible personal property includes corporate stock, bonds, money on deposit, goodwill, patents, and franchises.

^bGeneral property taxes are those that relate to all taxable property in a jurisdiction, real or personal, whether taxed at a single rate or classified rates according to the class of property. Special property taxes relate to selected classes of property, for example motor vehicles, oil and gas properties, house trailers, and intangibles, subject to rates not directly related to general property tax rates.

^cAccording to Appendix F of the source report (see "source" above), only Kansas has a special property tax on motor vehicles. Yet on page vii of the same source report, the Census states that "some" states subject motor-vehicles to special property taxes, and then refers the reader to a separate report, *State Government Tax Collections in 1992*, for details on special property taxes. *State Government Tax Collections in 1992* does indeed show that a number of states have special property taxes on motor vehicles; these taxes are summarized in Table 17-12 here. It is not clear, then, why the Census shows only one special property tax on motor vehicles in Appendix F of the *1992 Census of Governments*.

^dThe Census does not consider a license or registration fee in lieu of a property tax to be a property tax; hence motor vehicles in California and Washington, which have such in-lieu fees, are classified as exempt from local general property taxation.

TABLE 17-20. ASSESSED PROPERTY VALUES IN THE U. S., 1986 AND 1991

	1986		1991	
	<i>10⁹ \$</i>	<i>% gross</i>	<i>10⁹ \$</i>	<i>% gross</i>
Total gross assessed value (AVTotal _{USA,Yr})	4,817.8	100.0%	6,924.2	100.0%
State-assessed property ^a	242.8	5.0%	285.8	4.1%
Locally assessed real property	4,104.5	85.2%	6,043.6	87.3%
Residential single family	2,180.3	45.3%	n.a.	n.a.
Residential multi-family	331.3	6.9%	n.a.	n.a.
Acreage	309.3	6.4%	n.a.	n.a.
Vacant platted lots	189.2	3.9%	n.a.	n.a.
Commercial	710.5	14.7%	n.a.	n.a.
Industrial	286.9	6.0%	n.a.	n.a.
Other and unallocable	97.0	2.0%	n.a.	n.a.
Locally assessed personal property	470.3	9.8%	594.7	8.6%
Commercial and Industrial ^b	305.6	6.3%	n.a.	n.a.
Motor vehicles ^c (AVMV _{USA,Yr})	69.8	1.4%	87.5	1.3%
Other ^d	94.9	2.0%	n.a.	n.a.
Tax exempt portion of gross assessed value	198.1	4.1%	242.6	3.5%
Total net assessed value subject to tax ^e	4,619.7	95.9%	6,681.6	96.5%
State assessed property ^a	242.8	5.0%	285.8	4.1%
Locally assessed taxable real property	3,910.7	81.2%	5,806.7	83.9%
Locally assessed taxable personal property	466.3	9.7%	589.0	8.5%

From the 1992 *Census of Governments* (Bureau of the Census, 1994?), and the 1987 *Census of Governments* (Bureau of the Census, 1989a).

^aAssessed value subject to tax, after deduction of partial exemptions.

^bThe 1987 *Census of Governments* (Bureau of the Census, 1989a) reports the assessed value of the following classes of personal property, in every state: commercial and industrial property, agricultural property, household property, motor-vehicle property, other and unallocable

tangible personal property, and intangible personal property (such as corporate stock, bonds, money on deposit, goodwill, patents, and franchise). However, some states did not or could not allocate the total assessed value of personal property to all of the individual classes defined by the Census. In these states, the unallocable amounts are included in the “other and unallocable” category. To estimate the portion of the reported unallocable total that should be allocated to commercial and industrial property, I multiplied the total unallocated amount by the average allocation shares for commercial and industrial property, where the average share was calculated from the states for which the Census did report the value of commercial and industrial property.

The *1992 Census of Governments* (Bureau of the Census, 1994?) does not report assessed values by individual class of property.

^cMy estimate, from Table 17-21. I use my estimate of the total assessed value of motor-vehicle property rather than the total reported by the Census because as explained in footnote b and in Table 17-21, the Census total is incomplete, because some states that assess motor vehicles did not report the assessed value of motor vehicles.

^dIncludes agricultural personal property, household personal property, other tangible personal property, and intangible personal property such as bonds.

^eEqual to the gross assessed value less the tax-exempt portion.

TABLE 17-21. ESTIMATION OF GROSS ASSESSED VALUE OF MOTOR VEHICLES SUBJECT TO PROPERTY TAX, 1986 AND 1991

	Basis of assessed value ^a (AF _{State,Yr})			Registrations ^b (REG _{State,Yr}) (10 ⁶)		Gross assessed value (10 ⁶ \$) (AVMV _{State,Yr})		
	1991	1986		1991	1986	1991- est. ^c	1986- est. ^c	1986- actual ^d
Alabama	15%	15%	of fair and reasonable value (passenger automobiles and noncommercial pickup trucks, with some exemptions)	3.48	3.46	1,870.5	1,595.9	1,606.3
Alaska	100%	100%	of full and true value (motor vehicles taxed at local option) ^e	0.47	0.36	842.8	558.1	n.a.
Arkansas	20%	20%	of usual selling price or average value	1.48	1.43	1,059.2	877.9	n.a.
Colorado	29%	0%	of actual value, unless otherwise specified ^f	3.05	2.76	3,161.0	0.0	0.0
Connecticut	70%	70%	of true and actual or fair market value	2.59	2.56	6,486.3	5,520.3	6,009.9
Georgia	40%	40%	of fair market value	5.71	4.84	8,181.3	5,959.5	6,450.4
Kentucky	100%	100%	of fair cash value	2.94	2.69	10,530.8	8,264.4	8,959.2
Mississippi	30%	30%	of true value	1.89	1.77	2,026.7	1,634.0	n.a.
Missouri	33%	33%	of true value (with some exemptions for motor vehicles)	3.95	3.68	4,708.3	3,775.0	n.a.
Montana	9%	13%	of market value (different % for different vehicle classes)	0.77	0.67	246.7	269.1	36.1
Nebraska	100%	100%	of actual value	1.40	1.28	5,027.0	3,941.4	3,550.7
N. Carolina	100%	100%	of true value in money	5.22	4.74	18,670.6	14,585.1	10,764.0
Rhode Island	100%	100%	of full and fair cash value, or uniform percentage not to exceed 100%	0.63	0.63	2,249.3	1,944.5	1,942.8
S. Carolina	11%	11%	of fair market value	2.47	2.30	928.8	744.6	n.a.
Tennessee	5%	5%	of actual value	4.54	3.93	812.8	605.1	n.a.
Texas	100%	100%	of fair market value (motor vehicles taxed at local option only) ^e	12.70	12.41	3.4	2.9	292.3
Utah	0%	100%	of reasonable fair cash value (motor vehicles made exempt July 1, 1991)	1.23	1.11	0.0	3,418.2	3,106.3
Virginia	100%	100%	of fair market value	5.02	4.53	17,976.3	13,947.5	n.a.
W. Virginia	60%	60%	of true and actual value	1.27	1.17	2,734.9	2,160.8	n.a.
Totals	52%	55%	of market value ^g	60.81	56.33	87,516.7	69,804.3	42,718.1

^aFrom the *1992 Census of Governments* (Bureau of the Census, 1994?), and the *1987 Census of Governments* (Bureau of the Census, 1989a).

The *1987 Census of Governments* (Bureau of the Census, 1989a) also shows that Kansas levied property tax on 30% of the fair market value of motor vehicles, and that this assessment basis was \$226 million in 1986. However, as noted above, the *1992 Census of Governments* (Bureau of the Census, 1994?) and *State Government Tax Collections: 1992* (Bureau of the Census, 1994) indicate that this is a special not a general property tax. Therefore, in this analysis, I count the classify the motor-vehicle property tax in Kansas as a special tax, and include it in Table 17-12, and exclude it here.

None of the general taxes shown here are counted as special taxes in Table 17-12.

^bFrom FHWA (1993, 1988).

^cEstimated using equation 17-14 for $AVMV_{State,Yr}$.

^dActual gross assessed values reported by the Bureau of the Census *1987 Census of Government* (1989a). Some states that tax motor vehicles did not report the assessed value of the vehicles; these are indicated with "n. a.," not available. The 1992 Census did not report assessed values by class of personal property.

^eIn these states, the tax is assessed at the option of local governments. It appears that in Texas, only 1% of the vehicles are assessed for property taxes. I assume that in Alaska, 50% of the vehicles are assessed.

^fVehicles are subject to ad valorem tax until they are registered; thereafter, they are subject to specific ownership tax..

^gThe registration-weighted average assessment fraction in the states that tax motor vehicles.

TABLE 17-22. PAYMENTS BY MOTOR-VEHICLE USERS FOR THE USE OF HIGHWAYS AND PUBLIC SERVICES RELATED TO MOTOR-VEHICLE USE (10⁹ \$)

A. YEAR 1991, WEIGHTED RESULTS

<i>Payment item</i>	<i>Low cost</i>	<i>High cost</i>	<i>Q^a</i>	<i>section</i>
<u>A1. Special taxes and fees targeted to vehicles and fuels and used for MVIS</u>				
A1.1. FHWA-estimated federal, state, and local tax, license, and toll payments by highway users	49.0	49.0	A3	17.4.1
A1.2. Interest earnings on payments invested to cover highway and other capital	25.9	123.7	A3	17.4.2
Subtotal Way #1 of counting	74.9	172.8	n.a.	n.a.
<u>A2. Other taxes, fees specifically related to motor-vehicle use.</u>				
A2.1. Taxes and fees dedicated to nonhighway purposes, including collection expenses	14.3	14.3	A3	17.4.3 17.4.4
A2.2. Property-tax-like fees specifically related to motor-vehicle use	0.4	0.4	A3/4	17.4.5
A2.3. Extra \$ due to Oct. 93 \$0.043/gal tax increase ^b	--	--	A3	17-A.4
A2.4. The amount extra that would have been collected had there been less, or no, tax evasion ^b	--	--	C [A2]	17-A.4
A2.5. Air-quality, environmental fees on motor vehicles	0.1	0.1	A3	17.4.8
A2.6. Environmental excise taxes on petroleum ^c	0.4	0.4	A3	17.4.9
A2.7. Gas-guzzler taxes, luxury taxes, other minor taxes	0.3	0.3	A4	17.4.10
A2.8. Traffic fines and parking fines	6.0	4.0	A2	17.4.11
A2.9. Public parking fees and all parking taxes	4.2	5.1	A3	17.4.12
A2.10. Miscellaneous taxes, fees not counted elsewhere	0.3	0.3	D	17.4.13
Subtotal Way #2 of counting	100.8	197.6	n.a.	n.a.

Summary table continued on next page.

Table 17-22, Part A, Year 1991 weighted results, continued.

<i>Payment item</i>	<i>Low cost</i>	<i>High cost</i>	<i>Q^a</i>	<i>section</i>
<u><i>B. Selective taxes, fees on limited commodities and activities.^d</i></u>				
B1. Severance taxes paid on oil and gas (attributed to MV use)	1.6	0.0	A3	17.5.2
B2. Special property taxes	0.1	0.0	A3	17.5.3
B3. Special sales taxes	0.8	0.0	A3	17.5.4
B4. Other selective taxes and fees	0.7	0.0	A3	17.5.5
<u><i>C1. General taxes on a wide range of commodities, activities</i></u>				
C1.1. Portion of general sales taxes on motor vehicles, fuels, parts, and services	0.4	0.8	A2	17.6.2
C1.2. Portion of corporate income taxes paid by motor-vehicle related industries	0.1	0.3	A3	17.6.3
C1.3. Portion of personal income taxes paid by employees in motor-vehicle related industries	0.8	2.0	A2	17.6.4
C1.4. Portion of general property taxes paid on motor vehicles and by motor-vehicle related industries	0.2	0.5	A3	17.6.5
<u><i>C2. Tax expenditures</i></u>				
C2.1. Tax expenditures: corporate income taxes	0.0	(2.5)	A2/ 3	17.6.6
C2.2. Tax expenditures: general sales taxes	0.0	(1.6)	A2/ 3	17.6.6
C2.3. Tax expenditures: property taxes on highways	0.0	(5.9)	A3	17.6.6
Subtotal Way #3 of counting	105.5	191.3	n.a.	n.a.

B. YEAR 2002, WEIGHTED RESULTS

<i>Payment item</i>	<i>Low cost</i>	<i>High cost</i>	<i>Q^a</i>	<i>section</i>
<u>A1. Special taxes and fees targeted to vehicles and fuels and used for MVIS</u>				
A1.1. FHWA-estimated federal, state, and local tax, license, and toll payments by highway users	79.6	79.6	A3	17.4.1
A1.2. Interest earnings on payments invested to cover highway and other capital	47.4	226.4	A3	17.4.2
Subtotal Way #1 of counting	127.0	306.0	n.a.	n.a.
<u>A2. Other taxes, fees specifically related to motor-vehicle use.</u>				
A2.1. Taxes and fees dedicated to nonhighway purposes, including collection expenses	21.1	21.1	A3	17.4.3 17.4.4
A2.2. Property-tax-like fees specifically related to motor-vehicle use	0.7	0.7	A3/4	17.4.5
A2.5. Air-quality, environmental fees on motor vehicles	0.1	0.1	A3	17.4.8
A2.6. Environmental excise taxes on petroleum ^C	0.0	0.0	A3	17.4.9
A2.7. Gas-guzzler taxes, luxury taxes, other minor taxes	0.4	0.4	A4	17.4.10
A2.8. Traffic fines and parking fines	12.0	8.0	A2	17.4.11
A2.9. Public parking fees and all parking taxes	6.1	7.5	A3	17.4.12
A2.10. Miscellaneous taxes, fees not counted elsewhere	0.5	0.5	D	17.4.13
Subtotal Way #2 of counting	167.0	344.3	n.a.	n.a.

Summary table continued on next page.

Table 17-22, Part B, Year 2002 weighted results, continued.

<i>Payment item</i>	<i>Low cost</i>	<i>High cost</i>	<i>Q^a</i>	<i>section</i>
<u><i>B. Selective taxes, fees on limited commodities and activities.^d</i></u>				
B1. Severance taxes paid on oil and gas (attributed to MV use)	1.3	0.0	A3	17.5.2
B2. Special property taxes	0.2	0.0	A3	17.5.3
B3. Special sales taxes	1.2	0.1	A3	17.5.4
B4. Other selective taxes and fees	1.1	0.0	A3	17.5.5
<u><i>C1. General taxes on a wide range of commodities, activities</i></u>				
C1.1. Portion of general sales taxes on motor vehicles, fuels, parts, and services	1.1	2.1	A2	17.6.2
C1.2. Portion of corporate income taxes paid by motor-vehicle related industries	0.3	0.6	A3	17.6.3
C1.3. Portion of personal income taxes paid by employees in motor-vehicle related industries	2.0	4.3	A2	17.6.4
C1.4. Portion of general property taxes paid on motor vehicles and by motor-vehicle related industries	0.6	0.9	A3	17.6.5
<u><i>C2. Tax expenditures</i></u>				
C2.1. Tax expenditures: corporate income taxes	0.0	(3.1)	A2/ 3	17.6.6
C2.2. Tax expenditures: general sales taxes	0.0	(9.8)	A2/ 3	17.6.6
C2.3. Tax expenditures: property taxes on highways	0.0	(10.8)	A3	17.6.6
Subtotal Way #3 of counting	175.6	328.5	n.a.	n.a.

C. YEAR 2002, UNWEIGHTED RESULTS AND WEIGHTS

<i>Payment item</i>	<i>Low cost</i>	<i>High cost</i>	<i>Low wt.</i>	<i>High wt.</i>
<u><i>A1. Special taxes and fees targeted to vehicles and fuels and used for MVIS</i></u>				
A1.1. FHWA-estimated federal, state, and local tax, license, and toll payments by highway users	79.6	79.6	1.00	1.00
A1.2. Interest earnings on payments invested to cover highway and other capital	47.4	226.4	1.00	1.00
<u><i>A2. Other taxes, fees specifically related to motor-vehicle use.</i></u>				
A2.1. Taxes and fees dedicated to nonhighway purposes, including collection expenses	21.1	21.1	1.00	1.00
A2.2. Property-tax-like fees specifically related to motor-vehicle use	0.7	0.7	1.00	1.00
A2.5. Air-quality, environmental fees on motor vehicles	0.1	0.1	1.00	1.00
A2.6. Environmental excise taxes on petroleum	0.0	0.0	1.00	1.00
A2.7. Gas-guzzler taxes, luxury taxes, other minor taxes	0.4	0.4	1.00	1.00
A2.8. Traffic fines and parking fines	12.0	8.0	1.00	1.00
A2.9. Public parking fees and all parking taxes	6.1	7.5	1.00	1.00
A2.10. Miscellaneous taxes, fees not counted elsewhere	0.5	0.5	1.00	1.00

Summary table continued on next page.

Table 17-22, Part C, Year 2002, unweighted results, continued.

<i>Payment item</i>	<i>Low cost</i>	<i>High cost</i>	<i>Low wt.</i>	<i>High wt.</i>
<u><i>B. Selective taxes, fees on limited commodities and activities.</i></u>				
B1. Severance taxes paid on oil and gas (attributed to MV use)	1.6	1.0	1.00	0.051
B2. Special property taxes	0.1	0.1	1.00	0.051
B3. Special sales taxes	0.8	0.8	1.00	0.051
B4. Other selective taxes and fees	0.7	0.4	1.00	0.051
<u><i>C1. General taxes on a wide range of commodities, activities</i></u>				
C1.1. Portion of general sales taxes on motor vehicles, fuels, parts, and services	19.6	16.3	0.020	0.051
C1.2. Portion of corporate income taxes paid by motor-vehicle related industries	6.3	6.2	0.020	0.051
C1.3. Portion of personal income taxes paid by employees in motor-vehicle related industries	40.1	38.9	0.020	0.051
C1.4. Portion of general property taxes paid on motor vehicles and by motor-vehicle related industries	12.4	9.0	0.020	0.051
<u><i>C2. Tax expenditures</i></u>				
C2.1. Tax expenditures: corporate income taxes	-2.5	-2.5	0.00	1.00
C2.2. Tax expenditures: general sales taxes	-2.0	-1.6	0.00	1.00
C2.3. Tax expenditures: property taxes on highways	-5.9	-5.9	0.00	1.00

See the text for details. "Low cost" means "low social costs net of user payments" and hence can have the numerically higher user payments; "high cost" means "high social costs net of user payments" and hence can have the numerically lower user payments. See Appendix 17-A.3 for further discussion of "low" and "high" user payments in this context.

The weighted costs shown in parts A and B are equal to "unweighted" costs multiplied by weights that represent the fraction of each unweighted cost that is counted as a payment under Way #3 of counting. The weights are explained in the pertinent cost sections, and generally in section 17.3.3. Part C of this table shows the weights and the unweighted costs for the year 2002.

^aQ = Quality of the estimate (see Table 1-3 of Report #1). Ratings in brackets refer to the quality of the analysis in the literature reviewed.

^b In the original version of this analysis I counted the amount extra that highway users would have paid in 1991 had the October 1993, \$0.043/gal increase in the Federal excise tax and post-

1991 increases in state and local highway-user taxes been in effect. I also estimated how much additional tax revenue would have been collected had there been less tax evasion. However, because the analysis now has been updated to include public costs and user payments through the year 2003, I no longer include these items for the year 1991. See section 17-A.4 for the original estimates.

- ^c Most of the environmental excise taxes are for public control and clean up of hazardous waste sites and oil spills. However, the oil-spill liability trust fund also is used to compensate for oil-spill damages. Technically, whatever amount compensates for damages should not be included here, but rather in a separate table called “payments for environmental damages”, or “Pigovian taxes”. These environmental charges would then be netted against environmental damages. However, the amount is too small to worry about.
- ^d In the low-cost case I count all of these taxes as payments by motor-vehicle users specifically for motor-vehicle use (weight of 1.0). In the high-cost case I treat these taxes as general taxes, like a sales tax or an income tax, and count as a user payment for motor-vehicle use only the portion that on average goes into general funds and comes out as an expenditure related to motor-vehicle use.

TABLE 17-23. SUMMARY OF MOTOR-VEHICLE-USER PAYMENTS FOR AND GOVERNMENT EXPENDITURES ON MVIS, UNDER THREE WAYS OF COUNTING

A. 1991

	Way #1 of counting		Way #2 of counting		Way #3 of counting	
	<i>low</i>	<i>high</i>	<i>low</i>	<i>high</i>	<i>low</i>	<i>high</i>
User payments for MVIS (10 ⁹ \$)	74.9	172.	100.	197.	105.	191.
		8	8	6	5	3
Government expenditures on MVIS (10 ⁹ \$) ^a	97.8	193.	111.	210.	122.	243.
		5	4	4	9	2
Difference between expenditures and payments (10 ⁹ \$)	22.9	20.7	10.6	12.8	17.4	52.0
Ratio of payments to expenditures	0.77	0.89	0.90	0.94	0.86	0.79
Additional fuel tax that makes payments equal expenditures (\$/gallon)	0.18	0.16	0.08	0.10	0.13	0.40

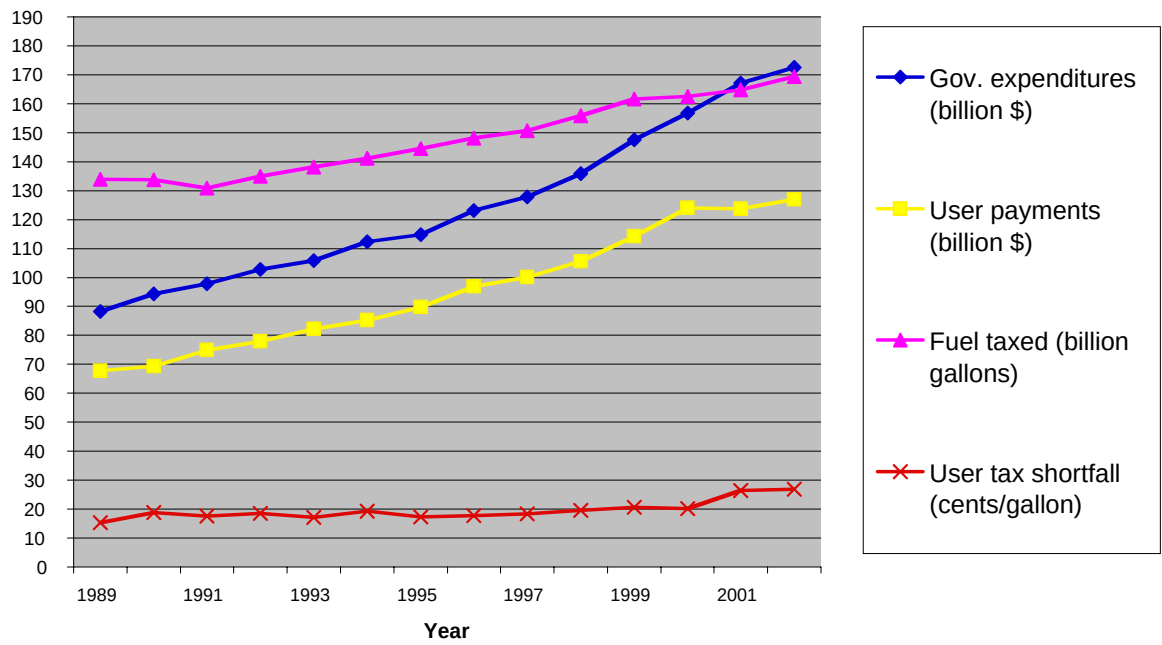
B. 2002

	Way #1 of counting		Way #2 of counting		Way #3 of counting	
	<i>low</i>	<i>high</i>	<i>low</i>	<i>high</i>	<i>low</i>	<i>high</i>
User payments for MVIS (10 ⁹ \$)	127.0	306.0	167.9	344.3	175.6	328.5
Government expenditures on MVIS (10 ⁹ \$) ^a	172.5	351.4	191.7	372.1	216.5	433.6
Difference between expenditures and payments (10 ⁹ \$)	45.5	45.4	23.9	27.8	40.9	105.1
Ratio of payments to expenditures	0.74	0.87	0.88	0.93	0.81	0.76
Additional fuel tax that makes payments equal expenditures (\$/gallon)	0.27	0.27	0.14	0.16	0.24	0.62

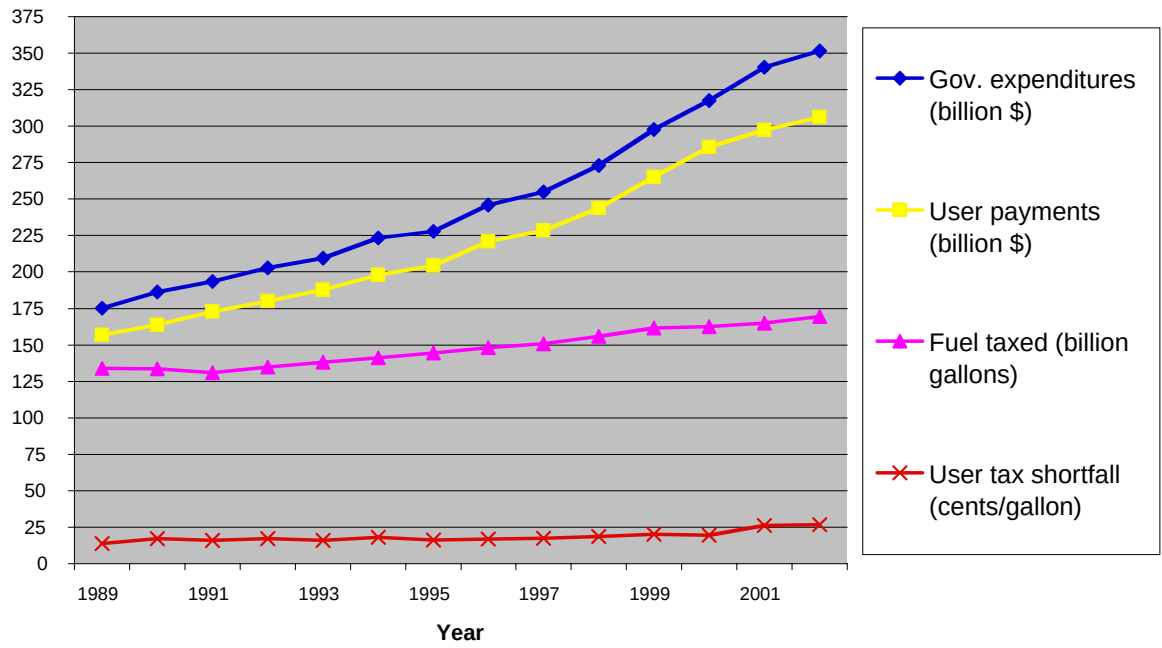
^a Section 17.2 shows our classification of government expenditure. Section 17.3 shows how these classes of government expenditures are counted under each of the four Ways of Counting. Report #7 in the UCD social-cost series presents our estimates of government expenditures.

FIGURE 17-1 USER PAYMENTS AND GOVERNMENT EXPENDITURES, 1989-2002

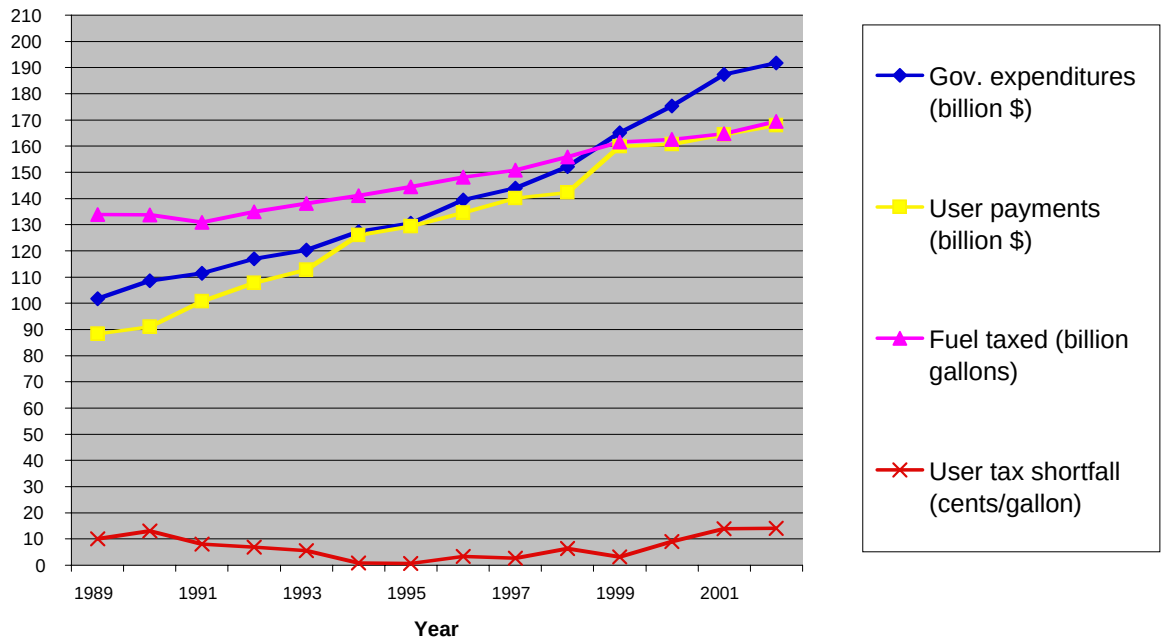
A. WAY #1 OF COUNTING, LOW-COST CASE



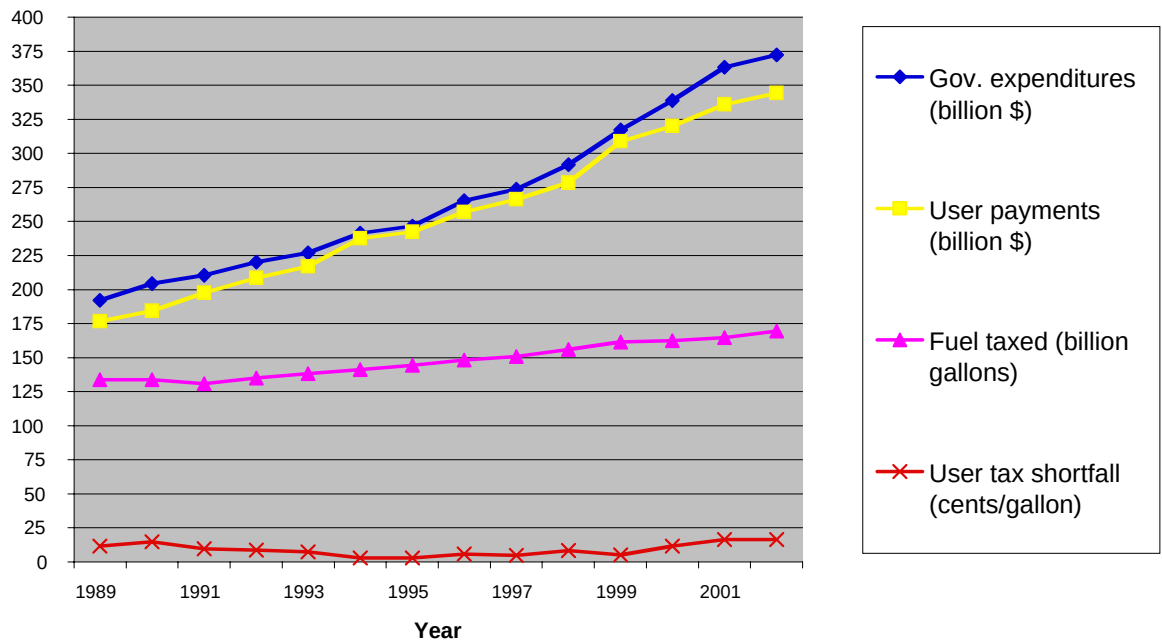
B. WAY #1 OF COUNTING, HIGH-COST CASE



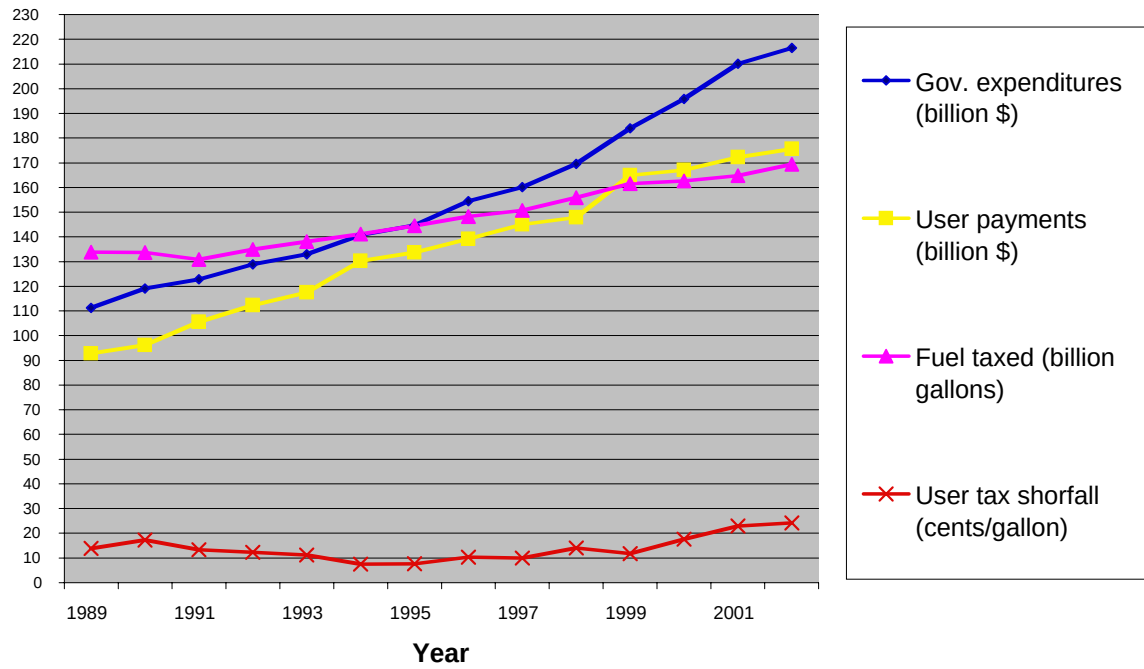
C. WAY #2 OF COUNTING, LOW-COST CASE



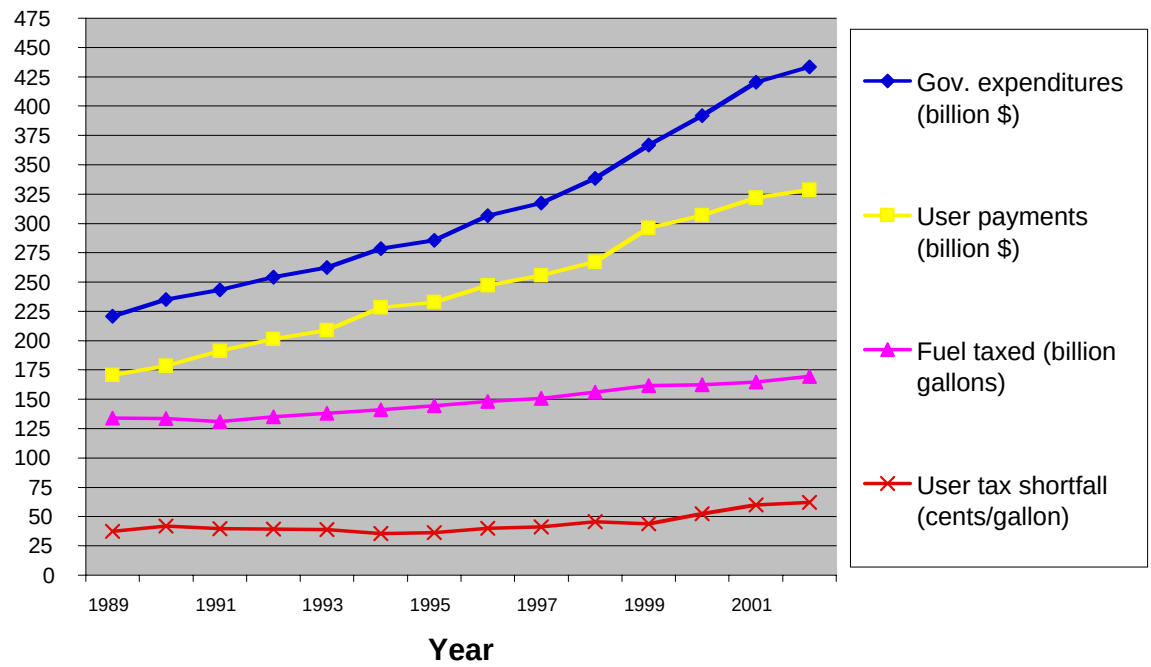
D. WAY #2 OF COUNTING, HIGH-COST CASE



E. WAY #3 OF COUNTING, LOW-COST CASE



F. WAY #3 OF COUNTING, HIGH-COST CASE



APPENDIX 17-A.1: AN ESTIMATE OF NON-USER PAYMENTS TOWARDS GOVERNMENT-PROVIDED MVIS

In this appendix, we analyze payments when everyone is classified as either a user or a non-user of motor-vehicles, and our sole concern is to minimize payments by non-users, directly or indirectly, towards government provided motor-vehicle infrastructure and services. We thus will estimate the contribution of persons who never use motor vehicles as a fraction of government expenditures on MVIS, whereas in the main body of this report we estimated motor-vehicle user payments a fraction of MVIS.

We set up a simple formal model of the contribution of non-users towards the cost of government MVIS, in which the contribution is estimated as the difference between the total cost of government MVIS and the total payments of users. Referring to the classes of tax and fee payments presented in section 17.2, plus a new class (D), we have:

$$\begin{aligned} NUP &= GE - GR \\ GR &= A + k1 \cdot B + k2 \cdot C + k3 \cdot D \\ \text{if } A + k1 \cdot B + k2 \cdot C &< GE, \\ \text{then } k3 &= 1 \text{ and } D = MVUF \cdot (GE - A - k1 \cdot B - k2 \cdot C) \\ \text{otherwise } k3 &= 0 \end{aligned}$$

where:

NUP = non-user payments towards government provided MVIS (GE) (\$/yr)

GR = government revenue from tax and fee payments that in our equity analysis count as user payments against government expenditures for MVIS (\$/yr)

GE = government expenditures for MVIS (\$/yr)

A = special taxes and fees related to motor-vehicle use -- classes A1 and A2 of section 17.2.1 (\$/yr)

B = selective taxes and fees related to motor-vehicle use -- class B of section 17.2.2 (\$/yr)

k1 = the fraction of B that counts as a user payment towards GE specifically rather than towards other government services in general

C = general taxes and fees related to motor-vehicle use -- class C of section 17.2.3 (\$/yr)

k2 = the fraction of C that counts as a user payment towards GE rather than towards other general government services

D = general taxes and fees paid by motor-vehicle users but *not* related to motor-vehicle use (e.g., property taxes on homes or sales taxes on appliances paid by motor-vehicle users) and applied towards any funding shortfall for GE (\$/yr)

MVUF = of the total population of persons paying the general (not-motor-vehicle-related) taxes that make up any funding shortfall for government MVIS, the fraction that can be called “motor-vehicle users”

In this formulation, general taxes not related to motor-vehicle use but paid by persons who use motor vehicles (class D) are counted towards government expenditures for MVIS only if there is a funding shortfall ($GE > A_1 + A_2 + k_1 \cdot B + k_2 \cdot C$) that must be made up from general funds. (Note that here we can introduce payments of class D – tax and fees payments unrelated to motor-vehicle use, but made by motor-vehicle users – because in this case we don’t care whether the payments are related to motor-vehicle use, whereas in section 17.3 we do and hence disallow class-D payments.)

Continuing, we have:

$$\begin{aligned} NUP &= GE - (A + k_1 \cdot B + k_2 \cdot C + k_3 \cdot D) \\ &= GE - [A + k_1 \cdot B + k_2 \cdot C + k_3 \cdot MVUF \cdot (GE - (A + k_1 \cdot B + k_2 \cdot C))] \end{aligned}$$

It is convenient to define all of the parameters relative to GE, so that:

$$\begin{aligned} NUP/GE &= NUP' \\ GE/GE &= 1.0 \\ A/GE &= A' \\ B/GE &= B' \\ C/GE &= C' \end{aligned}$$

and thus:

$$NUP' = 1 - [A' + k_1 \cdot B' + k_2 \cdot C' + k_3 \cdot MVUF \cdot (1 - (A' + k_1 \cdot B' + k_2 \cdot C'))]$$

Let us now perform an illustrative calculation to determine the likely contribution of non-users, NUP' . Using the results of Table 17-23, we see that the quantity $[A' + k_1 \cdot B' + k_2 \cdot C']$ is about 0.70 to 0.90. For the case in which it is equal to 0.70 we have:

$$\begin{aligned} NUP' &\leq 1 - (0.70 + MVUF \cdot (1 - 0.70)) \\ NUP' &\leq 0.30 - MVUF \cdot 0.30 \\ NUP' &\leq 0.30 \cdot (1 - MVUF) \end{aligned}$$

And for the case in which it is equal to 0.90 we have:

$$NUP' \leq 0.10 \cdot (1 - MVUF)$$

The magnitude of NUP now depends on MVUF, the motor-vehicle-user fraction of the population. Here, the crucial issue is what we mean by “motor-vehicle user” or “non-user”. I will submit, however, that by any reasonable definition, there are very few “non users” of motor vehicles. For example, virtually all adults are part of a household that has a motor-vehicle: in 1990, only 6.4% of people lived in households without vehicles (Lave and Crepeau, 1994). We may presume that every household with a vehicle uses the vehicle, and further that nearly every householder uses the vehicle at least occasionally. Also, private vehicles are used for nearly 90% of all person trips and all person miles of travel by *all* modes, including walking, bicycling, and flying (Hu and Young, 1993).

Given that MVUF is at least 90%, NUP', the total non-user cost contribution, is approximately 1 to 3% of total costs GE. Thus, at worst, non-users pay for only a small fraction of motor-vehicle infrastructure and service costs. This is because, in the first place, direct payments by users cover nearly all of the costs, and in the second place, there are many more users than non-users paying the general taxes that fund the costs not covered by direct user payments.

It may be possible to justify a small payment by non-users on the grounds that even non-users benefit indirectly from motor-vehicle use⁴⁹. However, if this justification is not palatable, and one wishes to reduce the non-user contribution to zero, then the quantity $A' + k_1 \cdot B' + k_2 \cdot C'$ must increase all the way to 100%.

⁴⁹ This possibility has been recognized for a long time: decades ago, Zettel (1952) asserted that “there are good reasons...why users should not be held responsible for all costs of all segments of the highway, road, and street plant – a certain share should be assigned to property owners and general taxpayers” (p. 13).

APPENDIX 17-A.2: CLASSIFICATION OF FINES AND PENALTIES IN FHWA'S HIGHWAY STATISTICS

17-A.2.1 Present (post-1993) classification

It appears that in its present classification of financial statistics in the *Highway Statistics* reports, FHWA includes under “miscellaneous receipts” (e.g., Table HF-1) two kinds of fines and penalties:

- 1) those imposed by states for violation of motor-vehicle regulations such as weight restrictions but *not* for violation of traffic and parking laws; and
- 2) those imposed by local governments for violations of motor-vehicle, traffic and parking laws, *if* the fines and penalties are dedicated to street and highway purposes.

The classifications apparently changed around 1994, and became clearer. Prior to 1994 there was some ambiguity. In this section I discuss the present classification, and in the next section I discuss the classification prior to 1994.

Information on the classification of fines and penalties is presented in several sources: the *Highway Statistics* reports; the actual forms that state and local governments fill out; the FHWA's guidelines for filling out those forms (*A Guide to Reporting Highway Statistics*), and in the FHWA report *Highway Taxes and Fees, How They Are Collected and Distributed 2001*. Information pertaining to the current classification is summarized in the following tables.

Source:	<i>Highway Statistics</i>	<i>Form FHWA-531, State Highway Income</i>	<i>Form FHWA-536, Local Highway Finance Report</i>
Category with fines and penalties	"Miscellaneous receipts"	"B.10. Miscellaneous State highway income"	"II.A.4. Miscellaneous local receipts"
What is included in the category	Private donations, sign fees, insurance recoveries, rentals, fines and penalties, and permit fees (FHWA, <i>Highway Statistics</i> 2002, p. IV-5).	"Those types of revenue that cannot be specifically classified under another item listed on form FHWA-531 (FHWA, <i>Guide to Reporting Highway Statistics</i> , 2002, p. 8-9). Form 531 lists interest on investments and private contributions.	"Record all local income not otherwise identified as specifically dedicated for roads and streets, such as traffic fines and penalties, investment income, net profit or loss from investment transactions, surplus funds applied to highway activities...and other miscellaneous local receipts" (FHWA, <i>Guide to Reporting Highway Statistics</i> , 2002, p. 11-5).

Source:	<i>Form FHWA-561, State Motor-Vehicle Registrations, Registration Fees, and Miscellaneous Receipts</i>	<i>Form FHWA-561, State Motor-Vehicle Registrations, Registration Fees, and Miscellaneous Receipts</i>	<i>Highway Taxes and Fees, How They Are Collected and Distributed 2001</i>
Category with fines and penalties	"III.C. Fines and penalties (infraction of motor-vehicle laws)"	"III.G. Miscellaneous Receipts"	Receipt classification category #8 in Table MV-106
What is included in the category	"Fines and penalties imposed for infractions of motor-vehicle laws and regulations, including oversize and overweight penalties...The State's receipts from fines and penalties imposed for infractions of traffic laws, i.e., moving violations and parking violations, should not be shown in this report" (FHWA, <i>Guide to Reporting Highway Statistics</i> , 2002, p. 3-5).	Nonresident tags, other temporary entry permits, fees for official cars, duplicates of all kinds, vehicle inspection fees, personalized(vanity plates), oversize and /or overweight permits, title lien fees, special titling taxes, adjustments (Form 561).	Table MV-106 lists the disposition of state motor-vehicle and motor-carrier receipts, by type of receipt. The footnotes to the table list 12 categories of receipts; number 8 is: "Fines and penalties. (Represents only that portion received and retained by the State. Excludes traffic fines.)"

From this we can infer that in the present FHWA financial accounting fines and penalties are classified as "miscellaneous receipts" (although on Form FHWA-561 they are in a separate category and not under "miscellaneous receipts"), that state fines and receipts do not include traffic fines, and that local-government fines and receipts include traffic and parking fines only if dedicated for street and highway purposes.

Although localities are instructed to include receipts from traffic fines and parking fines "specifically dedicated for roads and streets" (FWHA, *A Guide to Reporting Highway Statistics*, 1990, p. 10-4), FHWA believes that local agencies are not particularly diligent about reporting dedicated fines and penalties. As I discuss in note j of Table 17-2, several years ago FWHA did report separately the amount of dedicated traffic fines, but now includes them as an undifferentiated "miscellaneous receipt". Based on the historical data, I estimate that current FHWA financial statistics include on the order of \$300 million in dedicated traffic and parking fines.

17-A.2.2 Earlier (pre-1994) classification

It seems that before 1994, fines and penalties may have been classified as “user imposts” rather than as “miscellaneous receipts” in Table HF-1. The 1994 and 1995 editions of *Highway Statistics* state that the category “miscellaneous receipts” in the *Highway Statistics* reports includes fines and penalties and permit fees, but earlier editions state that the category “highway user imposts” (or “highway user revenues”) includes fines and penalties.

The treatment of traffic fines in the earlier statistics also is unclear. The 1990 *Guide to Reporting Highway Statistics* (FHWA, 1990) instructed states to include as highway-user income “fines and penalties for infractions of the motor-vehicle or traffic laws”, under item B-2, “state registration fees and driver license fees, fines, etc.,” of form FHWA-531 (p. 8-5; emphasis added). However, Form FHWA-531 itself, as well as other instructions, also said that the amount entered under item B-2 of FHWA-531 should be “consistent” with the amount on Form FHWA-566. Form FHWA 566, in turn, compiles amounts from other forms, including FHWA-561. The instructions for Form FHWA-561 were (and are) unambiguous: “Enter here all receipts of the motor-vehicle department from fines and penalties imposed for infractions of motor-vehicle laws and regulations...The state’s receipts from fines and penalties imposed for infractions of traffic laws, i.e. moving violations and parking violations, should *not* be shown in this report” (FWHA, *A Guide to Reporting Highway Statistics*, 1990, p. 3-5; emphasis added [quote is same in 2001 version of the *Guide*; see above]). Thus, in 1990 form FHWA-531 apparently could include receipts from traffic fines, but FHWA-566, with which 531 was (and is) supposed to be consistent, definitely could not.

Form FHWA-531 apparently allowed for such discrepancies, and asked that they be enumerated. However, I have no way of knowing how state agencies handled this subtlety.

In the 1990 edition of the *Guide to Reporting Highway Statistics*, as in the current edition, localities were instructed to include receipts from traffic fines and parking fines only if they were “specifically dedicated for roads and streets” (FWHA, *A Guide to Reporting Highway Statistics*, 1990, p. 10-4), so there was no ambiguity regarding the instructions to local governments.

APPENDIX 17-A.3: DISCUSSION OF INTERNALLY CONSISTENT DESIGNATION OF “LOW” AND “HIGH” PAYMENTS

On account of uncertainty in the underlying data, several of the estimates of user payments developed in this report have a “low” estimate and a “high” estimate.” Now, our estimates of government expenditures for MVIS (Report #7), with which our estimates of user payments here are to be compared, also have a low estimate and a high estimate. The question thus arises: when we compare estimates of user payments developed in this report (according to any one of the four Ways of counting laid out in section 17.3) with estimates of expenditures developed in Report #7, do we compare numerically “low” payments with numerically “low” expenditures and “high” payments with “high” expenditures, or do we compare “low” payments with “high” expenditures and vice versa?

The answer to this question is conceptually straightforward, but the application of the answer requires some care. If in terms of data and analytical assumptions an estimate of a user payment is completely independent of *all* estimates of government expenditures, and if we wish the “low” outcome of our comparison of payments with expenditures to be that with the lowest *net* costs and the “high” outcome to be that with the highest *net* costs, where the net cost is equal to expenditures minus payments, then one should compare the numerically high estimate of payments with the numerically low estimates of expenditures, and vice versa. This is because doing the comparison this way results in a lower “low” and a higher “high” net cost than does comparing low payments with low expenditures and high payments with high expenditures.

However, if an estimate of a user payment is *not* independent of all estimates of expenditures – that is, if the payment and the expenditure estimates rely ultimately on some of the same data or analytical assumptions – then we are not free to compare high payments with low expenditures and vice versa, but rather must make sure that our designation of low and high are consistent with the nature of the relationship between estimates of payments and estimates of expenditures. This will become clearer as we examine each of the specific estimates of payments, next.

Type of user payment Discussion of “low” and “high” payments

A1. Special taxes and fees used for MVIS

FHWA-estimated
payments by highway
users

No difference between high and low estimate of user payment.

Interest earnings on
payments towards MV-
related capital

The low-cost and the high-cost results are determined by the low and high values of the interest rate and the life of the investment (the amortization period). Now, the interest rate and the amortization period also determine the interest charge on capital invested in the highways (Report #7), as well as the interest earnings from user

payments invested against the highway capital. Obviously, the interest rate and the amortization period used to determine the interest earnings from invested user payments must be the same as the rate and the period used to estimate the interest charge on highway capital. Thus, the interest rate and amortization period that result in the high interest charge on highway capital are defined as the “high-cost” parameters for our estimate (here) of interest on user payments as well.

A2. Special taxes and fees
not used for MVIS

Taxes, fees dedicated to nonhighway purposes	No difference between high and low estimate of user payment
Special property taxes dedicated to highways	No difference between high and low estimate of user payment.
Other imposts dedicated to highways	No difference between high and low estimate of user payment.
The amount extra that highway users would have paid in 1991 had the October 1993 \$0.043/gallon increase in the Federal excise tax been in effect	No difference between high and low estimate of user payment. (However, this amount no longer is included. See Appendix 17-A.4.)
Amount extra if less tax evasion	This user payment is independent of any estimate of expenditures, so the “high” payment estimate can be used in the low-cost case here. (However, this amount no longer is included. See Appendix 17-A.4.)
Air-quality and other environmental fees	No difference between high and low estimate of user payment.
Environmental excise taxes on petroleum	These taxes are equal to the total amount of the tax on petroleum (crude oil or products) multiplied by the low or high motor-vehicle share of petroleum. The motor-vehicle shares are from Table 10-14 in Report #10 in the social cost series. In that report, low and high are determined according to the same criteria used here. Thus, the use here of the low and high values from the analysis of Report #10 ensures consistency throughout the entire analysis.
Gas-guzzler taxes, luxury taxes, etc.	No difference between high and low estimate of user payment.
Traffic fines and parking fines	This user payment is independent of any estimate of expenditures, so the “high payment” estimate can be used in the low-cost case here.
Public parking fees and all parking taxes	Fees paid for municipal and institutional parking are equal to the estimated cost of that parking (Report #7). Hence, the low estimate of fee payments here corresponds with the low-cost estimate from Report #7, and the high estimate of fee payments corresponds with the high-

cost estimate from Report #7.

Parking taxes are equal to parking fees multiplied by an estimated tax rate. There is a low and a high tax rate, and both are independent of estimates of government expenditures (including municipal parking costs) and parking fees. Hence, the low case here uses the higher parking tax rate (multiplied by the low estimate of fees) and the high case uses the lower parking tax rate (multiplied by the low estimate of fees).

B. Selective taxes and fees
on limited commodities
and activities

Severance taxes paid on oil and gas (and attributed to motor-vehicle use)

Severance taxes attributed to motor-vehicle use are equal to total severance taxes multiplied by an estimated low or high motor-vehicle share (section 17.5.2; Table 17-11). The motor-vehicle share is estimated on the basis of data from Report #10, which specifies low and high values according to the same criteria used in this report.

Special property taxes and special sales taxes

These are independent of any estimates of expenditures. Hence, the low-cost case uses the numerically higher estimates of payments.

Other selective taxes and fees (attributed to motor-vehicle use)

Other selective taxes and fees attributed to motor-vehicle use are equal to the amount of the tax or fee multiplied by an estimated low or high motor-vehicle share (Table 17-13). The motor-vehicle share is estimated on the basis of data from Report #10, which specifies low and high values according to the same criteria used in this report.

C1. General taxes on a
wide range of commodities
and activities

As shown in section eq. 17-18, section 17.6.7, the portion of a general tax that ends up going into general funds and then being applied to any government MVIS not covered by the taxes and fees above (parameter T_u in eq. 17-18) is a function of the *difference* between total government expenditures (parameter $GEmv$) and total user payments ($GRmv$), total government receipts of general taxes (Ft), and general taxes on goods or services related to motor-vehicle use (parameters St , Ct , Pt , Pr).

$GEmv$ minus $GRmv$. Since the object here is to determine the amount of expenditure not covered by all user payments (except general taxes), we must use the totals of expenditures and payments as estimated and classified (as "low" or "high") here. Hence, the low-cost case here uses the low value of government expenditures ($GEmv$) and the low value of government receipts ($GRmv$).

Ft . Ft is independent of any estimates of government expenditures and of estimates of user payments. Now, the lower the value of Ft , the higher the value of T_u , and the higher the value of T_u the higher the user payments and the lower the net cost. Because of this, and because Ft is an independent parameter, I use the lower value (generating the lower net cost) in the low-cost case.

St , Ct , Pt , Pr . These parameters are for the most part independent of

any estimates of government expenditures. The higher the value of these parameters, the greater the user payments and the lower the net cost. Hence, I use the high values of these parameters in the low-cost case here. (Note that in some cases these parameters are estimated as a function the “motor-vehicle-related fraction” of some broader value. Some of these motor-vehicle-related fractions are estimated in Report #10. [See e.g., section 17.6.4. here.] For internal consistency, the low and high as estimated in Report #10 are used here.)

A component of the calculation of the general property-tax payment is used in the calculation of the cost of motor-vehicle goods and services priced in the private sector (Report #5). Specifically, property taxes paid by motor-vehicle-related businesses are deducted from price-times-quantity payments for the goods and services of those businesses, to arrive at costs net of taxes. In that calculation, the low-property-tax estimate is deducted in the “high” cost case, and obversely. This is consistent with our treatment of the property tax as a user payment.

C2. Tax expenditures

Estimates of tax expenditures are for the most part independent of estimates of government expenditures for MVIS. Because a positive tax expenditure is tantamount to a negative user payment, a higher absolute value of the expenditure results in a higher net cost. In the low-cost case here I ignore tax expenditures altogether (see section 17.3). In the high-cost case, if there is a range of estimates, then – with one exception (explained below) – I use the high end of the absolute value of the range, because as just indicated this results in the higher net cost.

The exception is with regards to sales-tax expenditures. The calculation of the sales-tax expenditure involves some of the same parameters as does the calculation of the general sales-tax payments (see C1), and as a consequence, in either the low-cost case or the high cost case the sales-tax expenditure and the general sales-tax payments must be calculated on the same basis, using the same values of the parameters common to both the expenditure and the general payments calculation. Thus, since the numerically “low” general-sales-tax payment is used in the high-cost case, the numerically low sales-tax expenditure also must be used in the high-cost case.

Note that in some cases (e.g., environmental excise taxes, severance taxes, general taxes) the motor-vehicle-user payment is estimated as a function of (among other things) the motor-vehicle-related fraction of some broader payment. Report #10 estimates some of these motor-vehicle-related fractions. In Report #10, “low” and “high” are determined according to the same criteria used in this report. Where pertinent, the estimates from Report #10 are used here, thus ensuring consistency of the meaning of “low” and “high” throughout the entire social-cost analysis.

APPENDIX 17-A.4: THE AMOUNT EXTRA THAT USERS WOULD HAVE PAID IN 1991 HAD POST-1991 TAX INCREASES AND ANTI-TAX-EVASION MEASURES BEEN IN EFFECT

17-A.4.1 Background

In the original version of this analysis I counted the amount extra that highway users would have paid in 1991 had the October 1993, \$0.043/gal increase in the Federal excise tax and post-1991 increases in state and local highway-user taxes been in effect. I also estimated how much additional tax revenue would have been collected had there been less tax evasion. I included these “extra” payments so that the estimates for 1991 – originally, the only year for which estimates were made – would more closely reflect the current situation. However, because the analysis now has been updated to include public costs and user payments through the year 2003, there is no longer any reason to adjust the early-year estimates to reflect the current situation (because the recent-year estimates reflect the current situation). In the following sections of this appendix I present the original calculations of the extra amount that users would have paid in 1991 had post-1991 tax increases and anti-tax-evasion measures been in effect. These amounts are presented here only for reference; they are *not* included in the summaries of Tables 17-22 and 17-23.

17-A.4.2 The amount extra that highway users would have paid in 1991 had the October 1993 \$0.043/gallon increase in the Federal excise tax, and other increases in state and local excise taxes, been in effect

In October 1993, the Federal excise tax on gasoline and diesel fuel was increased by \$0.043/gallon. Since 1991 there also have been increases in state and local excise taxes (my base year). The EIA (*Short-Term Energy Outlook*, 1993) estimates that the from 1990 to 1994, state and local taxes will have increased \$0.007/gallon per year. However, it appears to me that there was not that much of an increase in 1992 compared to 1991 (my base year). Therefore, I assume that in 1993 and 1994 state and local motor-fuel excise taxes increased a total of \$0.010/gallon.

If the increases in the gasoline tax did not affect gasoline consumption, then the amount extra that would have been collected in 1991 would have been equal to the tax increase multiplied by the original 1991 fuel volume subject to taxation. However, in theory the increase in the tax would have slightly reduced consumption. Formally accounting for this, I calculate the extra total tax payment as follows:

$$Ex = (0.043 + 0.010) \cdot G \cdot (1 - F) \quad \text{eq. [17-2]}$$

where:

Ex = extra payments that would have been made in 1991 had the \$0.043/gallon Federal tax increase and the 0.010 state and local tax increase been in effect in 1991

0.043 = increase in the Federal excise tax on motor fuels, effective October 1993 (\$/gallon)

0.010 = increase in state and local excise taxes on motor-fuels, after 1991 (my estimate, based on EIA (*Short-Term Energy Outlook*, 1993) and FHWA (*Highway Statistics* 1992, 1993) data (\$/gallon)

F = the fraction by which total gasoline consumption in 1991 would have been less than actual consumption had the \$0.043/gallon Federal tax increase and the estimated state and local tax increases been in effect (assumed to be 0.01; see discussion below)

G = total net gallons of motor-fuel taxed in 1991 (130.9 billion; FHWA, *Highway Statistics* 1991, 1992)

Reduction in fuel consumption due to tax increase. The EIA (*Short-Term Energy Outlook*, 1993) estimated that increases in Federal, state and local motor-fuel taxes from 1992 to 1994 would reduce demand for motor-gasoline by 0.6%, and demand for diesel fuel by even less. Krupnick et al. (1993) estimated that the \$0.043/gallon increase in the Federal excise tax would cause a 1.87% reduction in VMT per vehicle. If the total number of vehicles and average fuel economy did not change, then a 1.87% reduction in VMT/vehicle translated into a 1.87% reduction in total fuel use. (Note that this latter estimate did not include the effect of increases in state and local taxes). On the basis of these studies, I assume that fuel consumption would have been reduced by 1%.

With these assumptions, Ex is about \$7 billion.

17-A.4.3 The amount extra that would have been collected had there been less, or no, tax evasion

In the mid-1980s, government officials uncovered widespread schemes in the New York metropolitan area to evade the motor-fuel tax (Baluch, 1996). For example, a major way of evading the tax on diesel fuel was to claim that the fuel was being sold for non-highway uses, which were not (and still are not) subject to the motor-fuel tax. By the early 1990s, it was estimated that distributors and others were evading as much as \$3 billion in motor-fuel taxes, (Baluch, 1996).

In response to this problem, Congress funded the Joint Federal/State Motor Fuel Tax Compliance Project, beginning in fiscal year 1990. The project recommended that non-taxable diesel fuel be dyed, to distinguish it from taxable fuel for highway use, and that the Federal tax be assessed at the point of removal from bulk storage from the terminal rack. The regulations regarding dyeing and point-of-taxation went into effect on January 1, 1994 (Baluch, 1996).

According to Baluchi (1996), the dyeing requirements have reduced evasion of the diesel fuel tax by at least 60%. However, the remaining evasion of Federal and state

tax on diesel fuel and gasoline probably still amounts to around \$2 billion (Baluch, 1996).

What is the significance of this tax evasion for estimates of user payments in 1990-1991? In 1990-1991, tax evasion amounted to close to \$3 billion. As noted above, these losses were reduced shortly afterwards. If the anti-evasion measures had been in effect in 1991, then the government might have collected an additional \$1 to \$3 billion in taxes.

APPENDIX 17-A.5: ALTERNATIVE ESTIMATES OF HIGHWAY USER REVENUE DEDICATED TO NON-HIGHWAY PURPOSES

17-A.5.1 Background

Section 17.4.3 and Table 17-3 present our estimates of highway-user revenue dedicated to mass transit and other non-highway purposes. As explained in section 17.4.3, we count these as user payments under Way #3 but not under Way #1 of counting. In this appendix, we discuss the use of alternative FHWA data to estimate highway-user revenue dedicated to non-highway purposes.

17-A.5.2 Federal imposts on highway users, dedicated to reducing the deficit

As mentioned in the text and indicated in Table 17-4, prior to 1998 a significant fraction of the Federal excise tax on motor fuels was dedicated to deficit reduction and other nonhighway purposes. Here, I calculate the total amount dedicated to deficit reduction in a given year by multiplying the cent/gallon tax dedicated to deficit reduction in the year (Table 17-4) by the “net gallons” taxed in the year (Table MF-2 of FHWA’s *Highway Statistics*). For years in which the tax rate changed, I weight each rate in the year by the fraction of total annual taxed gallons to which the rate applied. The tax rates and volume weights are as follows:

Period	Tax (\$/gal)	% of annual fuel volume subject to tax
before 1990	0.000	0%
1990, January 1 - November 30	0.000	92.18%
1990, December 1 - December 31	0.025	7.82%
1991	0.025	100%
1992	0.025	100%
1993, January 1 - September 30	0.025	75.17%
1993, October 1 - December 31	0.068	24.83%
1994	0.068	100%
1995, January 1 - September 30	0.068	74.76%
1995, October 1 - December 31	0.043	25.24%
1996	0.043	100%
1997, January 1 – September 30	0.043	assume 75%
1997, October 1 – December 31	0.000 – gasoline 0.043 – diesel	assume 25%
1998- on	0.000 – gasoline 0.043 – diesel	100%

The tax rates are from Table FE-101A of FHWA’s *Highway Statistics* 1996 (1997) and from the FHWA’s *Highway Statistics* web site

(www.fhwa.dot.gov/policy/ohim/hs03/hf.htm). The weights (the percent of total annual volume in each period) are estimated on the basis of monthly gasoline sales reported in Table MF-33GA of *Highway Statistics*⁵⁰. Note that here I have indicated that after October 1 1997, *no* portion of the tax on gasoline is earmarked for deficit reduction, but 4.3 cents/gallon of the tax on diesel fuel remains earmarked for deficit reduction. Although this is indicated in Table FE-101A of *Highway Statistics*, and appears to be consistent with reported allocations of receipts for “nonhighway purposes” in Table HF-10, it is *not* consistent with Table FE-21B of *Highway Statistics*, which indicates that after October 1, 1997 *none* of the diesel fuel tax, as well as none of the gasoline tax, was earmarked for deficit reduction (see Table 17-4 here).

17-A.5.3 Federal imposts on highway users, dedicated to mass transit

Starting April 1, 1983, 1.0 cents/gallon of the Federal motor-fuel tax was deposited in the Mass Transit Account within the Federal Highway Trust Fund. On December 1, 1990, the deposit was raised to 1.5 cents/gallon, and on October 1, 1995 it was raised to 2.0 cents/gallon, and on October 1, 1997 it was raised again (Table 17-4). (Prior to 1983, there was no mass-transit account in the Highway Trust Fund [Table FE-210, FHWA, *Highway Statistics* 1991, 1992], and so I assume that before April 1, 1983, no Federal highway-user dollars were diverted to mass transit.)

My alternative estimate of the amount diverted to mass transit is equal to excise-tax revenues to the mass-transit account of the Highway Trust Fund, excluding interest on investments, as shown in Table FE-210 of *Highway Statistics* (FHWA, 1997). (Note that Federal *income* to the mass transit account is not the same thing as Federal *distributions* from the mass transit account.) I exclude investment income because I treat all interest income separately.

17-A.5.4 Federal imposts on highway users, dedicated to the LUST trust fund

Since January 1 1987, a small portion of the federal excise tax, \$0.001/gallon, has been dedicated to the leaking-underground-storage-tank (LUST) trust fund. For the alternative estimate, I multiply the \$0.001/gallon tax by net gallons of motor-fuel taxed, from Table MF-2 of *Highway Statistics*, and count the entire amount as a payment for motor-vehicle use by motor-vehicle users. (Note that I also include the total amount in my estimate of expenditures related to motor-vehicle use, in Report #7.)

Collection of the tax was suspended from September 1, 1990 to December 1, 1990. (FHWA, *Highway Statistics* 1991, 1990). The tax expired on January 1, 1996, but was reinstated on October 1, 1997, and expired again on March 31, 2005 (FHWA, 1997). Consequently, I have multiplied total net gallons of fuel in 1990 by 9/12, total net gallons of fuel in 1997 by 3/12, and total net gallons in 2005 estimate by 3/12.

⁵⁰ The weights are calculated on the basis of monthly gasoline sales, even in the cases where the tax applies to all fuels, because the FHWA does not report monthly sales of all taxed fuels.

17-A.5.5 State imposts on highway users, dedicated to mass transit

A portion of the revenues received from state imposts on highways users are disbursed to finance mass transit and other nonhighway projects. My alternative estimates of state highway-user revenues and toll revenues diverted to mass transit are made as follows:

<i>Year</i>	<i>Data source</i>	<i>Comments</i>
1993-2003	Tables MT-1A and MT-1B or Table SDF (FHWA, <i>Highway Statistics</i> , annual)	Shows state “Highway-user tax revenues” and state “Road and crossing tolls” used for mass transportation purposes.
1986-1992	Table SMT (FWHA, <i>Highway Statistics</i> 1993 , 1994)	Shows state “Highway-user tax revenues” and state “Road and crossing tolls” used for mass transportation purposes.
1974-1985	Table DF-201 (FWHA, <i>Highway Statistics: Summary to</i> 1985 , 1987)	Shows state imposts on highway users disbursed for mass transportation purposes. These figures apparently do not include the small amount of road and crossing tolls diverted to mass transit (according to Table SMT, road and crossing tolls diverted to mass transit are about 2% of highway-user revenues diverted to mass transit).
1971-1973	no estimates	It is not clear if any state highway money was diverted to mass transit prior to 1974, or if FHWA simply did not report it.

17-A.5.6 State imposts on highway users, dedicated to other nonhighway purposes

My alternative estimates of state highway-user and toll revenue disbursed for nonhighway purposes other than mass transit are made as follows:

<i>Year</i>	<i>Data source</i>	<i>Comments</i>
1994-2003	Table SDF (FHWA, <i>Highway Statistics</i> , annual)	Shows state highway-user revenues and state toll and road-crossing receipts disbursed for nonhighway purposes other than mass transit.
1993	Tables DF, SF-3B, SF-21, and MT-1 (FWHA, <i>Highway Statistics</i> 1993 , 1994)	The estimate for 1993 consists of state highway-user revenue disbursed for nonhighway purposes other than mass transit, from Table DF, plus toll and road-crossing revenue disbursed for nonhighway purposes other than mass transit, estimated as described in footnote 2 to Table SF-4B of <i>Highway Statistics</i> 1993.
1986-1992	Table DF (FHWA, <i>Highway Statistics</i> , annual)	Shows state highway user revenue but not state road-and-toll revenue disbursed for nonhighway purposes other than mass transit. However, based on data in Table SMT of <i>Highway Statistics</i> , which show that toll and road-crossing revenues disbursed for mass-transit purposes are only a small fraction of state highway-user revenues disbursed for mass transit, I assume that toll and road-crossing revenues disbursed for other nonhighway purposes are a small fraction of total revenues diverted to other nonhighway purposes.
1971-1985	Tables SF-202 and DF-201 (FWHA, <i>Highway Statistics: Summary to</i> 1985 , 1987)	Equal to total disbursements of highway-user revenue and toll revenue for all nonhighway purposes, including mass transit (Table SF-202), less disbursements of state highway-user revenue (but not state toll revenue) for mass transit (Table DF-201). I was unable to identify and deduct the amount of toll revenue diverted to mass transit alone.

17-A.5.7 Local imposts on highway users, dedicated to nonhighway purposes

My estimates of local highway-user and road-toll revenue disbursed for mass-transit and other nonhighway purposes are made as follows:

<i>Year</i>	<i>Data source</i>	<i>Comments</i>
1991-2003	Table LDF (FHWA, <i>Highway Statistics</i> , annual)	Shows locally generated highway-user revenue and toll revenue disbursed for mass transit and for other nonhighway purposes.
1990	Table LGF-2 (FWHA, <i>Highway Statistics 1991</i> , 1992)	Shows locally generated highway-user revenue and toll revenue disbursed for all nonhighway purposes. I breakdown all "nonhighway purposes" into "mass transit" and "other nonhighway" on the basis of proportions for 1991 (62% to mass transit).
1985-1989	Tables LF-2 and UF-2 (FHWA, <i>Highway Statistics</i> , annual)	Show disbursements by counties, townships, and municipalities for nonhighway purposes. See discussion below.
1979-1984	Tables LF-202 and Table UF-202 (FWHA, <i>Highway Statistics: Summary to 1985</i> , 1987)	Show disbursements by counties, townships, and municipalities for nonhighway purposes. See discussion below.
1971-1978	No data	

There are several questions regarding these local-government finance data for 1979 to 1989. First, the FHWA does not say whether or not disbursements for mass transit are included in the disbursements for nonhighway purposes. I assume that they are, and that for all years the percentage of total disbursements for nonhighway uses that went to mass transit is equal to the percentage estimated above for 1990, 62%. Second, it is not clear if the disbursements for nonhighway purposes were of locally generated revenues only, or if they included some state revenues that were passed on to local governments. Because states and counties both are instructed to count as "nonhighway disbursements" monies sent to local governments for nonhighway purposes (FHWA, *Guide to Reporting Highway Statistics*, 1990), it is likely that some of the amount estimated as "Local highway \$ to other nonhighway" for 1979 to 1989 already has been as "State highway \$ to other nonhighway". I cannot disentangle this potential double counting. Third, it is not completely clear if the nonhighway disbursements from 1985 to 1989 are of *highway-user* revenues, although the fact that the

nonhighway disbursements from 1979 to 1984 definitely are of highway use revenues makes it probable that the disbursements from 1985 to 1989 are too.

17-A.5.8 Comparison of alternative estimates with Table 17-3 estimates

The following table shows ratio of our alternative estimates to our Table 17-3 estimates for 1971 to 2003.

Year	Fed-transit	State-transit	Local-transit	State-nonhwy	Local-nonhwy	Fed nonhwy
2003	0.82	1	1	1	1	1.06
2002	0.83	1	1.11	1	0.71	1.17
2001	0.92	1	0.8	1	0.99	0.62
2000	0.9	1.05	1	1	1	9.34
1999	0.91	1	0.91	1	0.4	0.17
1998	0.82	1	1	1	1	1.71
1997	1.02	0.97	1	1.28	0.99	0.59
1996	0.84	0.75	1	1.12	1	1.12
1995	0.84	1	1.26	1	0.57	0.96
1994	0.87	0.64	1	1.17	1	0.86
1993	0.98	0.86	1	1.27	1	1.28
1992	0.78	0.79	1	1.15	1	0.91
1991	1	1	1	1.17	1	1.18
1990	1	1	0.78	1.03	1.83	1.84
1989	1	1	1.15	0.97	0.82	0.68
1988	1	1	1.69	1.13	0.6	0.67
1987	1	1	0.9	0.99	1.22	0.84
1986	1	0.92	0.9	0.99	1.22	0
1985	1	0.93	0.87	1.03	1.32	0
1984	1	0.92	0.63	1.08	2.97	0
1983	1	0.94	0.83	1.04	1.5	0
1982	n.a.	0.91	1.21	1.05	2.29	0
1981	n.a.	0.85	0.86	1.44	0.71	0
1980	n.a.	0.89	0.69	1.23	0.58	0
1979	n.a.	0.86	0	1.11	0	0
1978	n.a.	1	n.a.	1.03	n.a.	0
1977	n.a.	1	n.a.	1	n.a.	0
1976	n.a.	1	n.a.	0.94	n.a.	0
1975	n.a.	1	n.a.	1.01	n.a.	0
1974	n.a.	1	n.a.	0.82	n.a.	0
1973	n.a.	n.a.	n.a.	0.91	n.a.	0
1972	n.a.	n.a.	n.a.	0.92	n.a.	0
1971	n.a.	n.a.	n.a.	0.95	n.a.	0

Here, the “Federal nonhwy” category includes our estimates of federal funds earmarked for deficit reduction and the LUST trust fund.

Generally the alternative estimates are close to the Table 17-3 estimates. I am unable to explain the few significant discrepancies (e.g., under “Federal nonhwy”).