Transport Policy 15 (2008) 196–208

TRANSPORT POLICY

www.elsevier.com/locate/tranpol

How large are tax subsidies to motor-vehicle users in the US?

Mark A. Delucchi[a,*], James J. Murphy[b]

[a]Institute of Transportation Studies, University of California, Davis, CA 95616, USA
[b]Department of Economics, University of Alaska-Anchorage, Anchorage, AK 99501, USA

Available online 7 April 2008

Abstract

There has been considerable discussion about the extent to which motor-vehicle use in the US is "subsidized," making petroleum-based motor vehicle use more attractive than other transportation modes. Estimates of these subsidies vary widely, and in many cases can be criticized on methodological grounds. In this paper we estimate corporate-income-tax, sales-tax, property-tax, and personal-income-tax subsidies related to motor-vehicle use. Whereas previous estimates of sales-tax and corporate-income-tax subsidies have been built piecemeal, tax provision by tax provision, we offer an alternative method, based on the difference between actual tax payments of the motor vehicle industry compared to other industries. We estimate that the total "tax subsidy" to motor-vehicle users in the US may be in the range of \$19–64 billion (10^9) per year, or \$0.11–0.37 per gallon (\$0.03–0.10 per liter) of motor fuel. However, the amount of the subsidy, and hence the magnitude of its effect, depends greatly on the tax baseline with respect to which the subsidy is estimated. (The property-tax subsidy is particularly uncertain.) We emphasize that without doing a full equilibrium analysis, we cannot say how eliminating these subsidies would affect social welfare.

Keywords: Subsidies; Taxes; Motor-vehicle use; Motor fuels

1. Introduction

1.1. Background

There has been considerable discussion about the extent to which motor-vehicle use in the US is "subsidized," making petroleum-based motor vehicle use more attractive relative to other transportation modes or alternative fuels (for summaries, see Delucchi, 2006a; Murphy and Delucchi, 1998). The war in Iraq and the record earnings recently reported by oil companies continue to stir the debate about national dependence on oil and subsidies to the oil industry. US Representative Henry Waxman, the chair of the House Government Reform Committee in 2007, has said that "a very appropriate area of investigation" for the Committee is the "billions of dollars in subsidies and tax breaks" given to oil and other energy producers (Waxman, 2006). And in January 2007, the US House of Representatives did indeed consider legislation that would cut billions of dollars in federal "tax breaks" to the oil and gas industry (Clayton, 2007).

Estimates of these "subsidies" vary considerably. Many studies focus on the energy sector as a whole, but some examine the oil industry in particular. The estimates of oil subsidies in the US range from as low as \$1.5 billion (10^9) in FY1992 (EIA, 1992)[1] to as much as \$273 billion (in 1997 dollars) (the high estimate of subsidies to gasoline use in ICTA; International Center for Technology Assessment, 1998).[2] In Europe, over the last two decades, most nations have reduced direct energies subsidies, and many taxes now have been restructured to penalize carbon-intensive fuels (EEA, 2004). Nevertheless, the EEA estimates that subsidies to the transport sector as a whole totaled

*Corresponding author. Tel./fax: +1 916 989 5566.
E-mail address: madelucchi@ucdavis.edu (M.A. Delucchi).
URL: http://www.its.ucdavis.edu/people/faculty/delucchi/ (M.A. Delucchi).

[1]This is before a \$3 billion offset to account for excise tax payments, leading to a net *negative* subsidy estimate of \$1.5 billion.

[2]\$18 billion in tax subsidies, \$115 billion in "government program subsidies," such as for road infrastructure, and \$141 in "protection subsidies," mainly for US defense of oil interests.

0967-070X/\$ - see front matter
doi:10.1016/j.tranpol.2008.03.001

126 billion Euros in 2005, only 16 billion of which was from VAT exemptions and other on-budget subsidies; the remaining 110 billion was for infrastructure subsidies (EEA, 2007).

Most of the nearly 200-fold difference between the low and the high estimates of US subsidies cited above can be explained by different definitions of what constitutes a "subsidy." Some analysts use the term quite broadly to describe anything that favors a particular industry or that causes an industry's prices to fall below an efficient, "fair" or full-cost price. These price distortions can be the result of government policies and programs (such as outlays for infrastructure or services), preferential tax treatment, government-funded research and development, regulatory policies, military expenditures to defend oil interests, the presence of externalities (such as pollution, climate change, or highway congestion), or other market imperfections and government intervention.

However, most economists adopt a much narrower definition of what constitutes a "subsidy," focusing only on direct cash assistance for particular activities or preferential tax treatment.[3] This more narrowly defined category has received comparatively little attention. For example, while there have many estimates of the external costs of motor vehicle use and of the government expenditures in excess of user payments (e.g., Delucchi, 2000, 2006a, b; Murphy and Delucchi, 1998; Greene et al., 1997), there are few comprehensive estimates of the preferential tax-treatment subsidies related to motor-vehicle use. To fill this gap, this paper provides original, detailed estimates of four major kinds of tax subsidies related to motor vehicles, motor fuels and highways. Although our analysis focuses on the US, most of the methodology can be adapted to other countries.

1.2. Overview of the paper

We begin in this section with a brief general discussion of tax subsidies in the context of our analysis. Next, we review of some of the most recent and comprehensive reviews of subsidies to the oil industry, which is a major component of our broader category of preferential tax treatment related to motor-vehicle us. We omit comprehensive but relatively old studies (e.g., Cone et al., 1980; Heede et al., 1985) and poorly documented or derivative studies (e.g., Management Information Services, 1993; Domestic Fuels Alliance, 1995; Friends of the Earth et al., 2002, 2003; Wahl, 1996; ICTA, 1998).[4] Readers interested in a broader review should see Delucchi and Murphy (2006), Koplow (2004), and especially Koplow and Dernbach (2001).[5]

After the literature review we discuss conceptual issues concerning the estimation of tax subsidies and the relationship between tax subsidies and social welfare. We then develop our own estimates of the subsidies related to four types of taxes:

(i) corporate income taxes in motor-vehicle and motor-fuel industries;
(ii) sales taxes on motor vehicles, motor fuel, and motor-vehicle services;
(iii) property taxes on roadways; and
(iv) personal income taxes not paid on the value of employer-provided free parking as a fringe benefit.

Whereas previous estimates of corporate-income-tax subsidies have been built piecemeal, tax provision by tax provision, we offer an alternative way to estimate corporate-income-tax subsidies, based on the difference between the actual income tax rate in the relevant motor-vehicle and motor-fuel industries and the average rate for all industries. Similarly, we estimate the sales-tax subsidy related to motor-vehicle use by comparing sales tax rates in the relevant industries with different estimates of average, overall sales tax rates. Then, we estimate the property-tax subsidy as the amount of property taxes foregone on the public road system. Next, we estimate the personal-income-tax subsidy as the amount of personal income tax foregone by exempting the value of employer-provided parking from personal income. Finally, we summarize our use of estimates of tax subsidies and put them in perspective by comparing them with the gasoline tax and with total user payments for government-provided motor-vehicle infrastructure and services.

1.3. Tax subsidies

Tax policy does not treat every individual and every business the same way. For example, certain products are exempt from sales tax, and some mineral production activities are allowed special deductions that reduce income tax liabilities. As a result of this differential tax treatment, some people and businesses pay less (or more) tax, both in total and per unit of income, than do others. If one defines a "baseline" or "standard" tax rate on particular entities, one can then calculate the difference between the taxes actually paid by the entity and the taxes that would have been paid had the entity been taxed at this standard or baseline rate.[6] This difference between actual tax payments

[3]This of course does not imply that the other factors, such as externalities and government expenditures, do not distort prices and outcomes or create market advantages. Rather, factors like government outlays or externalities simply do not fit our strict economic definition of a subsidy.

[4]Note that all of the reports we review here are from government agencies or advocacy groups rather than the scholarly literature [although the work of Koplow (1993) and Koplow and Martin (1998) is used in the journal article by Koplow and Dernbach (2001)].

[5]In addition, Earth Track (2006) hosts a web site (www.earthtrack.net) devoted to tracking government intervention in energy and related markets, and provides some data on intervention in oil markets.

[6]This approach, of course, makes no judgment on the merits of the tax, such as whether the tax is fair, efficient, appropriate, etc. Instead, given that the tax does exist, this approach asks about the extent to which some entities are treated differently.

and payments under some alternative tax baseline generally is called a "tax subsidy" or "tax expenditure." We adopt this definition here.

Tax subsidies or expenditures do not entail a direct fiscal outlay—there is no check written. Rather, tax subsidies reduce government tax revenues due to "preferential" tax treatment in the form of deductions, credits, exemptions, or reduced tax rates. The Joint Committee on Taxation (JCT) of the US Congress (see www.house.gov/jct/) and the Whitehouse Office of Management and Budget (OMB) (see www.whitehouse.gov/omb/) independently provide annual estimates of federal tax expenditures based on data from the Internal Revenue Service (IRS). These estimates are calculated by finding the "difference between tax liability under current law and the tax liability that would result from a recomputation of tax without benefit of the tax expenditure provision. Taxpayer behavior is assumed to remain unchanged for tax expenditure purposes" (JCT, 1993, p. 8). As discussed next, these JCT and OMB estimates of tax expenditures have been used by other researchers to estimate tax subsidies in various contexts. Since our definition of "tax subsidy" is the same as JCT's and OMB's, but our method of estimation is different, it will be interesting to compare results from the two methods.

2. Literature review

The US Energy Information (EIA) of the Department of Energy, as well as Doug Koplow and colleagues, have conducted studies of subsidies to the energy industry in the US, including the oil industry. Also, there is at least one study of sales-tax subsidies related to oil use. These are reviewed next.

In response to a Congressional mandate, the EIA prepared a report covering federal energy subsidies, methods of valuing those subsidies, and a survey of the subsidies in place in 1992 (EIA, 1992). The EIA report defines tax subsidies broadly to include "most governmental actions which [have] as their function alteration of energy markets benefiting some group of producers or consumers" (EIA, 1992, p. ix). However, the EIA limits its analysis to programs whose primary purpose is to directly influence energy markets (contrast this with Koplow, 1993). Thus, because tax expenditures such as accelerated depreciation and investment tax credits benefit capital investment in general, not just the energy sector specifically, the EIA does not include these.[7] Using OMB data, the EIA estimates that federal energy tax expenditures attributable to all forms of energy were $2.1 billion in FY1992 (p. 26). Of this, $395 million was allocated to the oil industry. As a frame of reference, the EIA notes that tax expenditures for all energy-related industries was relatively small—less than 0.5% of all federal tax expenditures ($417 billion in FY1992).

However, the EIA also counts as a *negative* subsidy any excise taxes—mainly the portion of the federal excise tax on gasoline that is earmarked for deficit reduction—that go into the general fund. This $3.1 billion negative subsidy swamps all other subsidies and results in an overall negative subsidy to the oil industry specifically. While we agree with the EIA that any excise tax revenues that contribute to the general fund and are not used for a specific purpose may be counted as a negative tax subsidy, we also note that one may instead classify these excise taxes as user payments for motor vehicle infrastructure and services, which is what we do in Delucchi (2006a).

In 1999 and 2000, the EIA updated its 1992 study (EIA, 1999, 2000). The 1999 report examines federal programs that provide a specific financial benefit to producers of primary energy, and the 2000 report examines programs targeted at the energy transformation and end-use sectors. The 1999 and 2000 reports use a narrower definition of subsidy than did the 1992 report and include some tax expenditures not in the 1992 report, but otherwise the methods and data sources in the reports are similar. These reports estimate that the tax expenditures attributable to the oil industry in FY1999 were $263 million on a budget-outlay basis.

Koplow and colleagues also have prepared a series of reports on tax subsidies. One of the first, prepared for the Alliance to Save Energy, focuses on all federal interventions in the energy sector, not just tax expenditures (Koplow, 1993). The study is modeled after that of Heede et al. (1985), but is a more detailed and comprehensive analysis. It is based on the 1989 tax laws and accounts the effects of the 1986 Tax Reform Act. Koplow (1993) estimates that the total subsidy to the energy sector was $36 billion in 1989. Of this, tax benefits accounted for $18 billion, federal agency programs $15 billion, and two market interventions $3 billion. A "tax benefit" in Koplow (1993) is defined similar to a "tax expenditure" in the EIA as any tax provision that reduces the effective rate of taxation including tax credits, reductions in the tax rate, reductions in the tax basis, and alterations in the taxable entity. Koplow (1993) estimates that of the $18 billion in federal tax benefits to the energy sector, between $1.8 and $4.6 billion were attributable to the oil industry. After adjusting for inflation, the main difference between the EIA and Koplow estimates is that the latter includes programs that benefit the energy sector even if the program was not created solely for the benefit of that industry.

In 1998, Koplow and Martin (1998) performed an analysis similar to Koplow (1993), for Greenpeace, focusing on federal subsidies to the oil industry. They estimate that total government "subsidies" ranged between $5.2 and $11.9 billion in 1995, not including an additional $10.5–23.3 billion for defense of oil supplies. They estimate that federal tax expenditures account for $2–4 billion of this. Most of this was due to broad tax provisions that

[7]It is worth noting that these two items represent a significant percentage of the subsidy estimates in these other studies. In Koplow's (1993) study, these provisions represent between 62% and 79% of the total tax expenditures, and between 22% and 43% of the total subsidy to oil.

benefited others besides the oil industry; only a minor portion, $0.3–1.1 billion, was due to tax provisions targeted specifically to the oil industry. This shows that estimates of tax subsidies depend greatly on ultimately judgmental decisions about which broad tax provisions constitute "preferential treatment."

Loper (1994) is a companion to Koplow (1993) and is the only detailed study of state and local tax policies of which we are aware. Loper (1994) focuses on state and local tax policies that impact the 10 most widely used end-use energy products and services: petroleum, electricity and natural gas for residential, industrial and office use, and gasoline for highway use. The primary goal of the study is to estimate foregone state and local tax revenues, which he calls "net energy tax subsidies," on account of preferential tax treatment for energy. He estimates the net energy-tax subsidy on the basis of the difference between an actual "energy tax rate" and the general sales tax rate for each state.

Given this definition, Loper (1994) finds that 38 states under-taxed petroleum for highway use, 24 states under-taxed petroleum for residential use, 31 states under-taxed petroleum for industrial use, and 5 states under-taxed petroleum for office use. Loper estimates that nationwide, state and local taxes on end-use energy products are 30% lower than the average sales tax. He estimates that in 1991, this preferential treatment resulted in $7.4 billion in foregone tax revenue, $4.1 billion of which could be attributed to petroleum products generally and $2.7 billion to highway fuels specifically.

3. Preferential tax treatment for motor-vehicle use

As noted above, the major studies of tax subsidies have used estimates, data, or methods from the JCT or OMB. However, there are a number of well-known, but rarely adequately addressed, conceptual challenges with summing JCT or OMB estimates of tax expenditures and representing them in a meaningful way, such as the total costs to taxpayers, savings to taxpayers from eliminating these provisions, or the financial benefits to the industry. And perhaps more importantly, there is no straightforward way to relate estimates of tax expenditures to measures of social welfare.

A simple summation of piecemeal estimates of tax expenditures does not account properly for the interaction of joint changes in different tax provisions. For example, the JCT clearly states that "each tax expenditure is measured in isolation. If two or more items were to be eliminated simultaneously, the result of the combination of changes might produce a lesser or greater revenue than the sum of the amounts shown for each item separately" (JCT, 1989, p. 8). The EIA circumvents the issue by reporting their estimates before program interactions and commenting in a footnote that "technically, the program values are not additive because of their high degree of interaction. Actual totals with program interactions are not available but would probably differ substantially from those shown" (EIA, 1992, p. 23).

In addition, the JCT and OMB estimates are short-run and static, and make the strong assumption that firms and individuals would not change behavior in response to the elimination of a favorable tax position. Koplow (1993) acknowledges this problem, stating that it is difficult to determine how much of his estimated tax expenditures really could be saved, because "eliminating one subsidy might allow businesses and consumers to redirect their energy choices toward another subsidy" (p. 24). At the macro scale, tax expenditures that favor capital investment, such as accelerated depreciation and the investment tax credit, could impact aggregate income and economic growth. This is relevant to the estimate of the tax subsidies themselves because any changes in the projected growth rates for aggregate national income could alter the tax base against which tax expenditures are measured.

Finally, it is worth noting that even if the simple sum of individual tax subsidies were an accurate measure of aggregate tax subsidies, it still would not be a social cost of oil use or motor-vehicle use in the way that expenditures on the highway patrol or the environmental effects of oil spills are. This is because, even though tax subsidies distort prices and economic behavior, in any economy with multiple distortions, eliminating one distortion does not necessarily enhance efficiency [Davis and Whinston, 1965; Lipsey and Lancaster, 1956–57; Laffont, 1990; Sutherland (2001) makes this point specifically in response to Koplow and Martin (1998)]. Getting rid of tax subsidies in, say, the oil industry would not necessarily improve social welfare, and could in principle diminish it. The upshot, then, is that although tax expenditures may affect transportation choices and government budgets, their effect on economic efficiency is not straightforward and as a result one cannot automatically treat tax expenditures as if they were tantamount to, say, an external cost. A sophisticated general equilibrium analysis is required to determine the net effects of tax subsidies on economic welfare, but this is beyond the scope of this paper.

4. Our estimates of corporate income tax, sales tax, property tax, and personal income-tax subsidies

4.1. *Corporate income tax subsidies for the oil industry*

Previous estimates of corporate income-tax subsidies in the US identify individual "preferential" tax provisions, estimate the revenue losses owing to each provision, and then sum the losses to produce the total tax subsidy. In our view, this method has two shortcomings. First, it is piecemeal, and liable to inconsistency and incompleteness. It requires that the researcher decide upon a standard tax treatment and then examine every tax provision consistently with respect to that standard. Second, the estimates are derived from OMB and JCT figures, which, as discussed, do not sum to a meaningful total estimate.

An alternative approach is to estimate and compare overall tax rates—taxes actually paid as a fraction of some measure of income or value. This method has some advantages: it uses aggregated data on overall taxes, rather than estimates of individual provisions, and therefore will include the effect of all provisions, favorable or unfavorable (so that one is not liable to the charge of having omitted the countervailing effect of any unfavorable tax provisions), and it uses an intuitively appealing and straightforward basis of comparison: actual tax payments. There are, however, at least two disadvantages to this approach: (1) an aggregate analysis does not reveal potentially important details, and (2) as with the JCT and OMB tax-expenditure estimates, it is static and does not capture the effects of producer behavior as a result of changing tax provisions.

To develop our average tax estimates we use industry-level corporate federal tax and income data published by the Internal Revenue Service (IRS, 1994, 2003). Table 1 shows the full set of relevant data for income year 1991: net income, taxable income, income tax before credits, income tax after credits, and the motor vehicle-related fraction, for each industry group. With these data, we calculate the four different measures of income tax rates in Table 2. We do this for all industries, oil-related industries, motor vehicle related industries, other industries, and the motor fuel and motor vehicle-related industries.

The results of the 1991 analysis are illuminating. The income-tax liability of the oil industries, *before tax credits are taken*, and expressed as a fraction of net income (not taxable income), is actually relatively high—higher than the average for all other industries (31.1% versus 19.1% in 2000). However, the tax liability (tax before credits) expressed as a fraction of taxable income is similar in all industries: for every $100 of taxable income, most industries, including the oil industries, had a tax liability (tax before credits) of about $35. However, the oil industry had about $120 of net income for every $100 of taxable income, whereas all other industries had about $156 of net income for every $100 of taxable income (Table 1).

The relationships change when we consider income tax after credits—that is, income tax actually paid—which we think is the more appropriate basis of comparison. The last two columns of Table 2 reveal that the oil industry paid a relatively small amount of income tax after credits as a fraction of its income—considerably less than did other industries, on average. The after-credit income tax rate in the oil industry is about half of that in other industries (based on tax after credits divided by taxable income in Table 2).[8]

Finally, to estimate the corporate income-tax "subsidy" using our method, we estimate what the oil and vehicle industries would have paid in taxes if they had paid at the national average rate (of income tax after credits) for all *other* industries—making the strong (and obviously unrealistic) assumption that there would have been no change in industry behavior and pre-tax profits. Table 3 shows the results. If the oil industry had paid income tax after credits at the national average rate (for other industries) with respect to net or taxable income, in 1991 it would have paid $2.21–3.82 billion more in taxes after credit than it actually did (assuming, again, no other change in industry behavior). This is broadly consistent with Koplow's (1993) estimate of $4.5 billion in income tax subsidies to the oil industry in 1989 and Koplow and Martin's (1998) estimate of $2–4 billion in subsidies in 1995. For 2000, our estimated subsidy is $2.1–9.4 billion. The change in the motor-vehicle industry in both 1991 and 2000 is negligible.

To estimate the share of this "subsidy" attributable to motor-vehicle use, we limit the analysis to just the highway fuel share of oil industries plus motor-vehicle industries. The results are similar to those for the whole oil industry plus the motor-vehicle industry, given in the preceding paragraph, with the main exception being that the estimated tax subsidies are smaller because only a fraction of the oil industry (which receives the largest subsidies) is counted as being related to motor fuels (Table 1). Thus, we estimate that the corporate income-tax subsidies associated with the motor-vehicle and motor-fuel industries amounted to between $0.9 and $7.4 billion in 2000, with essentially all of this deriving from motor fuels (the oil industry) rather than from the motor-vehicle industry.

4.2. Sales tax subsidies related to the use of motor vehicles and motor fuel

Most states and some cities and counties assess a sales tax on retail transactions. Different rates apply to different products and to retail-sector versus wholesale-sector versus service-sector transactions. Generally, sales-tax subsidies related to motor vehicles, motor fuel, and motor-vehicle services arise because in some instances these simply are exempt from sales taxes. Consider sales of gasoline, which result in one of the largest sales-tax subsidies related to motor-vehicle use. In most states, gasoline is not subject to a general sales tax (Loper, 1994), presumably because gasoline has such large Federal and State excise taxes—about $0.38 per gallon ($0.10 per liter), on average (www.fhwa.dot.gov/policy/ohim/hs04/htm/mf121t)—that adding a sales tax on top of the excise tax would be seen as too burdensome. However, one could argue that because the excise tax and the sales tax have different functions—the excise tax is tantamount to a user fee, whereas the sales tax is meant to support general government functioning—sales of gasoline should not be exempt from the sales tax.

To estimate the sales tax subsidies related to motor-vehicle use using our method, one must decide the rate at which sales of motor vehicles, parts, and fuels *should have*

[8] Koplow and Martin (1998) estimate that income taxes actually paid by a selection of major energy companies (mostly oil companies) were 11.9% of taxable income in 1995, which is similar to our estimates.

Table 1
Corporate income taxes of active corporations in the US, income-year 1991 (billion current-year dollars, except as noted)

Industry group	Net income	Taxable income	Income tax before credits	Income tax after credits	MV-related fraction[a]
Agriculture, forestry, and fishing	3.77	1.88	0.52	0.47	0.00
Mining	7.72	4.50	1.81	1.04	
Oil and gas extraction	5.82	3.19	1.30	0.65	0.30
All other mining	1.90	1.31	0.51	0.40	0.00
Construction	14.97	6.66	2.01	1.72	
Heavy construction	3.58	2.34	0.80	0.60	0.38
Manufacturing	181.88	152.62	53.89	32.10	
Petroleum refining	23.75	22.61	7.93	2.83	0.78
Motor vehicles and equipment	1.12	0.69	0.28	0.20	1.00
All other manufacturing	157.01	129.33	45.69	29.08	0.00
Transportation and public utilities	53.59	47.11	17.14	15.79	0.00
Wholesale trade	29.10	16.27	5.34	4.65	
Petroleum and petroleum products	3.27	1.83	0.63	0.21	0.57
Motor vehicles and auto. equip.	1.91	1.40	0.50	0.49	1.00
All other wholesale trade	23.91	13.04	4.21	3.95	0.00
Retail trade	35.15	23.99	7.86	7.34	
Gasoline service stations	0.45	0.20	0.05	0.05	0.93
Motor vehicle dealers	1.70	0.56	0.16	0.15	0.99
All other retail trade	33.00	23.24	7.65	7.14	0.04
Finance, insurance and real estate	174.25	80.80	27.28	24.85	0.00
Services	n.e.	n.e.	n.e.	n.e.	
Auto repair and maintenance	1.25	0.58	0.18	0.15	1.00
Totals					
All industries	535.82	350.01	121.12	92.57	
Oil industries[b]	33.29	27.83	9.91	3.73	
Motor-vehicle industries[c]	5.99	3.23	1.12	1.00	
Oil and vehicle industries	39.28	31.06	11.03	4.73	
All other industries	496.54	318.95	110.09	87.83	
Motor-vehicle and motor-fuel related[d]	31.08	24.75	8.67	4.06	

Source: Internal Revenue Service (1994), except ''MV-related fraction'' (see footnote a). The taxes in this table include only the federal corporate income tax. They do not include any other federal taxes (e.g. excise taxes and other non-income taxes) or any state and local taxes. The data are for ''income year'' 1991, which refers to corporate accounting periods ending between 1 July 1991 and 30 June 1992; MV, motor vehicle.

[a]The fraction of activity in the industry group that is related to motor vehicles or motor fuels. Most of the values are from Delucchi (1996).

[b]Comprises oil and gas extraction, petroleum refining, petroleum and petroleum products, and gasoline service stations.

[c]Comprises motor vehicles and equipment (under manufacturing), motor vehicles and auto equipment (under wholesale trade), motor vehicle dealers, and automobile repair and maintenance.

[d]Equal to $\sum_I IT_I \times MVF_I$, where IT_I is the income or tax in industry group I (columns 2–5 of this table) and MVF_I is the fraction of IT_I that is related to motor vehicles or motor fuels (column 6).

been taxed, and compare that to the rate at which they actually *were* taxed. Table 4 presents comprehensive data on sales and sales taxes of motor vehicles and parts, motor fuel, and automotive services, at the retail and wholesale levels, and national data on sales and sales taxes in the entire retail, wholesale, and service sectors. With these data, we can make a number of comparisons of sales taxes actually paid on vehicles, parts, and fuel with the amount that would have been paid at different baseline tax rates—again assuming no changes in the behavior of economic agents. The last part of Table 4, from lines 26L to 30H, shows tax subsidies calculated with respect to different baseline tax rates, beginning with the highest rate (which results in the highest tax subsidies to motor vehicles and fuels) and ending with the lowest rate, which actually results in a negative tax subsidy (because the actual tax rate on motor vehicles and fuels is higher than the lowest baseline rate).

If the baseline rate is assumed to be state and local *posted* sales and use tax rates, then tax subsidies on items related to motor vehicle use are quite high, over $10 billion (lines 26L and 26H). This however does not seem a reasonable basis, because actual average tax rates clearly are well below the posted rates. Indeed, if one goes to the other extreme and assumes that the appropriate baseline tax rate is total national sales and use taxes divided by total final sales to consumers (which excludes wholesale sales), and compares this with actual average sales tax rate on motor vehicle related goods and services in the retail and service sectors, one finds the latter exceeds the former, with

Table 2
US corporate income-tax rates, income years 1991 and 2000

	Tax before credits/net income (%)	Tax before credits/taxable income (%)	Tax after credits/net income (%)	Tax after credits/taxable income (%)
Income year 1991[a]				
Oil industries	29.8	35.6	11.2	13.4
Motor vehicle industries	19.7	35.4	17.9	32.0
Oil and motor vehicle industries combined	28.5	35.6	12.0	15.0
Amount that is motor vehicle and motor fuel related	27.9	35.0	13.1	16.4
All industries	22.6	34.6	17.3	26.4
All other industries	22.2	34.5	17.7	27.5
Income year 2000[b]				
Oil industries	31.1	35.4	12.7	14.4
Motor vehicle industries	22.8	36.1	16.8	26.6
Oil and motor vehicle industries combined	28.6	35.6	13.9	17.3
Amount that is motor vehicle and motor fuel related	28.6	35.6	14.4	17.9
All industries	19.9	35.0	15.3	26.8
All other industries	19.1	34.9	15.4	28.1

[a]Calculated from IRS (1994) and summarized in Table 1.
[b]Calculated from IRS (2003).

Table 3
The effect on corporate income-tax payments of paying at the US average rate (for all other industries) rather than the actual rate, income years 1991 and 2000 (billion current-year dollars)

	Corporate-income tax rate basis[a]			
	Tax before credits/net income Δ Tax	Tax before credits/taxable income Δ Tax	Tax after credits/net income Δ Tax after credits	Tax after credits/taxable income Δ Tax after credits
Income year 1991				
Oil industries	−2.53	−0.31	2.15	3.93
Motor vehicle industries	0.21	−0.00	0.06	−0.11
Total oil and vehicle industries	−2.32	−0.31	2.21	3.82
Amount that is motor vehicle and motor fuel related	−1.78	−0.12	1.43	2.75
Income year 2000				
Oil industries	−9.35	−0.30	2.10	9.38
Motor vehicle industries	−1.23	−0.25	-0.47	0.33
Total oil and vehicle industries	−10.58	−0.55	1.63	9.71
Amount that is motor vehicle and motor fuel related	−8.54	−0.47	0.93	7.42

A negative number means a decrease in tax payments; i.e., that taxing at the average rate for all other industries would have decreased income tax payments by the amount shown.
[a]The rate basis used to calculate the effect of changing from the actual rate to the average rate for all other industries. These correspond to the rates calculated in Table 2.

the result that motor vehicle related items are overpaying sales and use taxes by several billion dollars (lines 30L and 30H). An intermediate case, in which one calculates the baseline tax rate for sales in the service, wholesale, and retail sectors that actually are subject to sales taxes (i.e., excluding in this case all "exempt" sales from the baseline, whereas in cases 30L and 30H exempt sales are included in the baseline), results in tax subsidies on motor vehicle and fuel-related sales on the order of $2 billion per year (lines 28L and 28H). (Note that the estimates of Table 4 indicate a sales-tax subsidy to motor fuel of over $2 billion in 1991, which is close to Loper's (1994) estimate.) If one considers just the retail sector, then the actual average rate on motor vehicles and fuels of about 2.5% is less than the national average rate of 3.6%, and the sales-tax subsidy is on the order of $5 billion in 1991 (lines 27L and 27H).

Table 4
Sales-tax subsidies related to the use of motor vehicles in the US (billion current-year dollars, except as noted)

	1990	1991	1994	2000	2004
Sales or receipts from[a]					
1. Retail of motor vehicles	297.50	285.60	407.31	557.86	670.05
2. Retail of auto parts and supplies	64.27	61.75	68.81	72.93	68.81
3. Retail of fuels and lubricants	122.83	121.76	126.29	176.90	213.05
4. Total retail sales (Line1 + Line2 + Line3)	484.59	469.11	602.41	807.69	951.91
5. Wholesale of motor vehicles and parts (SIC 501)	365.58	379.58	454.09	698.78	935.18
6. Automotive service sector (SIC 75)	73.72	71.54	91.29	139.83	185.41
7. Total motor vehicle related sales or receipts (Line4 + Line5 + Line6)	923.90	920.22	1,147.78	1,646.30	2,072.49
Sales tax as a fraction of[b]					
8. Retail sales of motor vehicles	0.025	0.026	0.024	0.025	0.024
9. Retail sales of auto parts and supplies	0.039	0.040	0.044	0.051	0.056
10. Retail sales of fuels and lubricants	0.017	0.018	0.019	0.020	0.022
11. All retail sales motor vehicles, parts, and fuels (Line15 × 1000–Line4)	0.025	0.026	0.025	0.026	0.026
12. Wholesale of motor vehicles and parts (SIC 501)	0.005	0.005	0.005	0.005	0.005
13. Automotive service receipts (SIC 75)	0.032	0.033	0.036	0.042	0.046
14. All motor vehicle related sales or receipts (Line18 × 1000–Line7)	0.018	0.018	0.018	0.018	0.018
General sales taxes from					
15. Retail sales of vehicles, parts, and fuel (Line1 × Line8 + Line2 × Line9 + Line3 × Line10)–1000	11.97	12.04	15.34	21.03	24.88
16. Wholesale of motor vehicles and parts (SIC 501) (Line5 × Line12−1000)	1.83	1.90	2.27	3.49	4.68
17. Automotive service sector (SIC 75) (Line6 × Line13−1000)	2.38	2.37	3.26	5.81	8.51
18. All motor vehicle related sales or receipts (Line15 + Line16 + Line17)	16.19	16.31	20.88	30.33	38.06
19. Total with low adjustment (Line18 × LA)[c]	16.19	16.31	20.88	30.33	38.06
20. Total with high adjustment (Line18 × HA)[c]	19.42	19.57	25.05	36.40	45.68
Baseline national sales tax rates					
21. Posted state and local average rate[d]	0.058	0.059	0.061	0.064	0.067
22. Sales tax fraction in retail sector[e]	0.036	0.036	0.037	0.039	0.041
23. Sales tax fraction in retail sector, wholesale sector, and service-sector SICs subject to sales tax[f]	0.020	0.020	0.021	0.023	0.025
24. Sales tax fraction in retail, wholesale, and service sectors[g]	0.017	0.016	0.017	0.018	0.019
25. Sales tax receipts as a fraction of final national sales[h]	0.021	0.021	0.020	0.022	0.020
Tax subsidies based on					
26L. Posted state and local average rates, low taxes (Line4 × Line21/1000–Line15 × LA)	16.32	15.62	21.25	31.06	39.01
26H. Posted state and local average rates, high taxes (Line4 × Line21/1000–Line15 × HA)	13.92	13.21	18.19	26.85	34.03
27L. Sales tax fraction in the retail sector (Line4 × Line22/1000–Line15) × LA	5.47	4.70	7.03	10.66	13.80
27H. Sales tax fraction in the retail sector (Line4 × Line22/1000–Line15) × HA	6.57	5.64	8.43	12.79	16.56
28L. Sales tax fraction in the retail sector, wholesale sector, and service-sector SICs subject to sales tax (Line7 × Line23/1000–Line18) × LA	2.08	1.64	2.84	7.24	12.93
28H. Sales tax fraction in the retail sector, wholesale sector, and service-sector SICs subject to sales tax (Line7 × Line23/1000–Line18) × HA	2.49	1.97	3.40	8.69	15.52
29L. Sales tax fraction in the retail, wholesale, and service sectors (Line7 × Line24/1000–Line18) × LA	−0.90	−1.30	−1.29	−0.53	0.72
29H. Sales tax fraction in the retail, wholesale, and service sectors (Line7 × Line24/1000–Line18) × HA	−1.08	−1.56	−1.55	-0.63	0.87
30L. Sales tax receipts as a fraction of final national sales of all goods and services, low taxes ([Line4 + Line6] × Line25/1000–[Line15 + Line17] × LA)[i]	−2.62	−3.30	−4.49	−6.43	−10.40
30H. Sales tax receipts as a fraction of final national sales of all goods and services, high taxes ([Line4 + Line6] × Line25/1000–[Line15 + Line17] × HA)[i]	−5.50	−6.18	−8.21	−11.79	−17.08

SIC, standard industrial classification, a scheme for classifying business establishments by the type of activity they are engaged in (Office of Management and Budget, 1987); LA, low adjustment factor (1.0); HA, high adjustment factor (1.2), where the adjustment factor accounts for the possibility of under-reporting of taxes to US Census (see Delucchi, 2006b). An "L" or an "H" after a row number (e.g., "28H") signifies the "low-adjustment" or the "high-adjustment" case.

[a]Our estimates of sales and receipts are based on data in the Bureau of the Census' *Census of Wholesale Trade*, *Census of Retail Trade*, and *Service Annual and Survey*, and on other sources. (See www.census.gov for recent Census' economic survey data.) For details see the discussion of Table 17-15 in Delucchi (2006b).

[b]The sales tax fraction—which is what the Bureau of the Census actually reports—is sales taxes actually paid divided by total pre-tax sales. Our estimates of sales tax fractions are based on data in the Bureau of the Census' *Census of Wholesale Trade*, *Census of Retail Trade*, and *Service Annual and Survey*, and on other sources. (See www.census.gov for recent Census' economic survey data.) For details see the discussion of Table 17-15 in Delucchi (2006b).

[c]As discussed in Delucchi (2006b), it is possible that respondents to the Census' surveys under-report sales taxes. In the "low" case, we assume that actual sales taxes are the same as reported sales taxes; in the high case, we assume that actual sales taxes are 20% higher than reported sales taxes.

[d]Loper (1994) states that the income-weighted national average state + local sales tax rate was about 6% in 1993. We assume that this has changed about 1%/year.

[e]Sales tax fractions in SICs 52–59 (the Retail Trade Division of the SIC) are from the sources used to estimate the values for lines 8–10 (see footnote b).

Table 4 (*Continued*)

[f]Equal to ($\sum_{SIC} SF_{SIC} \times TS_{SIC} / \sum_{SIC} TS_{SIC}$), where SF_{SIC} is the sales tax fraction in classification SIC and TS_{SIC} is total sales in classification SIC. The relevant SICs are 50 and 51 (the Wholesale Trade Division of the SIC), 52–59 (the Retail Trade Division), and 70 (except 704), 72, 75, 76, and 79 (the service-sector SICs for which sales taxes are reported). The data for the parameters SF_{SIC} and TS_{SIC} are from the same sources used to estimate the values for lines 1–3, 5, 6, 8–10, 12, and 13 of this table (see footnotes a and b).

[g]Same as line 23 (see table note f) except that for the term $\sum_{SIC} TS_{SIC}$ in the denominator the relevant service-sector SICs are all those from 70 to 89 not exempt from the Federal income tax.

[h]Equal to actual sales and general-use taxes received by state and local governments divided by final national sales to domestic purchasers in the US Sales tax receipts are from the Bureau of the Census state and local government finances (www.census.gov/govs/www/estimate.html). Final sales to domestic purchasers are from Table 1.4.5 of the NIPA accounts, "Relation of Gross Domestic Product, Gross Domestic Purchases, and Final Sales to Domestic Purchasers" (www.bea.gov/bea/dn/nipaweb/index.asp).

[i]Because this estimate of the tax subsidy is based on sales tax receipts as a fraction of final national sales, we do not include sales and taxes in the wholesale sector.

4.3. *Property-tax subsidy related to public roads*

One can argue that there is a property-tax subsidy related to roadways because no property tax is assessed on roadways, the land under roadways, or development opportunities foregone because of roadways.[9] Public roadways are exempt from property taxes because *all* public property is exempt from property tax, presumably on the grounds that taxing public property would just result in transferring funds from one governmental entity to another. Although this is a sensible reason, one can argue that failing to tax public roadways, while taxing privately held transportation right-of-ways, biases transportation choices and hence is unfair.[10]

The property-tax subsidy related to public roads is the amount of property-tax revenue that would be earned were public roads assessed some property tax. That amount, in turn, is a function of the assessed value and the average property tax rate. Now, normally, the assessed value is related to the market value of the land and improvements, which in turn typically is based on sales prices, but because public roads are not routinely sold, in this case the assessed value and market value would have to be based on something else. One can imagine at least three bases for assessing property taxes on public roads: (1) on the value of the land under the road right-of-way; (2) on the value of the land and the "improvements" (i.e., the road infrastructure itself); or (3) on the value of potential development displaced by the road right-of-way. We will estimate the property-tax subsidy for all three bases. Because the estimation based on the value of the potential development displaced (#3) is the most complex and includes most of the parameters needed to make estimates on the other two bases, we present our estimate of it (#3) in detail first.

[9]Parking lots at public institutions, such as public schools, also are exempt from property tax. However, we believe that the market value of these tax-exempt parking lots is less than the 10% of the market value of the entire public road infrastructure, and so do not attempt to estimate them here.

[10]One could argue that it is not sensible to attribute a property-tax subsidy to unpaved public roads in undeveloped rural areas, because such roads displace neither development nor other transportation options, but these roads account for such a small fraction of the total value of public roadways that they do not warant separate treatment.

The property tax foregone on potential development displaced by roads is a function of the assessed value of the potential development on land in road right-of-ways, the average property tax rate, and the extent to which roadways displace development rather than an alternative transportation infrastructure. The assessed value of potential development, in turn, is a function of the market value of the land currently in road right-of-ways, the relationship between land values and total property values, and the relationship between market values and assessed values. The market value of land in road right-of-ways is a function of the amount of developable land actually displaced by roadways (an amount which exceeds the roadbed itself) and the price of land under roads.

Table 5 shows the methods, parameters, and results of this way of estimating the property-tax subsidy (basis #3). We estimate that the value of the foregone property tax on development displaced by roads was about $6 billion in 1991 and $10 billion in 2000. However, there is considerable uncertainty in two parameters in the estimate: the market price of land taken up by road right-of-ways, and the extent to which the land in the right-of-way would have been put to a taxable use rather than a non-taxable use such as walkways or open space. As explained in the notes to Table 5, we assume that this latter factor, which we call the "net displacement factor," is 0.60 in urban areas and 0.70 in rural areas, which means that we assume that 30–40% of the land under road right-of-ways would have been put to nontaxable uses were the road not there. However, the amount of land that would have to be devoted to nontaxable uses such as walkways, bikeways, public transit, and open space could be much more or somewhat less than this, depending on how one imagines land use and transportation systems in the absence of roadways. Our estimate of the price of land (Delucchi, 2005), while informed by data, also is uncertain, and could be in error by 30% or more.

The property-tax subsidy estimated on the basis of the value of the land alone (basis #1) can be estimated with the parameters and methods of Table 5, with the assessed land value as a fraction of the total assessed value (line 3 of Table 5) and the net displacement factor (line 6 of Table 5) set equal to 1.0. The resultant estimated property-tax subsidies (line 8 of Table 5) are about one-third lower than

Table 5
Property tax subsidy related to potential development of land in road right-of-ways in the US

	1990	1991	1994	2000	2004
1. Market value of land currently in road right-of-ways (urban/rural) (10^9 current-year dollars)[a]	324/47	336/48	398/52	499/62	644/68
2. The assessed value of the land as a fraction of its market value[b]	0.40	0.40	0.40	0.40	0.40
3. The assessed value of the land as a fraction of the total assessed value of development (urban/rural)[c]	0.37/0.90	0.37/0.90	0.37/0.90	0.37/0.90	0.37/0.90
4. The assessed value of potential development on land in road right-of-ways (Line1 × Line2/Line3) (urban/rural)) (10^9 current-year dollars)	346/20	358/22	425/23	532/28	688/30
5. The average property tax rate (%)[d]	2.53	2.55	2.64	2.82	2.95
6. The net displacement factor (urban/rural)[e]	0.60/0.70	0.60/0.70	0.60/0.70	0.60/0.70	0.60/0.70
7. Total property tax subsidy (foregone property tax) (Line4 × Line5 × Line6) (urban/rural)) (10^9 current-year dollars)	5.2/0.4	5.5/0.4	6.7/0.4	9.0/0.5	12.2/0.6
8. Total property tax subsidy based on land-value only (line 3, line 6 = 1.0) (urban/rural) (10^9 current-year dollars)	3.3/0.5	3.4/0.5	4.2/0.6	5.6/0.7	7.6/0.8

[a]The market value of land currently in road right-of-ways is calculated as $\sum_R LADR_R \times PL_R$, where $LADR_R$ is the area of land displaced by roadway right-of-ways, by type of road R, and PL_R is the price of land devoted to roadways, by type of road R. The types of road are interstate freeway, other freeway, principal arterial, minor arterial, collector, and local road, with paved and unpaved roads treated separately (note that one-fourth of the total area is taken up by unpaved rural roads). $LADR_R$ and PL_R for 1991 are from Table 7-5 of Delucchi (2005), from which we estimate the following:

Parameter	Urban areas	Rural areas	Urban + rural
Land area taken up by paved and unpaved roads, 1991 (acres)	3,574,361	15,692,196	19,266,557
Average price of land under paved and unpaved roads, 1991 ($/ac)	93,923	3,085	19,937

For other years, we assume that PL_R increases 3% per year in nominal dollars, and that the area $LADR_R$ changes with the change in urban and rural lane-miles (lane-km) as reported by FHWA's *Highway Statistics* (www.fhwa.dot.gov/policy/ohpi/hss/index.htm)—a reasonable assumption, so long as the average width of a lane does not change.

[b]Delucchi (2006b) analyzes data from the 1982 *Census of Governments* (Bureau of the Census, 1984)—the last year for which data on the ratio of assessed value to sales price were collected (Hirsch, 2004)—and finds that the assessed value was about 38% of the market value. We assume that this value has remained the same since 1982.

[c]We 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?). We assume 0.90 for rural areas, because there are relatively few improvements to land (especially agricultural land) in rural areas. The Census has not published these data since the *1992 Census of Governments*, so we assume that the values estimated for 1991 apply to all years.

[d]The ratio of all property taxes paid to the assessed value of taxable property. Delucchi (2006b) uses data on assessed property values (Bureau of the Census, 1989; Bureau of the Census, 1994?) and property taxes paid (www.census.gov/govs/www/estimate.html) to estimate that this ratio was 2.42% in 1986 and 2.55% in 1991. We use the 1991 ratio for 1991, and then assume that the ratio changes 1.11% year (the rate of change between 1986 and 1991), because the Census has not published data on taxable property values since the *1992 Census of Governments*.

[e]The net displacement factor: for every foot of width of right-of-way, the fraction that displaces taxable land or development rather than an alternative form of (untaxed) transportation infrastructure, such as walkways. We 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. We assume that in rural areas less land would be devoted to public open space or circulation, and hence that NDF would be 0.70.

the subsidies based on the value of displaced development. Riedy (2007) uses a similar approach to estimate the foregone land taxes on urban roads in Australia. Assuming a land tax of 1.5% applied to the value of an estimated 0.066 million hectares of land under urban roads, he estimates the land taxes would be about AU$2.2 billion using 2003 data.

Finally, the property-tax subsidy estimated on the basis of the value the land plus improvements (basis #2) can be estimated by multiplying the value of the public road infrastructure ($1550 billion for paved roads + $34 billion for the land in unpaved roads in the US in 1991; Delucchi, 2005) by the assessed value/market value ratio (40% in 1991 [line 2 of Table 5]) and the property-tax rate (2.55% in 1991 [line 5 of Table 5]). The result is a foregone property tax of $16.2 billion in 1991, nearly three times higher than the amount estimated on the basis of the value of displaced development in 1991.

We use the preceding analysis to estimate low and high values of the property tax subsidy, taking as a starting point our estimate of the subsidy on the basis of the value of displaced development (basis #3) (line 7 of Table 5). As presented above, our analysis indicates that the property tax subsidy estimated on the basis of the value of the land under roadways (basis #1) is one-third lower than the subsidy based on the value of displaced development, and that subsidy estimated on the basis of the value of the land plus improvements (basis #2) is at least 2.5 times higher than the subsidy based on the value of displaced development. Therefore, in our final tally, we will assume that the low value of the property-tax subsidy is equal to line 7 of Table 5 multiplied by 0.67, and that the high value is equal to line 7 of Table 5 multiplied by 2.5. We believe that this range reflects the uncertainty in the estimates of line 7, Table 5 as well as the uncertainty due to using different bases of valuation.

4.4. Tax subsidy related to tax-exempt employer-paid parking

Many employers in the US provide free parking to their employees as a fringe benefit. However, the value of this free-parking fringe benefit is exempt from the employee's personal income tax (Shoup, 2005; Shoup and Willson, 1992). The Joint Committee on Taxation (JCT) (2007) considers this tax exemption to be a tax expenditure, although the JCT also notes that many if not most fringe benefits of employment—including employer-provided transit passess—are tax-exempt.

The free-parking income-tax subsidy—the amount of personal income tax foregone by exempting the free parking fringe benefit from personal income—can be calculated by multiplying the number of employer-provided tax-exempt parking spaces by the value of each space and the average marginal personal income tax rate. Shoup (2005) cites an estimate that "in 1995, the value of all tax-exempt employer-paid parking subsidies was estimated at $31.5 billion a year, while the marginal income tax rate for all taxpayers averaged 19 percent" (p. 52), which results in a tax subsidy of $6 billion in 1995. To estimate this income-tax subsidy in other years *Y*, we multiply the 1995 estimate ($6 billion) by the ratio of the producer price index (PPI) for "highway and street construction" for year *Y* to the PPI for 1995 (www.bls.gov/ppi/home.htm)[11] and by the ratio of total non-farm employment in year *Y* to total non-farm employment in 1995 (ftp://ftp.bls.gov/pub/suppl/empsit.ceseeb1.txt). (We assume that the average marginal income tax rate remains the same, 19%.) The results are shown in Table 6. Today, the income-tax exemption of the value of employer-provided free parking costs the federal government is on the order of $8 billion per year.

5. Summary and conclusion

5.1. Summary

We estimate that the corporate income-tax and sales-tax subsidy related to motor vehicles and motor fuels in the US, calculated as the difference between what tax payments actually were and what tax payments would have been at the average rate of other industries, was $0–16 billion in 2000. The property-tax subsidy may have been on the order of $6–24 billion, and the free-parking personal-income-tax subsidy another $7 billion. The total tax subsidy to motor-vehicle users in the US thus was $13–47 billion in 2000. Table 6 summarizes the estimates.

Table 6
Summary of our estimates of tax subsidies related to the use of motor vehicles in the US (billion current-year dollars)

Type of tax subsidy	1991		2000		2004	
	Low	High	Low	High	Low	High
Corporate income taxes	1	3	1	7	n.e.	n.e.
Sales taxes	−2	2	−1	9	1	16
Property taxes	4	15	6	24	9	32
Personal income taxes	5	5	7	7	8	8
Total	8	25	13	47	n.e.	n.e.

Source: For the corporate income-tax subsidy, the low is the "Tax After Credits/Net Income" basis, and the high is the "Tax After Credits/Taxable Income" basis, from Table 3. For the sales-tax subsidy, the low is line 29H of Table 4, and the high is line 28H. For the property-tax subsidy, the low is 67% of the total on line 7 of Table 5, and the high is 250%.

We estimate that the sales-tax subsidy and the property tax subsidy were significantly higher in 2004 than in 2000 (Table 6). We are unable to estimate the corporate income-tax subsidy 2004, but if we simply assume a range of $1–8 billion and then add this to the other estimates for 2004, the result is a range of $19–64 billion in 2004. To put this in perspective, if $19–64 billion per year in tax subsidies were to be recovered via a tax on motor fuel, the additional tax in the US would be $0.11–0.37 per gallon ($0.03–0.10 per liter) (based on 175 billion gallons of motor fuel taxed in the US in 2004 [www.fhwa.dot.gov/policy/ohim/hs04/htm/mf2.htm]), an appreciable increase. (If we exclude the most questionable component, the property-tax subsidy, the total might be in the range of $0.06 to at least $0.18 per gallon, or $0.02–0.05 per liter.) This estimate covers such a wide range because the different but equally valid tax baselines with respect to which the tax subsidy is calculated give quite different results.

We emphasize again that these tax subsidies do not necessarily represent a net reduction in social welfare, and hence do not have a straightforward application in analyses of the social cost of motor-vehicle use. However, estimates of tax subsidies are pertinent to studies of whether motor vehicle-users pay their "fair" share of the costs they occasion. With this in mind, we can consider our estimates of tax subsidies with respect to estimates of total user payments for government-provided motor vehicle infrastructure and services. Delucchi (2006a) estimates that these user payments total about $200–300 billion per year. Our estimated range of tax subsidies related to motor vehicle use, summarized in Table 6, thus is on the order of 10–20% of the total user payments. US tax subsidies, then, not only may be large in absolute terms, they also may be a non-trivial element in a complete accounting of motor vehicle user payments and costs.

[11] The PPI series for "other heavy construction" is similar.

5.2. Policy implications and conclusions

We conclude that motor-vehicle users do receive substantial tax subsidies, although the largest component, the property-tax subsidy, is very uncertain and arguably the least defensible conceptually. While one might be tempted to conclude from this that eliminating these substantial subsidies would substantially decrease the use of motor vehicles and motor fuels, one would have to consider how the subsidies interact with other taxes, whether subsidies on complements and substitutes for motor-vehicle use would be effected, how price-sensitive motor-vehicle use is, and so on, before drawing any firm conclusions about the effect of subsidies on motor-vehicle use. Absent a broader policy analysis, then, we cannot say much about the policy implications of our analysis in the US.

We can say, though, that the amount of the subsidy, and hence the magnitude of its effect, depends greatly on the tax baseline with respect to which the subsidy is estimated. Taking this to the extreme, one even may argue that the most reasonable tax baseline is current actual tax payments, in which case there are not any tax subsidies at all. (This is especially pertinent to the case of the property-tax subsidy related to public roads.) In any event, we have provided data and estimates that will allow readers to calculate the subsidies for whatever they deem to be reasonable tax baselines.

References

Bureau of the Census, 1984. 1982 Census of Governments, Volume 2, Taxable Property Values and Assessment—Sales Price Ratios, GC87(2). US Department of Commerce, Washington, DC.

Bureau of the Census, 1989. 1987 Census of Governments, Volume 2, Taxable Property Values, Number 1, Assessed Valuations for Local General Property Taxation GC87(2)-1. US Department of Commerce, Washington, DC, March.

Bureau of the Census, 1994. 1992 Census of Governments, Volume 2, Taxable Property Values, Number 1, Assessed Valuations for Local General Property Taxation, GC92(2)-1. US Department of Commerce, Washington, DC.

Clayton, M., 2007. US House Takes on Big Oil, Christian Science Monitor 〈www.csmonitor.com/2007/0118/p01s01-usec.html〉.

Cone, B.W., et al., 1980. An Analysis of Federal Incentives Used to Stimulate Energy Production—Revised, PNL-2410 REV II. Battelle Memorial Institute, Pacific Northwest Laboratory, Richland, WA, February.

Davis, O.A., Whinston, A.B., 1965. Welfare economics and the theory of the second best. Review of Economic Studies 32, 1–14.

Delucchi, M.A., 1996. The allocation of the social costs of motor vehicle use to six classes of motor vehicles, Report #10 in the series. The Annualized Cost of Motor Vehicle Use in the United States, Based on 1990–1991 Data, UCD-ITS-RR-96-3 (10). Institute of Transportation Studies, University of California, Davis 〈www.its.ucdavis.edu/people/faculty/delucchi〉.

Delucchi, M.A., 2000. Environmental externalities of motor vehicle use in the US. Journal of Transport Economics and Policy 34, 135–168.

Delucchi, M.A., 2005. Motor vehicle infrastructure and services provided by the public sector, Report #7 in the series. The Annualized Cost of Motor Vehicle Use in the United States, Based on 1990–1991 Data, UCD-ITS-RR-96-3 (7) rev. 2. Institute of Transportation Studies, University of California, Davis, August 〈www.its.ucdavis.edu/people/faculty/delucchi〉.

Delucchi, M.A., 2006a. Do motor vehicle users in the US pay their way? Transportation Research A 41, 982–1003.

Delucchi, M.A., 2006b. Tax and fee payments by motor vehicle users for the use of highways, fuels, and vehicles, Report #17 in the series. The Annualized Cost of Motor Vehicle Use in the United States, Based on 1990–1991 Data, UCD-ITS-RR-96-3 (17) rev. 1. Institute of Transportation Studies, University of California, Davis, August 〈www.its.ucdavis.edu/people/faculty/delucchi〉.

Delucchi, M.A., Murphy, J., 2006. Tax expenditures related to the production and consumption of motor fuels and motor vehicles, Report #18 in the series. The Annualized Cost of Motor Vehicle Use in the United States, Based on 1990–1991 Data, UCD-ITS-RR-96-3 (18) rev. 1. Institute of Transportation Studies, University of California, Davis 〈www.its.ucdavis.edu/people/faculty/delucchi〉.

Domestic Fuels Alliance, 1995. Petroleum Subsidies. Washington, DC.

Earthtrack, 2006. Web site devoted to tracking government interventions in energy and related markets, data on interventions in oil markets 〈www.earthtrack.net/earthtrack/interventions/index.asp〉 (accessed 31.11.06).

Energy Information Administration, 1999. Federal Financial Interventions and Subsidies in Energy Markets in 1999: Primary Energy, SR/OIAF/99-03. US Department of Energy, Washington, DC 〈http://tonto.eia.doe.gov/FTPROOT/service/oiaf9903.pdf〉 (accessed 31.11.06).

Energy Information Administration, 1992. Federal Energy Subsidies: Direct and Indirect Interventions in Energy Markets, SR/EMEU/92-02. US Department of Energy, Washington, DC 〈http://tonto.eia.doe.gov/FTPROOT/service/emeu9202.pdf〉 (accessed 31.11.06).

Energy Information Administration, 2000. Federal Financial Interventions and Subsidies in Energy Markets in 1999: Energy Transformation and End Use, SR/OIAF/2000-02. US Department of Energy, Washington, DC 〈http://tonto.eia.doe.gov/FTPROOT/service/oiaf0002.pdf〉 (accessed 31.11.06).

European Environment Agency, 2004. Energy Subsidies in the European Union: A Brief Overview, EEA Technical Report 1/2004, Copenhagen, Denmark 〈http://reports.eea.europa.eu/technical_report_2004_1/en/〉.

European Environment Agency, 2007. Size, structure and distribution of transport subsidies in Europe, EEA Technical Report 3/2007. Copenhagen, Denmark 〈http://reports.eea.europa.eu/technical_report_2007_3/en〉.

Friends of the Earth, et al., 2002. Running on Empty: How Environmentally Harmful Energy Subsidies Siphon Billions from Taxpayers, a Green Scissors Report 2002. Friends of the Earth, Washington, DC 〈www.greenscissors.org/publications/runningonempty.pdf〉.

Friends of the Earth, et al., 2003. Green Scissors 2003: Cutting Wasteful and Environmentally Harmful Spending. Friends of the Earth, Washington, DC 〈fwww.greenscissors.org/publications/gs2003.pdf〉.

Greene, D.L., Jones, D., Delucchi, M.A. (Eds.), 1997. Full Costs and Benefits of Transportation. Springer, Berlin, Germany.

Heede, H.R., Morgan, R.E., Ridley, S., 1985. The Hidden Costs of Energy. Center for Renewable Resources, Washington, DC.

Hirsch, D., 2004. Governments Division, Bureau of the Census, US Department of Commerce, Washington, DC, personal communication.

Internal Revenue Service, 1994. Statistics of Income, 1991 Corporation Income Tax Returns, Publication 16, US Government Printing Office, Washington, DC.

Internal Revenue Service, 2003. Statistics of Income, 2000 Corporation Income Tax Returns, Publication 16. US Government Printing Office, Washington, DC. Available from: 〈www.irs.gov/pubs/irs-soi/〉.

International Center for Technology Assessment (ICTA), 1998. The Real Price of Gasoline: An Analysis of the Hidden External Costs Consumers Pay to Fuel Their Automobiles. Washington, DC 〈www.icta.org/doc/RealPriceofGasoline.pdf〉.

Joint Committee on Taxation, 1989. Estimates of Federal Tax Expenditures for Fiscal Years 1990–1994, JCS-4-89. US Government Printing Office, Washington, DC.

Joint Committee on Taxation, 1993. Estimates of Federal Tax Expenditures for Fiscal Years 1994–1998, JCS-6-93. US Government Printing Office, Washington, DC ⟨www.house.gov/jct/s-6-93.pdf⟩.

Joint Committee on Taxation, 2007. Estimates of Federal Tax Expenditures for Fiscal Years 2007–2011, JCS-3-07. US Government Printing Office, Washington, DC ⟨http://www.house.gov/jct/s-3-07.pdf⟩.

Koplow, D., 1993. Federal Energy Subsidies, Energy, Environmental, and Fiscal Impacts. The Alliance to Save Energy, Washington, DC.

Koplow, D., 2004. Subsidies to energy industries. In: Cleveland, C. (Ed.), Encyclopedia of Energy, vol. 5. Elsevier Inc., The Netherlands, pp. 749–764.

Koplow, D., Dernbach, J., 2001. Federal fossil fuel subsidies and greenhouse gas emissions: a case study of increasing transparency for fiscal policy. Annual Review of Energy and Environment 26, 361–389.

Koplow, D., Martin, A., 1998. Fueling Global Warming, Federal Subsidies to Oil in the United States. Greenpeace, Washington, DC. ⟨www.greenpeace.org/raw/content/usa/press/reports/fueling-global-warming.pdf⟩ (accessed 31.11.06).

Laffont, J.J., 1990. Translated by J.P. Bonin and H. Bonin, Fundamentals of Public Economics. The MIT Press, Cambridge, MA.

Lipsey, R.G., Lancaster, R.K., 1956–1957. The general theory of the second best. Review of Economic Studies 24 (1), 11–33.

Loper, J.W., 1994. State and Local Taxation: Energy Policy by Accident. The Alliance to Save Energy, Washington, DC.

Management Information Services, Inc., 1993. Federal Government Subsidies and Incentives for US Energy Industries. Management Information Services, Inc., Washington, DC.

Murphy, J.J., Delucchi, M.A., 1998. A review of the literature on the social cost of motor vehicle use in the United States. Journal of Transportation and Statistics 1 (1), 15–42.

Office of Management and Budget, 1987. Standard Industrial Classification Manual 1987. Executive Office of the President, Washington, DC.

Riedy, C., 2007. Energy and Transport Subsidies in Australia, 2007 Update. Institute for Sustainable Futures, University of Technology Sydney, Sydney, Australia ⟨www.greenpeace.org/australia/resources/reports/climate-change/energy-and-transport-subsidies⟩.

Shoup, D., 2005. Parking cash out. Planning Advisory Service Report 532, American Planning Association, Chicago, IL.

Shoup, D.C., Willson, R.W., 1992. Employer-paid parking: the problem and proposed solutions. Transportation Quarterly 46 (2), 169–192.

Sutherland, R.J., 2001. 'Big oil' at the public trough? An examination of petroleum subsidies. Policy Analysis, No. 390. Cato Institute, Washington, DC, February 1, pp. 1–13 ⟨www.cato.org/pubs/pas/pa390.pdf⟩.

Wahl, J.B., 1996. Oil Slickers: How Petroleum Benefits at the Taxpayer's Expense. Institute for Local Self-reliance, Minneapolis, MN.

Waxman, H., 2006. US Representative from California. Interview with National Public Radio ⟨http://marketplace.publicradio.org/shows/2006/11/08/PM200611082.html⟩.