

Alternative Transportation Revenue Sources

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The concept of supply versus demand is clearly understood by every first-year economics student. That concept must be understood as it relates to petroleum-based fuels. Petroleum-based fuels power the economic engine of transportation. Research indicates that the current supply of petroleum-based fuel sources is finite, and that is commonly accepted. At the level of current demand, the defined supply may be consumed within the next 20 to 30 years. History also gives us some examples of the effects of supply shortages related to petroleum-based fuels. In the early 1970s the supply of fuel was artificially restricted by the world's petroleum-producing nations (the 1973 oil embargo) in an effort to increase the per-barrel cost of crude oil. The effects of this action can still be observed in the demographics of transportation today. The reduction in supply dramatically affected daily life in that the consumer/traveler had to plan trips around the ability to acquire fuel. Automotive producers were forced, as a result of consumer demands and legislative action, into rethinking design around fuel efficiency. Consumers had to adjust to the increased cost of fuel and the resulting effects not only on mobility of travel but cost of goods manufactured. Laws were enacted to require increased fuel efficiency and decreased emissions. In the late 1990s, supply was limited again in a temporary effort to increase the per-barrel price of crude oil. The limitation and duration were not as significant, but the effects were nonetheless impressive. The cost per gallon dramatically increased, resulting in short-term effects on mobility and other economic measures. As it relates to this discussion, the economic the-

ory of supply versus demand is very simple. As the supply of petroleum-based fuel is diminished, the demand will increase cost, reduce availability, and require alternative fuel options to maintain mobility and economic growth at present levels.

Fuel taxes provide 90 percent of the revenues deposited into the Federal Highway Trust Fund and are the primary revenue source for transportation financing in many states (1). According to professional consensus, the existing source of petroleum-based motor-fuel taxation will meet revenue demands for at least the next 20 to 30 years. During this period, technological advances in vehicle fuel mileage and alternative fuel types and changing transportation demographics will have an increasing negative effect on revenue collections resulting from petroleum-based fuel taxes, necessitating alternative sources of revenues to maintain and improve transportation infrastructure (2). Alternative methods of financing transportation costs must be considered now, and pricing systems must be developed and implemented in a structured approach to ensure revenue adequacy and stability, minimize tax evasion, and ensure equity among transportation users.

Brief summaries are given of alternative sources of transportation revenues that could be phased in over a period of time to replace revenues lost as the current method of tax revenues based on motor and diesel fuel decline or become obsolete. The fees are identified either as vehicle-related or as non-vehicle-related revenue sources. The vehicle-related revenue sources includes tolls, value pricing, licensing, vehicle miles of travel (VMT) fees, weight-distance fees, vehicle and parts sales

fees, vehicle property fees, alternative-fuel taxes, vehicle use fees, emission fees, and carbon or Btu taxes or ad valorem taxes on fuels and value-added fees on vehicles and vehicle parts. The non-vehicle-related revenue sources include leasing of airspace and right-of-way, public-private partnerships, private transportation facilities and privatization of rest areas, and road branding.

One approach to evaluating alternatives is provided by *NCHRP Report 377: Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements* (3). In that report a detailed, systematic approach is given to evaluate alternative transportation revenue sources by using a trade-off analysis. The revenue sources are evaluated on the basis of each source's ade-

quacy, simplicity and effectiveness, equity, economic efficiency, ease of implementation, and acceptability. While the sample analysis in the report contains general information and cannot be taken as conclusions for an actual study, a substantial amount of research has been conducted and could be used as a starting point that could be expanded in a more in-depth research project. Policy makers at federal, state, and local levels could use the results of such a research project to address alternative transportation revenue source issues. A portion of the summary of the analysis in the report, which compares current fuel taxes, VMT fees, value pricing, enhanced vehicle registration fees, and new-vehicle sales taxes, is included here as Table 1.

TABLE 1 Comparison of Selected Transportation Revenue Sources

| Criterion | Current Fuel Taxes | VMT Fees | Value Pricing | Enhanced Vehicle Registration Fee | New Vehicle Sales Tax |
|--|--|---|---|---|--|
| Consistency with a new approach | Partially | Fully | Partially | Not provided | Not provided |
| Adequacy and tax rate | Yes | Yes | Yes, if all roads are taxed | Yes, if rate is high enough | Yes, if rate is high enough |
| Point of taxation and incidence | Varies by state, depending on level that tax is implemented; few taxpayers | Vehicle owners, many taxpayers | Individual vehicle owners, many taxpayers | Vehicle owners, many taxpayers | New vehicle buyers, many taxpayers |
| Number of taxpayers | Few taxpayers | Equals number of vehicle owners | Probably equals number of vehicle owners | Equals number of vehicle owners | Equals number of buyers of new vehicles |
| Stability and predictability | Yes | Yes | Depends on availability of untaxed alternatives; should decline if conditions improve; not very predictable | Stable rate of growth | Substantial cyclical fluctuations |
| Responsiveness to inflation and road usage | Nonresponsive to inflation, unless indexed; partially responsive to VMT | Nonresponsive to inflation, unless indexed; fully responsive to VMT | Nonresponsive to inflation, unless indexed; partially responsive to VMT | Responsive to inflation if based on vehicle value | Responsive to inflation; non-responsive to VMT |
| Flexibility | Yes, can be adjusted | Yes, can be adjusted | Yes, can be adjusted | Moderate | Moderate |
| Appropriateness of dedication | Yes | Yes | Yes | Yes | Yes |
| Compliance cost (cost of paying) | Very low | Ongoing reporting expenses | Annual filing fee plus annual cost of transaction fees | No additional cost | No additional cost |

(continued on next page)

TABLE 1 (continued) Comparison of Selected Transportation Revenue Sources

| Criterion | Current Fuel Taxes | VMT Fees | Value Pricing | Enhanced Vehicle Registration Fee | New Vehicle Sales Tax |
|--|---|--|---|---|--|
| Additional compliance cost per vehicle | None | Cost of hub-ometer and vehicle inspection | Cost of transponder | None | None |
| Potential for tax evasion | Moderate to high: gasoline 3%–5%; diesel & gasohol 15%–25% | High: 10% (may be greater) | Low to high | Low | Low |
| Potential for tax avoidance | N/A | | Depends on extent of priced road network | | |
| Administrative costs (cost of collecting and issues) | Total of \$200 million/year for all states | Total of \$290 million/year for all states | \$437–\$874 million per year for all states | Part of current collection system | No additional costs |
| Additional administrative costs per vehicle | None | \$0.67 per year for enforcement | \$20–\$40/year | Part of current collection system (nominal) | Part of current collection system (nominal) |
| Equity by vehicle class | May or may not be proportional to vehicle class cost responsibility | Can be set to vehicle class cost responsibility per mile | High if rates differ by class, low otherwise | Cannot be set to vehicle class cost responsibility per mile because the fee is a fixed cost | High, if rates vary by vehicle class based on cost allocation; low if based on vehicle price |
| Equity by income group | Somewhat higher proportion of income spent by lower-income groups | VMT fees slightly less incident on lower-income groups than fuel taxes | Low, if alternative travel time/route not available | High, if based on vehicle price; low, if ad valorem tax (flat fee is regressive) | High, if % of vehicle price; low, if flat fee or by ad valorem tax |
| Equity by geography | Dependent on highway cost allocation results | Dependent on highway cost allocation results | If all roads are taxed, rural travelers facing low congestion are unlikely to pay full share of highway costs | Dependent on geographic distribution of vehicles | Cannot assess |
| Relationship to economic efficiency | Partially promotes economic efficiency | Partially promotes economic efficiency | Efficient if rate varies with level of congestion | No, fee is not affected by usage; basing fee on vehicle characteristics would be more efficient than a flat fee | No, tax discourages the purchase of new vehicles that are likely to be less polluting and safer; fee encourages inefficiency |
| Ease of implementation | Assumed high | Assumed low | Assumed very low | High | High |
| Political acceptability | High | Low | Low | High | Low to moderate |

VEHICLE-RELATED REVENUE SOURCES

The vehicle-related revenue sources are based on fees. The fees should be assessed for stability, adequacy, predictability, responsiveness to inflation and road usage, flexibility, appropriateness of dedication for transportation, point of taxation and number of taxpayers, compliance and administrative costs, potential for tax evasion, equity by income class, relationship to economic efficiency, ease of implementation, and political acceptability (3, pp. 70, 71, 73). Brief summaries of vehicle-related revenue sources that may be viable methods of funding transportation facilities are given below.

Tolling of Transportation Facilities

Widely practiced in the United States and around the world, tolling was used primarily on new facilities for which debt was issued for construction. Tolling is now being applied to existing highway facilities to leverage financing for improvements to those facilities as well as to construction of new facilities. Tolls can vary by the time of day and by vehicle type, although this method of toll management is seldom used today. While toll rates can be set at any level, high rates will result in avoidance by many potential users. The use of electronic toll collection technology could minimize many inconveniences caused by tollbooths. Toll fees are primarily responsive to usage and would not be responsive to inflation unless action is taken periodically by the tolling authority to adjust toll rates (4). Toll pricing has the advantage of being equitable among vehicle classes and can encourage efficient use of roads rather than road expansion. Until 1991, tolling was restricted on federal highways. It can now be used on federal highways with the exception of Interstates, although several existing Interstate segments have toll facilities, such as I-75 in Florida from Ft. Lauderdale to Naples, I-95 in New Hampshire, and the Chesapeake Bay Bridge-Tunnel on US-13.

Value Pricing

Creation of high-occupancy-toll (HOT) lanes as a part of new construction and the retrofitting of existing freeways that have high-occupancy-vehicle (HOV) lanes with HOT lanes could be used as a new revenue source. HOT lanes have the effect of both congestion management and generation of additional revenues. The tolling of HOV lanes introduces value-pricing concepts and allows the traveling public to make the choice of congestion-free commuting. Revenues from HOT lanes can be collected with today's electronic toll collection technology, license plate recognition systems, or conventional toll collection

procedures. This revenue-producing method encourages efficient use of road systems, with traffic reductions and increased vehicle speed in congested areas during peak periods and increases in traffic during nonpeak periods. The rates would be easy to adjust, according to the Energy Information Administration's Office of Coal, Nuclear, Electric, and Alternate Fuels. The cost of compliance will include not only the cost of paying the fees and the costs associated with recording and collecting the fees, but also on-vehicle and roadside equipment costs necessary to determine the fees. In addition, this revenue source would be volatile, since changes in congestion would affect the revenue stream and could affect the level of fees (5, pp. 4-29-4-31). However, value pricing is becoming popular internationally and has been implemented in parts of France, Norway, Singapore, and Canada, as well as in the United States. A comparison of value pricing with other revenue sources is provided in Table 1.

VMT Fees

A viable means of transportation revenue is to assess a fee for annual miles traveled. The technology exists today to measure travel accurately, as is currently done in the trucking industry with hub-odometers. In the future other meters can be developed to measure VMT accurately. The fee would provide a stable rate of growth and could be responsive to inflation if it is indexed. The cost of administration and compliance would be more expensive than motor-fuel taxation, however. Underreporting of mileage may also occur if vehicle owners are required to report their mileage. Alternatives to metering vehicles include annual readings of the odometer during the vehicle registration period, use of smart cards, and mandatory implementation of transponders. Issues to be resolved using this method of revenue collection are trucking industry opposition, costs to implement monitoring systems, and fees proportionate to vehicle type and actual transportation system use. Costs associated with compliance and fee administration would be higher for VMT fees than for motor-fuel taxes because of the change in the point of taxation from motor-fuel suppliers to vehicle owners and the increase in enforcement costs relating to VMT, according to the Office of Coal, Nuclear, Electric, and Alternate Fuels. Table 1 provides a comparison of the characteristics of VMT fees and several other types of transportation-related fees.

Weight-Distance Fees

Weight-distance fees are a revenue source and a variation of the VMT fee. Such fees are mainly relegated to

the multi-axle trucking industry; expansion to all vehicles could be a new source of transportation revenue. Similar to VMT fees, vehicles would be assigned a category with a corresponding cost per mile driven. Factors weighted by contribution to congestion, deterioration caused to facilities, and involvement in highway accidents (resulting in increased congestion) would determine the actual cost per mile charged each vehicle category (5, pp. 4-26-4-28). A fee based on these factors would be an equitable revenue stream.

New-Vehicle and Parts Sales Taxes

Some states levy a sales tax on vehicles at the time of vehicle registration. The proceeds from these taxes, which are responsive to inflation, could be dedicated to transportation purposes. The fee could have substantial cyclical fluctuations, however. The sales tax revenues on new vehicles are directly related to the economy, while the sales tax revenues on parts would be inversely related to the economy. The cost of compliance would be minimal. States currently collecting these fees as general sales tax but not using the fees solely for transportation may redirect them to transportation. That would require revision to existing legislation and may require a new source to replace funds formerly used for general-revenue purposes. Table 1 provides a comparison of the characteristics of new-vehicle sales taxes and several other types of transportation-related fees. A sales tax on vehicle parts with the proceeds to be used for transportation purposes could also generate additional transportation revenues.

Vehicle Property Fees

Vehicle property fees, similar to real property taxes, are personal property taxes based on millage rates that are applied to the value of the motor vehicles, taking depreciation into account (i.e., NAPA Blue Book values). The fees could be collected annually at the time of vehicle registration. Although the tax would be relatively easy to apply, it does not properly reflect transportation system usage, since it is value based (6, Appendix, p. b). This type of fee may be difficult to implement, especially if registration fees and license fees are currently collected. Vehicle property fees are currently collected in Kansas.

Alternative-Fuels Taxes

Alternative-fuel vehicle (AFV) use is growing at an average annual rate of 23 percent (7). Growth has been

encouraged through the Alternative Motor Fuels Act of 1988, the Clean Air Act Amendments of 1990, and the Energy Policy Act of 1992. As use of petroleum-based fuels declines and is offset to a degree by consumption of alternative-fuel sources, the current philosophy of subsidies and reduced tax rates for alternative fuels should be addressed. Restructuring the taxation of alternative fuels may offset a significant portion of the eventual decline in petroleum-based motor-fuel tax collections. Existing inefficiencies in mileage and additional costs of AFVs may be reduced as technology is focused on alternative fuels as a viable energy source. The tax structure for liquid alternative fuels (methanol, ethanol, and liquid petroleum gases) would be similar to the current taxation of petroleum-based fuels and would be relatively easy to implement since they are delivered to consumers in a manner similar to petroleum-based fuel. The tax structure for other alternative fuels such as natural gas and electricity would require a new tax structure.

Enhanced Vehicle Registration Fees

Vehicle registration fees generally are a flat fee or are based on vehicle price or weight. The fee may be reviewed for its responsiveness to inflation, equity among income classes, and adequacy, resulting in an enhanced vehicle registration fee. If the fee is based on current price, then it is responsive to inflation and is not regressive. If a flat fee is applied, it is recommended that the fee be indexed to inflation to eliminate erosion of its value. Vehicle registration fees are levied at the time a vehicle is purchased and, typically, annually with a clarification on the vehicle tag. Fees paid at these times are easy to implement and enforce and are not easily evaded. Table 1 provides a comparison of the characteristics of enhanced vehicle registration fees and several other types of transportation-related fees.

Vehicle Use Fees

Currently, vehicle use fees are levied by the federal government on trucks with gross vehicle weights or gross combination weights exceeding 25 000 kg (55,000 lb) and have been applied to other vehicles in the past. Vehicle use taxes were applied to automobiles for seven or fewer passengers between January 1, 1919, and June 30, 1926, and to all vehicles between February 1, 1942, and June 30, 1946. The federal government could expand this fee to include light vehicles again. It would be a stable revenue source and could be indexed for inflation. These fees may be based on weight, value, or other variables. Vehicle use fees differ from VMT fees

and weight-distance fees because the latter fees factor in distance in the calculation to determine the fee. Since the vehicle use fee does not take into consideration the distance traveled, the fees are easier to implement and enforce and are not easily evaded (5, pp. 4-6-4-15).

Emission Fees

An annual emission fee on vehicles can be based on a vehicle's emission characteristics or on a combination of a vehicle's emission characteristics and miles of travel. However, this would not be a stable revenue source because of the continued tightening of emission standards on vehicles.

Carbon or Btu Tax or Ad Valorem Tax on Fuels

These taxes would be based on carbon or energy content or the value of the fuels used and would be applied to all uses of the fuels, including transportation and heating. The Clinton administration proposed this type of taxation in 1993, but none of the proceeds from the collections were going to be deposited into the transportation trust fund accounts. This type of tax does not reflect cost responsibility, and diversions from transportation could be a potential problem (5, pp. 4-38-4-39).

NON-VEHICLE-RELATED REVENUE SOURCES

A number of transportation financing options that are not vehicle related are also available to supplement, but not replace, vehicle-related fees. These fees include leasing of airspace and right-of-way, contributions from public-private partnerships, various privatization arrangements, and road branding. Brief summaries of non-vehicle-related revenue structures that may be viable funding sources for transportation are given here.

Leasing of Airspace and Right-of-Way

This is a new area under consideration across the country for items such as fiber-optic cables, cell-phone towers, and possibly even use of airspace over the existing right-of-way for buildings or other facilities. The potential sources of revenue in these areas could be significant, but they can vary considerably from roadway to roadway. The major advantage is adding revenues to the transportation program by using existing transportation assets. A disadvantage includes developing a new program that would raise major issues associated with setting fair rules for competition, soliciting and

evaluating proposals, and managing and administering the various programs that may be developed (8).

Public-Private Partnerships

Interest in public-private partnerships is growing, and they are generating resources for transportation infrastructure, particularly in areas exhibiting significant growth. Transportation agencies within a state can work with local developers to form partnerships to add and improve transportation facilities to accommodate future private developments. Funding via these partnerships takes many forms, including special taxing districts, land or cash donations, impact fees, and other arrangements.

Private Transportation Facilities

Private ventures may propose to build, operate, and manage transportation facilities or operate and manage leased transportation facilities built with public funds. There are many variations of private transportation facility ownership and operations, including build-own-operate-transfer, build-operate-transfer, and build-transfer-operate types of projects. Nonprofit and private corporations have been established that develop and implement toll roads and bridges, and they have been given specific tools, including the ability to issue tax-exempt revenue bonds. These corporations perform the same functions as do expressway and bridge authorities. This type of arrangement should be considered a source of capital assets and not an additional source of cash for highway fund use. These facilities may address capacity issues and allow transportation agencies to direct traditional funding sources to other transportation needs.

Privatization of Interstate Rest Areas

Leasing rest stop areas could bring additional revenues for transportation. Currently there are federal and state laws that prohibit leasing Interstate rest areas. It might be extremely difficult to pass legislation, especially federal legislation, to allow leasing of concessions at rest areas because of opposition of service station and restaurant owners located at existing interchanges. Legislative action by Congress would be required, and security might be a problem.

Road Branding

Road branding would allow segments of roadway to be named for individuals or businesses willing to pay a fee

for the privilege, much like stadium naming rights. Proceeds from the fee could be dedicated to transportation purposes. Establishment of the fee would require legislative action (8).

FUTURE ACTION

There is a need for additional research into alternative revenue sources. A work group composed of federal, state, and local officials should be established to conduct in-depth research on the current fees and fee structures, the positive and negative effects of recent and proposed technological advances relating to highway transportation, and the methodology to use for implementing alternative revenue sources. Current and proposed revenue sources will need to be reviewed to determine the following:

- The adequacy of the proceeds from the fees,
- The stability of receipts,
- The fees' responsiveness to inflation and usage,
- Points of taxation,
- Administrative and compliance costs,
- Potential for tax evasion and avoidance,
- Costs associated with minimizing tax evasion,
- The equity of each tax geographically and between income groups and vehicle classes,
- Political acceptability,
- Whether the sources promote economic efficiency,
- Appropriateness to dedicate to transportation trust funds, and
- The ease of implementing the fees.

The work group may also consider developing methods to implement new or enhanced revenue sources based on the effect of the technological changes and other indicators reflecting the need for additional dedicated transportation revenue sources. The work group's findings should be submitted for review by government representatives as steps in the project are achieved, and they should be implemented as needed on the basis of a suggested plan developed by the work group and reviewed by the government representatives.

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