NCHRP
REPORT 623

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Identifying and Quantifying Rates of State Motor Fuel Tax Evasion

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

TRANSPORTATION RESEARCH BOARD 2008 EXECUTIVE COMMITTEE*

OFFICERS

CHAIR: **Debra L. Miller,** *Secretary, Kansas DOT, Topeka*
VICE CHAIR: **Adib K. Kanafani,** *Cahill Professor of Civil Engineering, University of California, Berkeley*
EXECUTIVE DIRECTOR: **Robert E. Skinner, Jr.,** *Transportation Research Board*

MEMBERS

J. Barry Barker, *Executive Director, Transit Authority of River City, Louisville, KY*
Allen D. Biehler, *Secretary, Pennsylvania DOT, Harrisburg*
John D. Bowe, *President, Americas Region, APL Limited, Oakland, CA*
Larry L. Brown, Sr., *Executive Director, Mississippi DOT, Jackson*
Deborah H. Butler, *Executive Vice President, Planning, and CIO, Norfolk Southern Corporation, Norfolk, VA*
William A.V. Clark, *Professor, Department of Geography, University of California, Los Angeles*
David S. Ekern, *Commissioner, Virginia DOT, Richmond*
Nicholas J. Garber, *Henry L. Kinnier Professor, Department of Civil Engineering, University of Virginia, Charlottesville*
Jeffrey W. Hamiel, *Executive Director, Metropolitan Airports Commission, Minneapolis, MN*
Edward A. (Ned) Helme, *President, Center for Clean Air Policy, Washington, DC*
Will Kempton, *Director, California DOT, Sacramento*
Susan Martinovich, *Director, Nevada DOT, Carson City*
Michael D. Meyer, *Professor, School of Civil and Environmental Engineering, Georgia Institute of Technology, Atlanta*
Michael R. Morris, *Director of Transportation, North Central Texas Council of Governments, Arlington*
Neil J. Pedersen, *Administrator, Maryland State Highway Administration, Baltimore*
Pete K. Rahn, *Director, Missouri DOT, Jefferson City*
Sandra Rosenbloom, *Professor of Planning, University of Arizona, Tucson*
Tracy L. Rosser, *Vice President, Corporate Traffic, Wal-Mart Stores, Inc., Bentonville, AR*
Rosa Clausell Rountree, *Executive Director, Georgia State Road and Tollway Authority, Atlanta*
Henry G. (Gerry) Schwartz, Jr., *Chairman (retired), Jacobs/Sverdrup Civil, Inc., St. Louis, MO*
C. Michael Walton, *Ernest H. Cockrell Centennial Chair in Engineering, University of Texas, Austin*
Linda S. Watson, *CEO, LYNX–Central Florida Regional Transportation Authority, Orlando*
Steve Williams, *Chairman and CEO, Maverick Transportation, Inc., Little Rock, AR*

EX OFFICIO MEMBERS

Thad Allen (Adm., U.S. Coast Guard), *Commandant, U.S. Coast Guard, Washington, DC*
Joseph H. Boardman, *Federal Railroad Administrator, U.S.DOT*
Rebecca M. Brewster, *President and COO, American Transportation Research Institute, Smyrna, GA*
Paul R. Brubaker, *Research and Innovative Technology Administrator, U.S.DOT*
George Bugliarello, *Chancellor, Polytechnic University of New York, Brooklyn, and Foreign Secretary, National Academy of Engineering, Washington, DC*
Sean T. Connaughton, *Maritime Administrator, U.S.DOT*
LeRoy Gishi, *Chief, Division of Transportation, Bureau of Indian Affairs, U.S. Department of the Interior, Washington, DC*
Edward R. Hamberger, *President and CEO, Association of American Railroads, Washington, DC*
John H. Hill, *Federal Motor Carrier Safety Administrator, U.S.DOT*
John C. Horsley, *Executive Director, American Association of State Highway and Transportation Officials, Washington, DC*
Carl T. Johnson, *Pipeline and Hazardous Materials Safety Administrator, U.S.DOT*
J. Edward Johnson, *Director, Applied Science Directorate, National Aeronautics and Space Administration, John C. Stennis Space Center, MS*
David Kelly, *Acting Administrator, National Highway Traffic Safety Administration, U.S.DOT*
Thomas J. Madison, Jr., *Administrator, Federal Highway Administration, U.S.DOT*
William W. Millar, *President, American Public Transportation Association, Washington, DC*
James S. Simpson, *Federal Transit Administrator, U.S.DOT*
Robert A. Sturgell, *Acting Administrator, Federal Aviation Administration, U.S.DOT*
Robert L. Van Antwerp (Lt. Gen., U.S. Army), *Chief of Engineers and Commanding General, U.S. Army Corps of Engineers, Washington, DC*

*Membership as of October 2008.

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP REPORT 623

Identifying and Quantifying Rates of State Motor Fuel Tax Evasion

Mark Weimar
BATTELLE
Richland, Washington

Patrick Balducci
Eihab Fathelrahman
Susan Whitmore
BATTELLE
Portland, Oregon

Anthony Rufolo
PORTLAND STATE UNIVERSITY
Portland, Oregon

Subject Areas
Planning and Administration

Research sponsored by the American Association of State Highway and Transportation Officials
in cooperation with the Federal Highway Administration

TRANSPORTATION RESEARCH BOARD

WASHINGTON, D.C.
2008
www.TRB.org

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Systematic, well-designed research provides the most effective approach to the solution of many problems facing highway administrators and engineers. Often, highway problems are of local interest and can best be studied by highway departments individually or in cooperation with their state universities and others. However, the accelerating growth of highway transportation develops increasingly complex problems of wide interest to highway authorities. These problems are best studied through a coordinated program of cooperative research.

In recognition of these needs, the highway administrators of the American Association of State Highway and Transportation Officials initiated in 1962 an objective national highway research program employing modern scientific techniques. This program is supported on a continuing basis by funds from participating member states of the Association and it receives the full cooperation and support of the Federal Highway Administration, United States Department of Transportation.

The Transportation Research Board of the National Academies was requested by the Association to administer the research program because of the Board's recognized objectivity and understanding of modern research practices. The Board is uniquely suited for this purpose as it maintains an extensive committee structure from which authorities on any highway transportation subject may be drawn; it possesses avenues of communications and cooperation with federal, state and local governmental agencies, universities, and industry; its relationship to the National Research Council is an insurance of objectivity; it maintains a full-time research correlation staff of specialists in highway transportation matters to bring the findings of research directly to those who are in a position to use them.

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the National Research Council and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Research Council and the Transportation Research Board.

The needs for highway research are many, and the National Cooperative Highway Research Program can make significant contributions to the solution of highway transportation problems of mutual concern to many responsible groups. The program, however, is intended to complement rather than to substitute for or duplicate other highway research programs.

NCHRP REPORT 623

Project 19-06
ISSN 0077-5614
ISBN: 978-0-309-11755-5
Library of Congress Control Number 2008938645

COPYRIGHT PERMISSION

NOTICE

The project that is the subject of this report was a part of the National Cooperative Highway Research Program conducted by the Transportation Research Board with the approval of the Governing Board of the National Research Council. Such approval reflects the Governing Board's judgment that the program concerned is of national importance and appropriate with respect to both the purposes and resources of the National Research Council.

The members of the technical committee selected to monitor this project and to review this report were chosen for recognized scholarly competence and with due consideration for the balance of disciplines appropriate to the project. The opinions and conclusions expressed or implied are those of the research agency that performed the research, and, while they have been accepted as appropriate by the technical committee, they are not necessarily those of the Transportation Research Board, the National Research Council, the American Association of State Highway and Transportation Officials, or the Federal Highway Administration, U.S. Department of Transportation.

Each report is reviewed and accepted for publication by the technical committee according to procedures established and monitored by the Transportation Research Board Executive Committee and the Governing Board of the National Research Council.

The Transportation Research Board of the National Academies, the National Research Council, the Federal Highway Administration, the American Association of State Highway and Transportation Officials, and the individual states participating in the National Cooperative Highway Research Program do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to the object of this report.

Published reports of the

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

are available from:

Transportation Research Board
Business Office
500 Fifth Street, NW
Washington, DC 20001

and can be ordered through the Internet at:

http://www.national-academies.org/trb/bookstore

Printed in the United States of America

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. On the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Charles M. Vest is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, on its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both the Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Charles M. Vest are chair and vice chair, respectively, of the National Research Council.

The **Transportation Research Board** is one of six major divisions of the National Research Council. The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied activities annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation. **www.TRB.org**

www.national-academies.org

CRP STAFF FOR NCHRP REPORT 623

Christopher W. Jenks, Director, Cooperative Research Programs
Crawford F. Jencks, Deputy Director, Cooperative Research Programs
Andrew C. Lemer, Senior Program Officer
Eileen P. Delaney, Director of Publications
Margaret B. Hagood, Editor

NCHRP PROJECT 19-06 PANEL
Field of Administration—Area of Finance

Debra A. Hillmer, *South Dakota Department of Revenue, Pierre, SD* (Chair)
Robert A. Turner, *Montana DOT, Helena, MT*
Cindy Anders-Robb, *Federation of Tax Administrators, Cheyenne, WY*
Ron Hagquist, *Texas DOT, Austin, TX*
J. Chris McAdams, *North Carolina DOT, Raleigh, NC*
B. Starr McMullen, *Oregon State University, Corvallis, OR*
Ashley Mixson, III, *Frankfort, KY*
Joe O'Gorman, *State of New Jersey, Trenton, NJ*
Robert Slaughter, *National Petrochemical & Refiners Association, Washington, DC*
Anne Price Warhola, *American Petroleum Institute, Washington, DC*
Martine A. Micozzi, *TRB Liaison*

AUTHOR ACKNOWLEDGMENTS

The research documented in this report was performed under NCHRP Project 19-06 by Battelle, with Portland State University acting as a subcontractor.

Dr. Mark Weimar of Battelle managed the project and was the principal author of Chapter 5. Patrick Balducci of Battelle was the principal author of Chapters 3, 4, and 6 and a major contributor to Chapters 1, 2, and 5. Susan Whitmore of Battelle was the principal author of Chapter 1 and a major contributor to Chapters 2, 3, and 4. Dr. Anthony Rufolo of Portland State University was the principal author of Chapter 2, was responsible for conducting extensive interviews with tax administrators and industry representatives, and served in an advisory capacity in the development of the methodology presented in Chapter 5.

Other contributors to the project included Eihab Fathelrahman of Battelle (Chapter 5), Katie Cort of Battelle (Chapter 5) and Chris Monsere of Portland State University (Chapter 2).

The authors wish to thank the tax administrators and industry experts who were interviewed for this study. The authors also wish to thank the NCHRP 19-06 Topic Panel, chaired by Debra Hillmer, for the thoughtful guidance they provided in support of this project.

FOREWORD

By Andrew C. Lemer
Staff Officer
Transportation Research Board

This report presents the results of a study of state motor fuel tax evasion. The study was intended to provide states with a methodological approach to examine and reliably quantify state motor fuel tax evasion rates and support agency efforts to reduce differences between total fuel tax liability and actual tax collections. While state agencies' unwillingness to make data available for the study limited the research team's ability to achieve fully the project's objectives, the report presents a comprehensive review of the literature on fuel tax evasion, assesses characteristics of state collection and enforcement practices, and identifies how these characteristics have traditionally correlated with certain types of evasion. The report also describes methods that could be used by states seeking to measure motor fuel tax evasion. The report will be useful to state government officials and others responsible for managing fuel tax collection and enforcement programs, researchers, and others concerned with fuel tax evasion and its curtailment.

Revenues from motor fuel are used primarily to support the states' transportation systems. In these times of large state budgetary deficits and shortfalls of revenues compared with needs for highway funds, it is particularly important that all motor fuel tax funds are collected, remitted, and credited to the respective state highway accounts. However, allegations of significant evasion of these taxes persist. The extent of loss of revenue from fuel tax evasion and the causes are not well understood. In the absence of reliable estimates for motor fuel tax evasion rates and evasion mechanisms, agencies cannot judge how to most effectively mobilize and deploy their enforcement resources.

For states to maximize receipt of their motor fuel taxes, they must develop effective enforcement resources and use those resources efficiently. To do so, the states must be able to determine the origin and extent of fuel tax evasion and to evaluate the potential effectiveness of enforcement options.

To assist agencies in meeting these challenges, the American Association of State Highway and Transportation Officials (AASHTO) requested the National Cooperative Highway Research Program (NCHRP) to undertake Project 19-06, Identifying and Quantifying Rates of State Motor Fuel Tax Evasion. This report is the final product of that study.

The objective of this research project was to develop and demonstrate a methodology for identifying and quantifying state-level fuel tax evasion. The methodology, as envisioned, would account for different practices among states that may lead to different rates of evasion. The results from applying this methodology would allow individual states to develop and evaluate potential solutions and enforcement options.

A research team led by Battelle – Pacific Northwest Division, Richland, Washington, conducted the research. The project entailed first reviewing the literature and other ongoing

research on fuel tax administration, enforcement, and evasion, and current state agency practices for fuel tax enforcement. An effort then was made to identify and collect state data on fuel tax collections and enforcement activities that could be used to analyze geographic, administrative, and other parameters that might be expected to explain the character and levels of evasion in states and variations among states' experiences.

In most states, the highway system is constructed and operated by the department of transportation, while fuel taxes are collected and tax regulations are enforced by a different agency. The ability of the research team to collect data was limited by the reluctance of most state revenue agencies to make data available for analysis. These agencies cited concerns for confidentiality of taxpayer information as the basis for their reluctance. Using data that were collected and knowledge from other work, the team developed a methodological approach to estimating state fuel tax evasion, presented the approach to selected professionals for review and discussion, and finally made refinements based on comments received.

The results presented in this report describe a methodology for estimating the error, omission, and evasion (EOE) level for each of nine defined types of fuel tax evasion. The methodology relies generally on three approaches to estimating EOE: (1) audit and inspection, (2) tracking to follow fuel from terminals to taxpayers, and (3) statistical analyses of sales for selected retail outlets. The report also describes data needed to undertake estimation of EOE levels.

CONTENTS

SUMMARY

Identifying and Quantifying Rates of State Motor Fuel Tax Evasion

This report was completed as part of a National Cooperative Highway Research Program (NCHRP) project that proposes to identify and quantify state motor fuel tax evasion in order to evaluate options for closing the gap between total tax liability and actual tax collections. This report covers the process of developing a methodological framework to examine and reliably quantify state motor fuel tax evasion rates.

Chapter 1 critically assesses physical, administrative, and enforcement characteristics of state practices and identifies how these characteristics have traditionally correlated with certain types of evasion. Chapter 2 compiles and summarizes the results of interviews completed with state motor fuel tax administrators and other relevant organizations including oil industry representatives and federal fuel tax authorities and explores key issues identified during the interview process including: evasion techniques, fuel tracking, point of taxation, state fuel tax collection and enforcement procedures, coordination and uniformity among states, and issues related to motor carriers. Chapter 3 describes various models and approaches that have been used to quantify fuel tax evasion in the past, and discusses the strengths and weaknesses of each approach. Chapter 4 provides a review of the data available for these types of analyses. Chapter 5 presents a detailed methodology for estimating state motor fuel tax evasion using readily available data and documents the data required to perform each estimation procedure. Chapter 6 presents conclusions and recommended methods for disseminating the outcome of the project.

The literature review provided in Chapter 1 indicates that major motor fuel tax policy changes (i.e., moving the point of taxation and diesel fuel dyeing) have had significant and measurable impacts on compliance. These changes have been adopted largely by states. For state fuel tax administrators, one of the most frequently discussed issues is related to the uniformity between state policies and programs. The Federation of Tax Administrators (FTA) has initiated a collection of best practices and uniformity principles to be used as a guide to combat motor fuel tax evasion through enhanced uniformity. At this point, the biggest effort at the state level appears to lie in moving state programs toward the ideal policies set forth in the 11-point plan in the FTA's Uniformity Project.

The interviews conducted in support of Chapter 2 helped identify factors that contribute to evasion. The interview team conducted 35 interviews with state tax administrators and industry representatives. Interviewers heard evidence suggesting that an assortment of issues impact evasion, including policies related to alternative and blended fuels as well as the geographic proximity to low-tax states. The issues identified in the interviews are explored in Chapter 2, which covers a number of topics under six primary categories, including: evasion techniques, the point of taxation, fuel tracking, enforcement, uniformity, and motor carrier issues.

Chapters 3 and 4 provide a review of the methodologies and available data related to motor fuel tax evasion. The methodologies reviewed include the literature review approach, various econometric approaches, and the audit review approach. These chapters describe the strengths and weaknesses of various approaches and the datasets available.

Based on information presented in Chapters 1 through 4, Chapter 5 presents a methodological framework to quantify state-level fuel tax evasion. The approach described in Chapter 5 provides a methodology to estimate the error, omission, and evasion (EOE) level for each type or groups of types of evasion described in Chapter 2. The methodology provides a strategy that allows the sum of the individual types of EOE to equal the amount of total EOE, as demonstrated in the following equation:

$$E = EM_1 + EM_2 + EM_3 + \cdots + EM_n$$

where

E = Estimated EOE in State *i;*
$EM_1 \ldots EM_n$ = Estimated EOE for technique 1 through *n;* and
$1 \ldots n$ = Evasion techniques (use of dyed fuel on-road, tampering with fuel dye equipment, illegal removal of dye from exempt fuel, abuse of the International Fuel Tax Agreement (IFTA) return process, false refunds or credits, import-export schemes across state lines, illegal importation of fuel from foreign refineries, abuses due to the presence of Native American reservations, false product labeling, cocktailing, failure to remit tax payments, and daisy chains).

The strategy implies that no one approach in and of itself can be used to accurately estimate overall motor fuel tax EOE in a state. The level and quality of compliance and enforcement differs by state and therefore, the approach to calculating EOE will differ. For states with significant enforcement and compliance efforts and good databases, the approach can provide a much more accurate EOE estimate, while states with less enforcement and compliance activities will have less accurate answers to EOE for their state.

Tiered Approach to EOE Estimation

The approach focuses on measuring the tax dollars lost to EOE, or the amount that is underreported whether intentional or unintentional. The estimate will contain the amount of tax dollars intentionally or fraudulently evaded, as well as errors and omissions.

This report highlights state-by-state variation in the data quality and quantity available, considering some of the following factors:

- Varied motor fuel tracking systems,
- Differing data on aspects of audits and inspections (i.e., some states have considerable data and some do not),
- Differing characteristics that lead to evasion (i.e., some states have Native American reservations and/or on-road diesel programs while others do not),
- Level of fuel tax compliance and enforcement in a state, and
- Varied requirements regarding access to existing (but restricted) data.

There are three approaches outlined in Chapter 5 to estimate EOE: audit and inspection, tracking, and statistical analyses of sales approaches. Various approaches could be used to examine audit and inspections data, including statistical sampling, and regression techniques such as ordinary least squares (OLS), Tobit, and logit analysis. The second approach, tracking, uses tracking systems to follow fuel from terminals to taxpayer and calculate the difference of fuel supplied to taxes paid. The third and final approach is recommended for estimating evasion losses due to the presence of Native American retail outlets. The approach recommended compares the amount of gallons in question and calculates a percent of the total fuel consumption

for that state that is associated with the nonpayment of taxes. If more variables and associated data are available, more sophisticated techniques can be used to calculate the amount of taxes forgone. Chapter 2 identifies nine evasion methods and provides recommended approaches for estimating EOE associated with each evasion method. Chapter 5 also presents a decision tree to assist states in conducting analysis of EOE and provides detailed data collection recommendations. In addition, Chapter 5 includes a list of data needed to undertake estimation of EOE.

Chapter 6 presents study conclusions and concepts for disseminating the outcome of this research project. Chapter 6 proposes a two-step process to disseminating the outcomes of the project. The first step would include developing a website that included the report. The second step would include hosting sessions at the 2009 Transportation Research Board (TRB) Meeting and the 2008 FTA Motor Fuel Tax Section Annual Meeting.

CHAPTER 1

Introduction and Background

1.1 Introduction

Revenues from motor fuel are used primarily to support the states' transportation systems. In this time of large state budgetary deficits, it is particularly important that all motor fuel tax funds are collected, remitted, and credited to the respective state highway accounts. Allegations of significant fuel tax evasion, however, persist, and the extent and causes for this loss of revenue are not fully understood. To effectively enforce tax codes, it is important to determine the origin and extent of fuel tax evasion and to be able to evaluate the potential effectiveness of enforcement options.

This report is completed as part of a NCHRP project to identify and quantify rates of state motor fuel tax evasion in order to evaluate options for closing the gap between total tax liability and actual tax collections. The objective of this research project is to develop and demonstrate a methodology for identifying and quantifying state-level fuel tax evasion. This report provides background material related to state fuel tax policies and techniques that have been used to evade these taxes in the past. The report analyzes methods that have been used in the past to estimate fuel tax evasion and characterizes the data available for such research. The report focuses on developing reliable estimates for motor fuel tax evasion rates to enable states to identify and measure state fuel tax evasion. The methodologies presented allow individual states to tailor approaches that suit the needs of their states and evaluate potential solutions and enforcement options.

This report is divided into six chapters, the first being this introduction and background on the motor fuel excise tax evasion issue. Chapter 2 presents perspectives on state fuel tax enforcement practices and highlights information gathered through interviews with state motor fuel tax administrators. Chapter 3 presents strategies, methods, and tools used to measure and evaluate motor fuel tax evasion. Chapter 4 examines the data required to support the methods and tools outlined in Chapter 3. Chapter 5 presents a methodology for identifying and quantifying state motor fuel tax EOE. This methodology includes a decision tree to assist states in conducting EOE analysis, presents approaches and models for estimating EOE and identifies the data needed to support the proposed estimation approaches. Conclusions are presented in the sixth and final chapter. This report also includes four appendices. Appendix A contains a glossary of motor fuel excise tax terms. Appendix B contains the interview protocol used to guide evaluators in their discussions with state motor fuel tax administrators and other industry experts. Appendix C encapsulates the interview responses. Appendix D presents an annotated bibliography.

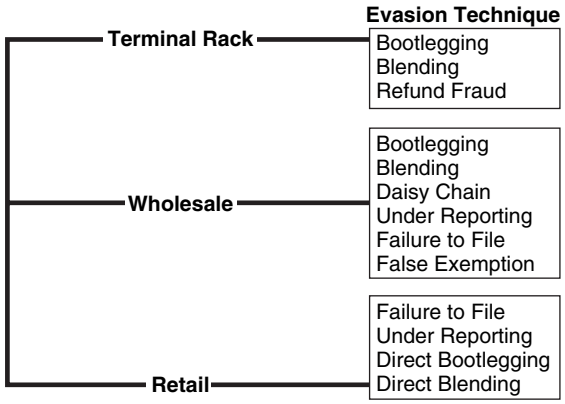
1.2 Background

The vast majority of financial support for our nation's transportation system is provided by revenues from federal and state motor fuel and other highway taxes. Ensuring all motor fuel and highway-use tax funds are collected, remitted, and credited to the Federal and State Highway Trust Fund (HTF) is a priority; however, evasion of motor fuel excise taxes has made this priority difficult to achieve. In 1993, the evasion rate for the federal gasoline tax was estimated to be between 3 and 7 percent and the diesel tax evasion rate was estimated at 15 to 25 percent (FHWA, 1992). This level of evasion translated, at the time, to roughly $1 billion in annual lost revenue. These estimates were largely based on Congressional subcommittee testimony of state and federal representatives, as well as convicted tax evaders. At the state level, estimates of annual motor fuel excise tax evasion have varied significantly, from as low as $600 million to as high as $2 billion (Weimar et al., 2002).

Since 1993, revenue for the HTF increased due to changes in legislation relating to enforcement and auditing, primarily directed toward diesel, kerosene, and aviation fuels. Simple, unscientific estimates that compare the growth rates of revenue indicators (i.e., vehicle miles traveled) with the actual

revenue growth suggest that these recent changes in motor tax policies have reduced evasion and enhanced collections (Baluch, 1996). However, the results of post-1993 joint audits performed under the FHWA's Joint Federal/State Motor Fuel Tax Compliance Project (JFSMFTCP, 1999) do not reflect broad-based motor fuel tax compliance. Historically, reliable estimates for motor fuel tax evasion rates and other highway user taxes have not been achievable.

Significant research attempts have been made over the past two decades to understand the nature and magnitude of fuel tax evasion, resulting in a fairly large body of literature. The bulk of this literature aims at quantifying evasion and exploring methods to increase compliance at federal and state levels. Relevant literature and information examined for this review fit into the following categories: literature relating to tax administration and enforcement, methods of quantifying evasion, sources of motor fuel consumption and revenue forecasting, and sources of studies that examine data.



Source: Adapted from FTA, 2004a

Figure 1-1. Evasion schemes associated with particular points of taxation.

1.3 Motor Fuel Tax Administration and Enforcement

Federal and state motor fuel tax administration and enforcement practices have transformed considerably over the past two decades. Motor fuel tax administration law has, and continues to be, changed to lessen the opportunities and incentives to evade. Further, many collection agencies have increased efforts to investigate and reconcile unlawful activity. This section will examine literature related to the following federal and state administrative and enforcement practices: point of taxation, diesel fuel dyeing, auditing efforts, uniform administrative forms and procedures, electronic reporting, and fines and punishments.

1.3.1 Point of Taxation

One of the central modifications to fuel tax administrative procedures since the discovery of the multi-million dollar fuel tax evasion schemes of the 1980s is the point of taxation. Fuel tax is generally collected and reported at one of three points in the distribution chain: at the terminal rack/import, at the wholesale level, or at the retail level.

Each point of tax collection throughout the fuel distribution chain has particular vulnerabilities to certain evasion techniques. For instance, taxing diesel fuel at the terminal rack, while allowing for tax-exempt uses of diesel, requires a credit or refund process, and consequently, opens the door to evasion schemes that exploit the refund or credit process. Figure 1-1 depicts numerous evasion methods as identified by the Federation of Tax Administrators (FTA) and their links to the different points of taxation. This figure does not provide a comprehensive list of evasion techniques. Rather, it identifies the evasion techniques most commonly associated with various points in the distribution chain. For example, failure to file and false exemption could be used at the terminal rack level to evade taxes but are more prevalent at the wholesale or retail level.

The main disadvantage of a retail point of taxation for collecting motor fuel excise taxes is the time and money necessary for processing a high volume of returns and delinquencies. Furthermore, moving the point of taxation up the distribution chain reduces the severity of down-stream evasion. One perceived advantage to taxing at the retail level is the decreased incentive to cheat because the volume of fuel sold by the taxpayer is lower at the retail level than at the distributor level (FTA, 2004a).

Taxing at the terminal rack for motor fuels is widely accepted as one key measure a government can take towards increasing motor fuel excise tax compliance. Moving the point of taxation to the terminal rack decreases the opportunities for downstream tax evasion and greatly reduces the number of taxpayers, decreasing the administrative and enforcement burden on collection agencies. There are, however, a number of disadvantages that do occur, despite having fewer taxpayers. First, the number of refund claims inevitably expands since many jurisdictions have several exemptions for use of fuel either for nontaxable purposes or by nontaxable entities. This dramatic increase in refund claims opens the door to increased refund fraud. Further, the savings in administrative costs from fewer taxpayers may be counterbalanced by the costs of processing refunds for fuels with a large number of nontaxable purposes. For instance, in 1994, less than 50 percent of diesel fuel was consumed nationally for on-road, taxable purposes. Some argue that the best strategy for fuels with a large number of tax-exempt uses is tax collection at the retail level since it is closest to the end user (CSG&CGPA, 1996).

At the federal level, the point of taxation for gasoline was moved to the terminal rack by the Tax Reform Act (TRA) of 1986. In 1990, the Revenue Reconciliation Act (RRA) tightened up administrative regulations by requiring that the imposition of gasoline tax take place at the point of import, the removal from the terminal or refinery, or the point of sale of any unregistered entity (KPMG, 2001). The point of taxation for diesel was moved to the terminal rack in 1994 by the Omnibus Budget Reconciliation Act (OBRA) of 1993.

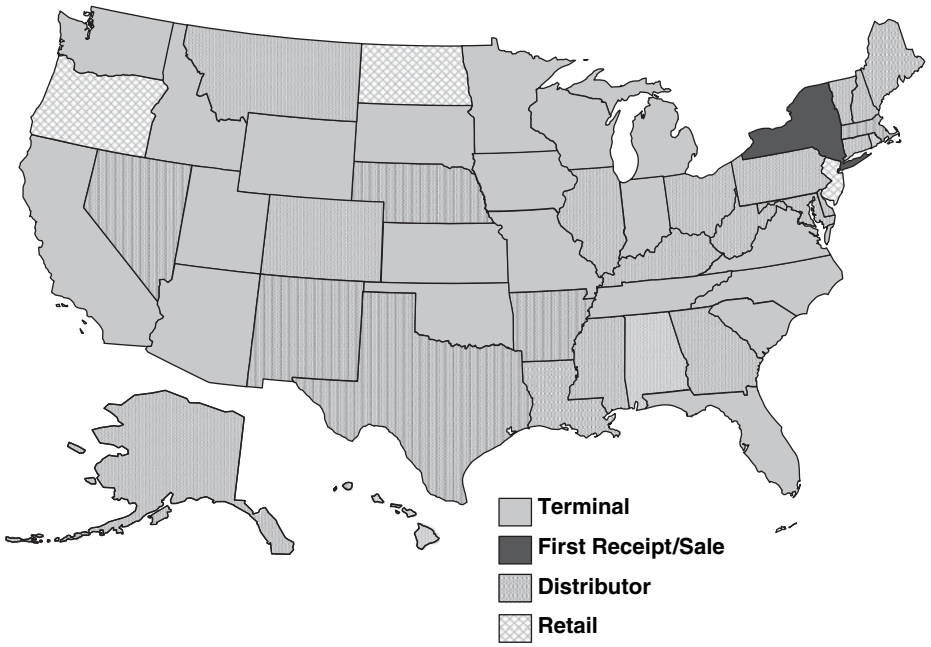
At the state level, points of taxation vary widely since the administrative conditions facing states also vary widely. Some states have many refineries while others have none. A few states have few to no terminals and must import fuel from other states and foreign locations (CSG&CGPA 1996). Many states now collect fuel taxes at the terminal level. In general, the position holder or importer is responsible for remitting the tax. States that tax at the wholesale level generally hold licensed distributors accountable for the tax when fuel is sold to an unlicensed entity. A system that taxes at the retail level can either require that the tax be paid when the retailer purchases the fuel, or when the fuel is placed in a highway transportation tank. Figures 1-2 and 1-3 depict the point of motor fuel taxation for gasoline and diesel by state.

Although it can be argued that a shift in the point of taxation to the terminal rack may increase administrative issues around refunds for some fuel types, many states have seen increased revenues after moving the point of taxation up the fuel supply chain. Maryland experienced an increase in revenue of about 20 percent in 1985 after moving the point of taxation for diesel fuel from the end user to the wholesale level (CSG&CGPA, 1996). Moreover, New York estimated a 19 percent revenue gain the first year after the point of taxation for motor fuel was moved up the distribution chain to first import in 1985 (FHWA, 1992). After moving aviation fuel taxation to the rack in 1996, Florida's aviation fuel tax collections increased by 21.4 percent that year (KPMG, 2001).

1.3.2 Diesel Fuel Dyeing

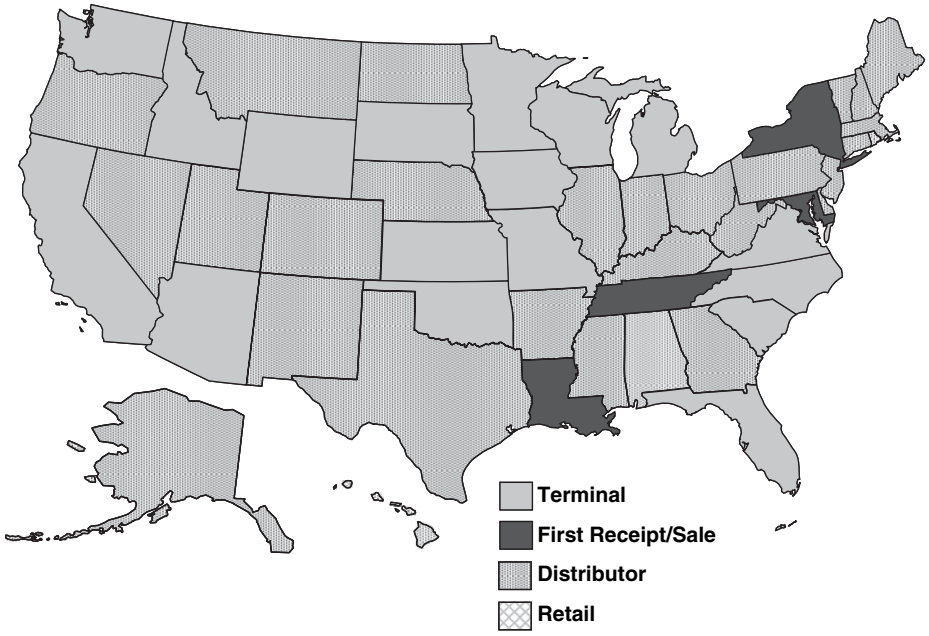
At the federal level, the OBRA of 1993 was perhaps the most significant piece of legislation designed to curtail motor fuel tax evasion. In addition to moving the point of taxation for diesel to the terminal rack, it also mandated a federal fuel dyeing program. All diesel fuel sold tax-free for exempt purposes (e.g., farm equipment and other off road vehicles) was to be dyed red beginning in 1994. Dyeing fuel red provides a quick and visible way of determining if tax-free fuel is being misused for taxable purposes. A federal penalty of $1,000 or $10 per gallon of fuel was also prescribed for motor carriers using dyed fuel for a taxable use (Baluch, 1996). The first year after the law took effect, federal diesel fuel revenues increased by $1 billion. Controlling for revenue growth due to increased fuel consumption and a $4.3 cents per gallon increase in the tax rate, it was estimated that $600 to $700 million of that $1 billion revenue increase was attributed to increased compliance (GAO, 1996).

State enforcement programs benefited from the federal dyeing regulations since the same undyed fuel for highway



Source: FTA, 2002b

Figure 1-2. State points of taxation for diesel fuel.



Source: FTA, 2002b

Figure 1-3. State points of taxation for gasoline.

use was generally also taxed for state transportation programs. Many states have adopted IRS definitions of taxable uses of diesel fuel for ease of enforcement and are enforcing the law by performing spot-checks to ensure that dyed fuel is not being burned on-road. By 1995, almost half of the U.S. states had adopted penalty provisions for improper use of dyed fuel (Baluch, 1996). States that have conformed to OBRA have seen substantial increases—double digit percentage increases in some cases—in diesel fuel tax revenue (Peters, 2002).

1.3.3 Auditing Efforts

Desk and field audits are widely recognized by numerous studies as one of the most fundamental components of any program for reducing evasion (FHWA, 1992; CSG & CGPA, 1996; and WSLTC, 1996). Highly visible and vigilant revenue agencies decrease the incentive to cheat the tax collection system. Rigorous and frequent auditing efforts are among the most effective deterrents when dealing with businesses that are well-established and expect to stay in the fuel supply business for the long-term. However, daisy-chain-type evasion methods, and other criminal activities involving organized crime, are not typically deterred by increased audits because the entire operation is geared to produce erroneous paperwork designed to lead auditors to a dead end (FHWA, 1992).

Federal and state agencies have increased the intensity of their enforcement projects over the past two decades. Significant funding for these efforts came from the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, which allocated $5 million annually in HTF funds to the Internal Revenue Service (IRS) and state collection agencies for enhanced audit and enforcement operations. Further, some state collection agencies have opted to create special evasion investigation units. Expenditures on state and federal audit operations have seen positive returns on investment. Out of 38 states, gasoline tax revenues averaged $443 per staff hour during the period of October 1992 through March 1993. For the same period and within the same states, diesel revenues were enhanced at the rate of $321 per auditing hour (CSG & CGPA, 1996). Further, FHWA reports that each dollar spent from HTF on compliance projects (i.e., audits and criminal prosecutions) has produced an estimated $10 to $20 in extra revenue from state and federal fuel tax violations (FHWA, 1999b).

1.3.4 Uniformity and Coordination

Cooperative efforts between state agencies can be extremely advantageous because in the absence of such agreements, people seeking to beat the system can take advantage of the disparities in reporting requirements and information exchange across state and international borders. However, the ability to cooperate and exchange information is made problematic when states have their own unique tax laws, report forms, definitions, exemptions, and compliance methods. Recognizing the importance of uniformity and coordination, states are working together in unison to create a more broad-based and consistent approach to enhancing collections and removing opportunities for evasion.

The International Fuel Tax Agreement (IFTA), created as a component of ISTEA in 1991, represents one of the first efforts toward uniformity. IFTA is an agreement between states that simplifies the reporting of fuel taxes by interstate haulers by establishing a uniform system for administering and collecting taxes. Congress ordered all states to participate in this program by 1996 or be faced with a reduction in federal highway funds (Raven, 1999). Before IFTA, motor carriers were obliged to register, obtain permits and file tax returns with each state where they operated. Now, motor carriers choose a base jurisdiction in which to register and file a single return with a single payment to their base jurisdiction. The base jurisdiction processes the IFTA tax return for net fuel taxes and forwards funds to, or requests funds from, each jurisdiction (MPR, 2004). By 1996, all 50 states and 9 Canadian provinces were IFTA members (CSG&CGPA, 1996).

The FTA Uniformity Committee is another key cooperative effort. The Uniformity Committee encourages states to adopt an 11-point plan for improving motor fuel tax compliance. The major points in this plan include: uniform definitions for imports and exports, federal identification codes that distinguish entities for reporting and information exchange, total accountability of fuel by licensing of all resellers and requiring third party reporting on the movement of fuel, uniform electronic reporting systems and trainings for auditors and investigators. Further, the FTA Uniformity Committee created a model-legislation checklist for states that wish to change their point of taxation for fuels and implement the 11-point plan (FTA, 2003).

In addition to legislative changes related to the administration of fuel taxes, state and federal governments intensified enforcement efforts during the early 1990s when combined state and federal revenue losses due to evasion were estimated at $3 billion (FHWA, 1999c). One feature of this continued enforcement effort was the formation of the JFSMFTCP, a product of a long-standing cooperation between the IRS and the FHWA. The JFSMFTCP steering committee is chaired by the IRS and the FHWA and is composed of representatives from nine lead states that head regional task forces. Among the activities undertaken by the task forces to improve fuel tax compliance are training, joint criminal and audit investigations, and information exchange (Baluch, 1996).

In 1991, Congress passed ISTEA that allocated funds to the JFSMFTCP to organize cooperative efforts on fuel tax enforcement (FHWA, 1992). This act provided $5 million annually in HTF funds to the JFSMFTCP through 1997. Of that $5 million, the JFSMFTCP allocated $2 million to the IRS to enhance its fuel tax enforcement efforts. The other $3 million was given to states for participation in regional motor fuel tax evasion task forces. By FY 1995, most of the states including the District of Columbia had taken part in one or more of the nine regional task forces.

1.3.5 Electronic Reporting

Many states have moved to require all fuel taxpayers file their returns electronically. The traditional paper processing system takes much more time, space, and funds. Establishing an electronic reporting system liberates a good deal of these resources for both state collection agencies and industry by reducing tax administration and compliance costs. Further, electronic reporting systems enable the information to be easily accessible for enforcement efforts within and between states. The FTA Uniformity Committee encourages states to not only adopt an electronic reporting system, but also to adopt uniform methods and standards for their systems so that states can share detailed information with each other in an efficient manner (FTA, 2003).

1.3.6 Fines and Punishments

Many states increased their penalties and interest on delinquent tax payments, with the intention of deterring evasion, for actions such as failure to fill out mandatory documents or pay compulsory taxes or knowingly providing false information on documents. A study of southern states found that great diversity exists between states on the nature and severity of penalties for fuel tax evasion (Denison and Eger, 2000). For instance, fuel tax evasion in Delaware was a Class E felony punishable by a fine of not more than $11,500 or by imprisonment of up to 5 years. Mississippi considered fuel tax evasion a misdemeanor with fines between $50 and $100, a mild punishment by comparison to Delaware. Further, in all but two of the 16 southern states reviewed, liability for fuel taxes was ultimately placed on the officers of a corporation. It is worth noting that the effectiveness of penalties for deterring tax fraud is still under considerable dispute (Denison and Eger, 2000).

1.4 Methods of Quantifying Motor Fuel Tax Evasion

Many studies have examined and measured the extent of state and federal fuel tax evasion. An extensive literature review, however, reveals there is no consensus among the evasion studies on the extent of evasion. These studies do, however, identify a number of techniques that have been employed to quantify evasion levels, including (1) the audit review method; (2) comparison of fuel consumption with taxed volumes method; (3) comparison of fuel sales volumes with taxed volumes method; (4) border interdiction method; (5) survey of tax administrators method; (6) the literature review method; and (7) the econometric analysis method. Studies employing these methods, including study findings and authors, are identified in Table 1-1 and are examined in detail in Chapter 3.

Table 1-1. Summary of fuel tax evasion studies.

Author(s)	Date	Tax	Evasion Estimate	Method
Eger	2002	Wisconsin gasoline taxes due to falsified agricultural refund requests	Upwards of $4 million annually	Econometric method, comparison of predicted and actual agricultural refund requests
KPMG	2001	Federal diesel taxed due to jet fuel diversion	$1.7 - $9.2 billion over 10 years	Comparison of fuel supplied to taxed gallons
Denison and Hackbart	1996	Kentucky fuel taxes	$26-$34 million	Survey of tax administrators, econometric analysis
Council of State Governments, Council of Governors' Policy Advisors	1996	All state fuel taxes	$666 million - $1.5 billion	Literature review, survey of state tax administrators, econometric analysis
WSLTC	1996	Washington fuel taxes	$15-$30 million	Literature review, border interdiction, random audits
Revenue Canada	1996	Canadian fuel taxes	$55-$110 Million	Comparison of monthly motor fuel sales volumes with gallons taxed
Mingo & Associates, Inc.	1996	All state diesel taxes	21 percent	Comparison of fuel consumption to taxed gallons
Federal Highway Administration	1994a	Federal and state fuel taxes	$1 billion (Fed fuel taxes), $3 billion (Fed/state fuel taxes)	Literature review, analysis of auditing data
Federal Highway Administration	1992	Federal gasoline and diesel tax	$466.1 million (gasoline tax), $860.2 million (diesel tax)	Literature/testimony review, analysis of auditing data
Mitstifer, National Association of Truck Stop Operators	1992	Federal diesel tax	$3 billion	Comparison of diesel fuel consumed (based on reports from truck stops) to taxed gallons
Addanki et al.	1987	Federal gasoline taxes	More than $500 million	Econometric Analysis, Comparison of fuel consumption with taxed gallons
Addanki et al.	1987	NY gasoline taxes	$168.4-$254.5 million	Econometric analysis

Source: Weimar et al., 2002

1.5 Motor Fuel Excise Tax Revenue Forecasting

Motor fuel consumption and excise revenue forecasting models have been developed by the federal government and many state governments. These models vary in parameters, scope, and data used. They are used to forecast and detect trends in fuel tax revenue and fuel consumption by identifying and examining factors strongly correlated with these variables. The fuel tax and consumption models examined in this section of the literature review have not been developed to address tax evasion directly. However, they can provide information about other factors that affect fuel tax collections, and present variables that could be used in any econometric examination designed to detect evasion.

The modeling needs of states and the federal government are similar, yet distinct. Figure 1-4 shows that state and federal models are used for budgeting purposes; however, federal models also are designed with revenue attribution and the revenue aligned budget authority mandate in mind. Revenue attribution is the process whereby the federal government determines how much fuel was burned on-road within each state, which in large part determines how much federal highway funding is redistributed to the states. Revenue aligned budget authority (RABA) is a budget mechanism that adjusts federal highway funding based on actual tax collections. RABA adjustments are based on disparities between forecast and actual collections. State models are primarily concerned with forecasting revenues to support highway construction, rehabilitation, and maintenance programs, as well as administrative/staffing overhead levels.

1.5.1 Federal Revenue Forecasting Models

The federal models use data relating to travel, fuel efficiency (e.g., fuel consumption, imports and exports, fleet composition), and national economic variables to forecast revenue and satisfy federal budgeting regulations (e.g., minimum guarantee and revenue aligned budget authority). Federal models examined in this section include: (a) the National Energy Modeling System (NEMS), (b) the Highway Revenue Forecasting Model, (c) the Joint Committee on Taxation Revenue Estimating Model, (d) the U.S. Treasury Office of Tax Analysis Fuel Tax Revenue Forecasting Model, (e) the FHWA Fuel Consumption Forecasting Model, and (f) the FHWA Gasohol Consumption Estimation Model.

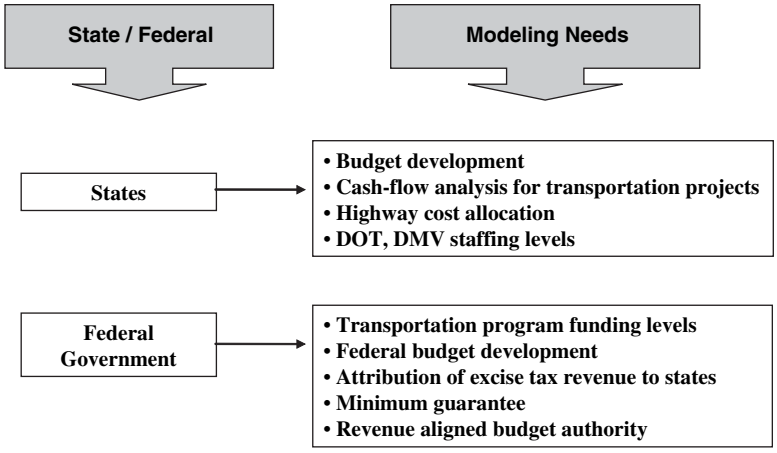


Figure 1-4. Federal and state revenue forecasting modeling needs.

1.5.1.1 National Energy Modeling System (NEMS)

At the federal level, the U.S. Department of Energy (DOE)'s Energy Information Administration (EIA) implemented NEMS, an expansive energy forecasting model for the mid-term period through 2025. NEMS is a computer-based model that forecasts the production, conversion, consumption, and import of petroleum products, as well as energy prices conditional on correlations with "macroeconomic and financial factors, world energy markets, resource availability and costs, behavioral and technological choice criteria, cost and performance characteristics of energy technologies, and demographics" (DOE, 2003).

NEMS is designed as a modular system. The Transportation Demand Module (TRAN) is one of seven modules and is of particular interest for this study because it provides mid-term forecasts of fuel consumption and explores the factors that correlate with motor fuel consumption. The TRAN itself is composed of several semi-independent models that address different aspects of the transportation sector. Combined, these models predict transportation fuel demand by transportation fuel type including gasoline, diesel fuel, aviation fuel, and other alternative fuels. These forecasts are developed and then published in the EIA's *Annual Energy Outlook*.

1.5.1.2 Highway Revenue Forecasting Model (HRFM)

HRFM is one more federal model that estimates federal fuel consumption. HRFM provides both short- and long-term estimates of federal fuel tax revenue. HRFM was developed by FHWA in 1981 but has since been updated. FHWA used this model in the 1997 Federal Highway Cost Allocation Study (HCAS) to attribute federal highway user revenues by tax type to vehicle classes and weight category (FHWA, 1997). HRFM estimates fuel consumption by multiplying miles per gallon (MPG) and vehicle miles traveled (VMT) for each vehicle class and operating weight. Estimation of fuel tax collections then is based on fuel consumption and the tax rate.

1.5.1.3 Joint Committee on Taxation (JCT) Revenue Estimation

The Joint Committee on Taxation (JCT), established under the Revenue Act of 1926, is another source and form of tax revenue forecasting. The JTC utilizes a variety of econometric models to estimate the impacts on revenue from changes in tax legislation. A description of JTC methodology is provided in the 1995 U.S. Congress report, *Written Testimony of the Staff of the Joint Committee of Taxation Regarding the Revenue Estimating Process* (JCT, 1995). Most of the revenue estimates by the JCT follow the same basic methodology. It is first determined what the revenue yield is under a current legislation. Then, they estimate what the revenue yield would be if the proposed change in legislation were to pass. The JTC uses IRS Statistics of Income (SOI) as a starting point for many of their analyses but also relies on other federal agencies (Weimar et al., 2002). An overview specifically relating to highway excise taxes, highway motor fuels tax rates, and highway fuels tax exemptions is presented in the 1998 amendment the *Chairman's Amendment Relating to Extension of Highway Trust Fuel Excise Taxes and Related Trust Fund Provisions* (U.S. Congress, 1998a).

1.5.1.4 U.S. Treasury Office of Tax Analysis (OTA) Fuel Tax Revenue Forecasting

OTA also has created federal revenue forecasts for fuel tax revenue. Seven different OTA models forecast highway user tax sources such as gasoline, gasohol, and diesel. These fore-

casting models are greatly reliant on data from the Office of Management and Budget (OMB), the Council of Economic Advisors and the Treasury Department (Weimar et al., 2002).

1.5.1.5 FHWA Fuel Consumption Forecasting Model

The Oak Ridge National Laboratory (ORNL) developed both a model to estimate national highway travel by vehicle type in 1995 and a model to estimate off-highway recreational fuel consumption by vehicle type at the state level in 1994 which was updated in 1999 for FHWA (Hwang, 2000). The national model is composed of a short-term module and a long-term module. While the short-term module is primarily driven by economic variables, the long-term module is more reliant on demographic factors and trends in key factors such as the dematerialization of GNP (Hwang, 2000).

1.5.1.6 FHWA Gasohol Consumption Estimation Model

As a part of the allocation of HTF funds for each state, a rule-based model estimating gasohol consumption was developed by ORNL for FHWA in 2003. This model is implemented as a spreadsheet application and is made up of three sub-modules: one to compute a control total of gasohol and ethanol gallons on which taxes are collected by the U.S. Treasury, another to estimate gasohol usage for states that have reliable data, and another to calculate gasohol for states that do not have reliable data. The model used HTF revenue data from Treasury, state fuel usage from *Highway Statistics,* reformulated gasoline (RFG) data from the U.S. Environmental Protection Agency (EPA), and data from the Petroleum Marketing Annual (PMA).

1.5.1.7 State Revenue Forecasting Models

Several U.S. states have their own fuel tax revenue forecasting models. The main objective of these models is to accurately forecast tax revenues apportioned to the state's transportation system. These estimates strongly influence transportation budgets and the decision process for new transportation projects. The Pacific Northwest National Laboratory (PNNL) reviewed several state fuel tax revenue models, focusing on states that use regression analysis to forecast revenue (Weimar et al., 2002). PNNL reviewed models from Oregon, Indiana, Maryland, Virginia, Washington, and Wisconsin. PNNL found that the majority of the tax revenue forecasting models were transfer function models, meaning they combine causal relationship models with time series models.

Oregon's Revenue Forecasting Model was cited to be representative of most of the models PNNL encountered, where Motor Vehicle Fuel Consumption = F(Fuel economy, price of gas_{t-1} / price index_{t-1}, Oregon employment participation rate, $\text{Oregon population}_{t-1}$, % change in real personal income) (Malik, 2002).

PNNL noted there were a number of commonalities between the state models reviewed such as the inclusion of fuel prices and macroeconomic factors as independent variables, and the separation of diesel and gas estimates. These state models appeared to provide relatively accurate forecasts (generally within 3 percent of actual collections).

1.6 Data Sources

Accurate and reliable data are essential to uncovering the magnitude of motor fuel tax evasion and also are necessary in related endeavors such as motor fuel tax revenue forecasting. Data pertinent to this subject fall into three categories: motor fuel volumes, travel, and auditing data. Chapter 4 discusses, examines the reliability of, and makes comparisons between relevant and available federal and state data. Further, detailed data recommendations for each proposed EOE estimation approach are presented in Chapter 5.

1.7 Fuel Tracking

The ability to track fuel through the distribution system can provide valuable data for estimating evasion and can serve as a key component of a program designed to improve motor fuel tax compliance. Recognizing that such a system could prove beneficial, Congress allocated HTF funds as part of the Transportation Equity Act of the 21st Century (TEA-21) for the development of what is now known as the Excise Files Information Retrieval System (ExFIRS). ExFIRS, in the process of development by the IRS, is an electronic system designed to gather and analyze motor fuel industry records to aid identification and prevention of fuel noncompliance. It is composed of 10 subsystems that support the collection and analysis of motor fuel industry operational information.

The Excise Summary Terminal Activity Reporting System (ExSTARS) is perhaps the most significant of these subsystems. ExSTARS is designed to track all movements of petroleum through state-designated fuel sales terminals. Since all federal excise taxes on fuels are imposed at the terminal rack, the IRS can balance all terminal disbursements with tax returns. It should be noted that while ExSTARS provides data on destination states for fuel leaving terminals, it does not supply exact destination location within states.

At the state level, the usefulness of ExSTARS will vary from state differences in the point of taxation. Some states tax at the rack while others tax at the point of first import, either wholesale or retail level. If the point of taxation for an individual state is at the terminal rack, similar to the federal government, the state may be able to make direct comparisons

between ExSTARS data and state tax returns. If a state's point of taxation is below the rack, data on how much fuel enters the state may still prove useful, though ExSTARS in practice has limited application in this case because it doesn't identify the company that receives the fuel delivery (FTA, 2004c). As of September 2004, ExSTARS was in full operation but the data are not yet comprehensive, with the vast majority of the data reported electronically but with a small share of the total data (roughly 10–20 percent) submitted on paper forms and entered into the database in a summarized version (Anders-Robb, 2004).

For states, the other notable subsystem of ExFIRS is the Excise Tax Online Exchange (ExTOLE). This system provides a convenient way for states to share information that could help in enforcement, compliance, and investigation efforts. ExTOLE allows states to do more scrupulous background checks before issuing registrations, determine where the taxpayers are in operation, and view fuel distribution activity in other states. It should be noted that retrieval of information from this system will not be made available to IRS taxpayers (FTA, 2004b).

Some states are opting to implement their own fuel tracking systems, choosing automated systems over manual accounting (Table 1-2). Other states have adopted fuel tracking systems developed by Lockheed-Martin and ZyTax (FHWA, 1999a).

1.8 Other Relevant Studies

There are a number of other studies of some relevance to this study. These studies include highway cost allocation studies (HCASs), reviews of highway apportionment models, and examinations of alternatives to motor fuel taxation. These studies, though unrelated to motor fuel tax evasion, provide some insight into the collection of motor fuel taxes, weaknesses in motor fuel tax compliance programs, the process for estimating VMT and MPG, and variables that could be used to model motor fuel tax evasion.

Table 1-2. State tracking systems.

	Tracking System
Virginia	ACS
Nevada	ACS
Mississippi	ACS
Arkansas	ACS
Michigan	ACS
Colorado	Explorer
Wisconsin	Synergy
South Carolina	ZyTax
Tennessee	ZyTax
North Dakota	ZyTax
California	In-house
Illinois	In-house
Missouri	In-house
Nebraska	In-house
Montana	In-house

Source: Anders-Robb 2004, FHWA 2003a, FHWA 2002, FHWA 2001, FHWA 1999a.

1.8.1 Highway Cost Allocation Studies

To evaluate highway-related costs attributable to various types of vehicles, FHWA performs periodic HCASs. The primary purpose of these studies is to evaluate the equity of federal highway user fees by examining which user fees cover highway cost responsibility for different vehicle classes. Those paying more than their share of highway costs are, for all intents and purposes, subsidizing the operations of others. To discern how fair federal highway fees are, equity ratios are calculated for each vehicle class by comparing total revenue for each vehicle class to the costs each vehicle class imposes on the highway infrastructure. To calculate revenue by vehicle class, detailed assumptions regarding VMT and MPG by vehicle class are made. To the extent that detailed data by user class can enable more detailed understanding of motor fuel consumption, the findings could be useful in allocating total fuel consumption to various fuel types and user classes in an evasion model. In an HCAS, an equity ratio of 1.0 means that a particular vehicle class is exactly covering its share of the cost responsibility. The most recent analysis found that the equity ratio for combination trucks weighing less than 50,000 lbs. was 1.4 while the equity ratio for combination trucks weighing more than 100,000 is 0.4 (FHWA, 2000a).

1.8.2 Highway Apportionment Models

In 1991, ISTEA authorized $155 billion for surface transportation programs from 1992 to 1997. Each fiscal year, FHWA apportions highway funds to the states based on their highway apportionment model. During the ISTEA reauthorization process in 1997, the General Accounting Office (GAO) conducted a review of the FHWA highway apportionment model for Congress to assess the model's impact on equity between states (GAO, 1997). The GAO concluded that the model accurately captures the highway funding allocation process and is internally consistent and adaptable. However, the GAO report found that the model was likely not to be used widely because it required specialized skills to use. Further, GAO found that the data used for the model was not properly verified and FHWA did not have the coordination and expertise to do so at the time (GAO, 1997).

In 2000, the GAO further reviewed the highway apportionment process by evaluating the relationship between the FHWA process for allocating HTF to states and the Treasury's process for assigning tax receipts (GAO, 2000). Because businesses that operate in several states send in their taxes from the state where they are based, the Treasury does not provide data on fuel tax receipts at the state level to FHWA. Therefore, the

FHWA disaggregates the data, relying on travel and fleet fuel efficiency data to allocate funds to states. This process is known as the "attribution process." GAO found that there is little assurance that HTF allocations to each state are accurate. The report outlines a number of recommendations to increase the reliability of the information and processes used to distribute highway funds. Because the highway apportionment model is used to estimate fuel consumption within each state in the nation, the model could be used as an important logic check when validating the evasion model with state data.

1.8.3 Examinations of Alternatives to Motor Fuel Taxation

Literature pertaining to alternatives to motor fuel taxation provides a picture of the transportation funding process and its challenges as a whole. A 1993 NCHRP study puts forward an alternative approach to highway funds generation (Weinblatt, et al., 1998). The study builds a methodology for developing alternative revenue source scenarios and for evaluating these revenue source alternatives. The study points out several challenges to the current revenue generating system: petroleum-based fuels may become increasingly scarce, tax rates are fixed per gallon and will not keep pace with inflation, improved fuel efficiency may reduce overall highway revenues, and issues relating to the prevalence of alternative fuels complicate the collection and enforcement processes for government agencies. Some conclusions of this research are that motor fuel taxes will remain a key component of transportation revenue creation for the next 20–30 years; fees based on VMT are desirable but hinge on political and technological factors; and changes made to alternative sources of funding should be done gradually rather than precipitously.

A further NCHRP study reviews alternative tax systems specifically for heavy vehicles and develops six criteria by which these systems can be evaluated (Weinblatt, et al., 1998). These criteria are adequacy, administrative efficiency, equity, economic efficiency, evasion and avoidance, and feasibility. Given these criteria, the authors found there was no unambiguously superior taxation system. Rather, the choice between systems involves tradeoffs between the criteria. For instance, one important trade-off mentioned was between administrative efficiency and evasion. Enforcement can decrease evasion but at a cost to both the public and private sectors. Further, the feasibility criteria may come at a cost of economic efficiency because the political arena is where choices among taxation systems are made. For example, political opposition may be insurmountable at this point in time for a proposition to increase highway taxes to internalize the full marginal social costs of highway use and fuel consumption. Further, there are limitations in the availability of data to be used to perform thoughtful tax system analysis.

A 1995 study prepared for FHWA examines a wide range of alternative tax sources for HTF including the addition of alternative fuels in the existing tax system (Jack Faucett Associates, 1995). The study concludes that the most likely and promising candidates for expanded HTF revenue are vehicle use taxes, VMT fees, vehicle sales fees, and pavement damage/weight distance taxes. Further, the study evaluates the potential for extending the tax system to alternative fuels. Among the findings from this portion of the study are that tax rates based on energy content would be most equitable and nonliquid fuels would require a totally different user tax system and also would open up extensive opportunities for evasion.

This study also attempts to quantify the likely impact of fuel efficiency and the use of alternative fuels on future HTF revenues (Jack Faucett Associates, 1995). The study forecasts HTF revenues based on eight future scenarios depending on factors such as fuel choice, technology, vehicle retirements, and driver behavior. With respect to fuel efficiency, this study forecasts expected average MPG and concludes that given those MPG forecasts, fuel consumption will be reduced by 3.3 percent in 1999 and 15.1 percent in 2014, decreasing HTF funds by 2.7 percent and 12.1 percent for those years.

1.8.4 Montana Motor Fuel Tax Evasion Study

Simultaneously with this project, Battelle conducted a study for the State of Montana, which estimated the amount of motor fuel tax errors, omissions, and evasion using the preliminary methodology developed by this project (Balducci et al., 2006). The evasion was estimated using several of the techniques discussed in Chapter 5 of this report. Six types of motor fuel tax evasion were identified: border schemes, dyed fuel schemes, alternative fuel schemes, IFTA fraud, failure to file schemes, and refund and credit schemes. Approximately 16.3 percent of taxable diesel fuel tax was not being properly paid while only about 2.1 percent of gasoline fuel was not being paid in 2004. The methodology and results of that project can be found at http://www.mdt.mt.gov/research/projects/admin/evasion.shtml.

CHAPTER 2

Perspectives on State Fuel Tax Enforcement Practices

2.1 Introduction

Over a 10-month period from October 2004 through August 2005, the project team conducted 35 interviews with state and tribal tax administrators, industry representatives, federal agents, the American Petroleum Institute (API), the American Trucking Association (ATA), the FTA and the Petroleum Marketers Association. The list of target interviews was developed with diversity and geography in mind. The organizations targeted for interview represent a diverse set of interests that all have a stake in the collection of motor fuel excise taxes but may have different concerns and approaches for minimizing evasion. Figure 2-1 shows the geographic spread of states (typically Department of Revenue or Transportation representatives) that were represented in the interview process. The states represented in the fuel tax interviews cover each U.S. region and a broad spectrum of motor fuel tax enforcement characteristics. Collectively, these characteristics include: a) high, moderate, and low tax rates; b) taxation at every point in the distribution chain; c) international borders; d) a broad range of enforcement program levels; e) significant Native American concerns; and f) vastly different penalty and fine levels. In addition, interviews were conducted with the representatives from the Office of the Navajo Tax Commission and the Canadian Fuel Tax Council.

Interviews that were conducted with petroleum industry representatives included Sinclair Oil Corporation, Chevron Corporation, National Biodiesel Board, American Petroleum Institute, and the Petroleum Marketers Association. Federal government interviewees included the FHWA, the IRS, and the Office of the Inspector General (OIG). Other organizations interviewed included the FTA and the ATA.

The objective of the interviews was to document current state motor fuel tax administrative and enforcement practices and to identify notable problems, policies, and issues that must be addressed in the modeling phase of this research program. Interviews and follow-on data collection efforts were undertaken to achieve the objective. Before conducting the interviews, an interview protocol was developed and tested on tax administrators in Oregon and Washington. Experience with these interviews along with comments and suggestions from the review panel were used to revise the protocol. Discussion questions are included in Appendix B. The interviewees were given a copy of the protocol and informed that the questions were to be used as a guide to ensure consistent coverage of topics; however, interviewees were not bound by the questions and were encouraged to discuss all relevant issues, regardless of whether they were included on the protocol or not.

Initial interviews were conducted at the October 2004 FTA Motor Fuel Tax Section meeting in Boston, Mass. Interviews were conducted over a two-day period, mostly with tax administrators. Remaining interviews were conducted by phone. The interview results were used to develop a preliminary list of topics for the issue papers that could potentially provide insight to developing methods to quantify state motor fuel tax evasion. The remainder of this chapter focuses on evasion methods and on the issues raised in the interviews. Interview responses are summarized in Appendix C.

2.2 Methods Used to Evade Motor Fuel Taxes

The rise of elaborate schemes to evade motor fuel excise taxes was seeded by the unprecedented increases in state and federal fuel tax rates experienced during the 1980s and early 1990s. Between 1980 and 1994, federal and state fuel tax rates ascended steadily, from 4 and 9.8 cents per gallon to 18.4 and 20.8 cents per gallon, respectively. The state average tax rate is weighted on a volumes-taxed basis. During the same time period, the passage of the Surface Transportation Assistance Act (STAA) of 1982 doubled federal fuel tax rates within just a few years. Motor gasoline tax rates are depicted in Figure 2-2. State tax rates in the figure are averaged over all U.S. states,

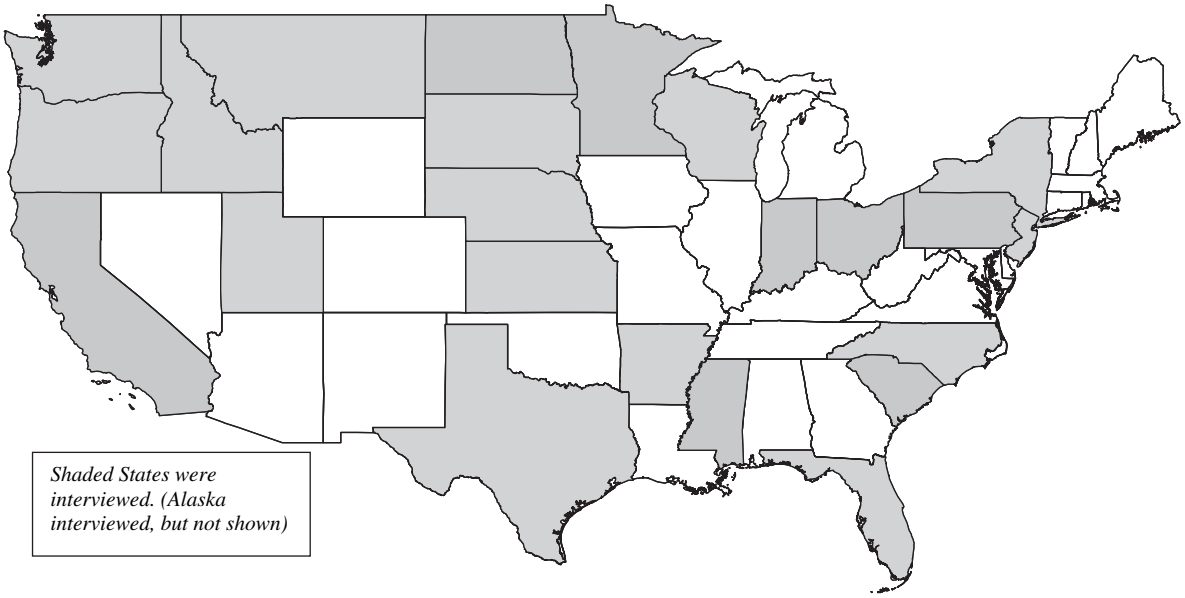
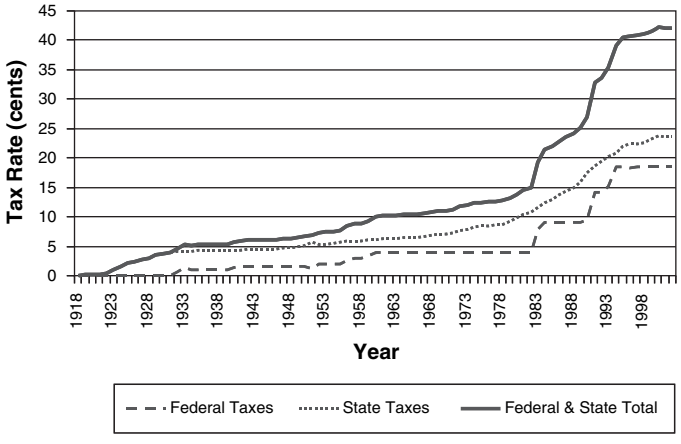


Figure 2-1. Geographic representation of states represented in fuel tax interviews.

weighted based on taxed volumes. Diesel taxes have had equivalent rate increases.

With these significant motor fuel tax rate increases, evasion of motor fuel taxes became a lucrative venture. In the mid 1980s, the IRS and state agencies discovered that organized crime was running large volume schemes known as daisy chains. In this scheme, paper transactions are run through several dummy corporations, with fuel entering the first company as nontaxed and exiting the last company as tax paid. Before federal agents can detect the scheme and eradicate it, one dummy company in the chain, known as the burn company, would dissolve along with any tax liability. However, tax evasion schemes detected to date have included more than large conspiracies involving organized crime. Fraudulent practices were discovered at many levels and scales throughout the motor fuel supply chain. While large organized crime operations were involved in elaborately concocted evasion schemes, small retailers and distributors simply could not report all or some of their gallons sold. Even motor fuel consumers had profit opportunities through tax fraud. For example, consumers could easily purchase tax-exempt fuel and use it on-road. Federal and state agencies found themselves hard pressed to keep up with these multilevel and multifaceted evasion tactics.



Source: American Petroleum Institute, 2002

Figure 2-2. Historical federal and state gasoline tax rates, 1918–2002.

As federal and state agencies have changed their administrative practices and motor fuel excise tax programs to cope with enforcement problems, the character, magnitude and variety of fuel tax evasion schemes have changed as well. It does not take long after steps are taken to curb motor fuel tax evasion for new ways of evading fuel taxes to be devised. Predominant tax evasion schemes prior to the tax at the rack policy adopted by the federal government and many state governments 20 years ago consisted of daisy chains, nonfiling and underreporting scams. Since some states still tax at the distributor level, these states continue to be susceptible to the aforementioned techniques. Tax at the rack jurisdictions are more likely to experience evasion through bootlegging across jurisdictional borders, large unreported imported bulk shipments, blending, and refund schemes.

To understand fuel tax enforcement challenges facing states, several motor fuel tax evasion schemes were examined by describing how these schemes are accomplished, where they occur in the fuel distribution chain, and what techniques have been used to cope with each form of evasion. Further, actual case examples have been provided wherever feasible.

2.2.1 Use of Dyed Fuel On-Road

2.2.1.1 Description

Business operations using off-road vehicles (e.g., farming, logging and construction) purchase tax-free dyed diesel. Dyed diesel is often delivered to these businesses and transferred into private storage tanks for use in off-road vehicles. To evade fuel taxes, diesel fuel in these tanks is used to fuel on-road vehicles owned by the business or individuals associated with the business. Another common way perpetrators fuel their on-road vehicles with dyed diesel is by using card-lock systems at retail stations that allow registered customers to access tax-free fuel by swiping a card. These stations are generally unmanned and a person with an access card can fill their on-road vehicles fuel tank or fill a container for later use in their highway vehicles.

2.2.1.2 Case Example

This scheme is thought to be extremely common and generally occurs on a small scale by many separate individuals, particularly individuals who own or work for businesses operating off-road vehicle equipment. One northwest television news group created a team of seven investigators to follow the misuse of dyed fuel in Washington State (Halsne, 2002). This team uncovered an extensive enclave of truckers, loggers, construction crews, and fruit growers using dyed fuel on-road. Here is a portion of the video transcript recounting an incident when the news team investigation crew caught up with an owner of a trucking and excavating business in Washington State who had just been seen filling his truck with dyed diesel:

Investigator: "Is this truck yours?"
Driver: "Yup."
Investigator: "You own it?"
Driver: "Yup."
Investigator: "We have videotape of you filling up your side tank here with red fuel."
Driver: [Shrugs] "I don't see any harm in it, just a pinch to do it. We pay thousands of dollars in taxes ever day for this kind of stuff. Yah, it's wrong, but if you're in a pinch, I'd say go ahead and do it."

2.2.1.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack at the retail level.

2.2.1.4 Evasion Curtailing Methods

The use of dyed fuel on-road can be deterred by changing the incentives to cheat such that the benefits of tax evasion are far outweighed by the risk of penalization. This can be accomplished by instituting considerable financial penalties while simultaneously implementing a vigorous on-road fuel inspection program. Often, due to resource constraints, the level of on road enforcement required cannot be achieved. Further, on-road enforcement may be constrained in some jurisdictions due to the fact that law may prohibit state agents from performing on-road inspections in the absence of probable cause.

Another technique to curtail the use of dyed fuel on-road is to register, license, and require reports from entities purchasing dyed fuel. To lessen the administrative burden of this approach, a state does not necessarily have to register all dyed fuel users. Instead, a limit can be placed on the number of gallons that can be purchased tax free. If individuals or businesses wish to purchase above this limit, they must be registered and licensed. In this manner, entities using tax-free fuel will be under the radar of collection and enforcement agencies (Reistma, 2005).

Another technique would be to require an undyed fuel usage report to be filed by individuals purchasing undyed fuel. Usage significantly above the business norms for the vehicles by industry standard would be sent a bill for taxes on that portion above the average for their particular industry. This would require the purchase of undyed fuel licenses, which would require the paperwork indicating the hours of usage by vehicle. If implemented at both the state and federal level, the added paperwork would be inconsequential for the right to use undyed fuel.

2.2.2 Abuse of IFTA Return Process

2.2.2.1 Description

IFTA is an agreement between jurisdictions that simplifies fuel tax remittance for multi-jurisdictional operating taxpayers by allowing them to file with one base jurisdiction. The base jurisdiction collects and disperses fuel taxes to other jurisdictions. The International Fuel Tax Association is a not-for-profit organization that receives dues from each jurisdiction and serves as support staff to aid communication and organization between these jurisdictions. The presence of differentials between state tax rates generates incentives to evade motor fuel taxes by defrauding the IFTA system. The following are examples of ways motor carriers can evade tax collections (Alderman, 2005):

- A motor carrier who buys fuel in a high-tax state can falsify information on IFTA returns claiming that more miles were driven in a low-tax state than actually were. The carrier receives a credit or refund, thus avoiding a higher tax burden and the high-tax state is underpaid.
- A motor carrier can purchase fuel in a low-tax state, do much of their driving in a high-tax state, but falsely claim lower

miles driven in the high-tax state. Thus, they avoid having to pay extra taxes to the high-tax state on the fuel they bought in the low-tax state.
- A motor carrier who obtains untaxed fuel can provide forged receipts for their IFTA return claiming taxes were paid on the fuel.
- A motor carrier, who actually bought fuel in a low-tax state, can provide forged receipts claiming that the fuel was purchased in a high-tax state while also claiming those gas miles were driven in the low-tax state. The motor carrier would receive a credit or refund, the high-tax state would issue a refund where none was deserved, and the low-tax state would receive road funds that were not warranted.
- Motor carriers can avoid tax liability by simply not registering with IFTA and not filing IFTA returns. One way of getting away with this is by illegally obtaining IFTA decals. These decals could be stolen somehow, but in some states, carriers may have extra decals that they could pass on to unregistered carriers. This technique is enabled by some states, which allow motor carriers to obtain more IFTA decals than the number of vehicles in their fleet, so that they do not have to obtain new decals every time they wish to expand their operations. To the extent that these decals are sold to evading motor carriers, these motor carriers can avoid on-road detection of noncompliance with IFTA, purchase fuel in low-tax states, and fail to reconcile tax payments with tax liability, thus increasing profits by an amount equal to the difference between the tax paid on gallons purchased and taxes owed to the states where the fuel is consumed.

IFTA evasion generally was not viewed as a widespread problem by the tax administrators surveyed for this study; however, there is evidence to suggest that IFTA evasion may be a more significant issue than realized (Balducci et al., 2006). Further, IFTA audits could be used to detect other forms of motor carrier evasion unrelated to IFTA.

2.2.2.2 Case Example

States are required to conduct audits on a minimum of 3 percent of all IFTA returns for motor carriers. Some states may audit at a higher rate, but due to resource constraints, most are not able to do so. Further, jurisdictions often find that assessments are minimal for the given audit effort. Thus, high profile criminal cases of IFTA abuse are not common and IFTA audits are generally viewed more as a deterrent than as a revenue-generating procedure.

Tommy Mitchell Thompson: Thompson was ordered to pay a $1,000 criminal fine and $22,000 in restitution to the State of North Carolina after he was sentenced for failing to correctly file his mileage and fuel purchases throughout the United States. This was an unusually high assessment (NCDR, 2002).

2.2.2.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack.

2.2.2.4 Evasion Curtailing Methods

There are many methods for approaching IFTA noncompliance. One way of preventing motor carriers from operating without IFTA registration is to increase on-road enforcement. Further, jurisdictions are not always able to cross check IFTA decals with the actual company or name that the decals are registered under (Alderman, 2005). This leads to the ability of motor carriers not registered with IFTA to obtain and use decals of other registered carriers and not get caught. One way of preventing this method is to have a system that enables enforcement officers to link the actual decal with the registered party.

Elevating the effort to audit motor carriers is also another and obvious option for improving compliance. This may not be a very favorable option for many jurisdictions, however, because of financial constraints and also because IFTA audits have not led to very sizable assessments. A number of tax administrators interviewed for this effort noted that IFTA audits yielded a negative return on investment.

Increasing penalties for IFTA nonpayment or nonregistration may improve the return on investment for audits. To improve the efficiency of and speed at which existing audits take place, substantial penalties can also be imposed for inadequacy of records kept by taxpayers.

2.2.3 False Refunds or Credits

2.2.3.1 Description

The extent that fuel tax evasion through refund and credit schemes is a significant compliance issue depends on the point of taxation and how elaborate the exemptions are within a jurisdiction. For instance, tax systems with a point of taxation high in the distribution chain (e.g., the terminal rack) tend to generate higher rates of refund and credit filings as taxpayers recover payments made on taxed fuel used for nontaxable purposes. Also, the more exemptions a jurisdiction allows, the more refund claimants it is likely to have.

There are generally two types of claimants: a user who buys or a vendor who sells fuel to be used for a nontaxable purpose. Contingent on the types of exemptions that a jurisdiction allows, the following reasons that refunds or credits may be claimed by a buyer or seller of taxed un-dyed fuel might include:

- Fuel used in agricultural equipment,
- Fuel used by a government agency,
- Fuel used in commercial off-road equipment,

- Fuel used in marine vehicles,
- Fuel used in home or business heating,
- Fuel used in certain intercity buses, and
- Fuel stolen, accidentally destroyed, or contaminated.

A buyer or seller may falsely claim on their refund or credit application that fuel was sold or bought for one of the above purposes, thus evading the tax owed. It also is possible under certain circumstances for a wholesaler to apply for a refund or credit as well. Under a tax-at-the-rack system, a wholesaler can claim to export or sell for export previously taxed fuel. The fuel, in turn, could be sold within the jurisdiction with the wholesaler keeping the refund as profit.

2.2.3.2 Case Example

Samuel Yakabowicz Case: Yakabowicz, owner of Twenty-Four Hour Fuel Corporation in Brooklyn, NY, was found guilty of filing false tax returns and obstructing an IRS audit. Yakabowicz managed to evade $684,318 on more than 2.8 million gallons by fraudulently claiming tax refunds for fuel that was purportedly sold to a tax-exempt railroad but was actually sold to gas stations selling to the general public for on-road use. He also, on numerous occasions, delivered tax-exempt home heating oil to a railroad and claimed that it was taxed diesel fuel. For these misdeeds, Yakabowicz was sentenced to 5 years in prison and ordered to pay $750,000 in restitution (OIG, 2003).

2.2.3.3 Point of Occurrence in the Distribution System

Schemes involving refunds and credits occur in the nonbulk distribution system.

2.2.3.4 Evasion Curtailing Methods

Most jurisdictions that tax at the terminal rack do have significant refund programs, which lead to opportunities for abuse. One way to manage these compliance difficulties is to eradicate refunds all together (i.e., clear diesel used for farming equipment will not be entitled to a refund), though this option is generally politically infeasible.

For jurisdictions that continue to allow refunds, information from electronic reporting by industry and motor fuel tracking systems can be used to trace refund requests back to suppliers so that phony receipts can be identified (Anders-Robb, 2004). Some states estimate the appropriate rate of fuel use for agricultural purposes on a per-acre basis and compare the estimate to the amount claimed for refund to ensure that farmers aren't claiming vast volumes relative to their farming needs. Similar approaches could be used to estimate the usage per dollar of revenue for other industries claiming a refund. Estimates of gross revenue could be found on income tax statements in most states. States without income taxes could request copies of Federal 1040 filings to get estimates of fuel used and gross revenue for purposes of checking refund claims. Refunds would not be approved for claims above industry averages. In addition, to further reduce refund fraud as noted in the case example above, requirements for permits and signatures for each purchase would reduce the incentives for fraud if random audits of sellers could improve the chances of being caught.

2.2.4 Bootlegging Across State Lines

2.2.4.1 Description

When bootlegging fuel to evade motor fuel excise taxes, the fuel is first purchased in a state with a low-tax rate. Without filling out the proper export documentation, it is then exported to a border state with a higher tax rate and sold at retail stations without remitting the tax in the high-tax state. The tax evader yields extra profit equal to the difference between the tax rates for each gallon illegally imported. Bills of lading can be forged to avoid detection while the fuel is being transported.

2.2.4.2 Case Example

It is generally perceived that this is a problem for bordering jurisdictions with a significant tax rate differential. However, no case examples were identified.

2.2.4.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack.

2.2.4.4 Evasion Curtailing Methods

Many jurisdictions share import and export information, which can help identify any discrepancies. This information can be analyzed more efficiently when electronic reporting and uniformity exists. When bordering states have fuel tracking systems that allow total fuel accountability and these systems are uniform, importing or exporting across state lines without knowledge of both jurisdictions becomes very difficult.

2.2.5 False Claim of Export

2.2.5.1 Description

Perpetrators buy fuel within one jurisdiction and file paperwork claiming it is tax exempt because it will be delivered to another jurisdiction. However, the fuel is actually sold within the jurisdiction where the fuel was purchased, thus avoiding the tax. This scheme occurs between states and across international borders. Tax evaders go to extreme lengths to mask their crimes. For example, there is evidence to suggest that

perpetrators have dumped their fuel within a state and refilled the carrier tank with water so that a weigh station would assume that there is fuel inside the tank (Turner, 2004).

2.2.5.2 Case Example

Nicholson Brothers Case: Bruce Norman Nicholson and Brian Lynn Nicholson were convicted in 2001 of evading more than $12 million in motor fuel taxes in Texas and New Mexico for several types of fuel tax evasion schemes. The brothers owned and operated a series of companies (e.g., J&R Mercantile, Rogers Oil, Allstar, and Sunwest-C). One scheme they organized was a false export scam. The brothers purchased gasoline and diesel tax free from refineries in Texas and claimed that the product was to be exported from Texas. The fuel was not exported but instead distributed to 25 convenience stores that they operated throughout Texas (Billstone, 2005).

2.2.5.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack.

2.2.5.4 Evasion Curtailing Methods

As is the case with fuel tax fraud via bootlegging across state lines, false exports also can be detected when bordering states have total fuel accountability through fuel tracking systems and uniformity.

2.2.6 Illegal Importation of Fuel from Foreign Refineries

2.2.6.1 Description

Untaxed fuel is smuggled into the country and sold to retailers at taxed rates. Perpetrators of this scheme take advantage of the fact that state and federal agencies have no jurisdiction over foreign fuel supply operations. Thus, fuel can be purchased from foreign entities and brought into the United States and distributed under the radar of the IRS and state tax agencies.

Fuel is bought from a foreign refinery or bulk dealer and transported to the United States by truck or shipped by ocean vessel. By truck, fuel can be illegally imported and delivered to retail stations or perpetrator-owned terminals or bulk plants. If fuel is delivered to terminals or bulk plants, required reports are not filed. At border crossings, truckers are required to present, if requested, a bill of lading (BOL) to U.S. Customs. These BOLs can be forged. Further, there are border crossings not routinely manned by customs agents that these trucks can pass through.

Even when U.S. Customs or state police patrol borders, there is evidence to suggest that tanker operators effectively communicate with each other to avoid such stings or checkpoint operations. One study designed to detect cross-border smuggling examined the operations of petroleum tankers crossing from Canada into Washington State through two international border crossings [Washington State Legislative Transportation Committee (WSLTC), 1996]. To establish a benchmark, inspectors from U.S. Customs counted the number of petroleum tankers crossing into the United States daily over a seven day period. During this time, an average of 1.6 petroleum tankers crossed into the United States on an hourly basis. Next, uniformed Washington State Patrol (WSP) enforcement officers and IRS diesel compliance officers were dispatched to the international border crossings to weigh and inspect trucks, and to dip tanks. During the three-day inspection, there was a marked decline in the number of petroleum tankers passing through these international border crossings, thus demonstrating the ability of tanker operators to communicate with each other to detect and bypass inspection operations (Figure 2-3).

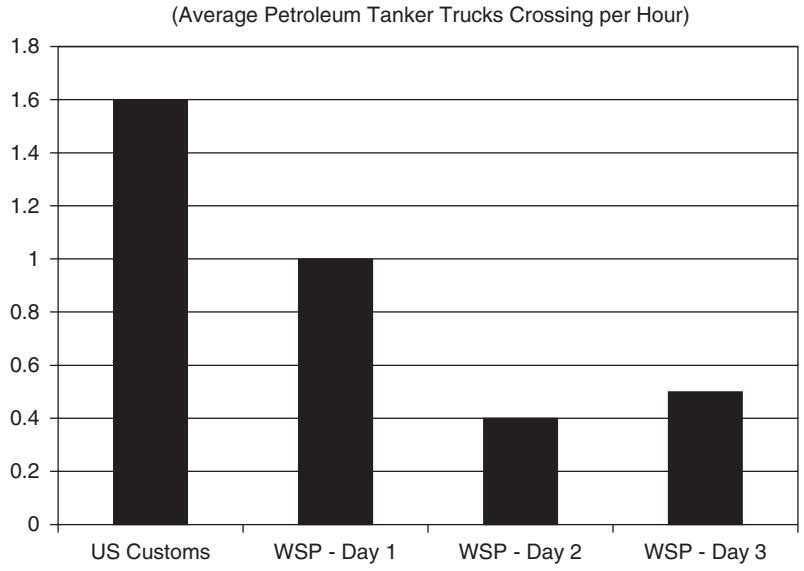
For fuel brought by ocean vessel, there are a few possible ways of unloading fuel from a ship without being detected. A perpetrator could simply not file Customs Form 3461, which contains shipment details such as when a shipment is scheduled to arrive and other data regarding the cargo, and Customs Form 7501, which is a statement of arrival of the shipment. However, there is a risk of being discovered unless the offloading happens at a hidden or remote location. A perpetrator could file the appropriate import documents, under-declaring the quantity of fuel actually imported. When the shipment arrives in the United States, the perpetrators only offload the amount of fuel claimed on Form 3461 in front of the gauger (customs officer inspecting bulk loads). After the gauger has signed the paperwork and left, the illegally imported fuel could then be offloaded. Alternatively, the gauger could be a part of the scheme (CBPP, 2004b). The fuel could then be delivered to the terminal or bulk plant, which would be owned by one of the perpetrators of this scheme. The gallons are not reported on federal and, if required, state terminal or bulk plant reports at delivery. Upon sale of the fuel, the perpetrator avoids the tax by not reporting the gallons on IRS Form 720 and equivalent reports at the state level. Also, these gallons also are not recorded as disbursements on terminal reports.

2.2.6.2 Case Example

While these cases have been suspected by state and federal fuel tax administrators, no cases of criminal prosecution were identified for this study.

2.2.6.3 Point of Occurrence in the Distribution System

This scheme affects points throughout the distribution process, both bulk and nonbulk.



Source: WSLTC, 1996

Figure 2-3. U.S. Customs versus WSP truck check.

2.2.6.4 Evasion Curtailing Methods

A system of total fuel accountability can disable perpetrators from selling illegally imported fuel if distributors or retailers are required to report the source of those volumes. Information exchange among foreign jurisdictions that require detailed reporting from their refineries and terminals also may be helpful in identifying any leakages. Finally, border interdiction efforts can detect and curb evasion of motor fuel taxes due to smuggling.

Certain technology can be applied as well to detect the movement of fuel loads across borders. Remote sensing devices can be used to track truckers crossing borders and allow interdiction on remote border crossings. Further, Global Positioning Systems (GPS) devices can be required to be attached to fuel tanker trucks to track truck movement and identify both miles and location of trucks entering the United States for IFTA. Not having an operational GPS device could, in turn, be an offense that could result in a penalty of a magnitude that would stop offenders. In addition, the comparison of GPS miles to truck odometer miles would be an easy check of compliance.

2.2.7 Abuses Due to the Presence of Native American Reservations

2.2.7.1 Description

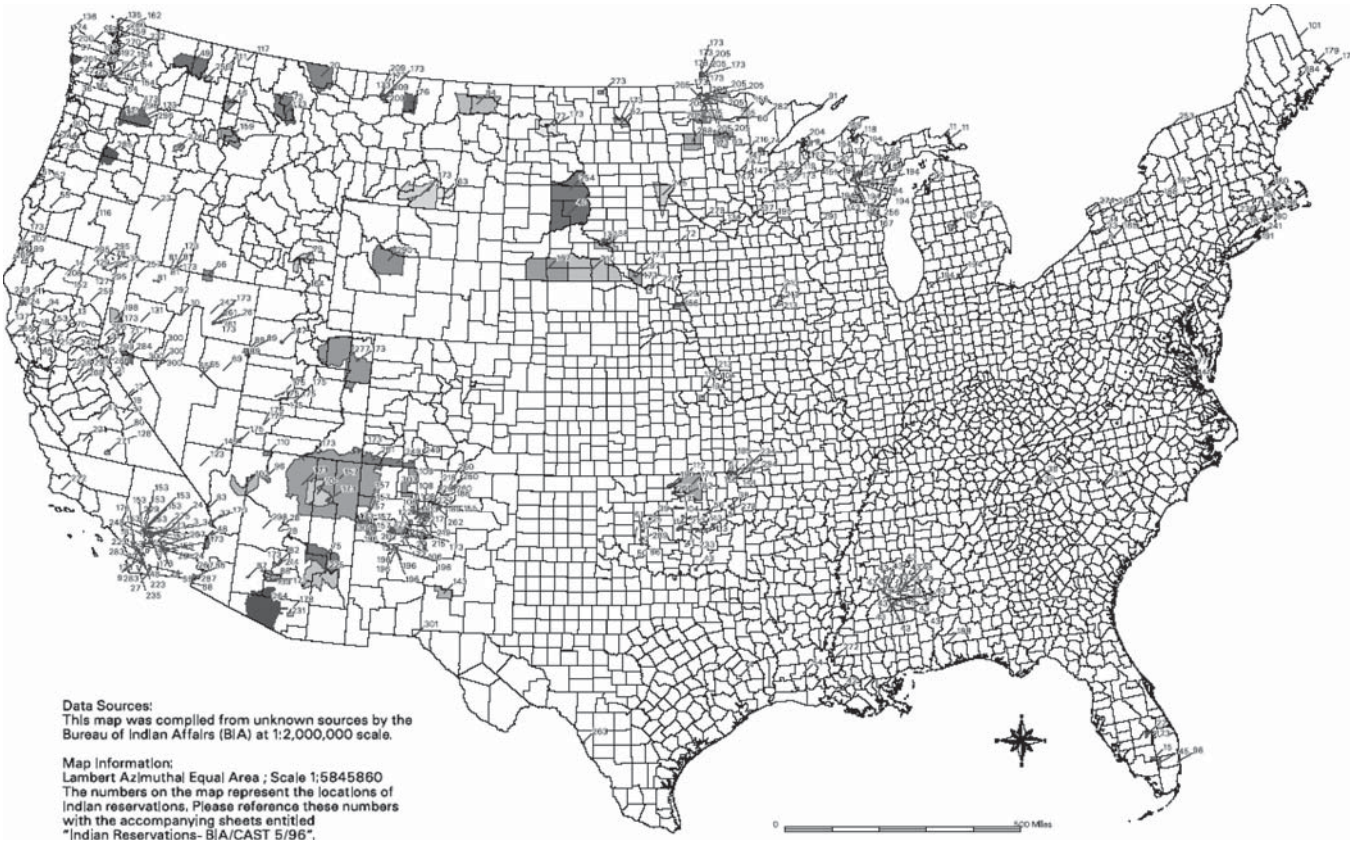
The issues faced by tax agents and compliance officers due to the presence of the Native American exemption are significant. According to the Bureau of Indian Affairs, there are 562 federally recognized tribal governments in the United States. These governments are spread out geographically over the United States from Alaska to Florida and from Maine to California. There are concentrations of Native American tribal governments in New Mexico, Arizona, Colorado, and Nevada. Figure 2-4 presents a map of the Native American Reservations in the continental United States.

The presence of retail motor fuel outlets on Native American reservations, therefore, presents two problems for federal and state tax agents and compliance officers:

- Nonreporting or inaccurate reporting of the quantity of fuel sold, which leads to lower returns of fuel tax dollars to the state from the federal highway trust fund than should be the case.
- Evasion of motor fuel excise taxes by motorists who purchase motor fuel on Native American reservations, but are not enrolled members of a Native American Tribe.

As noted in FTA's *Survey of Native American Issues,* there are a number of states that have entered into agreements for the collection of taxes with Native American Tribes (Arizona, Louisiana, Minnesota, Montana, Nebraska, Nevada, Oklahoma, South Dakota, Utah, Washington, and Wisconsin), states that are in active negotiations with tribes (Arizona, Connecticut, Montana, Nebraska, Nevada, North Dakota, Oregon, Utah, and Wisconsin) and states that are currently embroiled in litigation with tribes over the issue of motor fuel taxation (Idaho, Kansas, Minnesota, Nevada, and Pennsylvania) (FTA, 2002a).

While some states do have agreements about administering state fuel taxes in place with tribes, court cases in other states have determined that taxation of fuel in these lands



Source: Bureau of Indian Affairs.

Figure 2-4. Native American reservations in the continental United States.

would violate the sovereignty of these nations. In many states, Native American retail outlets may purchase tax-free fuel or obtain a refund for fuel distributed to reservation residents. One evasion scheme arises from the fact that fuel can be imported from Canada and delivered directly to Native American reservations without being reported. Perpetrators can, instead of actually delivering the product to the reservation, divert it to be sold for taxable purposes. If fuel is imported without filing correct customs paperwork, it would be very difficult to detect the diverted gallons since reporting to tax agencies isn't required.

2.2.7.2 Case Example

While abuses of this kind are often suspected, the federal government and states are restricted in how to respond as a result of the pervasive court cases and legal issues related to this problem. The IRS has filed tax liens totaling $79.3 million against three St. Regis Mohawk distributors for importing over 400 millions gallons from Canada; however, the liens have not been enforced (CBPP, 2004b).

Nicholson Brothers Case: Gasoline and diesel was purchased tax free from refineries in New Mexico under the false claim that it would be delivered to the Navajo Nation. Instead, the fuel was delivered to New Mexico and Arizona truck stops and convenience stores that were operated by the Nicholson's. The Nicholson brothers were not Navajo themselves, but had Navajo connections (Billstone, 2005).

2.2.7.3 Point of Occurrence in the Distribution System

Abuses resulting from the presence of Native American tribes can occur in the bulk and nonbulk distribution system.

2.2.7.4 Evasion Curtailing Methods

Some states have memoranda of understanding with Native American tribes, which can help to curb motor fuel tax evasion. These agreements can encompass provisions for fuel tracking, tax collections remitted to the state, refunds, and retailer licensing. If fuel is falsely imported to a Native American reservation, customs reports—if filed—may be compared to fuel transactions on reservation land to detect illegal diversion. Taxing motor fuel at the rack limits exposure to evasion as Native Americans must apply for refunds, which can be checked for

reasonableness, on all fuel delivered from local refineries and terminals. Some states have instituted policies where refunds are capped based on the number of enrolled members of a tribe and an assumption regarding a reasonable average number of gallons consumed per person for the time period each refund claim covers.

2.2.8 False Product Labeling

2.2.8.1 Description

The fact there are fuel products that have dual purposes or that there are other nontaxable products that can be used as a substitute for taxable product (e.g., kerosene, used oil, aviation fuel, off specifications fuel, and dyed fuel) creates opportunities for tax evasion. Fuel tax evaders can falsely label a taxable product as a nontaxable product at the point of taxation but eventually sell it for a taxable purpose. Mineral spirits is one form of fuel that is not taxable but can be used as a substitute for diesel. In some states, kerosene is not taxable and so a perpetrator can label diesel as kerosene and avoid state fuel taxes. Another scheme involves dyed diesel being acquired and delivered to retail stations under the false presumption that it is taxed fuel. Darker oils, such as waste oils, can be blended in with the dyed fuel to mask the apparent color. For these schemes, a perpetrator can minimize the risk of being caught by forging a BOL that specifies that the fuel had been taxed.

2.2.8.2 Case Examples

William S. Nappo Case: Nappo owned Eagle Oil Company in New York and was sentenced to 21 months in prison and ordered to pay $1.3 million dollars to the federal government in February of 2001 for fuel tax evasion. In 1994 and 1995, Nappo sold 5.7 million gallons of diesel fuel for on–road vehicles without remitting tax on those gallons. He accomplished this through falsified documents claiming he was selling home heating oil (U.S. Department of Justice, 2002).

2.2.8.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack, at the distributor level.

2.2.8.4 Evasion Curtailing Methods

False labeling may be detected by having a fuel inspection program that includes collecting samples from distributors and retail outlets. In addition, a requirement to have signatures and permits for undyed fuel usage would significantly reduce the potential for false labeling of fuel. Spot checks of signatures and delivery addresses could quickly identify fraudulent mislabeling of product.

2.2.9 Cocktailing

2.2.9.1 Description

Many products, not taxable or tracked by states or the IRS, can be used in gasoline or diesel engines. By blending these products with taxable fuel, fuel volumes can be extended. Perpetrators can either blend these products for their own use or they can profit from the tax collected on sales of the number of extra gallons created through blending. The actual process of combining the fuels can occur anywhere below the terminal rack (e.g., in a tanker truck, storage tanks at a bulk plant, or in storage tanks at a retail station) (CBPP, 2004a).

Many potential products can be blended with gasoline and diesel. One indicator that products have been blended is that some blending products will cause the overall blend to be darker in color. Further, some products, depending on the ratio of blend, will affect engine performance and may cause damage to the engine. Products that can be blended with diesel include: aviation fuel, bio-diesel, waste oils, used motor fuel, alcohol, transmix, and alkylates. Gasoline can be blended with transmix, or a number of blending stocks, which include toluene, alkylates, naphtha, and natural gasoline (Anders-Robb, 2004).

2.2.9.2 Case Examples

Richard Straka and Augustine Pesaturo Case: Pesaturo owned the Massachusetts-based company Covenant Oil and Straka was an employee. Both men were convicted of blending untaxed kerosene and home heating oil with diesel and not reporting tax on the blend (IRS 2005).

2.2.9.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack.

2.2.9.4 Evasion Curtailing Methods

Cocktailing schemes can be discovered through fuel sample collection and testing from tanker trucks and retail sites.

2.2.10 Tampering with Fuel Dye Equipment

2.2.10.1 Description

Many terminals with dye injection equipment have card systems in place so that registered drivers can load fuel without assistance. Further, these terminals are sometimes un-

manned at certain times of the week. A perpetrator can pull up to the loading rack, order a load of dyed diesel, tamper with fuel dye injection equipment, and leave with undyed and untaxed fuel.

2.2.10.2 Case Example

John M. Baker Case in Indiana: Baker operated Baker Oil Company and managed several truck stops in Orleans, Indiana. Based on an affidavit filed by an Indiana Department of Revenue investigator, Baker was arrested in September 2003 for tampering with fuel dye equipment. Baker was seen on surveillance videos rigging fuel dye injector equipment during the night at two unmanned terminals using a card lock system to enter and load fuel from the facility. The particular system that Baker bypassed had a 3-valve injection system (e.g., an intake valve, an injection valve, and a test valve). He was seen lifting the seals enclosing the valves and opening the test valve and closing the injection valve with a crescent wrench. The fuel was loaded, but instead of the dye being injected into the load of fuel, it was emptied into a separate bucket. An audit of his truck stops suggested that Baker collected over $500,000 in federal and state fuel taxes, which was not remitted to these agencies (CBPP, 2004b).

2.2.10.3 Point of Occurrence in the Distribution System

This scheme occurs at the terminal rack.

2.2.10.4 Evasion Curtailing Methods

States can adopt certain dye injection equipment standards to prevent easy access rigging of dye injection. Such standards can direct the installation of anti-tampering mechanisms (e.g., seals, sealed handles, and sturdy padlocks) on fuel dye injection equipment. Increased surveillance also can help to catch or deter those who tamper with dye injection systems.

2.2.11 Failure to Splash Dye

2.2.11.1 Description

Terminals that do not have dye injection equipment, or do but the equipment is malfunctioning, are allowed to permit dye to be splash blended (i.e., directly poured into the tanker truck). A tanker truck operator can purchase the fuel as tax free but fail to splash dye it and then sell it as tax-paid fuel, pocketing the amount of the tax. Suspected cases have involved a truck pretending to pour dye into the tanker truck and modified tanker trucks with internal storage containers that dye is poured into so as not to mix with the fuel (CBPP, 2004b).

2.2.11.2 Case Example

While this type of scheme has been suspected, no prosecutions resulting from such cases were identified for this report.

2.2.11.3 Point of Occurrence in the Distribution System

This scheme occurs at the terminal rack.

2.2.11.4 Evasion Curtailing Methods

This scheme can be stopped by disallowing the splash dye method and by requiring terminals to obtain and maintain operating dye injection equipment.

2.2.12 Illegal Removal of Dye from Exempt Fuel

2.2.12.1 Description

Dyed fuel is purchased and the dye is removed. The fuel is then sold at the retail level at taxed prices and the perpetrator pockets profit equal to the tax. There are many possible ways of ridding apparent red color from fuel (e.g., bleaching, masking, adding sulfuric acid, filtration, and re-refinement). These methods are discussed in further detail below:

- Bleaching: Household chlorine bleach is added to dyed nontaxed fuel to eliminate the visible red color (Marley, 1994).
- Masking: Green dye is added to red dyed fuel to conceal the appearance of red. The mixture of the red and greed dye produces a grey color that can not easily be identified (Taylor, 2005).
- Sulfuric Acid: Sulfuric acid can be added to dye to remove perceptible red color similar to using household bleach. The major problem with this method, however, is that this concoction is extremely volatile and dangerous to its handlers (Taylor, 2005).
- Filtration: Dyed fuel is transported to a warehouse where a charcoal filtration system has been set up. The fuel is run though the filtration system until no apparent red color is present.
- Re-refinement: Dyed fuel is bought and transported to a leased or owned, and most likely small, refinery and then refined to remove the dye. There already exist refineries that carry out the process of extracting red dye from transmix (i.e., the interface between dyed and undyed diesel in a pipeline) (CBPP, 2004b).

2.2.12.2 Case Examples

Hall Foster Case: Foster owned and operated Liskeard Transport, a fuel delivery company in Ontario, Canada. He was

caught, after being flagged for investigation when an inspector saw him purchasing tax-free fuel with cash, dumping a carton of green dye into the fuel tank on route between pick up and delivery. Ontario was able to test the fuel to ensure that it had originally been untaxed dyed diesel because of an invisible chemical marker that is injected into the fuel along with the dye. Foster had been delivering five to six loads of fuel a week, making $8,000 to $9,000 in profit weekly. Foster was assessed $16 million in fines in 1996, three times the amount of tax it was believed that Foster evaded (Taylor, 2005).

Murry Bowes and John Sangalia Case: Bowes and Sangalia bought tax-free, dyed diesel and brought it to a warehouse where they removed the dye. They had several large cylindrical containers that contained charcoal. The fuel was emptied into the first tank, filtered and then pumped into the next tank where it was filtered again. This process continued over several tanks until all visible signs of the red dye were gone. The charcoal could only be used for a limited duration of time, and the perpetrators dumped it into an adjacent field. This operation was estimated to have persisted for eight years. Bowes did not go to trial due to ailing health. Sangalia was sentenced to two years in prison in 2002 for fuel tax evasion and other offenses such as environmental pollution (Taylor, 2005).

2.2.12.3 Point of Occurrence in the Distribution System

This type of evasion scheme occurs during the nonbulk distribution process.

2.2.12.4 Evasion Curtailing Methods

A few jurisdictions have adopted the use of chemical markers integrated with fuel dye. Processes that are used to remove apparent red color from tax-exempt fuel do not remove the invisible marker. This scheme can be detected through the use of the invisible marker and a fuel dye inspection program that incorporates laboratory testing of fuel.

2.2.13 Failure to Remit Tax Payments

2.2.13.1 Description

The IRS and many states allow distributor registrants to purchase fuel untaxed. Perpetrators either obtain a registration legally or illegally or forge the registration documentation. Tax-free fuel is purchased and then sold as tax-paid fuel to other wholesale distributors or retailers. They evade the taxes by simply failing to file returns with the state and the IRS. A perpetrator may get away with this for some time before enforcement agencies can come after them due to long time periods between the filing of reports and remittance of tax. Further, the state agency must check the evading company's reports against other businesses to detect discrepancies or must find irregularities in the tax filings during the auditing process.

2.2.13.2 Case Example

Eugene Slusker: Slusker forged a registration and used an alias to purchase untaxed diesel, which he then sold to truck stops all over Ohio. He pled guilty to federal charges of diesel conspiracy in which he was able to evade over $88,000 in federal diesel taxes and over $117,000 in Ohio taxes in 1990 over a period of six months (FHWA, 1995).

2.2.13.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack.

2.2.13.4 Evasion Curtailing Methods

This scheme can be more quickly discovered by the implementation of a fuel tracking system that matches terminal disbursements with distributor reports. This type of scheme could be deterred through increased penalties as well.

2.2.14 Daisy Chains

2.2.14.1 Description

In this scheme, a ring of dummy corporations transact several fallacious purchases of fuel without remitting tax payments. The fuel is eventually sold at taxed rates to a legal retail operation. When investigators track the purchases of the fuel in an effort to track tax liability, one of the dummy companies—known as the burn company—dissolves along with any tax liability (Figure 2-5).

This scheme received a great deal of attention in the mid 1980s as mafia operations were using it to evade federal and state fuel taxes and earn profits in the millions. It relies on laws that allow licensed distributors to sell fuel to other licensed distributors, which was a characteristic of federal law before the points of taxation on gasoline and diesel were moved up to the terminal rack (in 1988 for gasoline and 1994 for diesel). The possibility of this scheme being employed still persists in some states that have not moved the point of taxation for gasoline and diesel to the terminal rack, though it is made much more difficult due to the movement of the federal point of taxation up the distribution chain.

2.2.14.2 Case Examples

Ammar Tabbaa and Khaled Tabbah Case: The Tabbahs pled guilty in 1997 for defrauding California of $8.5 million in fuel taxes and attempting to defraud the federal government of

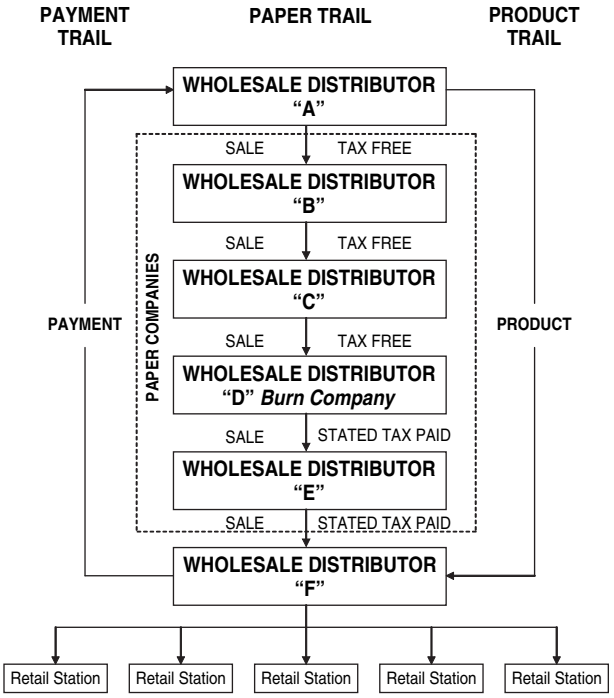


Figure 2-5. Structure of the daisy chain (FHWA, 1992).

approximately $25,325. The California charges were from a daisy chain scheme that operated between 1992 and 1995. The federal charges resulted from the sale of over 1 million gallons of jet fuel as diesel fuel between July and September of 1995.

Larry Iorizzo, Michael Franzese and the Colombo Organized Crime Family. The most well known tax evasion case, and certainly the most notorious use of the daisy chain, involved Larry Iorizzo, Michael Franzese and the Colombo crime family during the 1980s on Long Island, New York. Iorizzo broadened his reach and by 1983 had evasion schemes operating in New York, New Jersey, Connecticut, and Florida (CBPP, 2004b). Following capture, Iorizzo became an informant for the federal government and testified before Congress that the scam generated $8 million in illegal profit per week at its height. Iorizzo later dropped out of the Witness Protection Program and was arrested for developing tax evasion schemes in Texas and Washington State.

2.2.14.3 Point of Occurrence in the Distribution System

This scheme occurs below the terminal rack within the nonbulk system.

2.2.14.4 Evasion Curtailing Methods

Many jurisdictions have moved the point of taxation to the terminal rack specifically to deter this type of scheme.

2.3 Issues Related to the Point of Taxation and Refunds

Motor fuels are taxed at a variety of points in the distribution system. There are substantial differences among states about when taxes are due, and they often differ from the point of federal taxation. When the federal government moved the point of taxation for motor fuels to the rack, there were substantial increases in tax collection (Baluch, 1996). A number of states also have reported increases in tax collections when they moved the point of taxation to the rack. This has led other states to consider this move as well.

There are, however, a number of issues to address in trying to evaluate the effectiveness of this change on tax evasion. First, the federal government and most states made other changes at the time the point of taxation was changed. These are likely to account for some of the noted tax increases. Second, movement to the rack increases the number of refunds that must be made. This may complicate the estimation of the tax gains from moving to the rack, and refunds may create their own opportunity for tax evasion. Third, taxation at the rack may make it more difficult to monitor the movement of fuel coming from outside of the state. Fourth, taxation at the rack typically means that the firms paying the taxes are larger and have larger tax liabilities than firms further down the distribution chain; this raises the potential for large tax losses due to bankruptcy.

This section discusses these issues and their implications for detecting fuel tax evasion. The first section provides a general comparison of fuel taxes with other excise and sales taxes to help clarify key issues in the fuel tax collection process that may increase the likelihood of tax evasion. The next section discusses the evidence that tax collections increase when the point of taxation is moved to the rack. This is followed by a discussion of tax refunds and the potential problems created by increased refund activity. Appendix C contains a summary of many of the interview comments related to these topics.

2.3.1 Comparison with Other Excise Tax Systems

All tax systems have certain issues in common: administrative costs, enforcement cost and effectiveness, and compliance cost imposed on the taxpayer. In addition, fuel tax systems have some unique issues. While tax systems are designed to raise revenue, there are other aspects that often complicate the system. The biggest complication for fuel tax systems is that the system is tied to use of the roads, which may be difficult to measure. An excise tax is levied on all sales of a good, and it is often identified as an indirect tax since it is effectively levied on the seller rather than on the consumer.

Unlike the income tax, the motor-fuel tax is an indirect tax that is collected from citizens by vendors selling or distributing

fuel. While some individuals may successfully evade the fuel tax, most fuel tax evasion occurs after the tax is collected from the citizen and before the tax is remitted to the state. This is a principal-agent problem between the government collecting agency and the vendor responsible for remitting the tax to the state. In this regard, the fuel tax is similar to other excise taxes such as sales, tobacco, alcohol, and luxury taxes, with similar incentives and methods of fraud (Denison and Eger, 2000).

Fuel taxes also have unique characteristics. Many excise taxes have certain users who are exempt from the tax; however, this typically relates to the user rather than the use. For fuel taxes, there are users who are exempt from the tax and there are specific uses that are exempt. The latter complication makes the fuel tax relatively more difficult to administer and more subject to evasion than other excise taxes.

When a fuel tax is levied based on the tax status of the user, there are clear parallels with other taxes. If the tax is levied at retail sale to the final consumer, then the retailer can be charged with ascertaining the tax status of the consumer. The retail sales tax has a variety of tax-exempt purchasers so many sales are tax-exempt. While this creates the potential for tax evasion, it is typically not considered a large problem. Since tax-exempt users are often similar for the fuel tax and retail sales taxes, e.g., local governments, analysis of sales tax experience is likely to offer some guidance as to the potential for tax evasion associated with tax-exempt users. The sales tax experience is less relevant as the tax is moved up the distribution chain since it becomes more difficult to make tax-exempt sales and more common to rely on refunds for the tax-exempt users.

While retail sales taxes work well when the tax is levied at the time of sale, it is much less effective if the consumer is able to purchase an item without paying the tax (e.g., out of state). States levy a use tax to supplement the sales tax in such instances. If a person purchases an untaxed item for use in the state, they are supposed to pay the sales tax that would have been levied if the sale had occurred within the state. This is known as the use tax, and collecting the tax due is a significant issue. For example, the State of Washington (2003) finds that the noncompliance rate on the use tax was 27.9 percent in 1998 while the noncompliance rate on the sales tax was only 1.3 percent. The high rate of noncompliance for the use tax illustrates the potential problem for collecting tax on fuel purchased out of state and brought into the state. Unless the state has an effective method to monitor such fuel movements, there is likely to be an evasion problem. Alternatively, where states can monitor the activity, there is much less tax evasion. States find that they can collect the use tax when they have a method of tracking the item. In particular, the use tax can be effectively levied on automobiles purchased out of state because they must be registered for use in state (Due and Mikesell, 1983).

The more difficult problem is the use of fuel in both taxable and tax-exempt or low-tax uses. The user typically determines the tax-exempt uses, and must specify how much fuel was used in taxable versus nontaxable activities. There is typically a refund for tax-exempt uses if the fuel has been subject to taxation. In this case, it is necessary to determine the use of the fuel, and this may be difficult to verify. States can avoid most of the problem by requiring that fuel used for tax-exempt purposes be dyed, but this is often resisted by the fuel users.

While refunds may be a problem, many of the more substantial problems are associated with large volume movements of fuel between road use and other uses. Diesel is similar to if not identical to a variety of other high volume fuels, such as home heating oil, kerosene, and aviation fuel. Since it is possible to either convert or blend many of these tax-free or low-tax products into road use, there is substantial opportunity for tax evasion. Other taxes typically do not address this problem of a product that can be converted among different taxable categories with relative ease.

The gasoline tax is less subject to evasion than the diesel tax because there tend to be relatively few tax-exempt uses for gasoline while there are many off-road or nonroad uses for diesel. Hence, there tend to be fewer objections to taxing all uses of gasoline than restricting the tax exemption to specific users. Thus, FHWA (2001) reports that 17 states tax nonhighway use of gasoline while only two states tax agricultural use of gasoline. Hence, 17 states do not have to determine whether claims of off-road use for gasoline are valid. Nevertheless, tax exemption for off-road use is the most common situation.

Eliminating refunds for exempt uses substantially reduces the potential for refund fraud. The use of dyed fuel makes it possible to levy the diesel tax without a use exemption, with all undyed fuel subject to the tax without refund; however, most states and the federal government allow for refunds on undyed diesel if used for tax-exempt purposes. Tax-exempt uses typically include agriculture, off-road use, state and local government use, and federal government use. Some states also exempt use by transit systems and a variety of other uses.

Limiting exemptions to specific entities rather than uses eliminates much of the refund problem, but it does not solve all problems associated with the point of taxation. From a state perspective, movement of fuel among states creates the possibility of tax evasion either by not paying any state tax or by paying the tax of a low-tax state and delivering the fuel to a high-tax state. This topic is covered in the section of this chapter covering coordination and will not be discussed in this section except in relation to the point of taxation.

For administrative ease, the tax may be levied on sellers rather than on consumers directly, with the seller becoming an agent for the government in collecting the tax. The specification of the taxpayer and the collection system create a variety of problems and potential for tax evasion. If the tax is ultimately a tax on the consumer and it is levied on the seller, then there

must be a mechanism for the taxpayer to get a refund. In some cases, the government will allow the seller to claim that a sale was made to an exempt user or for an exempt use and file directly for the refund. In other cases, the end user must file directly. When the seller can file, there are fewer returns filed but it is harder to determine if the final use was indeed a tax-exempt one. However, if the end user must file, there is more opportunity to determine the actual final use of the fuel, but the number of refund claims increases. Hence, even the specification of who is eligible for a refund can create issues with respect to the potential for tax evasion.

Refunds also create problems for sellers and consumers. The need to file for a refund creates an extended need for record keeping on the part of the exempt user and uses. It also creates a float issue, since the government is getting use of the tax funds for a period of time. Balancing the different priorities of the government, the sellers, and the consumer leads different states to substantially different systems. These have implications for the type of evasion possible.

Refunds create the potential for several types of tax evasion. First, there is the possibility of false refund claims associated with using tax-paid fuel in taxable uses but claiming it was used in nontaxable uses. Second, there is the possibility of several types of outright fraud, where refunds are claimed for fuel on which no tax was paid or where false claims are generated. On the other hand, moving the point of taxation closer to the retail level reduces the possibility of refund fraud but increases the possibility of daisy chains and other types of evasion. A point of taxation closer to retail also increases collection problems, since the entities closer to the retail level tend to be less financially stable than the ones up the distribution chain. In interviews conducted for this study, a number of states complained of the difficulty of collecting bad debts from firms down the distribution chain. On the other hand, large firms have larger tax liability, so when there is a problem, the amount of tax at risk may be much larger when the tax is levied at the rack. Also, large firms tend to deal with a larger variety of products and may have more potential for misreporting or under-reporting of tax liability.

There is some feeling that better coordination among the states, with all taxing at the same point, would reduce the chances for evasion; however, there also are difficulties with this approach. In particular, states with different tax rates still would have to be able to track the fuel to its ultimate destination and, in many cases, the fuel would have to be taxed in one state for payment to another. This runs into what is known as the nexus problem. A state can only levy a tax on a business with a presence in the state. Hence, a terminal in an adjacent state that simply sells fuel for delivery into the state would typically not be judged to have nexus in the destination state. Thus, the destination state cannot force the terminal to collect tax for it.

States find that businesses will not collect sales taxes for them if they do not have nexus in the state. However, this is less of a concern for fuel taxes. The problem for a business collecting a sales tax is that the customer typically would not pay the tax if the seller does not collect it. While the customer is liable for unpaid taxes when the product is brought into the state, as a practical matter it is very difficult to enforce this tax. Hence, the customer would not want the seller to voluntarily collect the tax. However, movements of fuel are tracked more closely than movements of individual consumer items. Fuel imported into a state is likely to be taxed as it enters the state. To avoid the need to file separate tax returns, importers may prefer that the tax be collected at the terminal, and terminals are more amenable to collecting taxes for other states if it simplifies the taxation system and allows them to provide a service for their customers.

Consistent tracking of fuel would alleviate many problems with differences in collection systems and points of taxation but this also has drawbacks. One issue is the amount of reporting required and the compliance cost imposed on the industry. While tax collectors would prefer to have detailed records of all movement of fuel, this imposes a compliance cost and creates ill will when the taxpayers perceive that the information is not used by the taxing agency.

2.3.2 Moving the Point of Taxation as a Strategy for Decreasing Evasion

Moving the point of fuel taxation to the rack has an impressive set of empirical arguments, with virtually all tax jurisdictions that have made this move reporting increased tax collections following the move. In addition, most report other benefits and limited problems. The Texas Department of Transportation collected a variety of quotes relating to moving the point of taxation to the rack, and they offer some interesting perspective on the benefits of such a move. These are presented in Appendix C. However, movement to the rack does not work well for all states, and several seem satisfied with nonrack tax systems.

While it is common to identify tax as being at a particular point in the distribution chain, the reality is more complex. For example, a tax on a distributor when the fuel is removed from the rack is very close to a tax at the rack, and this is very different from a tax on the distributor at sale to retail or final use. A number of other characteristics are important when examining the point of taxation and its effect on tax evasion. Figures 1-2 and 1-3 show the nominal point of taxation as reported by states in a survey. Of the 22 states that list the distributor as the point of taxation for diesel fuel, they are about evenly split between whether the tax is levied on receipt or sale by the distributor. The specifics are even more complicated due to various other provisions about when taxes must be paid.

It is apparent that not all distributor taxes are the same and that there is a mix of agents and taxpayers. While the distinction is not universal, an agent for the state does not bear ultimate liability for the tax and is often credited with a collection allowance or other compensation for serving as an agent.

When taxation is moved to the rack, it is assumed that the increase in revenue is due to reduced tax evasion. However, there are other possible reasons to expect to see such an increase. First, when the point of taxation is moved up the distribution system, there will be a brief period of time when the tax is being collected from both the higher and lower point on the system. This period of "double taxation" typically would last a short time, but empirical analyses that did not take it into account would overstate the revenue impact of moving the point of taxation.

The second reason is that fuel previously not taxed would now be taxed but subject to a refund. Hence, initial collections would increase but net future revenue would go back down due to the subtraction of refunds. The IRS estimated increased revenue of $1.23 billion in 1994 associated with moving to the rack and instituting the dyed fuel requirement, but this was reduced to about half of that amount when refunds, credits, and economic growth were taken into account (Baluch, 1996).

A final concern is that while some fuel that should have been taxed was not taxed under the old system, fuel that should be tax-free may now be taxed. This could occur if the user of tax-exempt fuel finds the cost or bother of filing for a refund to be greater than the expected refund amount. There is ample evidence of this phenomenon in the private sector with rebates. Rebates have several attractions from the perspective of the seller. One is that they get the use of the funds for a period of time without any interest payment, and the second is that some percentage of the eligible users will fail to file for the refund. This raises the net proceeds from the sales.

This may be occurring with fuel sales. Some users who would purchase tax-exempt fuel if it were available will fail to file for refunds if the fuel is purchased with tax paid. This is complicated by the different interpretations of who can and should file for such refunds. Differences among the states in determining who is or is not eligible for a refund may increase the amount of tax collected that should have been refunded. States show substantial differences in exemptions and refunds for fuel taxes.

While increased revenue is a benefit when viewed from the tax collection perspective, the move typically encounters taxpayer resistance due to concerns of lost "float," increased refund requirements and other factors. Because of these concerns, anecdotal evidence of revenue increases when the point of taxation is moved should be viewed with caution. The amount of tax increase may be overstated due to the confounding effects of refunds and double taxation, and due to the fact that most states make other changes when moving the point of taxation that may influence the rate of tax collection. Attempts to estimate the impact of moving to the rack on tax evasion should take account of alternative causes for revenue increases to get an accurate estimate of the impact of this change alone.

The biggest benefit from taxation at the rack is the reduction in the number of taxpayers and the increase in their stability. Moving lower in the distribution chain, the tendency is to find many smaller firms and more entry and exit. This creates two problems for the tax collector. The first is there are more firms to deal with. While the cost of the audit for a small firm will be less than one for a large one, the difference is typically not proportionate to the size of the firm. More resources are needed to maintain the same number and intensity of audits with many smaller firms. The second problem with many small firms is that they tend to go out of business much more frequently. The State of Washington (2003) finds that noncompliance is higher among smaller firms. This creates legitimate problems for the tax collector with bankruptcy and related matters, but it also creates the potential for daisy chains and related schemes. On the other hand, some consideration should be given to the larger potential tax losses associated with large taxpayers. While they are less likely to default on taxes owed at any one time, any default could lead to large tax losses.

While movement up the distribution chain can reduce the potential for daisy chains, there are other actions that states can take as an alternative to moving the point of taxation. One item is to make the owners of the company liable for any taxes owed. By stripping away the corporate shield, it is possible to greatly reduce the incentive for daisy chains. The other major form of protection against daisy chains is to require the tax be paid at the first transaction. By eliminating the possibility of multiple tax-free sales of fuel, the potential for evasion is limited as well. The disadvantage of this approach is the higher cost to the industry in the form of reduced float and increased need for refunds. Industry values float because it is essentially an interest-free loan. Many states require that the tax be paid some time in the month following the fuel sale. This means that the taxpayer has use of the money for up to two months in some cases. While this seems like a trivial issue to many people (amounting to about 1 or 2 percent of the tax), it is highly valued in the industry.

Fuel is typically taxed either at the rack or the distributor level. Three states tax diesel at the retail level, and a number of states have local options that allow counties to add their own fuel taxes. The latter typically requires some differentiation of tax at essentially the retail level.

Interview responses generally confirm that points of taxation vary by state based on differences in industry structure, administrative preferences, and political climates among states. Some have considered moving the point of taxation to the terminal rack as a strategy to reduce evasion. Industry representatives resist the movement of taxation to the rack due to its perceived cost. When the tax is on the distributor, payment to the state

may be delayed for almost two months, allowing for interest-free use of the funds, known as the float. Distributors view loss of the float as a cost increase to them. Several states have addressed this issue by allowing the distributors to withhold payment of the tax to the supplier until the time the tax must be paid to the state.

A number of states have moved the point of taxation to the rack. Some report an increase in revenue associated with the move, but some do not. For example, Texas shifted the point of taxation to the rack in January 2004, but has not seen a spike in collections since moving the point of taxation. However, the point of taxation was already close to the rack. On the other hand, Idaho reports that the state experienced a 19 percent increase in revenue by moving the tax to first receiver and that it has not moved it to the rack due to industry resistance.

Florida reported that taxing at the rack has made an improvement in revenue collection, but it makes it easier to bootleg fuel from Georgia. Also, it is harder to catch untaxed kerosene coming into the state. The benefit of taxing at the rack, according to Florida, is that it has essentially eliminated bad debt and failure to file. Florida used to lose $2 or $3 million per year in bad debt.

A number of states reported that attempts to move taxation to the rack have run into industry opposition. For example, Alaska basically taxes at the distributor level and has done so since 1970. Changing the point of taxation has been discussed internally, but issues with refunds, as well as quirks in the physical distribution system and the problems they would create, prevent a shift.

Another conclusion from the interviews seems to be the ability to make tax-free sales at the distributor level that creates the potential for daisy chains. Limitations on tax-free sales seem to have many of the effects that occur with completely shifting the point of taxation to the rack. However, they also have many drawbacks, such as an increase in the amount of refunds. Nevertheless, it appears that it would be a significant error to look simply at the point of taxation. In particular, taxes at the distributor level can be very different in the potential for evasion based on the ability to sell tax-free fuel among distributors. The other issue when such sales are allowed is the ability of the state to recover taxes in the event of bankruptcy. Several states indicated they require directors of a corporation be personally liable for taxes in the event of a bankruptcy. Hence, careful monitoring of the directors and/or the use of bonds can limit the potential for daisy chain-type evasion.

2.3.3 Refunds

Several issues arise in analyzing refunds. From the perspective of the tax collector, the major issue is that refunds should only be issued for legitimate tax-exempt uses of the fuel. However, taxpayers want a simple, quick method of getting their refunds. These two objectives are often contradictory. For example, Alabama has a relatively simple refund form. The form requires little more than the allocation of fuel to nontaxable activities. On the other hand, Florida has a fairly complex refund claim form. The form requires information on fuel purchase and use by county. In addition, with complicated forms, there may be incorrect information or ambiguities regarding who may file or which uses are exempt from taxation. The potential for tax evasion is associated with the possibility of refund claims in excess of actual tax-exempt use or of fraudulent claims of exemption. Further, there are suggestions that claims for refunds have been made on fuel that was not taxed. For example, GAO (1996) reports on several refund fraud schemes detected by the IRS. States vary on their policies regarding refunds, the documentation needed, and the party entitled to the refund.

The differences can be quite significant. For example, in Canada and in Texas, all diesel fuel is either dyed or taxed. This significantly simplifies the refund process. However, there are substantial objections to this requirement. Diesel is either equivalent to or compatible with a variety of other uses, such as home heating oil or jet fuel. There are benefits to maintaining the option of converting between the different uses. However, if there is the potential that the fuel will be used in taxable road uses, it must remain undyed. This requires that either potential road fuel is untaxed or that the fuel be taxed and then allowed a refund. Neither option is particularly appealing, but most states opt for the use of refunds for direct end users. Fuel in the bulk system is typically not taxed if identified for a tax-exempt or lower tax use.

Most states exempt fuel for use by other governments, by agriculture, and for other off-road uses. However, a number of states levy a sales tax on fuel for off-road uses but not on fuel for on road uses. When the price of fuel is relatively low, the fuel tax is likely to be high relative to the sales tax, since the fuel tax is typically specified per gallon while the sales tax is specified as a percentage of the sales price. However, when the price of fuel is relatively high, there may be little incentive to apply for a refund for off-road use since the net difference in taxation from the taxpayer perspective is small. At high enough prices of fuel, it may actually be advantageous to the taxpayer to pay the fuel tax rather than the sales tax.

States vary substantially on the amount of refunds and the methods of verification. Some states contacted for this study report very high levels of refund claims while others report few if any. Some differences, such as the degree of agricultural activity, contribute to this, but much of the difference appears to be due to differences in state policy. Some states require substantial verification for a refund while others have less restrictive requirements.

Refunds are a large concern for North Carolina, amounting to more than $50 million annually. The state requires receipts

and an explanation of the operation for which the fuel was used. There are a number of companies/individuals who can claim refunds. In the last five years, the number of refund applicants has grown significantly. There are a number of exemptions and North Carolina views this as a significant source of evasion and wants to shift to the tax or dyed scenario.

At the other extreme, North Dakota does not consider refunds a problem at all. North Dakota representatives audited three years of refund applications but stopped doing so because the audit returns were so insignificant. There were only two assessments during the three years. However, they only allow refunds for gasoline. Diesel must be dyed or taxed.

Florida integrates its process for fuel tax refunds with its sales tax. Refunds are issued for diesel but not gasoline. The refund process has two primary categories. There is an ultimate vendor credit that allows vendors to sell fuel tax-free, e.g., for sales to farmers, kerosene for home heating, sales to the federal government, or for export. However, some users purchase taxed fuel and file for a refund. For example, if a construction company buys clear fuel, there is a tax return that they can file (refund document). It requires a schedule of all fuel purchased. A use tax is deducted from the fuel tax refund since the sales tax is due on off-road use of fuel. Some states require payment of the sales tax before processing the refund, but Florida has all of the taxes in the same department. They also can transfer the money between funds for payments to local governments. When a refund application is filed, they can require receipts but they usually only look at them during an audit. The refund schedule has the Federal Employer Identification Number (FEIN) of the vendor so they can track the purchase if there is a question. They believe that paper receipts are of questionable value since they can be forged easily.

Industry representatives had relatively uniformly negative views of refunds. One oil industry representative interviewed for this study called it a huge issue because in some states the supplier has to give a refund to the customer and then file with the state. If the supplier must apply, it limits the number of entities the state must deal with, but the suppliers think the end consumer should be applying. The focus is on what the end user did with the fuel. The opinion was expressed that refunds are a mess nationwide and may be one of the great sources of tax evasion. An example was cited of a case in Texas where a state employee created fictional refund claims. Often only the first refund claim is checked carefully, so the state employee would then enter false ones. The respondent believed this type of evasion has likely happened in other states as well. Issuing refunds as an income tax credit reduces fictional ones, but not all states have income taxes.

The Biodiesel Board finds refunds a significant issue. Most of the biodiesel is used for non-taxable uses. Thus, the issue of refunds is significant. Sales are lost because consumers do not want to have to file for refunds.

Filing for refunds at the state level is a large concern for trucking companies. There is an occasional complaint that the IRS can be slow to make a refund but it does not seem to be a large issue. It was asserted that most major carriers farm out state refund claims to third parties, who charge a percentage. The size of what they let collectors keep is an indication that filing state refund claims can be difficult. Thus, states likely over-collect fuel taxes in some cases due to the difficult process for refunds.

2.4 Issues Arising from the Lack of Coordination and Uniformity in State Taxing Systems

Coordination of state tax systems is one of the most significant issues affecting tax evasion at the state level. Coordination issues arise due to a lack of uniformity in tax rates and systems, methods of communication across state and international borders, and, where it is a problem, coordination between state and Native American Tribes where consumers are purchasing untaxed fuel. Each of these issues directly affects the methodology for estimating state-level tax evasion.

Uniformity of tax systems and rates could provide substantial benefits from the perspective of taxpayers and tax collectors. Uniform tax rates remove the incentive to pay tax in one state rather than in another state; and with uniform tax systems, it is more difficult to misrepresent the movement of fuel. The FTA Uniformity Committee has promoted a variety of actions that states could take to improve coordination, such as uniform definitions and reporting schedules. In addition, JFSMFTCP has promoted regional cooperation. However, individual states have a variety of reasons why they have different tax rates and structures. Given these differences, there are methods to mitigate the problems that different tax rates and structures create.

This section examines differences in tax rates and systems between states and then discusses the similarities and differences that occur at international borders as compared to state borders. This is followed by a discussion of the issues raised by Native American reservations in a state and the differences in opinion about how fuel sales on Native American reservations should be taxed. Within each section, the main issue is discussed followed by a summary of what interviews with state administrators and other interested individuals contributed. Appendix C contains a more detailed summary of the interview responses related to these issues.

2.4.1 Lack of Uniformity in Tax Systems

There is substantial discussion about moving the point of taxation to the rack for states that currently tax below the rack. While those states moving the point of taxation have gener-

ally reported higher tax collections and other improvements in the administration of the fuel tax, many states have other points of collection.

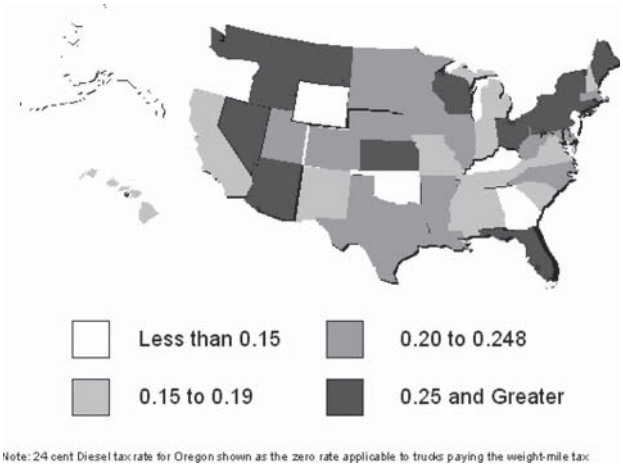
> The federalism system in this country allows each state to develop their unique system for road fund revenue collection. As a result, the structure of a state's road fund may differ from others in response to the unique characteristics of the industry in their state and the different views of its citizens regarding fair and equitable tax and revenue and tax base differences (Eger and Hackbart, 2001).

At the state level, points of taxation vary widely due to a combination of the differences in administrative conditions facing states and the actions of the different legislatures. Figures 1-2 and 1-3 in Chapter 1 illustrate graphically the differences in point of taxation by state. While political differences clearly affect decisions related to uniformity, administrative issues are important and provide some insight into state differences. Some states have many refineries while others have none. A few states have a small number of terminals or no terminals at all and import their fuel from other states and foreign locations (CSG&CGPA, 1996). Many states now collect fuel taxes at the terminal level but some still tax at the retail level. Taxation at the rack makes the most sense for states with refineries and terminals. States with no terminals effectively have no method to tax at the rack, and some argue that retail taxation is the most effective when fuel comes into the state from many out-of-state sources.

Differences in the point of taxation create problems with tracking fuel. While it is possible for states to collect and trade information regardless of their own point of taxation, there is some tendency to collect information relevant for the particular point of taxation in that state. Hence, a state with a retail-level tax may not be particularly concerned with tracking fuel before it gets to the retail level. However, a neighboring state that has the tax at the rack may want to know when fuel that is headed for the second state leaves the terminal in the first state. If the first state does not collect this information, then there is a potential for movement of untaxed fuel from the first to the second state.

Some states require that diversions of fuel from one state to another be submitted to a national registry (e.g., Alabama). However, it does not appear that there is substantial use of the registry nor the diversion information.

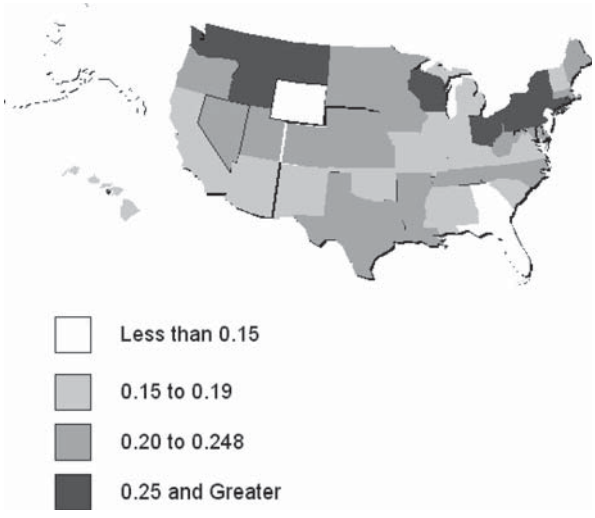
As noted in the section covering the point of taxation issue, there is widespread agreement that moving the point of taxation to the rack has reduced tax evasion for most states that have made the change. However, this section focuses on the coordination problems associated with differences in the point of taxation; these remain significant since many states still do not tax at the rack.



Source: FTA, 2002

Figure 2-6. State rates of taxation for diesel (cents per gallon).

States also vary widely in their tax rates and applicable taxes. Figures 2-6 and 2-7 illustrate the differences among states for tax rates on diesel and gasoline. There are a number of low-tax states surrounded by high-tax states. Further, these maps show fuel taxes only, and many states levy other taxes that may further magnify the differences between states. The tax rates may be effectively zero, as in Oregon where diesel fuel for heavy vehicles is not taxed, or it may be a combination of fuel and other taxes, such as sales taxes. In addition, some states have local options, allowing county governments to add their own fuel tax to that imposed by the state. Hence, fuel tax rates can vary substantially across and even within states.



Source: FTA, 2002

Figure 2-7. State rates of taxation for gasoline.

Tax rate differentials make payment of the tax in a low-tax state and sale of the fuel in a high-tax state very attractive. While states can take actions to deter such activity, a large tax differential may make it very profitable. "Evading just the federal tax on an 8,000-gallon truckload of diesel fuel would yield an illicit profit of $1,920. Thus, although the government has taken steps to better assure compliance with motor fuels taxes, a strong incentive to evade these taxes remains" (GAO 1996). In general, tax evasion is subject to economic incentives; the greater the reward for evasion, the more likely it is to occur. In addition, if incompatible reporting systems and limited border enforcement make it difficult to detect the evasion, it becomes more worthwhile due to the lower probability of being caught. The level of penalties for evasion will also enter into the calculation.

The interviews conducted for this study generally confirmed that lack of uniformity in both the point-of-taxation and the rate-of-taxation creates evasion opportunities. Some states have taken specific actions to deal with such problems while others are aware of the problem, but do not feel they have the appropriate resources to deal with it.

Several of the states interviewed noted that while states may exchange information on imports and exports, this information is not exchanged if the fuel is not declared for export. For example, Arkansas noted that Missouri and Tennessee only report exports to the state designated, so Arkansas may not receive a report if the destination is changed. Also, both states charge their own tax if an exporter is not licensed but the fuel may be exported anyway. The type of information needed, as well as the type of information collected, is shaped by the tax system. If neighboring states have different systems, then they may not be able to share useful information. Most states perceive the need for sharing and processing of information but many are not satisfied with existing arrangements. A number reported that neighboring states simply do not collect the information needed by the reporting state. The ability to track fuel depends on this sharing of information across borders. Analysis of how well each state can do this given their data needs and the data available should highlight the potential for fuel shipments across borders to go undetected.

Tax rate differences were noted by several interviewees as being a substantial problem. States that border low-tax states, especially if the low-tax state taxes at the rack, face a significant potential for bootlegging. Methods mentioned in interviews as being effective in dealing with tax rate differences are a clear listing of which taxes are paid on BOLs, requirements that exporters and importers be licensed, substantial penalties for diversion of fuel from a low-tax to a high-tax state without paying the appropriate tax, and laws that are enforceable, e.g., by making the in-state retailer responsible for the appropriate tax being paid rather than the out-of-state distributor.

As expected, many states do not find tax differentials to be a problem, either because the states around them have similar rates or because of isolation. For example, Alaska finds that this is probably not a problem due to the cost of shipment.

2.4.2 International Borders

A number of issues have been identified with the potential for movement of fuel across international borders to result in tax evasion. The general issues are not different from those associated with movement of fuel across state borders, but many specific issues differ. For example, movement of fuel across international borders typically requires a customs declaration and more information on the product being transported than would be collected in interstate movements. The potential for evasion is likely to be lower than it is for movement between states; however, international movements also would allow for evasion of the federal fuel tax, which is not accomplished by many of the interstate schemes. Hence, tax evasion may be more profitable across the international borders. "The IRS has found that abusive situations exist with regard to the entry of taxable fuel into the United States. For example, some enterers are not registered and are not paying the tax on their entries" (Federal Register, 2004). Aside from simply not paying the tax, there are reports of fuel being brought into the United States that is labeled nontaxable. There are also reports of imported fuel illegally being taken off barges; however, we have not been able to document any cases or obtain any estimates of the potential magnitude of the tax evasion.

Another complication for states is that the customs information may be more detailed than other information on fuel movements but states may not have easy access to the information.

While some states expressed concern about the ability to track fuel movement across international borders, it is unlikely to be an issue for the majority of states. Potential for an evasion problem also depends on the price and tax differentials. There is some indication that the problem is more likely to be for neighboring countries than for fuel coming from those countries into the United States since the Canadian tax is higher than the United States tax and fuel prices in general are higher in Canada and Mexico than they are in the United States. However, states with international borders should be modeled for fuel tax evasion just as they would be for adjacent states, with the rate differences, distances, and information systems affecting the potential for tax evasion. Also, states with imports by ship have a large but undocumented potential for evasion.

2.4.3 Intra-Governmental and Inter-Governmental Coordination

Different agencies within a state government may or may not cooperate in terms of exchanging information or taking

actions to support each other when it comes to tracking fuel, detecting and prosecuting tax evasion, or other actions. Similarly, coordination between states and the federal government has been raised as a potential issue in tracking fuel, detecting evasion, and collecting taxes. Within states, there is often a separation of duties among various departments. For example, the Department of Revenue (DOR) may be responsible for collecting and auditing fuel taxes while the Department of Transportation (DOT) is responsible for administering the IFTA reporting. In addition, criminal investigations and prosecution may involve the State Police and other agencies. Cooperation and exchange of information among these agencies may be problematic since they have different objectives and functions. Failure to cooperate and coordinate may increase the potential for tax evasion and reduce the ability to detect and prosecute such evasion.

There are few studies of the coordination issue but some authors comment on aspects of the problem:

> Functionally, an advantage to administering motor fuel taxes through a revenue department is the ability to exchange taxpayer information. States have long recognized the need to share information with their neighboring states to avoid fuel tax evasion. However, many states have confidentiality statutes in their tax administration laws that protect the privacy of taxpayer data thereby prohibiting the release of information to non-tax agencies. Revenue departments have several tools available to enable the sharing of confidential taxpayer data. The FTA Uniform Exchange of Information Agreement, signed by 45 states, the District of Columbia and New York City, provides a means of sharing taxpayer data among other revenue departments. Also, state revenue departments have access to Internal Revenue Service (IRS) data by utilizing Internal Revenue Code (IRC) sec/6103 (d). Furthermore, separate agreements have been signed to facilitate exchange among other states that administer motor fuel taxes through a non-tax agency. These agreements reduce the efficiency arguments portrayed by those who argue that revenue agencies should be the only collectors of taxation (Eger and Hackbart, 2001).

While it may be possible to exchange information among tax collectors, other exchanges within a state may be prohibited. States face certain legal issues regarding the sharing of information as well as the more mundane issues of coordination.

Similarly, the federal government and the state governments have a joint interest in preventing tax evasion and in investigating and prosecuting it. There are good examples of such cooperation; however, there also are a number of obstacles to it. For example, federal disclosure rules may prevent the IRS from sharing certain information with state governments, and the IRS may not care about movement of fuel among states since it does not affect the federal tax.

There are widely different levels of inter-governmental and intra-governmental cooperation regarding sharing information. As noted earlier, the sharing of information between states is likely to be very important for fuel tracking. However, there appear to be a variety of other types of information and cooperation that could be effective in combating tax evasion. These could be as simple as sharing information on firms that are having problems and the types of evasion being investigated. Intra-governmental cooperation also varies substantially. Some agencies note that poor cooperation with other agencies in their own government creates opportunities for evasion or difficulty in tracking potential evasion. In general, the interviews confirm that there are many areas where additional cooperation and coordination may reduce the opportunities for fuel tax evasion.

2.4.4 Native American Fuel Sales

The federal fuel tax is collected at the rack and any fuel on a reservation not used strictly by the tribal government is taxable at the federal level. In general, states cannot tax the tribes, but there are differing approaches to the sales of fuel on Native American lands. Some states treat all such sales as taxable, especially if the tax is levied at the rack, same as the federal government. However, most allow some form of tax exemption for sales to the tribal government and many exempt sales to tribe members (See Table 2-1).

There is a jurisdiction dispute between several states and the Native American tribes. The major area of controversy is sales to nontribal members that occur on Native American lands. Some tribes view all such sales as being exempt from state taxes. There are several cases in the courts that may change the relationship between the tribes and state governments. However, the issue with respect to tax collections is to determine the current amount of tax revenue not being collected by the states for fuel sold on reservations to nontribal members for use on roads in the state.

The dispute between the tribes and the states is more complicated with respect to diesel fuel than for gasoline. IFTA requires that appropriate taxes be paid to each state regardless of where the fuel is purchased if it is used in a truck for interstate commerce. Thus, even though taxes may not be paid at Native American stations, the taxes may be assessed through IFTA. The net loss to the states may be overstated by the gross estimate of fuel sales that are not taxed at tribal stations since interstate trucking firms may then be required to pay such taxes through IFTA. The gross estimate would have to be adjusted for tax collections that occur through IFTA if this turns out to be a significant number.

There was a perception expressed by tax administrators interviewed for this study that fuel sales by Native Americans are a substantial source of fuel tax evasion, and there are several states where this appears to be a significant problem. For example, Idaho estimates that evasion due to Native American sales is $2.2 million per year, an amount equal to roughly 1 percent of statewide fuel tax collections. However, many states either have minor amounts of fuel sales on reservations

Table 2-1. Fuel tax issues for Native Americans by state.

State	Tribal Exemption from Fuel Tax	Tribal Agreement with State for Fuel Taxation	Mechanism in Place to Ensure Tribal Sales to Tribal Members Not Subject to Tax
Alabama	No	No Agreement	No
Alaska	No	Not Reported	No
Arizona	Yes	Agreement/Negotiation	Yes
Arkansas	No	No Agreement	No
California	No	No Agreement	No
Colorado	Yes	No Agreement	No
Connecticut	No	Negotiation	No
Delaware	No	No Agreement	No
Florida	No	No Agreement	No
Georgia	No	No	No
Hawaii	Not Reported	Not Reported	Not Reported
Idaho	No	Litigation	No
Illinois	No	No Agreement	No
Indiana	No Tribal Lands	No Tribal Lands	No
Iowa	Yes	No Agreement	Yes
Kansas	No	Litigation/No Agreement	Not subject to taxation
Kentucky	No	No Tribal Lands	Not applicable
Louisiana	For one tribe	Agreement	No
Maine	No	No Agreement	No
Maryland	No	No Agreement	No for gasoline. Yes for diesel.
Massachusetts	Not Reported	Not Reported	Not Reported
Michigan	Not Reported	Not Reported	Not Reported
Minnesota	Yes	Agreement/Litigation	Yes
Mississippi	No	No Agreement	No
Missouri	No	No Agreement	Not Applicable
Montana	No	Agreement/Negotiation	No
Nebraska	Yes	Agreement/Negotiation	Yes
Nevada	Yes	Agreement/Litigation/ Negotiation	No
New Hampshire	No	No Agreement	No
New Jersey	No	No Agreement	No
New Mexico	Yes	No Agreement	No
New York	Not Reported	Not Reported	Not Reported
North Carolina	No	No Agreement	Yes
North Dakota	Yes	Negotiation	Yes
Ohio	No	No Agreement	No
Oklahoma	Yes	Agreement	Yes
Oregon	No	Negotiation	Yes
Pennsylvania	No statutory exemptions	Litigation	Not Applicable
Rhode Island	No	No Tribal retail operations	No
South Carolina	Not Reported	Not Reported	Not Reported
South Dakota	Yes	Yes, some agreements	Yes, sales on reservation to tribal members
Tennessee	No	No Agreement	No
Texas	No	No Agreement	No
Utah	Two tribal agreements	Agreement/Negotiation	No
Vermont	No	No Agreement	No
Virginia	Yes	No Agreement	No
Washington	No, unless by agreement	Agreement	No
Washington D.C.	No	No Agreement	No
West Virginia	No	No Agreement	Not Applicable
Wisconsin	Yes	Agreement/Negotiation	Yes
Wyoming	No	No Agreement	Yes

Source: FTA 2002a

or have agreements with the tribes in their jurisdictions. For estimating evasion, sales on Native American lands are relatively visible since it is more a question of jurisdiction than of purposeful evasion. Hence, it should be possible to identify the states where there is a conflict between the state and the tribes regarding fuel tax liability. In these states, it should be possible to generate reasonable estimates of fuel sales on the reservations and the impact on state tax collections. FTA (2002a) reports estimates from several states of the amount of tax not collected due to Native American sales. It also might be possible to get information from states with agreements on the amount of tax revenue generated through the agreements and use this information in estimating losses to states without such agreements.

2.4.5 IFTA

IFTA requires trucks operating in interstate commerce report their mileage in all member jurisdictions to their home state or province (hereafter referred to as states). They also report all tax paid on fuel by state. The tax due to each state is calculated and compared to the tax paid to each state and appropriate payments or refunds by state are made. The information is supplied on a fleet basis. The IFTA regulations require that each state audit 3 percent of the returns each year. Eger and Hackbart (2005) investigate the effect of audits on tax assessments and estimate that each additional auditor results in $415,219 in additional revenue. However, they do not differentiate between IFTA and other audits.

Many states complain that the IFTA audits are not very productive and apparently do not complete the required audits. This may be because the audits cover operations in all jurisdictions, and the money coming to a state from such an audit might only be a percentage of the additional tax money collected, with the remainder going to other jurisdictions. Hence, there appears to be a conflict between the self-interest of the states and the enforcement of the tax system. Most tax administrators interviewed for this study indicate that IFTA appears to be one of the clearest examples of coordination among states that simplified the process for most taxpayers, reduced opportunities for tax evasion, and increased tax revenue. However, it should be noted that it was effectively created by a federal mandate. While most observers believe that it is an effective system, there are concerns about the amount of tax evasion from trucking companies' misreporting of mileage by state and failure to report. One concern is that trucks may get illegal IFTA decals and never report their mileage.

While there is widespread agreement that IFTA has been effective, there are substantial disagreements about whether and how it could be improved. The biggest area of disagreement seems to be the audit requirement. Some believe it focuses too many resources on an area with little return, while others believe individual states are lax in looking out for tax collections that may accrue to other states. There appears to be some potential for tax evasion associated with the way miles are reported. The obvious incentive is for truckers to report more miles in low-tax states and fewer miles in high-tax states. Also, use of illegal decals may allow trucks to travel in high-tax states without ever declaring the mileage. Large trucking companies find IFTA to be a benefit by reducing the number of tax returns required. However, smaller and in-state firms may find that it represents an increase in paperwork.

Another important point expressed by tax administrators interviewed for this study was that with all its faults, IFTA was a required element of a motor fuel tax program and in its absence, evasion would be as simple as filling up in low-tax states and driving through high-tax states without remitting any taxes whatsoever. Thus, while some argued that the 3 percent auditing requirement did not yield positive returns on the state's investment, all agreed that IFTA auditing was necessary and lax IFTA enforcement could lead to significant reductions in diesel tax payments in high-tax states. Further, some administrators argued that IFTA audits also offer an effective means to detect other forms of motor fuel tax evasion perpetrated by motor carriers (e.g., purchase of tax-exempt fuel, cocktailing).

2.5 Issues Related to Fuel Tracking, Bonding, and Licensing

An important part of enforcement for any tax system is the ability to track activity. For example, most analysts believe that the income tax system works well for wage and salary income because employers are required to report this income to the federal government. Since the government has the information, the ability to under-report it is severely limited. In addition, the income tax typically requires payers to file a variety of information returns to inform the government of income items that the recipient should report for tax purposes. "The more comprehensive a state tax department's information-return system and the more usable the data, the better equipped the department is for enforcement" (Penniman, 1980).

Conversely, for types of income not reported, the expectation is that substantial amounts are under-reported for tax purposes. Similarly, for sales tax, where the tax is paid at the time of a retail transaction, the taxpayer has no opportunity to avoid the tax, although there may be problems with the government getting the tax revenue from the retailer. However, if a person buys a taxable good outside of the state and brings it back into a state with a sales tax, there is typically a requirement that the consumer must report the item and pay a use tax that is equivalent to the sales tax. This requirement is widely ignored because the government has no way to track most out-of-state purchases. However, where there is a method to track the purchase, e.g., if the consumer must register an automobile, the government has a much higher rate of collection on the tax.

A tracking system can allow a state to determine whether fuel movements are appropriately reported with taxes paid. However, a tracking system cannot cause payment to be made from an organization that has declared bankruptcy or is otherwise insolvent. Hence, monitoring the financial viability of those engaged in fuel distribution is another important issue when considering fuel tax evasion. A taxpayer that disappears without having paid appropriate taxes has engaged in a form of tax evasion. Whether this is intentional, as in the daisy chains or simply the result of poor business decisions, the state loses tax revenue.

To avoid the loss of revenue associated with firms declaring bankruptcy, a state can impose restrictions on who can engage in the fuel distribution system. These restrictions are typically either licensing requirements and/or bonding requirements. States differ substantially in both regards, and this is likely to affect the potential for tax evasion.

2.5.1 Tracking Systems

The purpose of a tracking system is to monitor whether appropriate taxes have been paid. If the government has good ability to track the movement of fuel, then there is a much higher probability of compliance with the tax. Tracking fuel has become a major concern for those trying to reduce fuel tax evasion, with a number of states adopting sophisticated tracking systems with mandatory reporting of all fuel purchases and sales. Table 1-2 in Chapter 1 shows 15 states that have adopted tracking systems. Several types of systems have been adopted. Most states opted for commercially provided systems, but five states chose to develop their own systems. All tracking systems require that information on fuel movement be provided on a load-by-load basis and that all participants in the distribution chain file timely reports.

The filing requirement, however, puts a burden on the taxpayers to make these reports to the government and on the government to process the information. It is not always necessary that the government actually use the information sent to them. There is evidence from the income tax that compliance for reported items is high even when the government does not have the capability of matching the reported information with the tax return. However, this rests on the taxpayer believing that the government does indeed match the information. If it were widely known that the information is not matched, compliance would likely be lower (Bloomquist, 2004).

From the perspective of both the taxpayer and the tax collector, it is helpful if the same information in the same form is collected by all states. This tends to reduce the compliance cost for the taxpayer and makes the information more useful when traded between states. Table 2-2 shows reporting requirements by various agents in the fuel distribution system for Virginia. Note that most high-volume transactions must be reported electronically. The use of electronic reporting substantially increases the ability of the state to match activity. Where reports are filed on paper, the information must be keyed into the system to allow for tracking, or the cross matching must be done by hand. The careful tracking of fuel from point to point in the distribution chain limits the possibility

Table 2-2. Virginia fuel activity reports.

License Type	Required Reports
Aviation Consumer	Aviation Consumer's Report (FT465) Aviation Consumer's Schedule of Disbursements (FT466) Aviation Consumer's Schedule of Receipts (FR467)
Blender	Blender's Report (FT471) Blender's Schedule of Receipts (2B) (FT472)
Bulk User of Alternative Fuel	Alternative Fuel Report (FT445) Alternative Fuel Schedule of Disbursements (FT446) Alternative Fuel Schedule of Receipts (FT447)
Distributor	Distributor's Report (FT448) Distributor's Schedule of Disbursements (FT449) Distributor's Schedule of Receipts (FT450
Fuel Alcohol Provider	Fuel Alcohol Provider's Report (FT441) Fuel Alcohol Provider's Schedule of Disbursements (FT442) Fuel Alcohol Provider's Schedule of Receipts (FT443)
Importer	Electronic Filing Required
Motor Fuel Transporter	Motor Fuel Transporter's Report (FT461) Motor Fuel Transporter's Schedule of Deliveries (FT463)
Provider of Alternative Fuel	Alternative Fuel Report (FT445) Alternative Fuel Schedule of Disbursements (FT446) Alternative Fuel Schedule of Receipts (FT447)
Retailer of Alternate Fuel	Alternative Fuel Report (FT445) Alternative Fuel Schedule of Disbursements (FT446) Alternative Fuel Schedule of Receipts (FT447)
Supplier	Electronic Filings Required
Terminal Operator	Electronic Filings Required

Source: <http://www.dmv.state.va.us/webdoc/commercial/taxact/reports.asp>

of fuel tax evasion, but, as noted in the interviews, this may not be sufficient to track all potential evasion. In particular, fuel that originates outside the reporting system can evade taxes.

One issue raised in the interviews is the ability to track potential blending fuels, e.g., alcohol or kerosene. In cold climates, diesel might be as much as 50 percent kerosene. This issue was addressed in a GAO report:

> Fuels such as No. 1 fuel oil (No. 1 furnace or heating oil), No. 1 diesel fuel, and jet fuel, may be formulated to satisfy all of the requirements for kerosene, as well as all of the requirements specific to these fuels the many legitimate on and off-highway uses of kerosene make its taxation in the case of highway use difficult to regulate and enforce (GAO, 1996, pp 6–7).

A tracking system will make it less likely that such blending occurs without tax being paid, but if the blending items are not tracked themselves, there is still potential for tax evasion. Table 2-2 shows that Virginia requires reports from blenders and for alternative fuels and fuel alcohol. Information on the tracking of blending stocks was not gathered for this report, but it appears to be less likely to be tracked than the motor fuel itself. Where there is tracking of fuel at all levels, then blending will require appropriate reporting; however, if fuel is not carefully tracked, blending may be an issue. Blending is probably not an issue for states that tax at the retail level because even blended fuels will be taxed there unless the retailer also is evading taxes.

With respect to motor fuel tracking systems, there are two basic data issues. The first is the level of detail that must be reported and the scope of reporting requirements. FTA uniformity guidelines call for load-by-load detail for fuel shipments, but some states still do not obtain or cannot process this information. Information must be filed by all fuel handlers if the state is going to track all movement of fuel but many states only require that the actual taxpayer files reports. A related issue is the form of the data, and most states indicate that they at least try to follow uniformity. However, some indicate that either because of state laws or other concerns, they are not able to completely comply. Lack of uniformity is most often a problem when states trade data, but it also can be a burden on those required to report. Inconsistent data definitions create a compliance cost for the industry.

The second data issue is whether the returns are filed electronically or by paper. Few states require all information electronically, but most agree this is important for complete cross checking of fuel reports. A few states report they receive the data on paper and either key the data into an electronic system or cross check manually, but this is rare. Most states that receive paper data report they do not process it completely. In the interviews, New York, Oregon, and Utah reported that they receive all or most of the data on paper. Only New York reports that it inputs all of this data into an electronic form.

Several states reported having tracking systems that work well. Several others either had new systems they have not evaluated yet or are in the process of installing new systems. A few problems were reported, such as getting inconsistent data from sellers and buyers, or not obtaining data on fuel originating out of state; but most users gave favorable reviews. Oregon reported that it had considered obtaining a system but decided it was not cost effective. This may be because Oregon does not collect diesel fuel taxes on motor carriers operating vehicles weighing in excess of 26,000 pounds. In general, states that have fuel-tracking systems and obtain all of their data electronically believe that the tracking systems significantly deter tax evasion. However, a number of states are still in the process of developing and testing their systems, and some report problems with either the form of the data or the method of filing.

2.5.2 Bonding and Licensing

Licensing can be an important enforcement mechanism with respect to fuel tax evasion. If a license is necessary to take part in the distribution chain for fuel, then a state gains two advantages. The first is it can set standards for a license that allow it to check for problems that have occurred in other states and other indicators of potential tax evasion problems. The second is that suspension of the license becomes a penalty since it then restricts the licensee's ability to conduct business in the state.

Related to the licensing requirement is a bonding requirement. A bond is either a direct deposit or an insurance policy that guarantees payment under specific circumstances. A bond imposes a cost on the business, and hence businesses prefer to keep bonds at low levels or avoid them altogether. However, the bond serves as a form of insurance for the state against certain types of tax evasion. One form of tax evasion is to simply go out of business with large amounts of unpaid taxes due. This is effectively how the daisy chain works. However, if the business has posted a bond, then the state can collect taxes up to the bond amount. Hence, bonds limit the ability of tax evaders to gain from certain schemes. In particular, if the bond is high enough, the state can still collect taxes owed. Even if the bond is insufficient to cover all taxes owed, there is some recovery by the state. Low bonding requirements will not serve as a deterrent. The state must be able to collect some substantial portion of the tax owed for bonding to be a deterrent. This typically means that the bond must be set based on the volume of fuel handled, but it is not necessarily easy to determine this in advance for a new company.

States vary substantially in the types of licenses required. Some will allow purchases and sales by unlicensed vendors while others have stringent licensing requirements for all participants. Some states have extensive licensing requirements

based on the particular activity for a business. For example, Virginia has 17 licenses posted on its web site. However, other states report that they allow substantial amounts of fuel activity for unlicensed entities. In addition, some states use the threat of suspending licenses as a form of enforcement. Several states indicated that their efforts to make licensing more rigorous resulted in improvements in their ability to enforce fuel taxes. In particular, background checks, including checks for license suspension in other states, appear to be an effective deterrent.

In addition to licensing, many states require the posting of a bond for those responsible for paying taxes. The bonding requirement can be quite effective against certain types of evasion if the bond is sufficiently large. For example, daisy chains would not cost the state money if all fuel purchasers were required to obtain bonds equal to the highest amount of tax that the company might owe.

Few comments from the interviews directly relate to bonding requirements, but representatives of Idaho noted that they would like to raise their bonding requirement. The present bonding requirement caps out at $200,000 and some distributors may have monthly liabilities substantially above that. They noted that Nebraska has a good system. Nebraska requires a bond of three months of tax liability if the company has been in operation less than one year.

There were some comments that it is difficult to determine the appropriate amount for bonds since the tax liability can vary over time. Also, it was not mentioned as a good enforcement mechanism. This may be due to the way the interview questions were asked but it suggests that bonding is not considered an important method to curtail tax evasion.

2.6 Issues Related to State Enforcement of Motor Fuel Tax Collection

All taxes must have various enforcement measures to ensure that taxpayers make appropriate payments and are treated fairly in the collection process. The relative emphasis on different aspects of tax collection will vary by tax since the potential for evasion also varies by tax. Fuel taxes, particularly special fuel taxes, tend to be use taxes. A use tax is typically defined as one based on activity within a state. The most common type of use tax is a supplement to a state sales tax. If a person or business buys an item outside the state that would normally be subject to the sales tax, that item is subject to a use tax when it is brought into the state. For fuel taxes, the use tax is typically associated with use of the fuel on roads in the state. Use taxes create more substantial collection problems and more opportunities for evasion than most other taxes.

This section discusses the various stages of tax compliance activity for a state along with information from the interviews related to these activities. More detailed interview results are presented in Appendix C. The topics covered in this section include (in order addressed): education and outreach, information, verification, audits, and fines and punishment. Enforcement related to dyed fuel is covered in another section of this report and will not be discussed extensively here.

2.6.1 Education and Outreach

The degree of compatibility with other states is a significant issue in education and outreach. The FTA Uniformity Committee promotes uniform forms, stating:

> Uniform Reports and Schedules serve two purposes in support of the 11 Point Plan. First, uniform reports and schedules provide a uniform reporting mechanism for industry and government to record motor fuel tax transactions. Second, the forms facilitate information exchange between states by ensuring each state collects similar data. If an oil company uses all of the forms, the company could account for all fuel transactions by reporting the same types of data in a similar format for each state's fuel tax reports. Industry will understand what is required and will be better able to comply with each state's requirements. The state will be more likely to get the data it needs in the desired format from all taxpayers. In addition, any taxpayer could easily format the uniform summary page for computer reporting. Since the reporting would be similar for all states, more taxpayers may move to computerized reports (FTA, 2004c).

There are recommended reports for each segment of the industry. States that adopt these forms make it easier for businesses operating in more than one state to complete the paper work and facilitate the trading of information between states. However, adoption of standard forms still means that new firms in the industry must know what information is required, when it must be filed, and so on. Similarly, when there are changes in state tax laws, the taxpayer must be informed. As noted in the Washington State report, ignorance is a significant reason for noncompliance.

Whether or not states adopt uniform forms, it is important to provide information to the taxpayer on what information is required and how it should be reported. States vary significantly in the amount of public information and outreach they provide. The interviews found that some make information available, e.g., on their web site, and expect the taxpayers to be aware of their obligations and seek out needed information and forms. Others are actively involved with the industry and with public outreach. Most who engage in the education and outreach efforts believe that they are successful, but there is little direct evidence on the effectiveness of various outreach efforts.

One area where there seems to be some effort among a number of states is with programs for the public to turn in others using dyed diesel on the roads. Having an 800 number and pro-

viding some outreach seems to be the most common method. The expectation is that honest taxpayers themselves feel cheated by those avoiding taxes and value the opportunity to turn in cheats. This may lead to a positive outcome in a number of ways, since people who feel others are getting away with cheating are more likely to cheat themselves.

There is also a widespread perception that people are more likely to follow the tax laws when there is ongoing visibility. Hence, public service announcements along with publicity regarding crackdowns on evaders are thought to be effective.

2.6.2 Information

The ability to collect and synthesize taxpayer information is essential to enforcing fuel taxes, especially when some uses are exempt from the tax. This is true no matter where the tax is collected. If the tax collector can track all fuel, whether taxable or not, from movement into the state until final distribution, then the opportunities for tax evasion are limited. However, any areas absent reporting create opportunities for evasion. Hence, the ideal system from a tax collector's position is one where every load of fuel is reported with origin and destination. This information is then cross checked to make sure that all purchase and sales records coincide.

Information gaps create opportunities for evasion. For example, if fuel is not tracked after it leaves the rack, state taxes can be paid for a low-tax state while fuel is delivered to a high-tax state. Gaps occur either because the data are not collected or because the data is not used. States generally find they can more easily use electronic data, but that processing paper data can be costly and may not be feasible.

FTA uniformity guidelines have promoted consistency between states in methods of identifying taxpayers, definitions of key terms, and the way information is filed. Consistency among states makes traded information much more valuable. Nevertheless, several states in the interviews noted that there are differences in state laws that may make complete adherence impossible even for states trying to follow the uniformity guidelines.

While tax collectors want more and better information, taxpayers often have a different perspective. They view the filing requirements as a burden and the enhanced tracking that it allows may impose additional costs on the industry associated with late payments or other errors. The compliance cost on the industry is increased when different states require different information or information in different forms. For example, costs are higher if some states require electronic submission while others require paper. We also heard from industry that electronic transfer protocols vary from state to state and that they tire of receiving discrepancy notices due to state error with respect to entering or interpreting data.

2.6.3 Verification of Information

All states audit tax returns and taxpayers. However, the audit activity is affected by a number of other characteristics. Perhaps the most important is the point of taxation. The higher the point of taxation, the lower the number of taxpayers, but each taxpayer will represent a more complex set of transactions. A higher point of taxation often is offset by an increase in the number of refunds. Since many states also audit refund requests, there may not be a large net impact on the need for auditing from moving the point of taxation up the distribution chain.

Other factors also affect the audit function. States differ in the amount of information they collect; some collect extensive information on all fuel transactions and carefully track all fuel while others require only summary information reported with their tax forms. Table 1-2 provides a list of states with tracking systems and Section 2.5 presents some information on states without formal systems that appear to track fuel effectively. Section 2.5 also notes that some states simply require summary information or require detailed information on paper and then fail to enter this information into a tracking system.

States also differ in their approach to audits, with some treating it largely as an information gathering and error correction process while others view it as somewhat adversarial. This highlights one of the key issues in audits: the distinction between errors or delays in payment versus true attempts to evade the tax. Some states are reluctant to use the term tax evasion when discussing audit results. Rather, they focus on monitoring tax collections to be certain that taxpayers are aware of the taxes due, timetable for payment, and paperwork requirements.

From this perspective, most enforcement efforts are focused on simply maintaining compliance with the law. There is often a vast difference between the dealings with ordinary taxpayers who may have made errors or delayed payment versus those working complex schemes to avoid tax payment and who are likely to face criminal charges if caught. Enforcement related to the latter may involve field investigation, surveillance, and the development of a case for prosecution.

2.6.4 Audits

Auditing is widely recognized as an important part of any tax system. Audits are important for identifying errors in tax payments and attempts to evade taxes. While audits are frequently associated with evasion attempts, most audits focus on errors and omissions. All states have some type of audit function that examines the tax returns for errors and for consistency among taxpayers. This may be limited to desk audits that may range from a simple review of supporting documents to complex cross matching of fuel purchases and sales to make

sure that all fuel can be tracked and that appropriate taxes were paid. These types of audits are more focused on detection of daisy chains, inappropriate sales of tax-free fuel, or attempts to avoid taxes by claiming exports for fuel that does not leave the state or related schemes. Most states also conduct field audits, which usually entail examination of documents that a company keeps but is not necessarily required to file with the tax return. Beyond the audits are actual investigations related to criminal activity. Criminal investigations may arise out of tax audits but they have a different focus since they may involve multiple states, other crimes, and much more restrictive rules of evidence than are needed for auditing.

There are significant differences in the number and types of audits performed by different states, with some relying almost exclusively on desk audits while others put more resources into field audits. Systems based on extensive electronic reporting may be able to effectively desk audit all returns as they come in. Where the information is not complete or where substantial amounts arrive by paper, the desk audits are more labor intensive and less complete. Field audits are typically much more thorough than desk audits and may cover multiple time periods. It is worth noting that Eger and Hackbart (2001) found that: "for an increase of one auditor, on average a state will receive an additional $1,232.09 per million miles traveled per truck." This is based on a statistical model exploring survey data. A variety of other estimates exist regarding the impact of auditing on tax collections. Many states can determine what they collected by comparing audits with what they spent, but this information may not be very helpful in determining how much could be collected with additional audit efforts since it represents an average return and incremental returns to audit efforts are likely to be lower than the average.

There are substantial differences across states in the methods of tracking and auditing fuel taxes. Table 2-3 shows the state-by-state differences in the taxpayers and the tax collectors. The tax collection and audit function is typically in either the DOR or DOT. The tax collection agency for special fuels is typically the same, and a detailed listing can be found at <http://www.fhwa.dot.gov/ohim/hwytaxes/2001/pt2.htm>. Eger and Hackbart (2001) found that the vast majority of states administer the motor fuel tax through their DOR:

> Forty-two states and the District of Columbia administer the motor fuel tax through a department of revenue, finance, or administration while eight states administer motor fuel tax through transportation (the major tax collecting agency). This places motor fuel excise tax administration under the control of the same agency collecting other types of taxes, which separates the collection of revenues from the management of highway appropriations.

The unique characteristic of the tax as a use tax creates more of a distinction in this area than would be noted for more general taxes. DOR is generally focused on issues of tax collection and audit of the state's broad-based taxes that supply most of the revenue. Many conduct audits of several taxes at once. A fuel company may owe both sales taxes and fuel taxes and may be audited for both at the same time.

States also can find advantages to making their DOT responsible for collection of motor fuel taxes. DOTs tend to have a vested interest in the collections that fund their operations and they have more expertise in the system. There is some potential to combine fuel tax enforcement with weight and safety inspections of heavy trucks. On the other hand, DOTs tend to have less expertise in tax collection and auditing. Where the collection and auditing function is housed seems to have some potential for influencing the rate of evasion.

Some state representatives interviewed for this study questioned whether DOR collection techniques were effective, particularly when audits cover multiple tax systems. Specifically, it was asserted that general auditors may not have expertise in fuel distribution systems and the taxable versus nontaxable fuel uses. In addition, fuel taxes represent a small part of a state's tax collections and seem to receive less attention from DOR staff because of the importance of other taxes. Finally, it was asserted that general taxes tend to receive more attention because they go into the general fund, while increased fuel tax collections are deposited in an HTF or DOT account. Thus some argue that the DOT should be the collector of fuel taxes. At the very least, some argue that a specialized unit within DORs should be established specifically for the collection of motor fuel taxes.

Few states conduct joint audits either with other states or with the IRS. One problem with joint audits is the differences in tax structures. Joint audits with the IRS are problematic for states that do not tax at the rack since they are interested in different information. Even states that do tax at the rack may have problems with a joint IRS audit since the IRS is not focused on which state the fuel ultimately is deposited. This problem was noted a number of times, either as the reason for not doing joint audits with the IRS or as the result of trying to do a joint audit. A final concern expressed about joint audits with the IRS is that the IRS has first claim on revenue in the event of insolvency, so the state might receive less revenue than if they had audited on their own.

Even when joint audits are completed with other states, there do not seem to be many positive outcomes. The major benefit noted was to keep open lines of communication between the states and to make auditors aware of what is happening in other states. Industry representatives noted that joint audits typically are involved with interstate commerce issues and that state auditors are typically not well versed on this topic.

2.6.5 Fines and Punishment

The economic analysis of crime focuses on the expected return to the crime versus the expected penalty. The expected

Table 2-3. State taxation of gasoline.

State	Tax Paid in First Instance By	Tax Computed on Basis of	Tax Collected and Administered by
Alabama	Distributors, refiners, retail dealers, users	Quantities sold	Department of Revenue
Alaska	Dealers and users	Quantities sold, transferred or used	Department of Revenue
Arizona	Distributors	Quantities sold	Department of Transportation, Motor Vehicle Division
Arkansas	Wholesale distributors (first receivers)	Inshipments or receipts	Department of Finance and Administration, Motor Fuel Tax Section
California	Distributors, manufacturers, and importers	Quantities distributed	State Board of Equalization Assesses, and State Controller Collects Accounts Receivable
Colorado	Distributors and refiners	Gross gallonage	Department of Revenue, Motor Carrier Services Division
Connecticut	Licensed distributors	Quantities sold and used	Department of Revenue Services
Delaware	Wholesale distributors	Quantities sold and used	Department of Transportation, Motor Fuel Tax Administration
Dist. of Col.	Licensed importers	Quantities sold and used	Department of Finance and Revenue
Florida	Importers, terminal wholesalers, suppliers, and blenders	Quantities removed through terminal rack, imported, or blended	Department of Revenue
Georgia	Licensed distributors (wholesalers, retailers)	Quantities sold and used	Department of Revenue, Motor Fuel Tax Unit
Hawaii	Manufacturers, producers, refiners, importers and distributors	Quantities manufactured, produced, refined, imported and sold or used	Department of Taxation
Idaho	Licensed distributors	Quantities received	Tax Commission, Motor Fuels Division
Illinois	Licensed distributors	Quantities sold and used	Department of Revenue
Indiana	Licensed distributors	Quantities received	Department of State Revenue, Special Tax Division
Iowa	Licensed suppliers, restrictive suppliers, and blenders	Quantities received as shown by lading or manifest	Department of Revenue and Finance
Kansas	Distributors of first receipt (defined as loaded at the terminal rack)	Quantities received or imported	Department of Revenue, Customer Relations, Oil, Gas, Petroleum Segment
Kentucky	Licensed gasoline dealers (wholesalers, refiners, importers, certain retailers)	Quantities received	Revenue Cabinet, Motor Fuel Tax Section
Louisiana	Manufacturers, refiners and importers	Quantities sold and used	Department of Revenue, Excise Tax Division
Maine	Wholesale distributors	Quantities sold and used	State Tax Assessor
Maryland	Licensed dealers	Quantities sold and used	Comptroller, Motor Fuel Tax Division
Massachusetts	Licensed distributors and importers	Quantities sold and used	Department of Revenue
Michigan	Supplier, terminal or refinery	Quantities sold	Department of Treasury, Motor Fuel Tax Division
Minnesota	Licensed distributors	In shipments	Department of Revenue, Petroleum Division
Mississippi	Wholesale distributors and producers	Quantities received	State Tax Commission
Missouri	Suppliers	Quantities removed from terminals	Department of Revenue, Business Tax Bureau
Montana	Distributors	Imports plus refinery distribution	Department of Transportation, Administration Division
Nebraska	Distributors and Importers	Gross gallons received or imported	Department of Revenue
Nevada	Licensed dealers (distributors)	Quantities distributed	Department of Taxation, Revenue Division
New Hampshire	Importers, producers or refiners	Quantities sold	Department of Safety, Road Toll Administration
New Jersey	Importers, distributors or jobbers	Quantities sold or used	Department of the Treasury, Division of Taxation
New Mexico	Distributors	Imports plus production	Department of Taxation and Revenue, Returns Processing Division
New York	Registered distributors on first import or production	Quantities imported or produced	Department of Taxation and Finance

(continued on next page)

Table 2-3. (Continued).

State	Tax Paid in First Instance By	Tax Computed on Basis of	Tax Collected and Administered by
North Carolina	First person in State who sells or uses fuel (distributor)	Receipts or sales at distributor's option	Department of Revenue, Motor Fuels Tax Division
North Dakota	Wholesale distributors	Quantities sold and used	Tax Commissioner, Motor Fuel Tax Section
Ohio	Wholesalers and Distributors of Motor Vehicle Fuel	Quantities distributed, sold, or used	Tax collected by the State Treasurer Motor fuel laws administered by the Department of Taxation
Oklahoma	Suppliers when removed from terminal rack	Quantities imported or removed from the terminal rack	Tax Commission, Audit Division Motor Fuel Section
Oregon	Licensed dealers	Quantities sold or used	Department of Transportation
Pennsylvania	Registered distributors	Quantities used or sold and delivered	Department of Revenue, Bureau of Motor Fuel Taxes
Rhode Island	Distributors	Quantities sold or used	Department of Administration, Division of Taxation, Excise Tax Section
South Carolina	Supplier at terminal rack	Quantities sold or used	Department of Revenue
South Dakota	Suppliers and importers	Gallons removed from the rack at fuel terminal	Department of Revenue, Motor Vehicle Division
Tennessee	Wholesale distributors	Quantities received and stored	Department of Revenue, Accounting Division, Petroleum Tax Division, Gasoline Tax Section
Texas	Person making first sale or use in State	Quantities sold or used	Comptroller of Public Accounts
Utah	Licensed distributors	Quantities distributed	Tax Commission
Vermont	Licensed distributors	Receipts or sales	Department of Motor Vehicles, Commercial Vehicle Operations
Virginia	Importers, producers, refiners, and some dealers	Quantities sold or used	Department of Motor Vehicles, Motor Carrier Services
Washington	Supplier (terminal rack) or importer	Quantities sold or imported	Department of Licensing, Prorate and Fuel Tax Division
West Virginia	Distributors	Actual metered gallons sold	Department of Tax and Revenue
Wisconsin	Licensed suppliers	Quantities received	Department of Revenue
Wyoming	Supplier (terminal rack)	Quantities sold	Department of Transportation.

Source: Highway Taxes and Fees: How They Are Collected and Distributed - 2001.

penalty in this sense is a combination of the probability of being caught, the probability of being convicted if caught, and the magnitude of the punishment. Increases in either the probabilities of apprehension or conviction or increases in the magnitude of the punishment reduce the incentive to commit the crime. This may induce a call for harsher penalties to deter crime. However, arguments for fairness, as well as many other issues, typically enter into the decision as to the level of punishment. The probability of being convicted once apprehended also is subject to public policy adjustment based on the rules of evidence and related matters. Hence, the impact of fines and punishments cannot be viewed in isolation. States with high fines may find they have little impact because of low probabilities of apprehension or conviction. Other states with lower penalties may have more of a deterrent effect because of higher probabilities of apprehension and conviction.

Penalties for late payment or for errors in filing give the taxpayer an incentive to get the payments in on time and to file correctly. If the penalties are small, it may be in the best interest of the taxpayer to purposely delay payment and to pay the penalties. Hence, most states try to make the fines and penalties for late payment and for errors sufficiently large that taxpayers have an incentive to send payments in on time. From the taxpayer perspective, the late payment or errors may seem minor, but with high penalties and interest payments they may be seen as punitive.

Penalties for fraud or other criminal activity are typically much higher than those for errors and omissions. States differ both in the level of penalties for fraud and in their willingness to classify an action as fraud or to prosecute the cases. Table 2-4 shows the differences in penalties for southern states. They range from no criminal penalties in Arkansas to a fine of $10,000 and imprisonment for two to 10 years in Texas. Denison and Eger (2000) noted that the trend in recent years had moved towards harsher punishments.

> In the southern states, a wide variety of penalties are associated with the criminal aspects of the motor fuels tax. Recently, a change has occurred in this arena. A misdemeanor penalty was formerly associated with failure to pay the motor fuels tax, but in the last few years this minimal deterrent has evolved toward felony pun-

Table 2-4. Criminal penalty for conviction of motor fuels tax fraud in the southern states.

State	Criminal Penalty
Alabama	Misdemeanor and shall be punished by a fine of not less than $50 or more than $300. Each month that payment is due a new misdemeanor is applied.
Arkansas	None.
Delaware	Class E felony and shall be punished by a fine of not more than $11,500 or by imprisonment not exceeding five years, or both.
Florida	Felony of the third degree and shall be punished by a fine of not more than $5,000 or by imprisonment not exceeding five years, or both. State reserves the right upon conviction to revocate or suspend fuel tax license.
Georgia	Misdemeanor and shall be punished by a fine of not less than $1,000 nor more than $10,000 or by imprisonment for a term not less than 30 days nor more than 12 months, or both.
Kentucky	Class A misdemeanor and shall be punished by a fine of $500 or by imprisonment for a term not less than 90 days nor more than 12 months, or both.
Louisiana	Misdemeanor and shall be punished by a fine of $500 or by imprisonment for one year, or both.
Maryland	Misdemeanor and shall be punished by a maximum fine of $1,000 or imprisonment not exceeding six months, or both. Revocation of license after noncompliance of 60 days.
Mississippi	Misdemeanor and shall be punished by a fine of not less than $50 or more than $100.
North Carolina	Class 1 misdemeanor and shall be punished for a term not less than one day or more than 45 days community punishment.
Oklahoma	Felony and shall be punished by a fine of not more than $10,000 or three years in the state penitentiary, or both.
South Carolina	Felony and shall be punished by a fine of not more than $5,000 or imprisonment not exceeding five years, or both.
Tennessee	Revocation of license. Class E felony and shall be punished by a fine of not more than $3,000 or imprisonment for not less than one year nor more than six years, or both, for evasion of excise tax.
Texas	Felony in the third degree and shall be punished by a fine of $10,000 or imprisonment for not less than two years nor more than 10 years in the state penitentiary, or both.
Virginia	Class 1 misdemeanor and shall be punished by a fine of not more than $2,500 or imprisonment of not more than 12 months, or both.
West Virginia	Misdemeanor and shall be punished by a fine of not less than $100 nor more than $1,000 or imprisonment of six months in jail, or both.

Source: Denison and Eger, 2000.

ishment. Some of the southern region's legislatures are looking carefully at motor fuels tax evasion and reinterpreting failure to pay as a felonious crime. This trend has led to harsher penalties and punishments. It should be noted that there is considerable debate regarding the effectiveness of penalties as deterrence to tax fraud (Denison and Eger, 2000).

The inability in some cases for penalties to effectively act as a deterrent, as noted by Denison and Eger, relates to the difficulty of proving fraud and to the lack of willingness of investigators and prosecutors to pursue criminal action.

Many states are relatively uniform in their late payment penalties. Table 2-5 shows the fines reported by the states interviewed. Typically, there is a 5 to 10 percent penalty for late payment plus interest of about 1 percent per month. Of course, there are substantial differences in both the application and enforcement of these penalties. However, the bigger difference is in the treatment of fraud. As noted above, some states have little possibility to levy criminal sanctions while others have active fraud units with heavy penalties. In the interviews, many respondents felt that existing penalties were too light for true tax evasion but the industry representatives also thought that the penalties were too large for late payment and other minor infractions. In particular, the tax collectors viewed penalties and interest for late payment as a strong incentive for taxpayers to make prompt payment of taxes due, while the industry sees late payment due to errors in paperwork as almost unavoidable. Hence, they perceive the penalties and interest charged as being excessive relative to the action.

Administrators interviewed for this study noted the larger problem was tied to the prosecution of criminal cases and not to the penalties. Several administrators indicated that they have substantial penalties for fraud at their disposal but their

Table 2-5. Civil and criminal penalties for late payments, fraud and other forms of noncompliance by state.

State	Civil Penalties	Criminal Penalties
Alaska	5% per month for late payment to a maximum of 25%. Negligence is 30%.	50% or $500 added if fraud proven. Criminal evasion is a class C felony.
Arkansas	10 % or $50 for late payments. Negligent penalties of 10%.	Fraud penalty of 50%.
Florida	Delinquency is 10% per month (or any part of a month) up to a maximum of 50%. Also lose collection allowance.	Fraud penalty is $10 per gallon. This was expanded from the IRS dyed fuel penalty to apply to all tax evasion.
Idaho	There is a 5% negligence penalty, 10% if it is a serious reporting problem (e.g., 10-25% under reporting). Interest is applied on an amended return and all late payments.	50% fraud penalty (dyed diesel and proved intent).
Kansas	Dyed fuel penalties are a minimum of $1,000 and max of $10,000 for first violation ($10 per gallon subject to the minimum and maximum). In addition, they collect the tax due on the fuel. Five times as much for second violation. Can file liens and tax warrants against property. 5% penalty and 1% per month interest for late payment.	There are criminal penalties that could result in jail time but to date these provisions have never been used.
Minnesota	10% late payment, 25% late filing, 50% civil fraud.	None.
Montana	Late payment – 10% of the tax due. Penalty for fraudulent activity related to diesel taxation is 25% of the taxes due plus 1% interest per month of underpayment.	Fraud is the revocation of the distributor's license. State can seize assets.
Nebraska	Late filing is $50 within 10 days. Later than that it is an additional 10% or $100, whichever is greater.	Many are class four felonies with potential prison time.
New Jersey	The interest on any late payment of Prime + 3%, 10% penalty.	Fraud is turned over to the criminal investigation unit and the criminal penalty is based on the amount of the fraud.
New York	Not reported	Fraud is assessed a 50% penalty.
North Carolina	Late filing is 5% per month with a maximum of 25%; late payment is 10%; 50% fraud penalty. There may be a $1,000 penalty (e.g., failure to maintain records) to $15,000 (e.g., 2nd diversion). In addition, the tax due is collected.	Not reported
North Dakota	A late report results in a 5% penalty + 1% per month interest charge on any balance. Also, ND can go back six years rather than three if the shortfall exceeds 25%.	They have not caught any fraudulent activity but it would result in the group turning the investigation over to the state's attorney.
Oregon	There is a 10% penalty and 12% interest on all forms of noncompliance relating to unpaid tax. Taxes are reported on a monthly basis.	Not reported
Pennsylvania	Late reporting results in a 10% penalty. Not being compliant with electronic reporting procedures results in a $500 penalty.	Not reported
South Carolina	Late payment is 5% per month not to exceed 25%. $5,000 per month for failure to file appropriately.	Not reported.
South Dakota	Late return, 10% of tax due or $10 (minimum) and monthly interest at 1.5%. In addition, the taxpayer could lose allowance for shrinkage. Dyed fuel penalties are $250 for pickup or $500 for semi-truck on first offense and double for repeat offenders.	There are civil and criminal penalties in statutes but these have not been extensively used.

Table 2-5. (Continued).

State	Civil Penalties	Criminal Penalties
Texas	There is a 10% penalty for errors plus interest.	If noncompliance involves fraud, there is an additional 75% penalty. Another $200 is added if dyed fuel is involved. It is a Class C misdemeanor for using dyed fuel on road.
Utah	There is a 10% late and nonpayment penalty, 10% negligence, 15% intentional disregard.	50% or 100% fraud penalties, plus interest. There is a criminal investigation unit that responds to criminal activity.
Washington	Regular underpayment results in a special fuels 10% penalty, 1% monthly cumulative interest; motor fuel 2% penalty and 1% monthly cumulative interest. Fines can reach up to 25% for significant negligence.	There is a 100% penalty on evasion.
Wisconsin	10% late filing fee and graduated penalty of 5% per month to 25% max. Delinquent interest rate is 18%. Nonfilers receive estimated tax bill, with penalties.	Fraud penalty is 50%.
Navajo Nation	Tax, interest, and penalties. Penalties are 5% for initial nonpayment and 0.5% per month (penalties plus interest).	No criminal penalties. No criminal code on Navajo Nation.
IRS	Not reported	If can prove fraud, criminal penalties apply. If convicted, there is a 50% penalty on any tax owed.

Source: Interview Responses

state has never prosecuted a case. This seems to be due more to the difficulty of prosecution than to the absence of fraud.

2.7 Issues Related to Motor Carrier Enforcement

Fuel tax evasion that is likely influenced by motor carrier enforcement is the use of illegal dyed fuel by heavy trucks. Evasion that involves transporting fuel from a low-tax state to high-tax state using fraudulent or modified bills of lading is not likely to be deterred by motor carrier enforcement efforts (cargo inspections in this issue paper) in the vast majority of states. The problem of estimating the effectiveness of any of these efforts (motor carrier weight, safety, and dyed fuel enforcement) on illegal use of dyed fuel is similar to overweight trucks since there is little confidence in any estimates of the total amount of use. Because enforcement and fine amounts work in conjunction to influence illegal activity, both need to be considered when developing methods to estimate evasion. The rest of this section highlights how some motor carrier enforcement and dyed fuel enforcement activities may be useful in the overall model to estimate fuel tax evasion.

Motor carriers have long been subject to size, weight, and safety regulations. These regulations have evolved over time and include a complicated assembly of both state and federal regulations including so-called grandfather rights. Enforcement of motor carrier regulations is primarily the responsibility of each individual state. Federal involvement began with the passage of the Federal-Aid Highway Act of 1956 and was expanded and strengthened with the Surface Transportation Assistance Acts of 1978 and 1982 (FHWA, 2000b). Currently, the federal government has oversight responsibility but no enforcement capabilities (with the exception of the IRS' ability to inspect vehicles for dyed fuel use). The objective of motor carrier size and weight enforcement is to limit infrastructure damage caused by illegal overweight vehicles while safety enforcement activities are intended to improve safety performance of motor carriers.

The primary areas where motor carrier enforcement efforts may have measurable effect as deterrents on motor fuel tax evasion are:

- illegal use of untaxed dyed diesel fuel on public highways; and
- illegal transportation of motor vehicle fuel (as part of evasion schemes).

Little literature relates motor carrier enforcement efforts to the above issues primarily because the objectives of the enforcement programs are not associated with fuel tax evasion. This section focuses on describing weight, safety, and dyed fuel enforcement efforts with the objective of illuminating trends, issues, or data as they relate to fuel tax evasion issues.

2.7.1 Motor Carrier Enforcement

The enforcement of motor carrier regulations requires the cooperation of state DOTs, which build, operate, and construct the highway infrastructure, and the law enforcement agencies responsible for commercial vehicles within that state. Typically, these enforcement agencies are the State Police or equivalent. In some cases, the state DOT may have its own enforcement personnel who conduct weight, safety and dyed fuel enforcement activities. Local law enforcement agencies also may have enforcement responsibilities.

Weight enforcement can take place at fixed (static), weigh-in-motion, or mobile scales. At fixed and mobile scales, the vehicle is usually stopped (or nearly so), while weigh-in-motion (WIM) can be done at highway or slow speeds. Typically, weight enforcement efforts are coupled with motor carrier safety inspection efforts at the fixed weigh station locations because of the availability of space to conduct the inspections. Depending on a host of factors, supplemental safety inspections can be conducted that may include the vehicle, driver, or both. Dyed fuel inspections require the tank be dipped to inspect for the presence of red dye. The sample may be sent to the laboratory for verification of dyed diesel. The following sections describe weight, safety, dyed fuel, and cargo enforcement activities.

2.7.1.1 Weight Inspections

The motivation and focus of weight enforcement activities is directed at limiting the damaging effects of overweight vehicles to highway infrastructure. The damage caused by overweight trucks is not insignificant; TRB's Truck Weight Limits study estimated that nearly $160 to $670 million in highway pavement costs could be saved if all overweight axles were eliminated (Special Report 225, 1990). The range of the estimate reveals that the extent of overweight trucks operating on highways is not readily known.

In contrast, the actual number of trucks weighed is fairly well known. In 2003, nearly 177 million trucks were weighed in the United States as reported to FHWA. As recently as 10 years ago the majority of vehicles were weighed with fixed scale technologies. However, as shown in Figure 2-8, the most recent FHWA data (2003) indicate that a majority of trucks are now weighed by WIM devices. WIM can be done at highway or slow speeds; however, WIM scales have not been certified by the National Institute for Standards and Technology (NIST) for weight enforcement practice, and thus, they typically serve to screen and identify potentially overweight vehicles for weighing at a fixed scale.

Accordingly, nearly half of all vehicles weighed were weighed at fixed scales located off the mainline highway at a dedicated facility. Trucks must depart the main highway, slow to a relatively low speed or stop, and be weighed. The stations are fixed

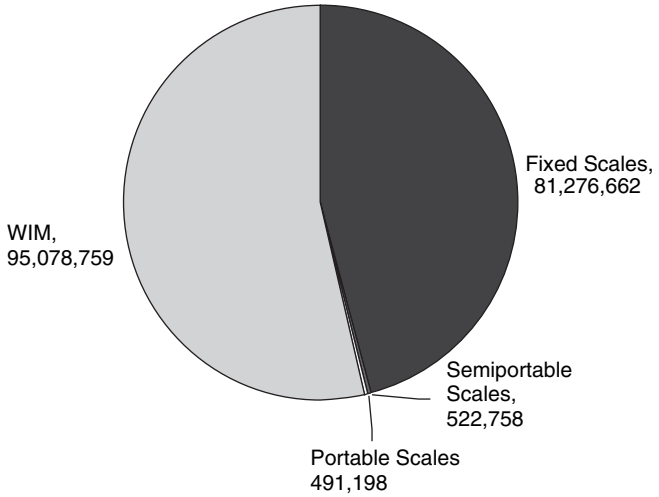


Figure 2-8. Number and location of trucks weighed (2003).

in location, are typically in high-volume truck corridors, and may be open limited hours of duration. Mobile weight enforcement uses portable scales, and allows enforcement on potential diversion routes for trucks evading fixed scales. It can be targeted to seasonal or other patterns where known weight violations are likely to occur.

WIM devices are part of larger Intelligent Transportation Systems (ITS) (for commercial vehicles) aimed at improving the efficiency of the weight and safety inspection activities. Commercial vehicles that participate in these programs can be equipped with a transponder or electronic license plate. As the vehicle approaches the fixed weigh station, the tag can be read and the vehicle identified. That information, along with the vehicle gross and axle weights can be used to decide if the vehicle should bypass the scale, or be required to pull in for further inspection. In this manner, the overall operating efficiency of the system can be improved and more trucks can be weighed. Limited enforcement resources are directed toward the most likely violators.

Static scales provide a visible reminder of enforcement and a deterrent effect for overweight trucks. However, largely because scale locations are fixed and it is relatively easy for overweight vehicles to evade the weigh stations, the number of overweight citations or violators is relatively low, on the order of 0.7 percent of the total trucks weighed. As shown in Table 2-6, this violation rate has stayed relatively constant over time. Portable scales or targeted mobile enforcement efforts have much higher violation rates, but these activities are more expensive to conduct. They have the added advantage of being able to target seasonal or known bypass routes.

While generalizations are difficult, the primary trucking industry segment thought to be operating near- or over-weight limits are those transporting dense, bulk commodities such as agricultural, mining, or construction materials products

Table 2-6. Selected national truck weight violation data.

	FY 1985	FY 1989	FY 1995	FY 2000
Trucks weighed (Excluding WIM)	97,331,000	124,687,000	111,620,000	100,103,108
Trucks weighed by WIM scales	7,903,000	22,263,000	57,948,000	92,888,114
Weight citations	664,000	692,700	655,000	653,310
Violation rate	0.7 %	0.6%	0.6%	0.7 %

Source: FHWA (2000a)

(*Special Report 267,* 2002). Interestingly, these may be the same industry segments with the easiest access to dyed fuel. Long haul interstate trucks have less incentive to operate overweight since their routes (interstates) have higher enforcement presence and their commodities are less dense.

Fines levied for overweight violations vary substantially from state to state. No current inventory of overweight fines was found (though our search was not exhaustive). Downs (1981) cites a dated 1979 FHWA summary of overweight penalties of which there may be a more current version available. There is substantial evidence that overweight fine structures are well below marginal revenues from overloading, as well as estimates of the marginal cost of road damage from overloading (Bisson and Gould, 1989; Casavant and Lenzi, 1993; Church and Mergel, 2000; Euritt, 1987). In a sense, it could be argued that the fines are often too low for a sufficient deterrent effect. In addition, there is also the issue that the judicial process may undermine the weight enforcement programs by regularly reducing the fines. Jessup and Casavant (1996) found that, for all cases contested in court, typically only 63 percent of the original fine is paid. Finally, the state differences include whether citations are civil or criminal offenses and which fund receives the fine revenues. In some cases, not all revenue generated is returned to the maintenance of highways, which may have an effect on motivation of enforcement, particularly for highway agencies.

2.7.1.2 Safety Inspections

Motor carrier safety inspections provide perhaps the most direct link between potential fuel tax evasion and motor carrier enforcement activities. Because the vehicle is stopped, enforcement actions such as fuel tank dipping are more easily conducted. As part of the inspection procedure a host of vehicle and driver items can be verified or inspected depending on the type of inspection. In all cases, the vehicle is stopped and an enforcement officer is present. Inspection procedures are standardized and any criterion that doesn't meet a standard can place a driver or vehicle "out of service." When these violations occur, the violation must be corrected before any additional activity can take place.

The Commercial Vehicle Safety Alliance provides standardized inspection procedures and training through the North American Standard Inspection (NASI) program. Inspections are targeted at violations that are more likely to cause a crash, although some argue that the link has not been established definitively. This program is designed to improve commercial motor vehicle safety and promote uniformity in compliance and enforcement, while minimizing duplication efforts and unnecessary operating delays for the motor carrier industry. Motor carrier safety inspections are categorized by the depth of inspection, with Level 1 inspections being the most complete. The following are descriptions of each (FHWA, 2004):

LEVEL I: North American Standard Inspection. An inspection that includes examination of driver's license, medical examiner's certificate and waiver, if applicable, alcohol and drugs, driver's record of duty status as required, hours of service, seat belt, vehicle inspection report, brake system, coupling devices, exhaust system, frame, fuel system, turn signals, brake lamps, tail lamps, head lamps, lamps on projecting loads, safe loading, steering mechanism, suspension, tires, van and open-top trailer bodies, wheels and rims, windshield wipers, emergency exits on buses and hazardous material (HM) requirements, as applicable.

LEVEL II: Walk-Around Driver/Vehicle Inspection. An examination that includes each of the items specified under the North American Standard Inspection. As a minimum, Level II inspections must include examination of: driver's license, medical examinees certificate and waiver, if applicable, alcohol and drugs, driver's record of duty status as required, hours of service, seat belt, vehicle inspection report, brake system, coupling devices, exhaust system, frame, fuel system, turn signals, brake lamps, tail lamps, head lamps, lamps on projecting loads, safe loading, steering mechanism, suspension, tires, van and open-top trailer bodies, wheels and rims, windshield wipers, emergency exits on buses, and HM requirements, as applicable. It is contemplated that the walk-around driver/vehicle inspection will include only those items that can be inspected without physically getting under the vehicle.

LEVEL III: Driver-Only Inspection. A roadside examination of the driver's license, medical certification and waiver, if

applicable, driver's record of duty status as required, hours of service, seat belt, vehicle inspection report, and HM requirements, as applicable.

LEVEL IV: Special Inspections. Inspections under this heading typically include a one-time examination of a particular item. These examinations are normally made in support of a study or to verify or refute a suspected trend.

LEVEL V: Vehicle-Only Inspection. An inspection that includes each of the vehicle inspection items specified under the North American Standard Inspection (Level I), without a driver present, conducted at any location.

States report most of their inspections activities to the Federal Motor Carrier Safety Administration (FMCSA) as part of the Safety and Fitness Electronic Records (SAFER) System. As shown in Table 2-7, there is a relatively even split between the number of level 1, 2, and 3 inspections performed in 2003. Level 1 and 2 inspections are more likely to be associated with dyed fuel inspections (if conducted). There are a very small number of level 4 and 5 inspections done compared to the others.

Fines may be assessed for safety violations determined at the state level. It should be noted that a summary of these fine levels has not been found, but the primary penalty associated with the safety inspections is the threat of being placed out of service. Vehicles placed out of service must remain so until the repair is completed. As shown in Table 2-7, the violation rate is relatively high with approximately 20 to 30 percent of the vehicles inspected having some sort of violation. This is indicative of targeted enforcement efforts, and one would assume, a strong deterrent effect.

2.7.1.3 Dyed Fuel Inspections

Fuel to be used for exempt or off-road use is currently dyed red per IRS standards that require Solvent Red 164 be added at a concentration spectrally equivalent to 3.9 pounds per thousand barrels (PTB) (11.13 mg/liter) of solid dye standard Solvent Red 26 (Chevron, 1998). The concentration can be measured according to American Society for Testing and Materials (ASTM) D 6258—Determination of Solvent Red 164 Dye Concentration in Diesel Fuels. The dye is usually added at the terminal with dye injectors that should be tamper proof. These sites may be inspected by IRS or state enforcement officers. Diesel fuel dyed red is not subject to highway use tax and, as such, if used on public roads is considered fuel tax evasion. It should be noted that some states allow the use of dyed fuel legally by government vehicles, school buses, or other exempt uses.

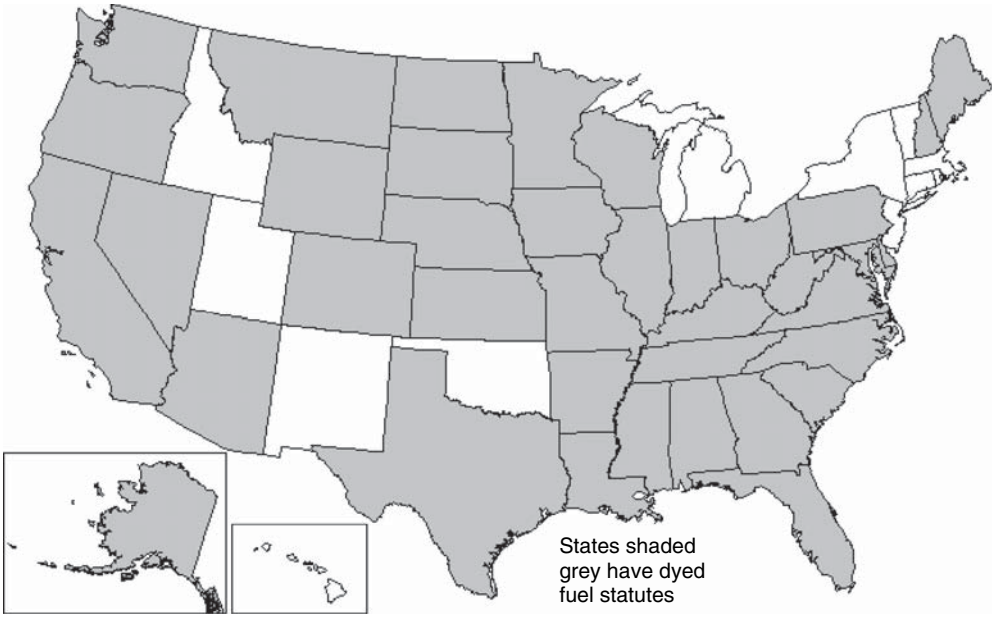
The likelihood of being caught with dyed fuel depends on how active an effort is made to catch those who illegally use dyed fuel. One important measure of enforcement activity is whether the state has its own dyed fuel statues. Not all states have dyed fuel statutes; those that do may have differing civil and criminal penalties. Unofficial data from FHWA indicate that 38 states have corresponding dyed fuel statutes. These states are shown in Figure 2-9. Presumably, many of the states with dyed fuel statutes have enforcement activities dedicated to dyed fuel use. For those that choose not to enforce it, this enforcement effort is primarily left to the IRS. The IRS currently has approximately 150 officers nationwide devoted to dyed fuel enforcement activities (Burwell, 2005).

Each state may tailor its dyed fuel enforcement program differently, and it may be conducted independently of motor carrier safety inspections. While inspection of the fuel system is required in some levels of motor carrier inspections, checks for dyed fuel usage are not required as part of the NASI procedure. The interview analysis and our research indicate that weight and safety inspections are not systematically combined with dyed fuel inspections. Washington state commercial vehicle enforcement division indicates that all Level 1 motor carrier inspections include a fuel dip as a matter of policy (Estes, 2005). Oregon DOT does not do any fuel inspections as part of its enforcement program. Any dyed fuel inspections done in Oregon are done by the IRS although they may at times use ODOT weigh station facilities (McKane, 2005). Oregon's practice likely reflects the state's reliance on weight-mile rather than diesel fuel taxes levied on motor carriers. The Minnesota Department of Public Safety has an aggressive dyed fuel enforcement program that includes roving patrols and inspections at weigh stations. Much of the focus is on agricultural vehicles (Bergstrom, 2005). Additional searches of state commercial vehicle enforcement web sites find that a number have a focus on dyed diesel fuel, while others do not.

An official source for dyed fuel inspections nationwide was not found; however, FHWA maintains an unofficial source of

Table 2-7. Motor carrier inspection activity by inspection level (2003).

Inspection Activity	I. Full		II. Walk-Around		III. Driver Only		IV. Special Study		V. Vehicle Only	
	Number	%	Number	%	Number	%	Number	%	Number	%
With no violations	263,766	25.87	216,715	19.62	301,079	36.42	9,966	44.46	19,809	58.94
With violations	755,691	74.13	888,076	80.38	525,563	63.58	12,452	55.54	13,802	41.06
Total Inspections	1,019,457	33.90	1,104,791	36.74	826,642	27.49	22,418	0.75	33,611	1.12



Source: Federal Highway Administration

Figure 2-9. States with dyed fuel statutes.

dyed fuel inspections data in the United States. From these data, it appears the violation rates for dyed fuel inspections are similar to the overweight citations. The majority of violations rates are near 1–2 percent of total samples taken.

A few states report dyed fuel inspection activities in their annual reports or newsletters. Some of those found are summarized in Table 2-8. These data closely resemble the FHWA unofficial tabulations. In a 2004 report for the Nevada Highway Patrol, the agency reported 530 dyed fuel inspections and no violations issued in October 2004, 626 in October 2003 with no violations, and 521 in September 2004 with no violations. Revenue Canada, as part of the Canadian/USA Motor Fuel Tax Northeastern Compliance Initiative, conducted fuel sample inspections at U.S. and Canadian border crossings as well as locations in the northeastern United States. A total of 3,894 samples were taken and 6 fuel violations were discovered as well as 11 "bleached" fuel samples. A 2004 report by the Nebraska Department of Revenue cited 7,198 inspections and 42 violations. The report states that the trend has been declining over the years since the number of violations was down from 100 in 1997/98. Finally, the California Air Resources Board conducted 23,829 inspections in 2003, sent 171 samples to the lab, and found 114 violations.

Fines and penalties for dyed fuel use at the federal level are $10 per gallon or $1,000, whichever is greater, plus payment of the tax. Illegal use of dyed fuel also may be subject to a fine of $25,000 per day per violation of the Clean Air Act since the dye also is applied to fuels with high sulfur content. States may impose additional sanctions and penalties on top of the federal ones.

2.7.1.4 Cargo Inspections

A few of the tax administrators interviewed for this report suggested that motor carrier inspections or stops by enforcement personnel could result in BOL inspections for fuel transporting vehicles. The intent would be to verify declared weight with the measured weight in an effort to capture possible evasion schemes that involve transporting fuels. Additionally, it was suggested that enforcement could verify that the vehicle was reasonably on a path to the declared delivery point.

Table 2-8. Sample dyed fuel inspection data.

	Nevada Oct 04, Oct 03, Sept 04	Northeastern Canadian/USA Duration Unknown	Nebraska Fiscal Year 2003-2004	California 2003
Inspections	1,677	3,894	7198	23,829
Violations	000	17	42	114
Violation rate	0%	0.4%	0.5%	0.4%

Sources: Nevada Highway Patrol (2004), Sansfaçon, Georges (2004), Nebraska Department of Revenue (2004), and California Environmental Protection Agency, Air Resources Board (2004)

Opportunity for other future enforcement techniques (i.e., cargo tracking of fuel to destination) is certainly a possibility. In fact, this technology has been proposed and tried at a few international border crossings where cargo is tagged and tracked to a final destination to increase the speed of border crossings. The TransCorridor project allows containerized in-bound cargo to travel from the ports of Seattle and Tacoma north into British Columbia (BC) to be tracked with automated vehicle identification (AVI) readers at the port and the border crossing at Blaine, Washington. This information can be used to expedite transit through the border crossing or to detain vehicles for further inspection if unnecessary travel time is encountered. Further efforts will include electronic seals on containers to verify that transshipments bound for Canada are not tampered with while in the United States. Other ports have similar efforts underway.

2.7.2 Effectiveness of Motor Carrier Enforcement

Enforcement's influence on motor carrier behavior works mainly through the principle of deterrence. Deterrence affects human behavior by making punishment for certain actions credible and certain. The associated penalties need to be sufficiently high to provide a disincentive but not too high to be considered punitive. Each motor carrier enforcement efforts has a deterrence element. More discussion on the effects of fines and punishment on behaviors can be found in Section 2-6.

There is a body of literature suggesting that the fines for overweight vehicles are proportionate to the effectiveness of the enforcement. However, there is a wide variety of fines and penalties for overweight violations in each state. In fact, one recommendation of TRB's Special Report 267 is for some consolidation or uniformity in penalties (TRB, 2002). Bisson and Gould (1989), Hildebrand (1990), and Paxson and Glickert (1982) conclude that current penalty and fine structures have a minimal effect on carrier behavior. At current penalty levels, total vehicle operating costs per ton-mile decrease dramatically, while the cost per mile increases slightly as load weight increases. Depending on the probability of detection and level of enforcement the economic gain to truckers who are risk-inclined is consequential. Market revenue from overloading can exceed the cost of detection by as much as a factor of 10 (Bisson and Gould, 1989).

However, empirical studies have found that enforcement activities can reduce the number of overweight vehicles. Grenzeback et al. (1988) in an NCHRP study estimated that 15 percent of large trucks would exceed axle or gross vehicle weight on Interstate highways with no enforcement and that the minimum value of violations would be 6 percent with enforcement. Cunagin et al. (1997), Grundmanis (1989), Fepke and Clayton (1994) and the FHWA (2000a) assess the effectiveness of fixed location versus portable scales and recommend mobile safety and weight enforcement activities as a stronger deterrent to avoidance behavior. Observed levels of weight violations, at fixed scales, range from 0.8 percent to 4 percent at various enforcement levels. At portable scales, the level of weight violations varied from 3 percent to 58 percent. Evidence indicates that portable scales are more effective at capturing weight violators. Mobile and portable scales are more costly to operate than fixed-scale facilities per vehicle and suffer from poor safety characteristics for the enforcement officer, drivers, and vehicles. Nevertheless, portable scales are highly flexible in terms of secondary and bypass route deployment.

The primary measure of effectiveness for motor carrier safety inspections is in terms of reduced motor carrier collisions. The motor carrier safety inspections are directed and targeted at likely violators as evidenced by the high violation rates found in the inspections. FMCSA has developed a methodology to estimate the effectiveness of the motor carrier inspections (FMCSA, 2004). The report attempts to quantify the outcomes of safety inspections on number of lives saved, crashes avoided, and injuries avoided. Their methodology indicates that in 2003, motor carrier safety inspections avoided nearly 12,000 crashes and saved 500 lives. The report states that FMCSA intends to measure the indirect effects of enforcement—the deterrent on likely or repeat violators for improving safety—by comparing overall trends of out of service rates. In other work, Lantz (1993) summarizes numerous studies that have related the quality of inspections (either maintenance or roadside) to a decline in truck accident rates. One study by Jack Faucett and Associates (1992) found that there was a 12 percent reduction in truck defect-related crashes following an increase in the number of safety inspections upon starting the MCSAP program. Another study by Lantz (1994) found that the violation rate for anticipated inspections and those considered spontaneous (not at fixed scale locations) found nearly similar violation rates.

There does not appear to be any literature relating the effectiveness of dyed fuel inspections to the amount of illegal use of dyed diesel. Anecdotally, many of the interviews suggest that the dyed fuel enforcement effort is perceived to be effective but it has not been quantified. The penalties for dyed fuel violations are substantial and when compared to overweight fines may be considered extreme. Alternatively, just the practice of dyeing fuel may be an effective way to reduce evasion. In fact, after the dyed fuel program was introduced in 1993, the U.S. Department of Treasury estimated that $600–700 million more in diesel fuel tax receipts were received after adjustments and refunds (FHWA, 1999c). Other states have reported similar revenue gains in the interviews.

CHAPTER 3

Strategies, Methods, and Tools To Measure and Evaluate State Fuel Tax Evasion

3.1 Introduction

This chapter examines the motor fuel excise tax evasion studies completed in the past 20 years in order to assess the strategies, methods, and tools they employed. Historically, these studies have attempted to determine the percentage of total tax liability captured by current state or federal tax collections, and document program characteristics that exacerbate or deter evasion. The focus of this chapter is to examine the approaches these studies used to estimate motor fuel excise tax noncompliance and document their relative strengths and weaknesses for estimating various types of evasion. Some methods seek to estimate total evasion (e.g., econometric analysis), while others seek to estimate specific types of evasion (e.g., border interdiction or use of dyed fuel).

Numerous approaches have been employed to study evasion at both the state and federal level. These approaches are outlined in the next section. From a conceptual standpoint, the literature review carried out for this study sought to find consensus among the evasion studies completed to date to determine the most promising model or accepted practice. No such consensus or preferred approach was found. Rather, methods used in previous studies varied widely from a simple review of previous literature to complex econometric models. In a small number of studies, more than one method was employed and findings were compared to construct ranges of evasion estimates. These strategies, methods, and tools are reviewed in the next section of this report, which offers brief analysis of other alternative methods that hold promise but have not yet been used to study motor fuel excise tax evasion.

The most successful approaches were designed with flexibility in mind, capturing the unique characteristics of the state being examined (e.g., variance in fuel tax rates in the state relative to its neighboring states, or relative enforcement efforts). There are a number of state explanatory variables (e.g., point of taxation, proximity to international borders) that could also have been incorporated into the methodology, regardless of the approach taken in measuring evasion. It is the uniqueness of these characteristics that pose challenges to the modeler, thus requiring a comprehensive approach mindful of the state-by-state variability in tax code, enforcement programs, and geographic location that largely determine levels of evasion. Chapter 5 outlines the methodology for identifying and quantifying state-level fuel tax evasion by the authors of this report. This chapter is intended to document the numerous approaches used to date.

3.2 Strategies, Methods, and Tools for Examining Evasion

During the past 20 years, states and the federal government have devised a multitude of tools, strategies, and methods for estimating motor fuel tax evasion. These studies have employed a broad spectrum of approaches. Generally, these studies have used one or several of the following methods to estimate evasion: (a) literature review, (b) audit review, (c) analysis of border interdictions, (d) survey of tax administrators, (e) comparison of fuel supply with taxed gallons, and (f) econometric analysis. Studies employing these methods, including study findings and authors, were identified in Table 1-1 of Chapter 1. This section examines these methods.

3.3 Literature Review Method

The literature review method, as applied to estimate motor fuel excise tax evasion, has historically relied on the work of previous studies of evasion, testimony, anecdotes, and interviews with motor fuel tax administrators. FHWA used the literature review method in 1992 to estimate all federal fuel tax evasion (1.3 billion) and nationwide state fuel tax evasion (1.2 billion) annually (FHWA 1992). The literature review method has also been used to estimate total state fuel tax evasion at as high as $1.5 billion when summed to the national level (CSG & CGPA, 1996). WSLTC used the literature

method to estimate evasion in Washington State in 1996. The information gathered by the WSLTC estimated an expected range of fuel tax evasion between $15 and $30 million annually in Washington State (WSLTC, 1996).

The literature review method is limited to generating rough estimates of fuel tax evasion based on qualitative information and assumptions. One significant drawback to this method is that certain types of information sources used are not based on rigorous analysis and are often anecdotal and unconfirmed. For instance, the FHWA study (1992) estimates were largely based on the unsubstantiated testimony of state and federal officials, industry representatives, and perpetrators of tax evasion.

An additional weakness of relying on previous studies is that assumptions used in those studies rarely share common ground (e.g., data sources, time period covered, methods used, etc.). The WSLTC (1996) study, for example, based its lower bound estimate on several state studies that analyzed the impacts of changing the point in taxation. However, the legislation analyzed in these studies differed by fuel type, time period, and the place in the distribution system where the point of taxation was moved. The variation in points of taxation, motor fuel type, and other factors can be sorted out through meta regression analysis, which is an application of quantitative methods to the procedure of comparing and combining results from separate yet similar analytic studies. Stanley (2001) briefly defined meta-analysis as "quantitative research synthesis." This approach, however, was not used in the studies previously conducted in this field.

3.4 Audit Review Method

The audit review method estimates evasion by examining audits of motor fuel excise taxpayers. These evasion estimates are aggregated assessments based on the percentage and degree of fraudulent activity found through random audits. Two studies identified here have employed this method. In both cases, audit reviews were combined with other methods to gauge fuel tax evasion and only were used to supplement other forms of evasion analysis. One study combined this method with the literature review and border interdictions methods to examine Washington State motor fuel excise tax evasion (WSLTC, 1996). At the national level, FHWA employed this approach along with a literature review and testimonies from fuel tax administrators and perpetrators of fuel tax evasion to estimate the level of nationwide state and federal motor fuel excise tax evasion at $1.2 billion and $1.3 billion, respectively (FHWA, 1992).

Information collected from the audit reviews could be applied to improve the understanding of motor fuel excise tax evasion. At a basic level, audit analysis could be used to gain a grasp of the potential monetary range that individual schemes cost in terms of evasion. Taking this type of analysis further, evasion estimates could be created by taking the percentage of all audits in which illegitimate activities occurred and aggregating that percentage out to the population of taxpayers. When using this method, analysts must control for bias associated with selecting the sample of companies for audits.

Neither identified studies that used this method went beyond the basic level just described, nor did they take measures to control for bias. Though analyzing information from audits may enable analysts to investigate the possible magnitude of specific evasion techniques, there are a number of drawbacks that need to be addressed to make using the audit method useful in estimating base jurisdictional fuel tax evasion estimates. First, the number of firms audited is generally a very small percentage of the total universe of taxpaying companies. The characteristics of such a small sample of taxpayers cannot be universally applied to all taxpayers. Efforts must be taken to understand the sample characteristics and understand how representative the sample is compared with the overall population. Second, audits are not always randomly selected; sometimes they are the product of a tip, suspicious return or previous issue with a higher risk taxpayer. Sample results cannot be aggregated with reasonable confidence unless they are either random or steps are taken to control for bias. Third, due to the complexity of business operations, audits may fail to uncover all of the fraudulent activity occurring within the investigated entities. Finally, audit data fail to capture evasion occurring outside the legitimate fuel supply system through techniques such as daisy chains and fuel smuggling.

3.5 Border Interdictions Method

Border interdictions involve the examination of petroleum import records and inspection of vehicles and vessels crossing international and state borders. Operation activities can involve dipping tanks and inspecting fuel, comparing shipment loads with shipping documents and checking IFTA documentation. This method can be used to gauge the misuse of dyed fuel, illegal importation or exportation, the movement of chemicals used for fuel cocktails and certain types of IFTA abuse. The WSLTC (1996) study employed this approach to analyze the activities at the border between Washington State and Canada.

This method has several weaknesses. First, the border interdiction method is limited due to time and cost constraints. Second, it does not provide the basis for a jurisdictionalwide estimate of evasion. Rather, it can only identify a few forms of tax evasion while other forms (e.g., underreporting or nonfiling, refund and credit schemes) go undetected. Further, for the evasion techniques it can identify, it will only identify them at the location where the operation is set up; it will not identify them at other points in the jurisdiction and other border

points. Lastly, border interdictions may not even be able to assess average evasion occurring at borders.

Even when U.S. Customs or state police patrol borders, there is evidence to suggest that tanker operators effectively communicate with each other to avoid such stings or checkpoint operations. One study designed to detect cross-border smuggling examined the operations of petroleum tankers crossing from Canada into Washington State through two international border crossings (WSLTC, 1996). As illustrated in Chapter 2, during the three-day inspection, there was a marked decline in the number of petroleum tankers passing through these international border crossings, thus demonstrating the ability of tanker operators to communicate with each other in order to detect and bypass inspection operations.

3.6 Survey of Tax Administrators Method

Surveying state and federal fuel tax administrators is a method that has been used to investigate fuel tax evasion. The CSG & CGPA (1996) study surveyed tax administrators to discern perceptions of the nature and magnitude of fuel tax evasion in each state. On average, fuel tax administrators believed that motor fuel tax revenue would increase by 6.53 percent if fuel tax evasion was completely eliminated for both gasoline and diesel (CSG & CGPA, 1996). When aggregated for all states, this would mean a perceived revenue loss of $1.2 billion annually. Denison and Hackbart (1996) also surveyed state fuel tax administrators to explore the affect of enforcement efforts on state tax collections and applied the results to the State of Kentucky. However, the information gathered for this research was not opinion based. Rather, it elicited fact-based information on enforcement programs such as the number of auditors and total assessments. This information was used to support a statistical analysis of enforcement activities on fuel tax collections.

One weakness associated with estimating fuel tax evasion based on tax administrator surveys is that many resulting fuel tax evasion estimates are based on unsubstantiated perceptions. In the case that survey responses are based on quantitative analysis, there remains the problem that there will most likely be significant differences in the methods and assumptions used in each analysis. General problems that arise in the survey of tax administrators relate to survey design and bias. Survey bias will be reflected in the way information is presented, the order of the questions, question format, and the survey response rate.

3.7 Comparison of Fuel Supply with Taxed Volumes Method

The comparison of supply with taxed gallons is another method for estimating evasion. This method was employed by Addanki et al. (1987) for estimating federal gasoline tax evasion. It also was used to estimate evasion of diesel fuel taxes due to the blending of aviation fuels in vehicles for on-road uses (KPMG, 2001).

This method of estimating evasion involves comparing taxed gallons to volumes supplied in the distribution system. The primary problem with this approach is the inherent differences in how data are collected and treated. For instance, methods used by the EIA to develop fuel supply estimates differ from how FHWA develops estimates of fuel consumption and how IRS-taxed gallons data are generated. In fact, an EIA study showed that EIA estimates of gasoline supplied to the system are actually less than FHWA estimates of taxed gallonage (Hallquist, 1999). The differences in data collection techniques and discrepancies in data collection lead to various factors (e.g., treatment of blending fuels data, varying data sources, breaks in the time series, double counting of shipments, and incomplete data) that can undermine evasion estimates. Thus, even though this approach has theoretical appeal, it must be applied with care and researchers must account for a number of factors, including data collection techniques, treatment of blending fuels, and allocation of fuels between taxable and nontaxable uses, for this technique to be valid.

Relying on data from the Federal Aviation Administration (FAA), the EIA, and the IRS SOI, KPMG (2001) estimated federal tax leakage due to the diversion of jet fuel to highway use. Based on this approach, KPMG (2001) estimated the cost of evasion associated with the diversion of jet fuel to range from $1.7 billion to $9.2 billion over a 10-year time horizon. The lower bound estimate is based on the presumption that only the 4.4-cent commercial jet fuel tax is being evaded, while the upper bound is based on the assumption that the full 24.4-cent diesel tax is the target of the evasion scheme. This study, however, did not properly account for the reclassification of jet fuel between the terminal and final sale to end users and was criticized by industry (API, 2002). In this case, FAA aviation fuel consumption data as reported by U.S. carriers is compared with EIA production of aviation fuel data as reported by refineries. However, data presented in the EIA's Petroleum Marketing Annual (PMA) report suggest that, in 2002, the amount of fuel ultimately sold by prime suppliers of jet fuel was over 3 billion gallons less than that reported in EIA's Petroleum Supply Annual (USDOE/EIA, 2002). In the event that studies are not capable of accounting for variations in data collection techniques and discrepancies in the datasets, it is difficult to evaluate whether or not the divergence between fuel consumption and supply is due to tax evasion.

Addanki et al. (1987) had begun research with the intent of using this method to estimate federal gasoline tax evasion. However, the study deemed it implausible to identify a reasonably precise yearly magnitude of evasion due to the limitations and bias in available data sources. The authors decided to use an alternative econometric approach examining trends

in supply and consumption data rather than comparing data to estimate evasion in any given year.

3.8 Econometric Analysis

The econometric approach can be used to develop a comprehensive fuels model to forecast fuel excise tax collections for each state based on economic activity and demand for fuel use in each sector. Highway travel, freight transportation, residential, and industry all consume fuel in the course of business and the different fuels (gasoline, gasohol, and distillates) can be used somewhat interchangeably between sectors. For example, domestic freight can be hauled by truck, rail, water (ship or barge), or by air. People can commute to business and take pleasure travel by air, rail, bus, or private vehicle (automobiles, light trucks, and sport utility vehicles [SUVs]). Similarly, industry can use either gasoline, gasohol, or distillate fuels in machinery and vehicles to conduct business not taxable for state or federal highway trust fund purposes. In addition, home heating oil used in the residential sector can be used interchangeably with the diesel used in freight trucks. Thus, consumption of gasoline, gasohol, diesel, and aviation fuel (gasoline and kerosene types) could be estimated econometrically for passenger vehicles, light trucks and SUVs, heavy trucks, residential, industrial sectors, rail, air, and waterborne traffic sectors. When applied in this manner, the econometric method measures motor fuel excise tax evasion by examining historical structural relationships between economic indicators [e.g., nonfarm employment, income, and gross state product (GSP)] and motor gasoline consumption to predict the escalation and decline in total excise tax liability. Estimated tax liability is, in turn, compared to tax collections to estimate evasion rates. This method, along with the literature review, has been the one applied most regularly when estimating fuel excise tax evasion. The econometric method has been applied at the state and federal levels.

The econometric method also has been used to examine the relationship between enforcement activities and returns to state agencies as higher motor fuel excise tax collections. Econometric analysis also has been applied to examine the relationship between apparent motor fuel excise tax evasion rates and state characteristics (e.g., geographic proximity to international borders, motor fuel excise tax rate differential relative to border states) that exacerbate or curb evasion.

There are shortcomings to the econometric method (e.g., availability and reliability of data, changes in structural relationships between variables over time, and the inability of econometrics to predict future extraordinary events and unexpected trends); however, Battelle in Weimar et al. (2002) viewed this technique as conceptually promising and used it to examine evasion at the federal level for the IRS. Weimar et al. controlled for shortcomings by independently verifying components of fuel use wherever possible and using the most accurate available data sources where multiple sources existed.

The econometric and statistical models used in previous studies were based on survey data as well as time-series data. Previous state studies have indicated that differences among states in terms of program structure, geographic location, and tax rate have largely determined estimated rates of tax evasion (Addanki et al., 1987; Mingo et al., 1996). Earlier research in this field, however, has largely under-examined the dynamic nature of motor fuel excise tax evasion over time and other significant effects such as the impact of inflation on evasion penalties.

3.8.1 CSG and GPA 1996 Study of Motor Fuel Tax Evasion

The CSG & CGPA (1996) study utilized a combined approach to examine motor fuel tax evasion employing the literature review, survey of state tax officials and the econometric approaches (CSG & CGPA 1996). The findings of the study are shown in Table 3-1. The variables used in the statistical model were (1) income/wealth, (2) demographic characteristics of the population, (3) price variables, (4) geographic dispersion variables, and (5) other variables.

3.8.2 Mingo et al. 1996 Study for Proposed Diesel Tax in Oregon

Mingo et al. (1996) employed a linear regression analysis to study the impact of tax evasion on a proposed diesel tax for trucks weighing in excess of 26,000 pounds in the State of Oregon (Mingo et al., 1996). Presently, Oregon is the only state in the nation that does not impose a diesel tax on trucks weighing in excess of 26,000 pounds, instead relying on its weight-mile tax. The weight-mile tax is based on a graduated fee schedule with rates that grow in relation to the declared weight of a heavy truck configuration. The amount of the weight mile tax is based on the declared weight of the vehicle and the miles it travels in Oregon.

Table 3-1. Findings of CSG & CGPA 1996 study of fuel tax evasion.

Method	Value of State Fuel Tax Avoided in Billion ($)
1- Literature-Based Estimates	1.5
2- Survey-Based Estimates	1.2
3- Statistical Model	0.952

Source: CSG & CGPA, 1996.

Mingo attempted to measure the extent of evasion associated with a proposed tax in Oregon by examining the relationship between various factors and perceived motor fuel excise tax evasion and then applying the resulting model in Oregon. Using calculated noncompliance as the dependent variable, the study used the following regressors: (1) whether the state is coastal or bordering another state, (2) the diesel tax rate of nearby states and proximities of their population centers, (3) the intensity of truck ownership and usage within the state, and (4) the relative rates of other truck taxes within a state. The model was successful in explaining only three-fourths of variation in compliance rates among states.

3.8.3 Eger and Hackbart 2001 Study of 50 States

Eger and Hackbart (2001) reviewed road fund assessment, collection, audit, and enforcement processes using survey data for several states and developed recommendations to improve the efficiency of the road fund collection process in Kentucky (Eger and Hackbart, 2001). To collect data for the statistical model employed in this analysis, an electronic survey was sent to road fund tax administration officials in the 50 states and the District of Columbia. Survey respondents based their answers on information for fiscal years 1997 and 1998. The survey was designed to collect information needed for the statistical model's dependent and independent (explanatory) variables represented in Table 3-2. The econometric model was developed to explore the affect that enforcement, auditing, and assessments had on highway fund revenue compliance.

The strength of the Kentucky study is that the authors relied on cross-sectional data and survey data as opposed to time-series data. By using cross-sectional data, the authors avoided problems typically associated with time-series data, such as statistical aggregation errors, seasonality issues and the problem of using nominal versus real values. Eger and Hackbart also

Table 3-2. Eger and Hackbart (2001) statistical model dependent and independent variables.

Dependent Variables:		
	Variable Name	Variable Definition
1	Assessment per million truck VMT for FY 1997 (for Model 1)	Total amount of assessment (defined as the total tax due per audit less the amount reported by the taxpayer with original return) due to audits, of all taxpayers combined, of highway revenue fund (i.e., motor fuel taxes, motor carrier fees, etc) audits in fiscal year 1997 per million VMT. In other words, this variable reflects the absolute assessment value per million VMT without influencing the value by differentials in penalty and interest used by each individual state.
2	Assessment for FY 1997 in real dollars (for Model 2)	Total amount of assessment in real dollars (defined as the total tax due per audit less the amount reported by the taxpayer with original return) due to audits, of all taxpayers combined, of highway revenue fund (i.e., motor fuel taxes, motor carrier fees, etc) audits in fiscal year 1997. In other words, this variable reflects the absolute assessment value without influencing the value by differentials in penalty and interest used by each individual state.

Independent Variables:		
	Variable Name	Variable Definition
1	Border State	A dummy variable that includes the states bordering Kentucky: Illinois, Indiana, Missouri, Ohio, Tennessee, Virginia and West Virginia and including Kentucky
2	Number of Field Auditors	The number of field or desk auditors as reported on the survey
3	Diesel Tax	Excise tax in cents per gallon of diesel for 1997
4	Per Capita Income	Per capita income measured in 1997 dollars
5	Urban Road Miles	Miles of road in urban areas owned by state highway agencies
6	Rural Road Miles	Miles of road in rural areas owned by state highway agencies
7	Federal Tax Contribution	Amount of federal tax revenue awarded to the state for FY 1997
8	Location	A dummy variable that takes 1 if collection agency/department is revenue, 0 otherwise

Adopted from Eger and Hackbart (2001)

applied a number of regression analysis functional forms: (1) linear model with assessment per million VMT as a dependent variable; (2) linear model with total assessments in real dollars as a dependent variable; and (3) a log-log functional form of Model 2. Reliance on the most representative data set and selection of the correct functional form are basic econometric practices often encouraged before deciding on the most appropriate model for estimation. A significant problem with this study is its reliance on VMT data, which is usually criticized due to its large margin of error, particularly on lower-order road systems (e.g., county roads and city streets). At the national level, such aggregated data usually hide significance variances between the states.

Eger and Hackbart (2001) reported that, of the aforementioned eight explanatory variables, only three were found to be statistically significant at the 0.05 level of significance (95 percent level of significance). Based on these equations, total nationwide state motor fuel excise tax evasion was estimated to be $952 million. A shortcoming in the model developed in Eger and Hackbart is that a large proportion of insignificant variables typically indicates that a model is not statistically sound, even in the case where the model's *R*-square, the measure of the overall model fitness, may be relatively high (Eger and Hackbart, 2001).

3.8.4 Hackbart and Ramsey 2001

Hackbart and Ramsey (2001) developed a stepwise regression model to estimate revenue loss due to motor fuel excise tax evasion. Three equations outlined below were used by Hackbart and Ramsey (2001) to determine which independent variables provided the best fit in terms of explaining the demand for motor fuels.

The first equation in the model deployed by Hackbart and Ramsey (2001) estimated the demand for motor fuel on a gallon-per-resident basis for each state as follows:

Equation 1: Gallons of fuel per resident = f (per capita personal income, land area per 1,000 residents, and interstate highway miles per 1,000 residents)

The second equation estimated the gallons of fuel per driver:

Equation 2: Gallons of fuel per driver = f (per capita personal income, land area per 1,000 residents, and interstate highway miles per 1,000 residents)

The third equation estimated gallons of fuel per vehicle:

Equation 3: Gallons of fuel per vehicle = f (per capita personal income, land area per 1,000 residents, and interstate highway miles per 1,000 residents)

To calculate total motor fuel consumption, Hackbart and Ramsey multiplied the estimated gallons of fuel per resident by each state's population (Equation 1), gallons of fuel per driver by the number of registered drivers in each state (Equation 2), and gallons of fuel per vehicle by the number of registered vehicles in each state (Equation 3). These estimates of motor fuel consumption were combined with tax rates to produce estimated state motor fuel tax liability. These three estimates of liability were compared with actual tax collections in each state and the differences were calculated. In turn, these three evasion estimates were averaged. Finally, the evasion estimates for all states were summed to produce a nationwide estimate of state motor fuel excise tax evasion.

Hackbart and Ramsey (2001) employed a statistical model that appears to be more efficient in econometric terms relative to that employed by Eger and Hackbart (2001) because the authors dropped the statistically insignificant variables. Each explanatory variable included in Hackbart and Ramsey (2001) was shown to be statistically significant. In turn, the model's overall performance is shown to be more statistically sound when compared to the Eger and Hackbart (2001) model. The model showed high *F*-statistics (overall significance of an overall multiple regression) as well as a high *R*-square test of a step-wise regression.

Though the model deployed by Hackbart and Ramsey (2001) is statistically sound, it doesn't include a number of economic variables that are theoretically likely to drive motor fuel consumption (e.g., gross state product, nonfarm employment and motor fuel prices). Statistical models should be sound from both a theoretical and statistical standpoint.

Hackbart and Ramsey (2001) relied on cross-sectional data collected in 1992 as part of the GSG & CGPA (1996). Data used to support the model were collected prior to several advancements in motor fuel excise tax collection. For example, the data were collected prior to:

- Federal government collecting diesel tax at the terminal rack,
- Dyed fuel requirements,
- Taxation of kerosene,
- Development of ExSTARS and many state fuel tracking systems, and
- Movement of many state points of taxation up the distribution chain.

3.8.5 Addanki et al. 1987 Gasoline Tax Evasion in New York

Addanki et al. (1987) employed the econometric method using time-series data for the period 1974–1982. The study fitted IRS data on taxed gallons to FHWA and EIA gasoline

consumption estimates over the 1974–1982 time period using a conventional regression technique. The authors then used the estimated trend line to estimate what IRS taxed gallons should have been for the 1984–1986 time period based on FHWA and EIA estimates of consumption. The study also examined the issue of gasoline tax evasion in New York State, using regression analysis to estimate gasoline tax evasion at $168.4 to $254.5 million annually. This estimate would appear to be extremely high given that estimates of state gasoline tax evasion at the national level have historically hovered in the $600 million to $1.2 billion range.

The model employed in Addanki et al. (1987) included taxed gallons as the dependent variable and the FHWA-estimated consumption estimates and the EIA-estimated consumption estimates as the independent variables. The authors in the Addanki study regressed the dependent variable (taxed gallons in billions of gallons) on two explanatory variables (FHWA and EIA consumption statistics) as indicated in the following equation.

Equation 4: Taxed gallons in billions of gallons = f (FHWA consumption estimate from Highway Statistical reports, EIA consumption estimate from Petroleum Supply Monthly reports)

3.8.6 Eger et al. 2003 Agricultural Consumption of Tax-Exempt Fuel in Midwestern States

Eger et al. (2003) presented a statistical analysis of trends in the consumption of tax-exempt fuel in the agriculture sector in Midwestern states. Eger et al. (2003) used Ordinary Least Square (OLS) and the Autoregressive Analysis to correct for autoregressive error terms over time. The model employed by Egger et al. regressed seasonal monthly gasoline refunds in agriculture (dependent variable) against a number of explanatory variables: monthly fuel tax rates (cents), number of farms in state, average acreage of farms, and dummy variables for each state included in the analysis. This study used this model and a time-series cross-sectional data set (panel data) to conclude that Wisconsin's annual consumption of tax-exempt fuel for agricultural uses exceeds the average for other Midwestern states by nearly $4 million annually. This higher-than-anticipated level of refunds in Wisconsin suggests relatively higher levels of refund fraud.

3.9 Alternative Econometric Methods

In addition to models previously used to estimate motor fuel excise tax evasion, the research team also reviewed two other econometric modeling approaches that hold promise but have not yet been used in this field. Other models of note mentioned here are the simultaneous fuel supply and demand model and the Tobit model. The Tobit model has been used by economists to assess income and other forms of tax evasion.

3.9.1 Simultaneous Fuel Supply and Demand Model

In contrast to single-equation models, a simultaneous supply and demand model uses more than one dependent variable and necessitates as many equations as the number of dependent variables. This model uses a system of equations rather than one equation and fits the fuel tax evasion case better because it examines an entire motor fuel system. Simultaneous models take advantage of the fact that supply and demand should be in equilibrium and, to the extent the model identifies large undefined discrepancies between supply and demand, tax evasion may be present. Both prices and quantities of fuel supplied and demanded are considered in the model structure. A unique feature of the simultaneous model is that a dependent variable in one equation may appear as an explanatory variable in another equation in the system.

The econometric method is used to examine the relationship between taxable motor fuel consumption and various economic indicators (e.g., nonfarm employment, income, and GSP), tax program elements, geographic characteristics, and other factors that exacerbate or curb evasion at the state level. The strength of econometric analysis is that it can use historical data for a dependent variable and several explanatory variables to measure the relationships among variables to predict future values of the dependent variable or examine trends in the escalation and decline in the dependent variable.

However, when applying econometric analysis to tax evasion, the analyst is unable to measure the dependent variable (e.g., evasion rates) directly and must rely on indirect measures or assumptions concerning taxable fuel consumption based on estimates of supply or demand, with estimated demand generally being calculated by dividing estimated VMT by estimated motor fuel economy by vehicle class. Data required to perform such a computation, however, often have too many shortcomings to adequately support this form of analysis. For example, there are shortcomings with FHWA VMT data (e.g., sampling techniques are used to estimate VMT on the lower-order road systems, traffic counting devices malfunction, and more emphasis is commonly placed on mature growth areas). Furthermore, estimates of motor fuel economy reported to FHWA as presented in highway statistics are largely based on state fuel tax records. To the extent that fuel tax evasion occurs at the state level and errors are present in the survey data collected to estimate fleet MPG, there will be shortcomings in FHWA-estimated vehicle motor fuel economy.

3.9.2 Tobit Model

Another econometric method that improves upon the simple statistical sampling analysis is the Tobit model, an extension of the Probit model. The Probit model is a binary-choice-based regression model (the dependent variable in the regression analysis is binary in nature taking 0 or 1 values only). The Tobit model was first introduced in 1958 by James Tobin. Tobit and Probit models substitute the normal cumulative distribution function (CDF) in place of the logistic CDF of the Logit model. This expansion has been found to be useful in solving issues related to using OLS regression analysis. Both Probit and Logit solve the problems of the binary choice variable. Tobit is a variation on the Probit. With missing information on the dependent variable, for example the data is censored (having a value of 0 or 100 when the actual value would be less than 0 percent or greater than 100 percent) the coefficients estimated by OLS are likely to be biased. Tobit corrects for this bias.

Each model is based on the idea that regular forms of regression analysis fail in the case of a binary dependent variable, such as evasion or no evasion. These models consider the appropriate mathematical adjustment needed to ensure that basic regression analysis assumptions do not fail (e.g., dependent variable values are not bound, explanatory variable values are fixed in repeated sampling, zero mean value of the error term, homoscedasticity or equal variance of the error term, and no autocorrelation between the error terms).

The Tobit model also deals with the issue of censored data. The censored data issue arises when there are two groups of respondents. For the first group, we have information about both the dependent variable (what we are measuring) and the explanatory variables. In the second group, we have information concerning the explanatory variables but no information relating to the dependent variable. A sample in which information on the dependent variable is available from some but not all observations is known as a censored sample (Gujarati, 1995). The Tobit model fits the tax evasion problem because the dependent variables (i.e., tax evasion levels) are not completely known.

Economists like Jonathan Feinstein (2003) have used the Tobit model to analyze and estimate nationwide income tax evasion based on IRS data. The advantage of the Tobit model over the Logit and Probit models is that it solves the problem associated with the binary variable but also handles the lack of information with respect to some dependent variable observations.

CHAPTER 4

Data Availability

4.1 Introduction

Quality and availability of data are important factors when considering competing methodologies to be used for an evaluation of motor fuel excise tax evasion. Ultimately, the underlying data set forms the foundation upon which an assessment is performed. Any methodology chosen to estimate motor fuel tax evasion at the state level will need to be supported by consistent and reliable data. By understanding the coverage, limitations, and collection methodology of various data sources, an appropriate methodology can be selected and discrepancies in the data can be realized, thus opening the door to possible corrective measures. In turn, reasonable assurance can be had that study conclusions are not erroneously based on data anomalies.

Data needed for an analysis of state-level motor fuel tax evasion fall into the following broad categories: transportation data; motor fuel data; economic and population data; and tax administration, enforcement, and collections data. Transportation data captures the number of vehicles by class traveling on state highways and roads, documents the number of vehicle miles of travel occurring by vehicle type, and examines the impact and nature of this travel as it relates to factors such as fuel consumption and motor fuel economy. Data relating to the fuel distribution system maps the movement of motor fuel within and between states through different points of the supply chain (e.g., ports of entry, refinery, terminal, and retail). Economic data is a necessary component for an econometric-based motor fuel tax evasion analysis and is comprised of data such as population, gross state product, and employment. Tax administration, enforcement, and collections data comprise information such as historical state tax rates, motor fuel tax collection, and enforcement/audit budgets.

4.2 Overview of Data Categories

This section presents a brief overview and analysis of several categories of data (transportation data, motor fuel data, tax collections and administration, and economic and population data) relevant to motor fuel excise tax EOE estimation. Further, it identifies and characterizes data elements falling within each category and, where appropriate, examines and compares various sources of data.

4.2.1 Transportation Data

Data tracking the number and travel of vehicles in a state can indicate how much fuel is being consumed within that state. The Vehicle Inventory and Use Survey (VIUS), formerly known as the Truck Inventory and Use Survey (TIUS), provides data on the number of private and commercial trucks operating, as well as the number of miles traveled by these vehicles within each state. This data is accessible through the U.S. Census Bureau. The primary limitation of this data is that it only captures travel by large transport trucks, vans, minivans, pickup trucks, and sport utility vehicles, only captures a fraction of the travel occurring in each state by missing other vehicles types (e.g., passenger cars, motor homes, and motorcycles). Further, the VIUS survey is conducted only once every five years.

Vehicle registrations and travel data also are available by means of the administration of IFTA and the International Registration Plan (IRP). IRP is a reciprocity agreement that allows motor carriers to pay state registration fees in a one–stop process based on the percent of total miles their fleet travels in each state. IFTA is a similar reciprocity agreement that enables motor carriers to pay their fuel taxes to all states they travel in while filing in just one state. As is the case with VIUS, these sources of VMT only capture a segment of the motoring public (i.e., those that are traveled by heavy trucks in this case).

A more complete view of VMT data also is presented in FHWA's Highway Statistics. States, required to submit highway-use data to the FHWA as part of the Highway Performance Monitoring System (HPMS), collect VMT on a continual basis for multiple vehicle classes. The annual Federal Highway Statistics publishes VMT data for six vehicle classes:

automobiles, motorcycles, light trucks, single-unit heavy trucks, combination trucks, and buses. HPMS VMT data are based on traffic counts performed by states using roadside traffic monitoring devices (e.g., pneumatic tubes, inductive loops, and manual counts). Shortcomings in FHWA VMT data include possible deficiency of traffic data on less-used road systems, the occasional malfunctioning of traffic counting devices and the lack of reliable estimates of the margin of error for this data.

Even though the margin of error has not been reliably estimated for the nationwide HPMS system, there is evidence that VMT estimates produced by the states are reliable at the national level. Table 4-1 compares 1995 Federal Highway Statistics VMT estimates to those generated through surveys completed for the National Personal Travel Survey (NPTS) (Pickrell and Schimek, 1998). FHWA estimates were within 0.6 percent (odometer readings) to 3.5 percent (personal estimates) of those published in the 1995 NPTS.

4.2.2 Motor Fuel Data

Motor fuel volumes supplied, exported, imported, distributed, sold, and consumed are published in a number of data sources that could be used to support a motor fuel excise tax evasion analysis (e.g., API, EIA, Bureau of Transportation Statistics, FHWA). These estimates are presented at the state-level, and may prove useful in a state motor fuel excise tax evasion study. Historically, the volumes estimated by these various sources have proven to be in conflict with one another due to discrepancies between data collection methods and errors corrected over time (e.g., double counting, missing some reporters, inaccurate treatment of blending fuels). The U.S. Department of Energy (DOE)'s Petroleum Supply and Reporting System failed to adequately address the consumption of ethanol, methanol, methyl tertiary–butyl ether, and other blending stocks prior to 1993. In recent years, however, these errors largely have been addressed though discrepancies persist between data collection methods.

Motor fuel consumption data, when used in combination with VMT estimates, can generate motor fuel economy estimates. National and state motor fuel consumption is generated by state tax records, however, and, to the extent that evasion is reflected in the gallons not identified by state tax agencies, motor fuel economy estimates would be subject to error. There could be a form of circular referencing from an analytical standpoint if motor fuel economy estimates from motor fuel tax records are used within a model to examine motor fuel excise tax evasion.

In addition to the sources of gross estimates of motor fuel gallons supplied, distributed, and consumed outlined above, there also are more detailed fuel tracking systems that have been deployed at the state and federal levels. At the federal level, the IRS is developing ExFIRS. ExFIRS has several component systems, not all focused directly on tracking motor fuel. The two components that do relate to fuel tracking are the ExSTARS and the Excise Classification Information System (ExCIS). Motor fuel tracking systems are also in operation within a number of states. As of 2004, 13 state fuel tracking systems were in operation (Anders-Robb, 2004; FHWA, 2003a; FHWA, 2001; FHWA, 1999a). In general, these federal and state systems provide sales and stocks information for various fuel types.

One primary purpose of these systems is to collect and organize fuel tax collections data and data relating to the position of fuel volumes throughout the supply chain, allowing these two types of data to be compared. Another goal of these systems is to compare records of shipments to ensure accountability and identify discrepancies between companies engaging in motor fuel transactions. By comparing tax collections and reported fuel volumes from various entities in the fuel distribution process, a determination can be made as to whether all responsible for remitting fuel taxes are actually paying them. Further, comparing the sale and distribution of motor fuel reduces the disappearance of volumes from the distribution system. Figure 4-1 depicts a system of reporting that provides information on fuel position that can be input into a fuel tracking system.

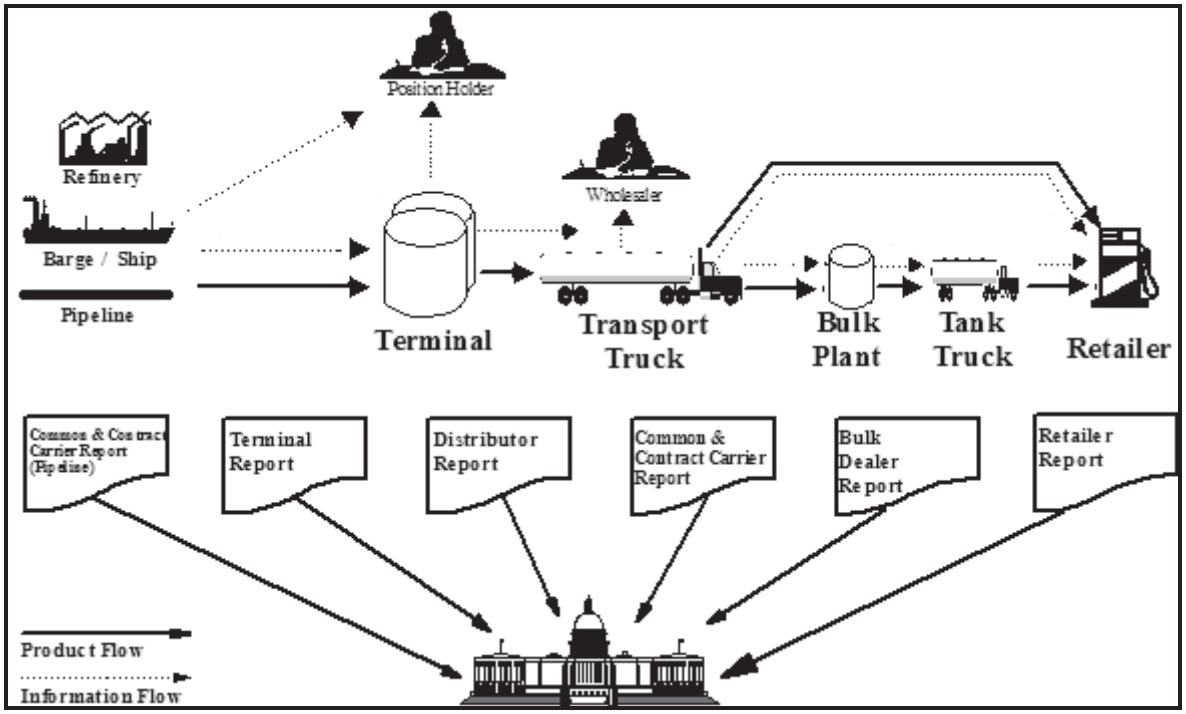
Limitations of ExSTARS and ExCIS are that these systems are still in the process of development, so current data may not be complete or reflect high-quality. Data from ExSTARS and ExCIS also may contain only information for the limited time that they have been in operation, thus limiting their use for time trend analysis. Further, ExSTARS identifies motor fuel volumes as they leave the terminal rack but does not capture downstream sales and transport of motor fuels. Finally, a fraction of the motor fuel transactions is still submitted in paper form and, for these transactions, only summary information is entered into the system.

A shortcoming of data provided by state fuel tracking systems is that data may not be comprehensive. Figure 4-1

Table 4-1. VMT estimates, 1995 NPTS and 1995 highway statistics.

Source	Universe	Type of Data	Trillion VMT
1995 NPTS	Personal vehicles	Reported by respondent	2.149
1995 NPTS	Personal vehicles	Odometer reading	2.215
1995 NPTS	Travel period & day	Trip diary	2.181
1995 Highway Statistics	Light duty vehicles	State traffic counts	2.228

Source: Pickrell and Schimek, 1998.



Source: FTA, 2004b.

Figure 4-1. Reporting throughout the fuel distribution system.

presents a very thorough system of reporting to account for the movement of fuel at every step in the process. States may not have this level of fuel accountability and may only require reports from a few entities along the distribution process. Further, states will vary on which fuels they track and how they track them. For instance, some states may track kerosene while others do not. Also, while states are moving toward implementing the uniform report schedules recommended by the FTA uniformity project, many states may still require different sets of information from the fuel industry. Finally, only a handful of states have implemented fuel tracking systems, thus limiting the use of this type of data to certain states.

4.2.3 Tax Administration, Enforcement, and Collections

Historically federal motor fuel excise tax collections were obtained from the IRS' SOI reports. Within the SOI reports, motor fuel excise tax collection data are shown for 22 motor fuel types: gasoline, gasoline floor stock, diesel, diesel floor stock, kerosene, aviation gasoline, noncommercial aviation fuel other than gasoline, noncommercial aviation fuel other than gasoline floor stock, commercial aviation fuel, gasoline for gasohol 5.7 percent, gasoline for gasohol 7.7 percent, gasoline for gasohol 10.0 percent, gasoline for gasohol floor stock, gasohol 5.7 percent, gasohol 7.7 percent, gasohol 10 percent, gasohol floor stock, special fuels, special fuel floor stock, dyed diesel used for certain intercity buses, dyed diesel used for trains, and dyed diesel used for trains floor stock.

State tax collections data are held at the taxpayer level; however, the data made available for examining motor fuel excise tax evasion will represent aggregated collection totals by motor fuel type. Taxpayer-level information is treated as confidential. Motor-fuel volumes taxed are generally reported at a summary level, with detailed schedules identifying the date, volume, and supplier or customer for detailed transactions. Data are reported monthly or quarterly based on state tax code. The motor fuel excise tax collections data are typically housed within state departments of transportation or revenue.

State audit and enforcement data are of principal importance when performing EOE estimation. On-road dyed fuel inspection data often are extensive at the state level, including thousands of records obtained annually. These records will typically include only summary information for stops that do not result in a violation (e.g., vehicle type, inspection result). When a violation is discovered, additional vehicle and company characteristics are identified.

Audit data are generally available through at least four forms of audit: refund audits, IFTA audits, desk audits of taxpayers, and field audits of taxpayers. In some cases, data also may be available from other forms of audit, including retail audits. When conducting analysis of EOE, it is important to

obtain the following general types of information from audit records:

- Business characteristics (e.g., years in operation, annual revenue, number of employees),
- Operational characteristics (e.g., type of operation audited, states in which the company is licensed to operated),
- Type of audit (field or office audit),
- Date audit is performed,
- Trigger for the audit (e.g., third party tip, random sampling, flagged return),
- Auditor information (e.g., years in service, detection rate, rank), and
- Assessment by type of violation found.

Chapter 5 contains more detailed information about audit and enforcement data that could be used to estimate motor fuel tax EOE.

Certain aspects of a state's motor fuel tax administration processes may be important to address in an evasion analysis. These characteristics include state fuel tax rates, motor fuel tax collections, enforcement/audit budgets, auditing assessments, and collections generated through audits. For instance, one would expect that, if tax rates increase, a state will have more evasion because the incentive to cheat is higher (all other variables remaining the same). Likewise, if an auditing budget increases, a state may experience less evasion because more evasion activities would be uncovered and possible evasion would be deterred (all else being equal). There has been no single source identified for state motor fuel excise tax collections, revenue, and auditing budgets. In most cases, this information should be available by request of motor fuel tax sections of state revenue or transportation departments.

4.2.4 Economic and Population Data

Macroeconomic and population data may be used to support an econometric examination of motor fuel excise tax evasion. In the econometric approach, mathematical models are set up to describe economic and structural relationships (such as the relationship between fuel tax evasion and fuel tax rates) and statistical techniques are applied to test hypotheses about those relationships and to measure the relative strength of the influences of certain variables on a dependent variable. For example, motor fuel prices and economic activity correlate with vehicle miles of travel and motor fuel consumption, with prices negatively correlating and economic activity and income positively correlating. To the extent that an economy is expanding but diesel consumption, as measured by state tax records, is stagnant or in decline, evasion may be present.

Economic variables must be controlled for when using the econometric method as they will be the primary driving force of trends in state fuel consumption and tax collections. Economic and population variables that would suit this purpose are gross state product, population, income, motor fuel prices, and employment.

Gross state product for every U.S. state is reported annually by the Bureau of Economic Analysis (BEA) as part of their annual Survey of Current Business. State population data are collected and reported by the U.S. Census Bureau as part of the Census of population and housing survey conducted every 10 years, with annual estimates generated based on updated data. State employment data are collected and reported monthly by the Bureau of Labor Statistic's (BLS) Current Employment Statistics survey. This survey is the largest monthly survey of businesses within the United States.

CHAPTER 5

Methodology for Identifying and Quantifying State-Level Fuel Tax Evasion and Required Data

5.1 Introduction

Chapters 1 through 4 and Appendix D, the Annotated Bibliography, describe fuel tax evasion techniques and issues as well as strategies and methods used in the past to estimate fuel tax evasion. Chapter 5 puts this information together and highlights approaches that could be used to estimate evasion for each state. Evasion estimation approaches are, in turn, evaluated based on their ability to estimate tax losses associated with specific evasion techniques, which are assessed later in this chapter and in Chapter 2.

This chapter includes five sections, the first being this introduction. The second section presents approaches for estimating tax losses associated with EOE. Section 5.3 presents a decision tree to assist states in conducting analysis of EOE. Section 5.4 examines several evasion methods, presents EOE estimation approaches, and models and reviews the data needed to support the proposed estimation approaches. Section 5.5 provides detailed data collection recommendations.

It is important to note that in some cases this chapter repeats information about evasion techniques, including figures, contained in Chapter 2. The decision to repeat information was made because this chapter was designed to be a stand-alone EOE estimation pamphlet, which can be used on its own to document evasion techniques and present approaches for estimating EOE.

5.2 EOE Estimation Approaches

The approach described in this chapter provides a methodology to estimate the EOE level for each type or groups of types of evasion described in Chapter 2. The methodology provides a strategy that allows the sum of the individual types of EOE to equal the amount of total EOE, as demonstrated in the following equation:

$$E = EM_1 + EM_2 + EM_3 + \cdots + EM_n$$

where

E = Estimated EOE in State *i;*
$EM_1 \ldots EM_n$ = Estimated EOE for technique 1 through *n;*
$1 \ldots n$ = Evasion techniques (use of dyed fuel on-road, tampering with fuel dye equipment, illegal removal of dye from exempt fuel, abuse of the IFTA return process, false refunds or credits, import-export schemes across state lines, illegal importation of fuel from foreign refineries, abuses due to the presence of Native American reservations, false product labeling, cocktailing, failure to remit tax payments, and daisy chains)

The strategy implies that no one approach can be used to accurately estimate overall motor fuel tax EOE in a state. The level and quality of compliance and enforcement differs by state and the approach to calculating EOE will differ. For states with significant enforcement and compliance efforts and good databases, the approach can provide a much more accurate answer to EOE, while states with less enforcement and compliance activities will have less accurate answers to EOE for their state. One issue that will arise for external analysis of audit information for taxpayers is privacy concerns under the law. For example, other than IFTA data, most states will not consider releasing audit information for analysis, even if the identities of the taxpayers were removed. In this case only an internal analysis can be undertaken unless confidentiality rules can be extended to the outside evaluator. In addition, if data limitations prevent estimates of evasion by type, regression analysis or statistical sampling could provide an overall estimate of the amount of EOE occurring rather than by evasion technique.

5.2.1 Tiered Approach to EOE Estimation

The approach focuses on measuring the tax dollars lost to EOE, or the amount under-reported. In all cases, estimates represent the amount of under-reporting that occurs, whether intentional or unintentional. The estimate will contain the amount of tax dollars intentionally or fraudulently evaded as well as errors and omissions.

Previous chapters have highlighted state-by-state variation in the data quality and quantity available, considering some of the following factors:

- Varied motor fuel tracking systems,
- Differing data on aspects of audits and inspections (i.e., some states have considerable data and some do not),
- Differing characteristics that lead to evasion (i.e., some states have Native American reservations and/or on-road diesel programs while others do not),
- Level of fuel tax compliance and enforcement in a state, and
- Varied requirements regarding access to existing (but restricted) data.

For these reasons we eliminated as possibilities the more rigid Simultaneous Equation Approach (SEA). The SEA approach requires that a consistent set of state explanatory variables be developed (e.g., proximity to high–low tax states, international borders, amount of enforcement applied, state accounting rules, and what level the state collects fuel taxes). In addition to state explanatory variables, the SEA approach relies on estimates of demand from VMT data supplied to the FHWA by the states. Based on discussions with the FHWA, data did not appear to be estimated accurately enough to be used to estimate EOE for individual states (Oregon DOT, 2000). It appears that the reliability of the VMT data is at best plus or minus 5 percent nationally and could be much worse for individual states. Furthermore, the SEA approach depends on independent, but reliable, estimates of average fuel efficiency for vehicles. Current estimates of fuel efficiency published by FHWA are largely based on VMT and taxes collected, which negates the ability to estimate motor fuel evasion.

The first approach proposed in this chapter uses audit and inspections data to develop estimates of the amount of EOE occurring. There are various approaches outlined in this report that could be used to examine audit and inspections data, including statistical sampling, and regression techniques such as OLS, Tobit, and logit analysis. The second approach uses a tracking system to follow fuel from terminals to taxpayer and calculate the difference of fuel supplied to taxes paid. The third, and final, approach is recommended for estimating evasion losses due to the presence of Native American retail outlets. The approach recommended compares the amount of gallons in question and calculates a percent of the total fuel consumption for that state associated with the nonpayment of taxes. If more variables and data are available, more sophisticated techniques can be used to calculate amount of taxes forgone.

5.2.2 Approach #1: Audit and Inspections Analysis

The audit and inspections review method produces estimates of evasion by examining audits and inspection records of motor fuel excise taxpayers. These evasion estimates are aggregated assessments based on the percentage and degree of fraudulent activity found through random audits. In two studies reviewed (see Chapter 3), audit and inspections reviews were combined with other methods to gauge fuel tax evasion and only were used to supplement other forms of evasion analysis. Information collected from the audit reviews and inspections could be applied to improve the understanding of motor fuel excise tax evasion. At the very least, audit analysis could be used to gain a grasp of the potential monetary range that individual schemes cost in terms of EOE.

Tax audits result in an estimate of tax liability. This estimate is typically equal to or greater than the tax liability reported by the taxpayer. The taxpayer's reported liability may be countered by an assessment from the auditor. The assessment is typically based on incomplete information, and the audited party can provide information to reduce the assessment. The ultimate goal of the audit is to determine true tax liability. While perfection is not possible in reality, for the purposes of this study, the amount arrived at as the true tax liability will be treated as the best estimate of this amount. An audit reveals the difference between reported tax liability and true tax liability or the amount of EOE. Actual tax collections may be less than the additional amount identified at the end of the audit, but it is the tax liability rather than the tax collected that we are using with underpayments to determine EOE.

Audit programs that include random and targeted elements are considered best in targeting evasion and maximizing assessments per auditing dollar spent. Random audits could be used to establish an unbiased sample to support EOE estimation and to uncover forms of evasion not well understood by state auditors. Targeted audits, on the other hand, maximize returns on investment by using a screening process to identify high-risk taxpayers whose tax returns under audit are most likely to yield assessments.

5.2.2.1 Approach #1-A: Simple Average Approach

The most simplistic approach to using audit and inspections data is to extrapolate the average or weighted average EOE rate uncovered through audits and inspections to the

overall taxpayer population. Under this approach, if 1 percent of the heavy trucks inspected on-road were found to be misusing dyed diesel, it would be assumed that 1 percent of all heavy trucks were burning dyed diesel on-road.

This approach, however, is fraught with complications and potential problems. For example, audit data often include a small sub-set of the overall taxpayer population. Expanding the sample uncritically to the universe of taxpayers, whose characteristics may not match the sample, could lead to significant under- or over-estimation. Second, there is often significant bias in the sample because auditors often use screening methods or triggers (e.g., tips, questionable tax returns) to target the taxpayers whose returns are most likely to generate an assessment. Finally, targeted inspections and audits not part of a more comprehensive enforcement program could fail to capture evasion occurring outside of the legitimate fuel supply system through techniques such as daisy chains and import/export fraud.

Problems associated with the simple average approach limit its usefulness. It is recommended to use this approach only when there appears to be no bias in the process for selecting companies or vehicles for audit or inspection and the other approaches outlined in this section are not feasible due to data limitations.

5.2.2.2 Approach #1-B: Statistical Sampling

Taxpayer audits may be treated as a random sample of all taxpayers, although this is not likely to be true. If the sample were truly random, the difference between true tax liability and reported tax liability found in the sample could be applied to the population as a whole to get an unbiased estimate of the total amount of EOE. Evasion estimates could be created by taking the percentage of all audits/inspections in which illegitimate activities occurred generalizing to an EOE assessment over the reported tax liability for the sample population and applying this factor to reported tax liability for the entire population of taxpayers. As noted, audits are seldom done on a truly random basis. Hence, some analysis would be required of the basis for selection, and the resulting information used to correct for the bias associated with applying information from a non-random sample. When using this method, analysts must control for bias associated with selecting the sample of businesses for audits. For example, the basic equation would be as follows:

$$E = \frac{X}{n} \times N \times t$$

where

E = $ fuel evasion or EOE;
X = Violations (in gallons of fuel);
n = Sample size—total inspections or audits (in gallons of fuel);
N = Population size—target population susceptible to specified evasion scheme (in gallons of fuel); and
t = Fuel tax rate in state.

The characteristics of a very small sample of taxpayers could not be applied universally to all taxpayers; efforts must be taken to understand the sample characteristics and how well the sample represented the overall population. Second, audits and inspections are not always randomly selected; sometimes they are the product of a tip, suspicious returns, or previous issues with high-risk taxpayers. Sample results cannot be aggregated with reasonable confidence unless they are either random or steps are taken to control for bias. For example, if audits are conducted on 5 percent of the taxpayers, but these taxpayers are selected for audit because the auditors have found that a particular group within that population has twice the EOE liability of the population, then adjustments for that bias must be made. Applying the ratio from this sample to the entire population would overstate the actual amount of EOE expected. In this simple case, the correction is obvious; but in more realistic cases, it is likely to be complex.

Although statistical sampling may not be the best approach for estimating total evasion in a state, it can be useful for estimating EOE for specific evasion techniques where the targeted population can be clearly defined or where more explicit data that could be used in statistical regression analysis are unavailable. Due to the complexity of business operations, however, audits and inspections may fail to uncover all fraudulent activity occurring within the investigated entities. Audit and inspections data might fail to capture evasion occurring outside legitimate fuel supply systems through techniques such as daisy chains and fuel smuggling; however, through the examination of distributor field audit data combined with analysis of retail-level data, this can be an appropriate estimation approach for these types of schemes.

5.2.2.3 Approach #1-C: OLS Analysis

Economists often deal with data that does not represent a random sample. The typical method to correct for the non-random nature of the data is to control for various characteristics using regression analysis. In regression analysis, measures of important characteristics likely to affect the outcome variable are included in the analysis. The regression is said to "control for" the influence of these characteristics to determine the true effect of the items of interest. For example, if businesses that had started within the past year are generally found to have more EOE than established businesses, auditors are more likely to audit such businesses. By including the amount of time in business in explaining EOE, the analyst can

control for the effect of time in business on the amount of EOE detected. Applying this information to the population at large would control for the difference in time in business between the audit sample and the rest of the population. If this were the only difference between the audit sample and the rest of the population, the resulting estimate of EOE for the population as a whole would be an unbiased estimate. An unbiased estimate is one that would be equal to the actual EOE if the experiment were conducted many times. If the analyst did not control for time in business, then applying the EOE from the audit sample to the entire population would overstate the amount of EOE since the rest of the population has more time in the business and, hence, is less likely to have more EOE than the audit sample. Many important characteristics (e.g., trigger for the audit, experience of the auditor) can be entered in this way to improve the ability to generalize the estimates from the sample group to the entire population.

5.2.2.4 Approach #1-D: Tobit Analysis

The simplest type of regression analysis (ordinary least squares or OLS) may not work well on some audit data. If many of the observations are cut off (censored) at a particular level (e.g., no evasion), the standard regression model does not work well and a different modeling approach must be taken. Audit data are often clustered at a zero evasion level; this is known as censored data since no negative results are reported. If audit results are censored, then a model approach called the Tobit procedure can be used to determine a more appropriate estimate of how various characteristics affect EOE. The Tobit model allows adjustment of the estimated slope when data are censored. In Tobit analysis, a single maximum likelihood estimate of the slope coefficients is generated that corrects for the bias associated with use of censored data.

Feinstein (2003) suggests extensions to the simple Tobit model described above. In the extension, a second step is undertaken if data are available on what auditor performed the assessment. Further analysis may capture how much more evasion could be detected based upon what the best auditor could find. New variables of probability are calculated for complete detection, fractional detection, and no detection. Feinstein further suggested a third step. In the third step, the probabilities to evade and not evade are combined with the probability of detection (if they exist) based on the characteristics of the population. Using assumptions about the distribution of the populations, an estimate of the propensity to evade can be developed for the type(s) of fuel evasion being analyzed.

An additional caveat with the Tobit procedure needs to be addressed. The Tobit procedure assumes that the same variables affect the level of evasion and whether evasion is found or not. Sometimes there is information that this assumption is not correct. When there are variables that affect whether evasion occurs or not and they are different than the variables that affect the amount of evasion, an alternative procedure may be used.

One approach to correct for the shortcoming in the Tobit procedure is the Sample Selection procedure developed by Heckman (Crown, 1998). First a probit model is estimated based on whether evasion is detected or not. These estimated probabilities are used to generate what is known as an inverse mills ratio. The resulting values are then included as a variable in an OLS regression to determine the amount of evasion detected. For example, when vehicles are inspected for dyed fuel, audit information on violators is often much more complete than for nonviolators. Nonviolator information only may include whether it is an in-state vehicle or out-of-state vehicle, type of vehicle license, and region where the violation occurred; while information on the violators could include primary industry, how many gallons, the type of vehicle, etc. The sample selection procedure allows for estimates of the affect of these latter variables on EOE that can then be applied to all vehicles.

5.2.2.5 Approach #1-E: Logit Analysis

When appropriate data are not available on individual cases or information is lacking on the amount of fuel being misused or taxes are not paid, a simplified approach called logit analysis may be used to determine the percentage of fuel usage not in compliance. Logit analysis determines the probability for EOE based upon the characteristics of those complying and those not complying.

More importantly, logit analysis can be based upon the use of grouped data. Grouped data means entities with a similar set of characteristics can be grouped together in the analysis. For example, when vehicles are inspected for dyed fuel, information on violators is often much more complete than for nonviolators. Nonviolator information only may include whether it is an in-state vehicle or out-of-state vehicle, type of vehicle license, and region where the violation occurred, while information on the violators could include primary industry, how many gallons, the type of vehicle, etc. Thus, logit analysis can use reduced information to calculate probabilities of violations based on the limited characteristics available in the data.

5.2.3 Approach #2: Fuel Tracking Approach

In states where fuel tracking systems exist, the tracking system can be used for examining fuel evasion for some evasion techniques. Such a system then could be used to correlate state collections to the fuel usage values for a state. A first step is to examine existing state fuel distribution systems and assess their viability in terms of estimating evasion. Note, however, that the small number of fuel tracking systems available

at the state level and the lack of uniformity, with respect to such models, constrains their application as a viable methodology for many states. That is, the overall methodology and model for each state must be designed to allow states to ignore or take advantage of fuel tracking system data, depending on the state-specific circumstances.

5.2.4 Approach #3: Statistical Analysis of Sales

The primary approach recommended for estimating evasion losses due to the presence of Native American retail outlets is a hybrid approach that compares consumption with taxed gallons and motor fuel tracking approaches. This approach can be used when consumption data and tracking systems are in place. The alternative approach, however, involves the development of a statistical model for estimating motor fuel sales on Native American reservations. In the model, the number of gallons of motor fuel sold by Native American establishments serves as the dependent variable, and a number of explanatory variables are used to estimate the sales volumes. Independent variables could include:

- The number of Native American reservations in a state;
- The number of retail motor fuel outlets on reservations;
- The number of pumps located at each Native American retail outlet;
- State motor fuel excise tax rates;
- State populations; and
- Proximity to high-tax states.

Data provided by states with agreements with Native Americans could serve as the base data required to test the predictive capacity of the model, or data tied to other retail establishments in the state could serve as the underlying data for the model. Estimates of motor fuel sales, in turn, would be compared to estimated gallons consumed by Native American populations based on the number of enrolled members and estimated per-capita consumption of motor fuel. The difference between the modeled estimates of motor fuel sales and estimated Native American motor fuel consumption would represent EOE.

5.2.5 Remaining Issues and Caveats

The biggest issue facing anyone estimating the level of evasion will be the quality of the data the state possesses. Those states with good data from audits, inspections, and tracking systems may provide good bases for estimates of evasion. Conversely, because of their good data (presumably used for enforcement and compliance) those states also may experience less evasion. The methods chosen are believed to be the most suitable approaches considering the likely data quality and availability. Data availability and quality will have an impact on the method that can be used.

- The lower the quality of information retained associated with audits and inspections, the greater the likelihood that the approach would not be able to remove bias from estimates.
- For each state, careful attention is needed to ensure that the individual estimation approach to evasion does not overlap and that all attempts have been made to remove double counting. The quality of data that a state possesses may require a method to capture and understand the levels of double counting.
- Limitations of each estimation method, including the audit review approach, were identified in Chapter 3; however, with appropriate use of statistical techniques to remove the bias, the approach is believed the most viable.

The following sections provide a decision tree to help states work through estimating evasion and then provide methods for estimating EOE for each general category of evasion. In general, EOE categories are grouped together by similar characteristics of the evasion technique. The techniques analyzed for methodological approaches include false refunds or credits, use of dyed fuel on-road, tampering with fuel dye equipment, illegal removal of dye from exempt fuel, abuse of the IFTA return process, import–export schemes, illegal importation of fuel from foreign refineries, abuses due to the presence of native American reservations, false product labeling, cocktailing, failure to remit tax payments, and daisy chains.

5.3 Decision Tree for Individual State Analysis

This section illustrates the decision tree recommended to follow to get an estimate of the amount of fuel tax EOE for a state. Key questions and their answers will lead to a total estimate for each state.

5.3.1 Key Questions

1. Does state have an electronic fuel tracking system that tracks fuel at each stage in the distribution process from the terminal rack to the retail level?
   a) Is the difference in taxes paid versus taxes owed tracked by fuel type, e.g., gasoline, diesel, etc.?

If the answer to these questions is yes to both, then calculate the amount of fuel tax owed based on initial tracking of taxes paid versus taxes owed by fuel type. In other words, calculate the percent EOE based on the amount of tax found owed on the initial assessment, not after the correction has

been made by the taxpayer. The tracking system approach, however, may not capture some forms of import/export fraud. Thus, retail audit data may be required to augment the fuel tracking approach. If the answer to question 1a is no, then calculate the percentage by all fuel types and apply to total fuel taxed. If the state has no fuel tracking system or the fuel tracking system does not achieve total fuel accountability, move on to Question 2.

2. Does state have a method to track audits by type of evasion found?
   a) What types of evasion do the audits detect?
   b) Is the difference tracked by fuel type (e.g., gasoline, diesel)?

If the answers to Questions 2 and 2a are both yes, then use Sections 5.4.1 to 5.4.9 to determine the appropriate approach to calculate the percent EOE for each evasion technique. Go to Question 3 to determine which calculation method for EOE is appropriate. If the answer to Question 2b is yes (the audit reveals the EOE found by fuel type) then calculate the amount owed by each fuel type. If the answer to Question 2 is no, then use one of the techniques described in Section 5.2 to calculate EOE for all types of evasion found through the audit process and apply it to all taxed fuel by determining the answers to Questions 3 through 9.

3. How is the audit investigation started?
   a) Is the investigation started randomly (e.g., no processes are used to determine what entities should be investigated)?
   b) Was some tip or other method used to develop the list of taxpayers audited?
   c) Is the selection method unknown?

If the answer to Question 3a is that the entities to be audited were selected randomly from the population, then the weighted percent EOE from the sample population can be attributed to the whole population using the statistical sampling method. If the answer to Question 3b is that some tip was used to determine who is audited, then determine what proportion of the population the sample population represents. The percent of the total population represented by the audits can be used to calculate the EOE based on those audited. It should not be extrapolated to the whole population.

If there is a mix of tips and random selection and the audits that are randomly selected can be determined, or the answer to 3c is that the method is unknown, then those audits that are randomly selected or for which the selection method is unknown could be analyzed based on the answers to Question 4.

4. How robust are the characteristics of the taxpayer in the sample data?
   a) Does the audit data contain enough information to characterize the entity audited?

If the answer to 4a is yes, then choose the statistical approach that reflects the best approach in 5.2 Approaches 1-C through 1-E by answering Question 5. If the answer to question 4a is no, there is not enough information and the best answer that can be stated is the percent EOE for that type of evasion. However, it should be noted that the results aren't statistically valid but the EOE estimate is the best available answer.

5. Does the sample reflect the overall population of motor fuel taxpayers?

If the answer to Question 5 is yes then the weighted average percent EOE of the population can be applied to amount of fuel reflected by the population. If the answer to Question 5 is no, then go to question 6.

6. Does the sample data appear to be censored?

If the answer to Question 6 is that data are censored, then the approach chosen should be a Tobit analysis following Section 5.1 Approach 1-D. Reread Section 5.1 Approach 1-D if unsure whether the data are censored. If the answer is no, then go to Question 7.

7. Does data have a differential in the amount of information available for violators as opposed to nonviolators? Typically dyed fuel investigations have little information collected about nonviolators whereas violators have significantly more information about them collected.

If the answer is yes, then a Logit analysis is appropriate. Follow the approach in Section 5.2 Approach 1-E. The approach is usually appropriate with dyed fuel investigations if the data are collected. Calculate the probability of evasion based upon the available characteristics of the sample data and apply to the population. If the answer is no, then use OLS analysis following Section 5.2 Approach 1-C to obtain a set of coefficients that can be applied to the population.

8. Have all types of evasion been accounted for by the data?

If the answer to this question is yes, then go to Question 10. If the answer is no and for some states this should be true, especially those with Native American issues, follow the approach discussed in Section 5.4.8.

9. Has EOE been estimated for all the evasion techniques?

If the answer is yes, then go to Question 10. If there are types of evasion still to be estimated for which there is no data, then data could be collected based on availability of funding for such an investigation. Such samples should be stratified and randomly selected to reflect the population. Once the investigation is complete, then the resulting estimate of EOE could be applied to the population from which the sample was selected.

10. Calculate total EOE.

Sum together the EOE for each type of evasion technique or group of techniques found in answering Questions 1 through 9. Make sure that each is applied appropriately to the fuel type that the evasion technique covered. For example, IFTA evasion probably mostly reflects diesel fuel. Dyed fuel investigations reflect improper use of dyed fuel as transportation fuel and would be counted as diesel. It is possible if a state is a low-tax state to have a negative EOE.

5.4 Evasion Techniques

This section presents approaches for estimating EOE associated with nine evasion methods:

- False refund or credit,
- Evasion of untaxed dyed fuel,
- Abuse of IFTA return process,
- Evasion associated with exporting/importing fuel across state lines,
- Illegal importation across international borders,
- Failure to remit,
- Cocktailing and false labeling,
- Abuses due to the presence of Native American reservations, and
- Daisy chains.

This section presents an overview of, and prescribes approaches for, estimating EOE associated with each evasion technique. It also directs the reader to the data required to support each EOE estimation approach as specified in Section 5.5 and identifies data limitations.

5.4.1 False Refund or Credit

5.4.1.1 Overview of Evasion Technique

The extent to which fuel tax evasion through refund and credit schemes is a significant compliance issue depends largely on the point of taxation and how elaborate the exemptions are within a jurisdiction. For example, tax systems with a point of taxation high in the distribution chain (e.g., the terminal rack) tend to generate higher rates of refund and credit filings as taxpayers recover payments made on taxed fuel used for nontaxable purposes. Also, the more exemptions a jurisdiction allows, the more refund claimants it is likely to have.

It also is possible under certain circumstances for a wholesaler to apply for a refund or credit as well. Under a tax-at-the-rack system, a wholesaler can claim to export or sell for export previously taxed fuel. The fuel, in turn, could be sold within the jurisdiction with the wholesaler keeping the refund as profit. Further, motor fuel taxpayers may over-report refunds or credits associated with nontaxable uses (e.g., agriculture, construction, commercial off-road, marine vehicles, home or business heating, etc).

It is difficult, if not impossible, to directly measure true motor fuel consumption for tax-exempt uses because travel is not monitored off-road and states often lack the resources necessary to properly enforce motor fuel excise tax programs. Refund schemes have been addressed historically through auditor analysis of refund claims, dyed fuel requirements, and stiffer penalties for refund fraud.

5.4.1.2 Model Approach

There are two possible approaches: the first approach estimates EOE by developing estimates of off-road fuel use based on information collected on tax return forms about off-road vehicles and average fuel use and compares the refund with the amount of estimated off-road use to determine potential evasion. The second approach uses audit data to estimate the percent of total gallons refunded obtained through EOE and apply that to overall refunds using statistical analysis. When states maintain complete records of reported refunds and credits, evasion could be computed by estimating nonhighway consumption of motor fuels and comparing to reported refunds and credits. Many states presently analyze company operations to compare refund claims with expected motor fuel consumption, based on some rational measures such as the number of vehicles registered to the company using motor fuel for tax-exempt purposes or the number of acres managed by farming operations.

The approach for estimating EOE by comparing actual consumption with refunds requires construction of a spreadsheet-based model at the state level where data are collected on the number of exempted vehicles and the average fuel consumption per vehicle for each type of operation receiving an exemption. The approach entails analyzing data relating to the specific operation in question to determine a range of acceptable values in terms of total consumption per vehicle and using this value, combined with registration information, to determine an acceptable range of refunds for the industry

under examination. Estimated aggregate consumption could then be compared to data collected from motor fuel tax refund claims to estimate under-collection due to refund fraud. This is an accounting approach that simply compares estimated and reported consumption.

The alternative approach is to use a statistical analysis on the refund audits undertaken by the state. As a last approach, the amount of EOE found in the audits could be used to directly calculate how much EOE was found.

5.4.1.3 Data Needs and Limitations

The states collect data on refund claims and credits from various sources, including motor distributor schedules (which usually report tax-exempt fuel sales in a separate special worksheet or column) and the nonhighway fuel consumers' tax forms. States also may house industry-level data on the number of vehicles registered and operated within the state, miles reported, and motor fuel economy. Data required to support both modeling approaches detailed in the previous section are outlined in Section 5.5. Data requirements are specified for each approach in the refund and tax-exempt fuel data element subsection.

Due to the significant data requirements required to implement the proposed model approach, tax administrators and modelers must be careful when cross-referencing data and must examine discrepancies and data issues related to deferments of tax payments or refunds between periods or reporting lags, misrepresentation of nontaxable consumption, and the absence of available data related to taxable versus nontaxable consumption.

5.4.2 Evasion of Dyed Fuel Laws

5.4.2.1 Overview of Evasion Technique

Thirty-eight states require fuels for particular tax-exempt uses to be dyed at the rack. There are several forms of fuel tax evasion that can occur involving diesel that is untaxed and either dyed or intended to be dyed, but is instead used for taxable purposes. The three techniques used to evade dyed fuel laws include the following methods: misuse of dyed fuel, dye masking, and/or dye removal. The next section presents an overview of the three techniques.

5.4.2.2 Evasion Techniques

5.4.2.2.1 Misuse of Dyed Fuel. Business operations using off-road vehicles (e.g., farming, logging, construction) purchase tax-free dyed diesel. Dyed diesel is often delivered to these businesses and transferred into private storage tanks for use in their off-road vehicles. To evade fuel taxes, on-road vehicles owned by the business or individuals associated with the business use dyed diesel fuel from these tanks. Another common way perpetrators fuel their on-road vehicles with dyed diesel is by using card-lock systems at retail stations which allow registered customers to access tax-free fuel by swiping a card. These stations are generally unmanned and a person with an access card can fill their on-road vehicle's fuel tank or fill a container for later use in their highway vehicle.

5.4.2.2.2 Dye Masking (Blending and/or Falsely Labeling Dyed Fuel). Dyed diesel can be acquired and blended with darker oils (such as waste oils) or green dye to mask the apparent color. This fuel is then sold at the retail level, possibly to unsuspecting consumers, under the false presumption that it is taxed fuel. This can be achieved by blending fuels in a warehouse or simply by adding dyes in the fuel tanker.

5.4.2.2.3 Dye Removal. Many terminals with dye injection equipment have card systems in place so that registered drivers can load fuel without assistance, and these terminals are sometimes left unattended at certain times of the week. This situation enables a tax evasion perpetrator to pull up to a loading rack, order a load of dyed diesel, tamper with the fuel dye injection equipment, and then leave with undyed and untaxed fuel that eventually can be sold as taxed fuel at the retail level. In some cases, terminals do not have dye injection equipment, so the dye is poured directly into the tanker (splash blending). It is possible, in such cases, for a tax evasion perpetrator to purchase the fuel tax-free, but fail to splash dye it. It is also possible for dyed fuel to be purchased and then have the dye removed by bleaching it, adding sulfuric acid to it, or running it through a filtration and/or refining system. In all cases this fuel officially leaves the terminal rack as dyed untaxed fuel, but most likely ends up sold on the retail market as undyed taxed fuel, and the perpetrator then pockets the amount of the tax. This form of fuel tax evasion would most likely impact states that are taxing fuel at the terminal rack level or distributor level.

Each one of these evasion techniques can be measured separately if data are available (methodology described below). The following balance equation can be used to measure the overall disappearance of dyed fuel from the legitimate market:

$$F_{\text{dyed}} = \sum(F_i) + \sum(\text{EM}_t)$$

where

F_{dyed} = Reported dyed fuel that leaves the terminal rack for use in a given state;

F_i = Untaxed dyed fuel that reportedly is used by sectors with access to dyed fuel;

EM_t = Total fuel evaded by technique *t;* and
t = Dyed fuel misuse, dyed fuel removal, blending/false labeling.

The next two sections examine these evasion techniques in more detail.

5.4.2.3 Dyed Fuel Misuse

5.4.2.3.1 Overview of Evasion Technique. This scheme is thought to be common and generally occurs on a small scale by many separate individuals, particularly individuals who own or work for businesses operating off-road vehicle equipment. This type of evasion only could occur in states that have dyed fuel programs or at the federal level (see Chapter 2).

In Fiscal Year 2002, IRS Fuel Compliance Officers assessed more than 900 penalties, totaling more than $1.8 million for misuse of dyed diesel fuels. More than 70 percent of the penalties involved the misuse of fuel by taxpayers in the construction and agriculture industries. Both of these industries are subject to broad-based tax exemptions for nonhighway use of motor fuels thereby presenting opportunities for abuse (see Chapter 2).

The following addresses a key question that must be answered to model this type of evasion about who is deciding to evade and where (at what point in the distribution) the evasion occurs. Figure 5-1 shows where evasion leakage occurs (note "Bulk Plant" is actually part of the nonbulk distribution).

Sectors with Access to Tax-Exempt Dyed Fuel: Case studies appear to indicate that the vast majority of the evasion decisions about misuse of dyed fuel occur at the end-use/retail level. Businesses that currently use equipment for off-road or tax-exempt purposes also choose to use the fuel illegally for on-road purposes. One northwest television news group created a team of seven investigators to follow the misuse of dyed fuel in Washington State. This team uncovered an extensive enclave of truckers, loggers, construction crews, and fruit growers using dyed fuel on-road. This would suggest that closer scrutiny of the economic activity of these industries, as well as laws and enforcement methods related to dyed fuels used in these industries, is necessary to estimate the amount of taxes not paid using this evasion method.

Motor Carrier Use: It is also possible that fuel taxes are evaded by illegally acquiring dyed fuel permits and/or obtaining access to dyed fuel that is controlled through a card-lock system. This evaded fuel is sometimes channeled outside the tax-exempt sectors and is used to fuel large trucks. This form of evasion is detected through highway fuel inspections and also can be caught during IFTA audit analysis.

5.4.2.3.2 Model Approach. Three methodological approaches are suggested to estimate the EOE of this evasion technique, depending on data availability:

1. OLS or Tobit;
2. Logit; and
3. Statistical Sampling.

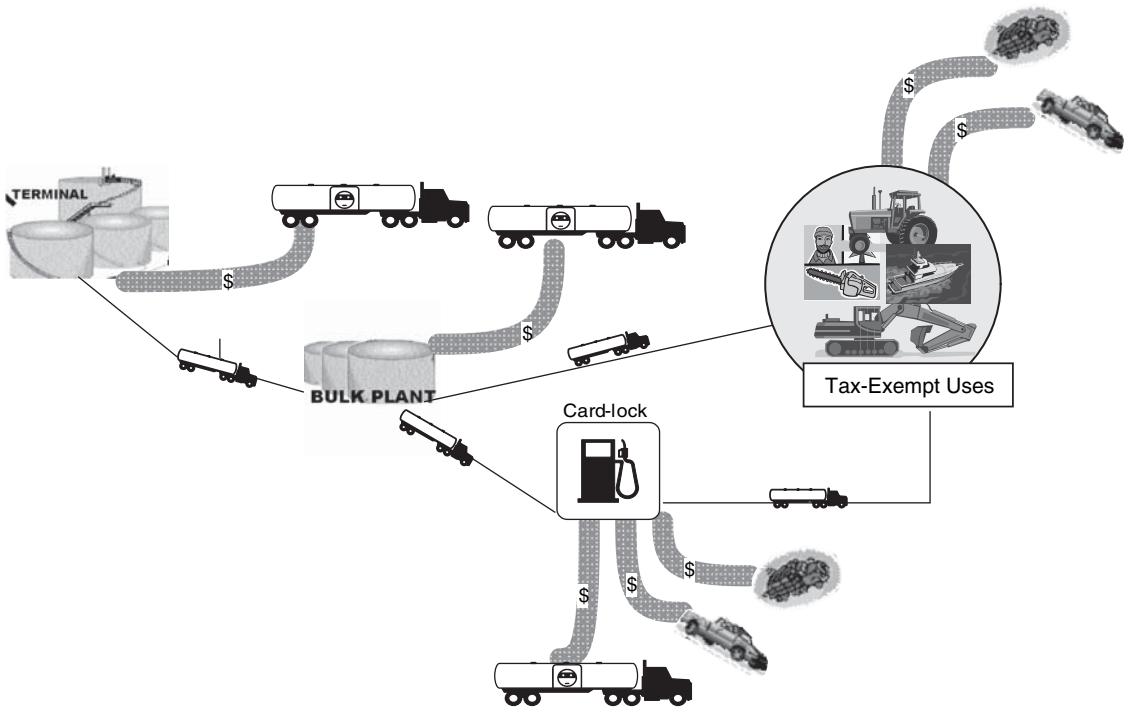


Figure 5-1. Nonbulk distribution system.

OLS or Tobit. Provided that sufficient data are available for individual filers through the audit and inspections process, the OLS or Tobit approach could be adopted. Explanatory variables would be developed for each sector evaluated. For example, explanatory variables could include:

- The difference between the state diesel tax rate and national average;
- Gallons of fuel associated with audit or inspection;
- Primary industry area;
- County (dummy variable);
- Examiner or inspector;
- Location of fuel source;
- Number of inspections/audits by sector; and
- Detection rate of inspector/auditor.

Logit. Logit analysis can be undertaken if the amount of gallons violated is not available for both the violators and nonviolators but the information on their characteristics is available. The characteristics would be the same for OLS or Tobit analysis.

Statistical Sampling. If data that obscures the taxpayer, but leaves remaining information intact cannot be obtained due to a state law or confidentiality issues, the statistical sampling approach can be used. This approach uses a probability sampling method from inspections and audit data. These data are potentially available from some states and the IRS. Data must be evaluated to remove bias (e.g., inspections based on tips) so that the sample is random. If the bias cannot be removed, methods to estimate the amount of bias need to be explored. The number of violations (in terms of total fuel evaded) as a percentage of total fuel covered through inspections and audits will be the basic statistic that is used to measure evasion. In each case this percentage will be expanded to the targeted population by multiplying the proportion of violations to inspections times the total amount of fuel use in the selected population.

For example, the estimate would be as follows:

$$E_i = \frac{X_i}{N_i} \times F_i \times S_i \times t$$

where

E_i = \$ Evasion in Sector *i;*
X_i = Violations attributed to Sector *i* (in gallons of fuel);
N_i = Total inspections of Sector *i* (in gallons of fuel);
F_i = Total amount of fuel used for Sector *i* purposes;
S_i = Proportion of *Fi* used by on-road vehicles;
t = diesel tax rate in state; and
i = agriculture, construction, logging, manufacturing, mining, motor carriers, retailers, etc.

E_i will be measured for all sectors with access to tax-exempt dyed fuel and for motor carriers and retailers.

If the data cannot be broken into industry-specific categories, then the percentage of violations is applied to the sum of the amount used for all the industries included. The answer would be much better, however, if the data would allow the breakdown by industry type, especially since retailer violation percentages would be applied to retail diesel use.

An alternative to applying the direct percentage of those evading is to calculate the number of gallons evaded and divide into the total gallons of undyed fuel to get an EOE percentage. This can only be done if information is available on vehicle tank sizes. This approach underestimates the amount of evasion because it is not applied to the whole population.

5.4.2.3.3 Data Needs and Limitations. Twenty-two states and the IRS have dyed fuel inspections data. The primary problem found in the analysis of two states data was that information on nonviolators is not kept. The best estimate that can be performed is the percentage of violators applied to the amount of fuel assuming equal usage. In one case we were able to estimate directly the amount of gallons evaded and that estimate was applied to the total number of gallons evaded. For states that regularly conduct on-road dyed fuel inspections, estimates of EOE for misusing dyed fuel could be based on inspection data, as specified in the dyed fuel data elements outlined in Section 5.5. By collecting detailed inspection data for both violators and nonviolators, the statistical sampling approach can be refined to generate more reliable estimates of EOE.

5.4.2.4 Dye Removal and Dye Masking

5.4.2.4.1 Overview of Evasion Technique. Schemes that involve tampering with fuel dye injection equipment and the failure to splash dye appear to occur when terminals are unattended by terminal employees. Some equipment has been altered in the past by simply using a wrench to close the dye injection valve.

There have been a number of different cases where dye has been removed illegally from tax-exempt fuel. In some cases household chorine bleach or sulfuric acid has been added to dyed nontaxed fuel to eliminate the visible red color. Green dyes and dark oils (such as waste oil) can also be added to the red-dyed fuel to conceal the appearance of red. Dyed fuel also can be transported to a warehouse where the fuel then is run through a charcoal filtration system until no apparent red color is present. There also have been reported cases where dyed fuel is bought and transported to a leased or owned refinery and then refined to remove the dye (there are a number of refineries that legally carry out the process of extracting red dye from transmix fuel, which is the interface fuel between dyed and undyed diesel in a pipeline).

The following addresses a key question that must be answered to model this type of evasion about who is deciding to evade and where (at what point in the distribution) the evasion occurs. Figure 5-2 shows where evasion leakage occurs (note "Bulk Plant" is actually part of the nonbulk distribution).

- Tampering and Failure to Splash Dye: Tampering with fuel dye equipment and failure to splash dye occur at the terminal rack and the perpetrators are motor fuel carriers.
- Illegal Removal or Masking of Dye from Tax-Exempt Fuel: Dye can be removed or masked from tax-exempt dyed fuel at any point in the nonbulk distribution process. It is possible for dyed fuel to be masked with other dyes or darker oils within the tanker truck just as it leaves the terminal rack. Other schemes may occur at refineries or warehouses further down the distribution process.

This would not be an effective evasion scheme for states that tax at the retail level (e.g., Oregon, North Dakota, New Jersey), as the tax would have to paid even when dye is illegally removed.

5.4.2.4.2 Model Approach. There are three methodological approaches that can be used to estimate the EOE of this evasion technique, depending on data availability:

1. OLS or Tobit;
2. Statistical Sampling; and
3. Motor Fuel Tracking.

OLS or Tobit. Provided that sufficient and appropriate data are available for individual filers through the audit and/or inspections process, the OLS or Tobit approach could be adopted. Explanatory variables could include the following:

- Size of business (# of employees);
- Income/revenue of business;
- Type of transport;
- Industry affiliation;
- Number of motor carriers in fleet;
- Number of fuel carrier drivers;
- Estimated number of miles;
- Estimated fuel use (number of gallons);
- Longevity of business (e.g., the year the transport/hauling license was obtained);
- Location of terminal from which fuel was obtained;
- Examiner or inspector;
- Number of inspections/audits; and
- Detection rate of inspector/auditor.

Statistical Sampling. If sufficient inspections and audit data exist regarding these types of evasion schemes, the methodological approach to estimating the amount of tax evasion that occurs by either withholding or removing dye from tax-exempt fuel uses a probability sampling method from inspections and audit data. Data need to be evaluated to remove bias (e.g., inspections based on tips), such that the sample is random. If the bias cannot be removed, methods to estimate the amount of bias need to be undertaken. The number of violations (in terms of total fuel evaded) as a percentage of total fuel covered through inspections/audits will be the basic statistic used to measure evasion. This percentage, expanded to the target population, equals the ratio of violations to inspections multiplied the total amount of fuel use in the selected population as shown in the equation below.

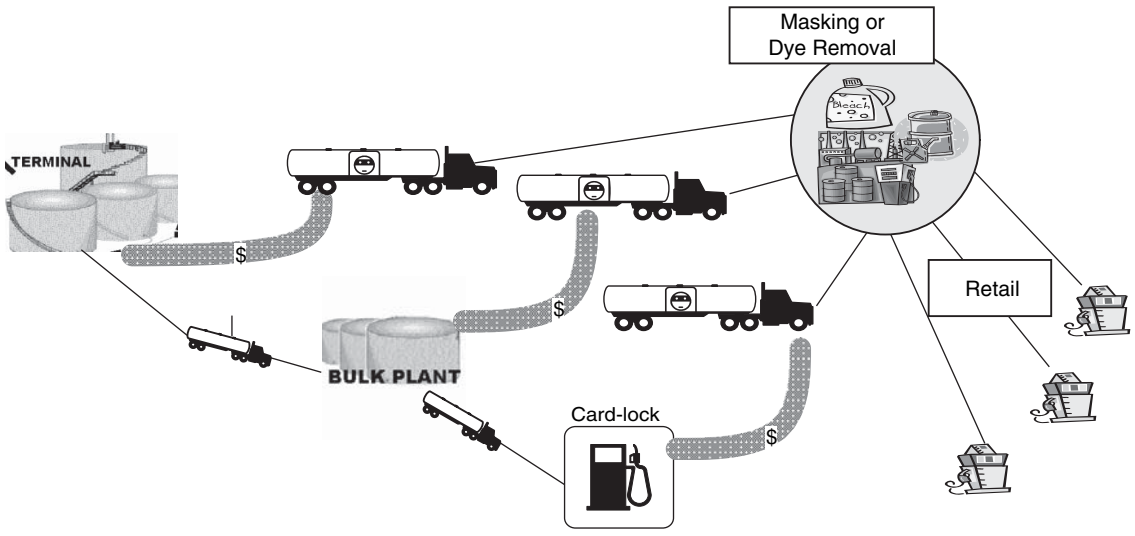


Figure 5-2. Depiction of where evasion through masking dye occurs.

For example, the estimate would be as follows:

$$E = \frac{X}{N} \times F \times t$$

where

E = $ evasion-altered dyed fuel;
X = violations (in gallons of fuel);
N = total inspections/audits (in gallons of fuel);
F = total amount of taxed motor diesel fuel sold in state; and
t = diesel tax rate in state.

If key characteristics are discovered about the perpetrators during the data gathering process, these characteristics may be used to adjust the total population. For example, if it is found that this type of evasion only occurs with terminals that have specific types of equipment, the results of the sampling would be expanded only for the total gallons associated with the terminals that possess that specific equipment.

Tracking. The tracking approach for estimating motor fuel sales is based on the examination of distributor reports to track motor fuel sales. The amount listed on distributor reports would be compared with motor fuel sales to detect evasion.

5.4.2.4.3 Data Needs and Limitations. The problem found in some states is that they don't track the type of EOE found in their audits. However, state audit data regarding dyed fuel violations that is kept could be expanded in the future to include the type of EOE that the audit was finding. Data required to estimate EOE through targeted dyed fuel inspections is outlined in the dyed fuel data element subsections in Section 5.5. The distributor audit data outlined in the third general audit data subsection of Section 5.5 also could be used to estimate EOE.

5.4.3 Abuse of IFTA Return Process

5.4.3.1 Overview of Evasion Technique

IFTA represents a contract between jurisdictions that simplifies fuel tax remittance for multi-jurisdictional motor carriers by allowing them to file with one base jurisdiction. The base jurisdiction collects and disperses fuel taxes to other jurisdictions. IFTA is a not-for-profit organization that receives dues from each jurisdiction and serves as support staff to aid communication and organization between these jurisdictions. The presence of differentials between state tax rates generates incentives to evade motor fuel taxes by defrauding the IFTA system. Fraud occurs when motor carriers underreport miles in high-tax states or fail to file IFTA reports. IFTA audit analysis also captures failure to remit taxes by motor carriers who use untaxed fuel either by using dyed fuel or untaxed clear fuel.

IFTA members include all states in the United States and all the provinces in Canada with the exception of Alaska, Hawaii, and the District of Columbia in the United States and the Northwest Territories (Nunavut and Yukon) in Canada. The intent of IFTA is to tax interstate motor carriers on the basis of the quantity of fuel used within the state rather than on the basis of fuel quantities sold within the state.

States are required to audit 3 percent of the number of base-state IFTA accounts; however, several states audit less than 3 percent in any given year. Figure 5-3 shows that Alabama, California, Georgia, Kansas, Michigan, Nebraska, Oklahoma, and Rhode Island conducted less than 3 percent of the IFTA audits on average during the last 5 years (2000–2004). Alaska and Hawaii are not members of IFTA (IFTA, 2006).

5.4.3.2 Model Approach

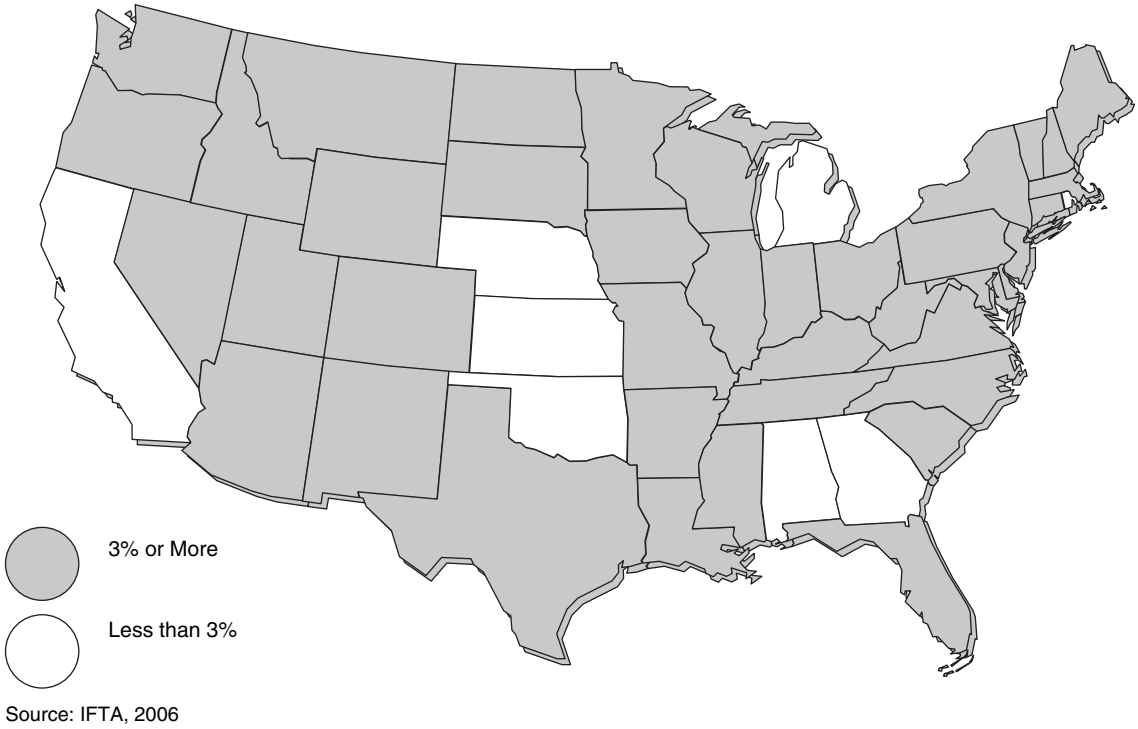
The approach used here follows the OLS or Tobit approach outlined above. If data are not censored then the process needs to follow the OLS approach. If data is found to be censored, e.g., evasion versus errors and omissions can not be differentiated then Tobit is the approach, otherwise OLS is required.

For example, using the case of IFTA abuse, explanatory variables used in the regression model could be extracted directly from the audit records. Examples of the explanatory variables that could be used to conduct the regression model procedure include:

1. Estimated annual total amount of gallons of fuel reported on the IFTA form;
2. Estimated annual total miles in the base state reported on the IFTA form;
3. Total estimate of miles in the base state as percentage of the total miles including travel in other jurisdictions;
4. Number of IFTA decals received;
5. Number of IFTA decals returned (not used by the end of the year);
6. Number of the motor fuel carrier fleet trucks;
7. Number of motor fuel carrier drivers; and
8. Number of states within which the motor carrier operates.

5.4.3.3 Data Needs and Limitations

The estimate of total taxes due is a difficult value to obtain. The value is needed to calculate the percent of EOE. The variable isn't the amount owed or the amount assessed, but the amount of tax paid in all jurisdictions. This value must be calculated by summing the amount paid in all jurisdictions plus any debits or credits found during the audit. The value is not one normally kept in the process of storing IFTA audit records but it should be if the amount of evasion is to be calculated. The analyst can compute this total if the audit data include gallons reported by each jurisdiction. Matching reported gallons



Source: IFTA, 2006

Figure 5-3. IFTA audits by state (average annual 2000–2004).

with published tax rate data can be done to construct total tax liability. Another variable that would be useful is the amount owed to other jurisdictions. If the amount owed other jurisdictions were available, the amount of EOE occurring in the home state could be calculated. If it isn't known, then the value calculated is the amount of EOE incurred by the home state motor carriers against the IFTA system.

Section 5.5 includes two sub-sections outlining the data required to estimate EOE associated with IFTA abuse. The first sub-section lists the general IFTA data items needed to establish total tax liability by motor carriers subject to IFTA in the examined state. The second subsection identifies data needing to be extracted from individual audit records to estimate EOE for the sample of carriers audited under IFTA.

5.4.4 Evasion Associated with Exporting/ Importing Fuel Across State Lines

5.4.4.1 Overview of Evasion Technique

Import/export fraud occurs when the taxpayer chooses not to pay taxes in the high-tax state. For example, this can occur if the taxpayer claims export of fuel across a state line and does not pay the tax to the importing state or if the taxpayer claims the export of fuel from his state and then does not export the fuel.

Export evasion occurs when fuel is purchased in a state with a low tax rate and exported to a state with a higher tax rate without paying the higher taxes. The tax evader yields extra profit equal to the difference between the tax rates for each gallon illegally imported.

Figure 5-4 demonstrates one form of the import-export evasion technique. In this example, a motor fuel distributor claims to sell 100 gallons of fuel in State A but actually exports it to State B. In turn, the distributor fails to claim imports and remit proper payment to State B.

The distributor profits from the differential in tax rates between State A and State B. Profit from tax evasion is captured in Equation 5.6.

$$E = (100 \times \mathrm{TR}_b) - (100 \times \mathrm{TR}_a)$$

where

E = $ evasion due to bootlegging;
TR_b = Tax rate in State B; and
TR_a = Tax rate in State A.

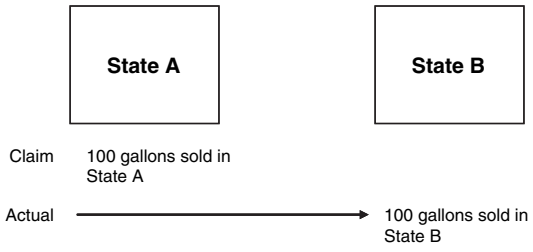


Figure 5-4. Exporting across state lines without paying State B fuel taxes.

False claim of export is another export-import evasion technique and is similar to the previous technique except the flow of fuel runs in opposite directions. In illegally exporting fuel across state borders, the taxpayer claims to sell the fuel in its home state but transports and sells it in a neighboring state. When making false claims of export, the perpetrator reverses the operation claiming to export the fuel but selling it in the home state.

With false claim of export, perpetrators buy fuel within one jurisdiction and file paperwork claiming it as tax exempt because it is targeted for delivery in another jurisdiction where taxes will be applied upon delivery. In turn, the fuel is actually sold within the original jurisdiction and never exported, thus avoiding the tax. This scheme occurs between states and across international borders.

Figure 5-5 demonstrates how to apply this technique. In this example, a distributor claims that 100 gallons are destined for export to State B. In turn, the distributor sells the fuel in State A and fails to remit tax payments. In this case, evasion is equal to the product of the 100 gallons and the tax rate in State A.

Tax evaders go to extreme lengths to mask their crimes and garner profit from evasion. For example, there is evidence to suggest that perpetrators have dumped their fuel within a state and refilled the carrier tank with water so that a weigh station would assume that there is fuel inside the tank (Turner, 2004).

The most significant factor motivating evaders to falsify claims on motor fuel shipments between states is the wide range of differences between state motor fuel tax rates. The JFSMFTCP, which was established to reduce motor fuel tax evasion between the states by maximizing efforts in motor fuel tax auditing, criminal investigations, and enforcement, has project goals that include the creation of automated data processing tools to monitor motor fuel production, and imports and exports across state and international borders. To achieve these goals, it is required to implement registration and reporting systems for motor fuel producers, distributors, and retailers.

5.4.4.2 Model Approach

Import-export evasion across state lines is relatively hard to evaluate without significant efforts to catch the evasion and evaluate whether there is a problem. Cooperating states with tracking systems can partially capture import-export evasion but they can't capture all. A tracking system can only capture those entities that fail to pay their taxes if they report they are exporting to State A or importing fuel. However, if the entity claims to not be exporting and then does export, it can only be caught by audits. Joint audits of supplier and purchaser at the distributor or retail level within the receiving state are the only way that type of evasion can be detected fully.

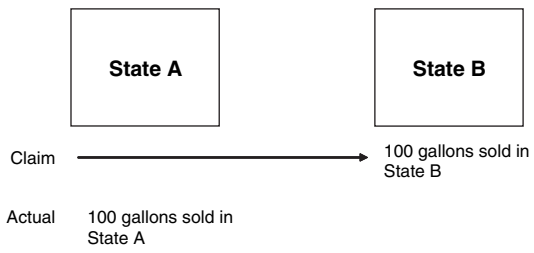


Figure 5-5. False claim of export.

The approach to measure import or export evasion is twofold. If tracking systems are available, differences can account for those who don't report or underreport. In addition, audit information that targets both sides of a transaction can add further information about the amount of evasion occurring.

When performing retail audits to detect cross-border evasion, it is important to reconcile inventory at the station by comparing inventory reports, meter readings or stick readings with BOLs, accounts payable, and invoices. This practice will ensure that each load of motor fuel is accounted for, that the payments made by the retailer include a tax component, and that each tax payment is received. It is recommended that states reconcile at least two to three months' records.

There are a number of EOE indicators to consider when conducting retail audits, including:

- The retailer keeps poor records or is missing records;
- The retailer regularly purchases fuel at below-market rates;
- Meters break repeatedly;
- There are discrepancies between inventory records and BOLs, accounts payable or invoices;
- The retailer experiences a large change in sales volumes; and
- There are discrepancies between distributor reports and the data obtained from the retailer.

Using the approach outlined above, the audit could yield an assessment that would serve as the dependent variable. Independent variables include the operational, business, audit, and other characteristics targeted in the second general audit data element subsection in Section 6.5.

5.4.4.3 Data Needs and Limitations

Data needed include field audits of both purchaser and suppliers in addition to the desk audits. Sources of export and import data could be obtained through one of two sources: (1) IRS—EXTOLE system or (2) state import/export data and motor fuel tracking systems. Section 5.5 includes a subsection that outlines the import/export data needed to establish total motor fuel volumes imported to, and exported out of, each state. Retail audit data requirements are outlined in the second general audit data sub-section of Section 5.5.

5.4.5 Illegal Importation Across International Borders

5.4.5.1 Overview of Evasion Technique

Evasion sometimes occurs by way of international borders when untaxed fuel is smuggled into the country and sold to retailers at taxed rates. Perpetrators of this scheme take advantage of the fact that state and federal agencies have no jurisdiction over foreign fuel supply operations. Fuel can be purchased from foreign entities and brought into the United States and distributed under the radar of the IRS and state tax agencies.

5.4.5.2 Background on Evasion Technique

Under this scheme, fuel is bought from foreign refineries or bulk dealers and transported to the United States by truck or shipped by ocean vessel. By truck, fuel can be illegally imported and delivered to retail stations or perpetrator-owned terminals or bulk plants. The owed taxes are not paid. If fuel is delivered to terminals or bulk plants, required reports are not filed.

At border crossings, truckers are required to present, if requested, a bill of lading to U.S. Customs. These BOLs can be forged. Further, there are other border crossings not routinely attended by Customs agents that these trucks can travel on; however, security at all border crossings has tightened considerably since 9/11.

Problems with international fuel smuggling into the United States appear to primarily be imports from Canada rather than Mexico; the geographic area of concern includes states close to the northern border. There are 130 land-border points on the Canadian-U.S. border and most of the volume of merchandise is transported by motor carriers. In a recent study conducted by the Joint USA/Canadian Motor Fuel Compliance Initiative (FHWA, 1994a), cross-border inspections in the Northeast resulted in 2 percent dyed diesel fuel violations and numerous other violations related to improperly documenting cross-border fuel shipments. Other states that would need careful scrutiny are those states with access to fuel off-loading with connections to transportation routes. Studies indicate that a portion of the fuel tax nonpayment is associated with failure to pay on the entire amount of fuel off-loaded.

5.4.5.3 Model Approach

The methodological approach to estimating the amount of fuel tax evasion uses the audit and inspections analysis, as well as an additional tracking approach:

1. Statistical sampling, and
2. Tracking.

5.4.5.3.1 Statistical Sampling. If sufficient cross-border inspections and audit data exist regarding cross-border evasion schemes, the methodological approach to estimating the amount of fuel taxes evaded will use probability sampling from inspections and audit data. This data is potentially available from some states and the IRS, as well as recently conducted inspections by the Joint USA/Canadian Motor Fuel Compliance Initiative (various years). Data need to be evaluated to remove bias (e.g., inspections based on tips) such that the sample is random. If the bias cannot be removed, methods to estimate the amount of bias must be explored. The number of violations (in terms of total fuel evaded) as a percentage of total fuel covered through inspections/audits will be the basic statistic used to measure evasion. For each type of fuel, this percentage will be expanded to the targeted population by multiplying the proportion of violations to inspections times the total amount of fuel that reportedly crosses the border.

For example, the estimate would be as follows:

$$E_i = \frac{X_i}{N_i} \times F_i \times t_i$$

where

E_i = $ Evasion for Fuel Type *i;*
X_i = violations attributed to Fuel type *i* (in gallons of fuel);
N_i = total inspections of Fuel type *i* (in gallons of fuel);
F_i = total amount of Fuel type *i* reportedly imported from Canada by a particular U.S. State or the amount of fuel imported by a particular state;
t_i = tax rate in state for fuel type *i;* and
where *i* = gasoline, diesel.

5.4.5.3.2 Tracking. If adequate inspections and audit data are not available, the amount of evasion occurring through cross-border schemes could be estimated by comparing the total amount of fuel imported from Canada by specific states with the amount of fuel officially imported and sold in specific states. These states would primarily include northern states and states with fuel off-loading facilities and access for fuel off-loading. Other states that could be susceptible to this type of evasion include states with off-loading facilities for fuel from ocean-going barges and tankers. Southern-border states with Mexico do not appear to be at risk for this type of evasion, as fuel is significantly more expensive in Mexico.

5.4.5.4 Data Needs and Limitations

The IRS may have data on fuel imports. In addition, state audit data on dyed fuel import violations could provide further information if available. During the summers of 2003 and 2004, the Canadian/USA Tax Compliance Initiative conducted

a series of cross-border inspections, documenting various fuel tax violations in the Northeast. Data required to estimate EOE using this approach is outlined in the illegal importation data element subsection of Section 5.5. The general audit data element subsections also could be used to estimate EOE associated with illegal importation across international borders.

U.S. Customs and some states have records of the amount of fuel imported from Canada, while the Canadian government tracks the amount of fuel reportedly exported to the United States by state. This approach requires that a state have a useable tracking system where imported fuel is recorded.

5.4.6 Failure to Remit

5.4.6.1 Overview of Evasion Technique

Many states allow distributor registrants to purchase fuel untaxed. Fuel tax evasion perpetrators either obtain a registration legally or illegally or forge the registration documentation. Tax-free fuel is purchased and then sold as tax paid to other wholesale distributors or retailers. They evade the taxes by simply failing to file or filing false returns with the state. A perpetrator may get away with this for some time before enforcement agencies can detect them due to long time periods between the filing of reports and remittance of tax. Further, the state agency must check the evading company's reports against other businesses to detect discrepancies or must find irregularities in the tax filing during the auditing process.

One example of a recent case in Ohio involves a perpetrator who forged a registration and used an alias to purchase untaxed diesel, which he then sold to truck stops all over Ohio. This scheme can be more quickly discovered by implementing a fuel tracking system that matches terminal disbursements with distributor reports. This scheme occurs at the point of taxation. The perpetrators typically fail to file returns or file false returns for taxes paid (reporting a certain amount but not the total amount of taxable fuel sold). (See Chapter 2 on Evasion Methods for more details.)

5.4.6.2 Model Approach

There are three methodological approaches that are suggested in order to estimate the EOE of this evasion technique, depending on data availability:

1. Motor Fuel Tracking;
2. OLS or Tobit; and
3. Statistical Sampling.

5.4.6.2.1 Tracking. Provided that a state has a good tracking system, the best approach to catching EOE in failure to remit is the tracking system. In the tracking system approach, the amount of fuel delivered for sale is compared with the state's motor fuel tax receipts. Careful analysis of the information would need to account for any double counting of the failure to remit on importation.

5.4.6.2.2 OLS or Tobit. Provided that sufficient data are available for individual filers through the audit and inspections process, a regression approach could be adopted. Explanatory variables would be developed for each sector evaluated. Explanatory variables might include

- Gallons of fuel;
- Type of business;
- Examiner;
- Industry affiliation;
- Fuel types;
- Terminals used;
- State of origination;
- Number of audits; and
- Detection rate of examiner.

5.4.6.2.3 Statistical Sampling. This approach will primarily rely on audit data. If a sufficient amount of audit information exists regarding this evasion scheme, the methodological approach to estimating the amount of fuel evaded uses a probability sampling method from audit data produced. This data is potentially available from some states. Data must be evaluated to remove bias (e.g., inspections based on tips), such that the sample is random. If the bias cannot be removed, methods to estimate the amount of bias will be explored. Instances of EOE (in terms of total fuel taxes not remitted converted to gallons) as a percentage of total fuel covered through audits will be the basic statistic used to measure EOE. This percentage will be expanded to the targeted population by multiplying the proportion of EOE to inspections times the total amount of fuel used in the selected population.

For example, the estimate would be as follows:

$$E_i = \frac{X_i}{N_i} \times F_i \times t_i$$

where

E_i = \$ Evasion of fuel *i;*
X_i = number of cases where EOE (in gallons of fuel) for fuel *i* were found;
N_i = total inspections/audits (in gallons of fuel) for fuel *i;*
F_i = total amount of taxed motor fuel sold in state for fuel *i;* and
t_i = tax rate in state for fuel *i.*

An alternative to this approach would be to examine tracking data for states to determine the amount of taxed fuel reported and the amount of taxes collected. The difference

between the two would be the level of EOE for that state. If audit data and tracking systems were available, estimates from the two could be used to determine the level of bias in the estimates from the audit data sampling approach.

5.4.6.3 Data Needs and Limitations

State audit data as outlined in the general audit data elements in Section 5.5 are required to estimate EOE. In Section 5.5, the first general audit data element would be used to establish the characteristics of the taxpayer population. The remaining general audit data elements are differentiated based on the point in the distribution system where the audits are being conducted.

5.4.7 Cocktailing and False Labeling

5.4.7.1 Overview of Evasion Technique

Many products are tax-redeemed, not taxable, or not tracked by that state or the IRS, which can be obtained under false pretenses and used in gasoline or diesel engines. Examples include aviation fuel, used motor oil, and mineral spirits. By blending these products with taxable fuel, fuel volumes can be extended. Perpetrators either can blend these products for their own use or they can profit from the tax collected on sales or the number of extra gallons created through blending. Sometimes fuels that are untaxed or have reduced tax rates (e.g., kerosene, jet fuel) can be used as a substitute for taxable fuels without any blending necessary. In all cases, fuel tax evaders would most likely falsely label taxable products as nontaxable products at the point of taxation, but eventually sell it for a taxable purpose.

A recent scheme uncovered in Massachusetts involved an oil company that was blending untaxed kerosene and home heating oil with diesel and not reporting tax on the blend. Another scheme in Florida involved an airport employee who was illegally siphoning jet fuel from the airport system and then labeling and selling it as taxed diesel at the retail level.

This scheme occurs below the terminal rack. Many perpetrators have access and licenses to distribute untaxed or tax reduced fuel, such as heating oil and kerosene. Figure 5-6 shows where evasion leakage occurs (note "Bulk Plant" is actually part of the nonbulk distribution).

5.4.7.2 Model Approach

The methodological approach to estimating the amount of fuel tax evasion uses an approach under the audit and inspections analysis as well as an additional tracking approach. For blending agents where the intended use is relatively easy to identify, isolate and measure, such as jet fuels, the supply and use approach is suggested. For all other blending agents, the statistical sampling approach is recommended.

1. Statistical sampling and
2. Supply and use.

5.4.7.2.1 Statistical Sampling. The first approach will involve statistical sampling, where the blending agent and its various uses will be used as the expansion coefficient for each sample. The number of violations (in terms of total fuel evaded) as a percentage of total fuel covered through inspections/audits will be the basic statistic used to measure EOE. For each blending agent or substitute fuel, this percentage will be expanded to the targeted population by multiplying the proportion of vio-

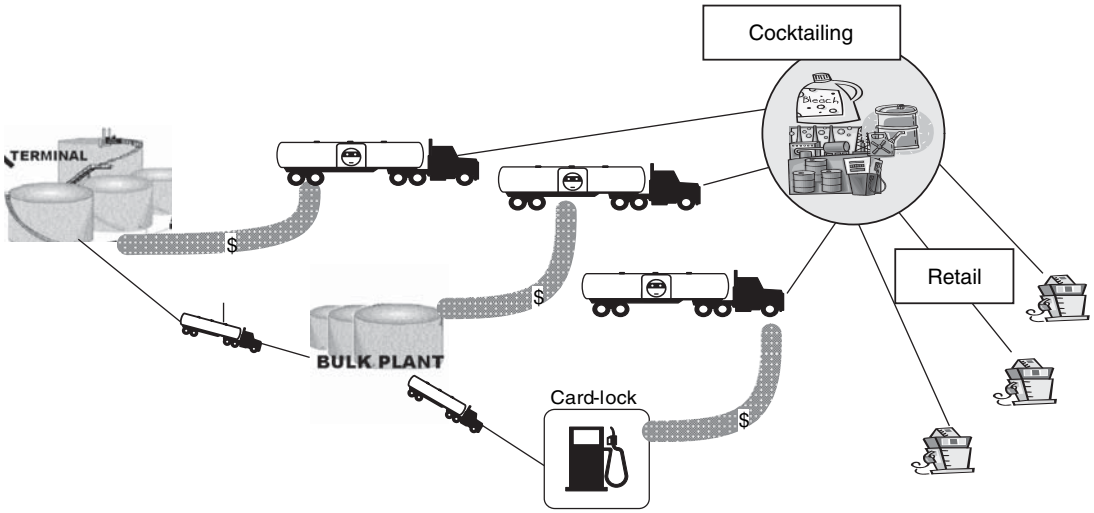


Figure 5-6. Where cocktailing occurs in the distribution system.

lations to inspections times the total amount of fuel used in the selected population. For example, the estimate would be:

$$E_i = \frac{X_i}{N_i} \times F_i \times t_i$$

where

E_i = $ Evasion for fuel type *i;*
X_i = Violations involving blending or falsely labeling fuel type *i* (in gallons of fuel);
N_i = Total inspections involving fuel type *i* (in gallons of fuel);
F_i = Total amount of fuel type *i* used in a particular state;
t_i = Tax rate in state for *i* type of fuel; and
i = Gasoline, kerosene, jet fuel, mineral spirits, and other tax-exempt or tax-reduced fuels.

E_i will be measured for all fuel types that are typically substituted or blended with diesel or gas.

Considering not every state will have inspections data, states could be grouped into statistically appropriate clusters for each type of evasion measurement. To extrapolate the total population, it will be important to examine the use of untaxed (or tax-reduced) fuels that are commonly used as substitutes for gas and diesel and/or can be easily blended with gas and diesel. This would involve closer examination of jet fuel use, kerosene, biodiesel, mineral spirits, etc. It would be much more difficult to examine the total amount of waste oils available for blending, as this is not routinely tracked.

5.4.7.2.2 Supply and Use. The supply and use approach could be applied to blending agents that are relatively easy to identify, isolate, and measure, such as jet fuel. In such a case, the supply and disappearance of jet fuel would be measured, where final discrepancies between supply and use would be attributed to fuel tax evasion.

5.4.7.3 Data Needs and Limitations

Inspections data could reveal the degree to which cocktailing is occurring. Inspection data requirements are outlined in the cocktailing and false labeling inspection data element subsection of Section 5.5. In addition, state audit data regarding fuel tax violations could provide further information if available. The data required to estimate EOE are outlined in the general audit data element sub-sections of Section 5.5.

5.4.8 Abuses Due to the Presence of Native American Reservations

5.4.8.1 Overview of Evasion Technique

Issues faced by tax agents and compliance officers due to the presence of the Native American exemption are significant. According to the Bureau of Indian Affairs, there are 562 federally recognized tribal governments in the United States. These governments are spread out geographically over the United States, from Alaska to Florida and from Maine to California. There are concentrations of Native American tribal governments in New Mexico, Arizona, Colorado, and Nevada. Figure 5-7 presents a map of the Native American Reservations in the continental United States.

As noted in FTA's Survey of Native American Issues, a number of states have entered into agreements for the collection of taxes with Native American Tribes (Arizona, Louisiana, Minnesota, Montana, Nebraska, Nevada, Oklahoma, South Dakota, Utah, Washington, and Wisconsin), are in active negotiations with tribes (Arizona, Connecticut, Montana, Nebraska, Nevada, North Dakota, Oregon, Utah, and Wisconsin) and are currently embroiled in litigation with tribes over the issue of motor fuel taxation (Idaho, Kansas, Minnesota, Nevada, and Pennsylvania) (FTA 2002a).

While some states do have agreements about administering state fuel taxes in place with tribes, court cases in other states have determined that taxation of fuel in these lands would violate the sovereignty of these nations. In many states, Native American retail outlets may purchase tax free fuel or obtain a refund for fuel distributed to reservation residents. One evasion scheme arises from the fact that fuel can be imported from other states and foreign points of origin and delivered directly to Native American reservations without taxes being remitted.

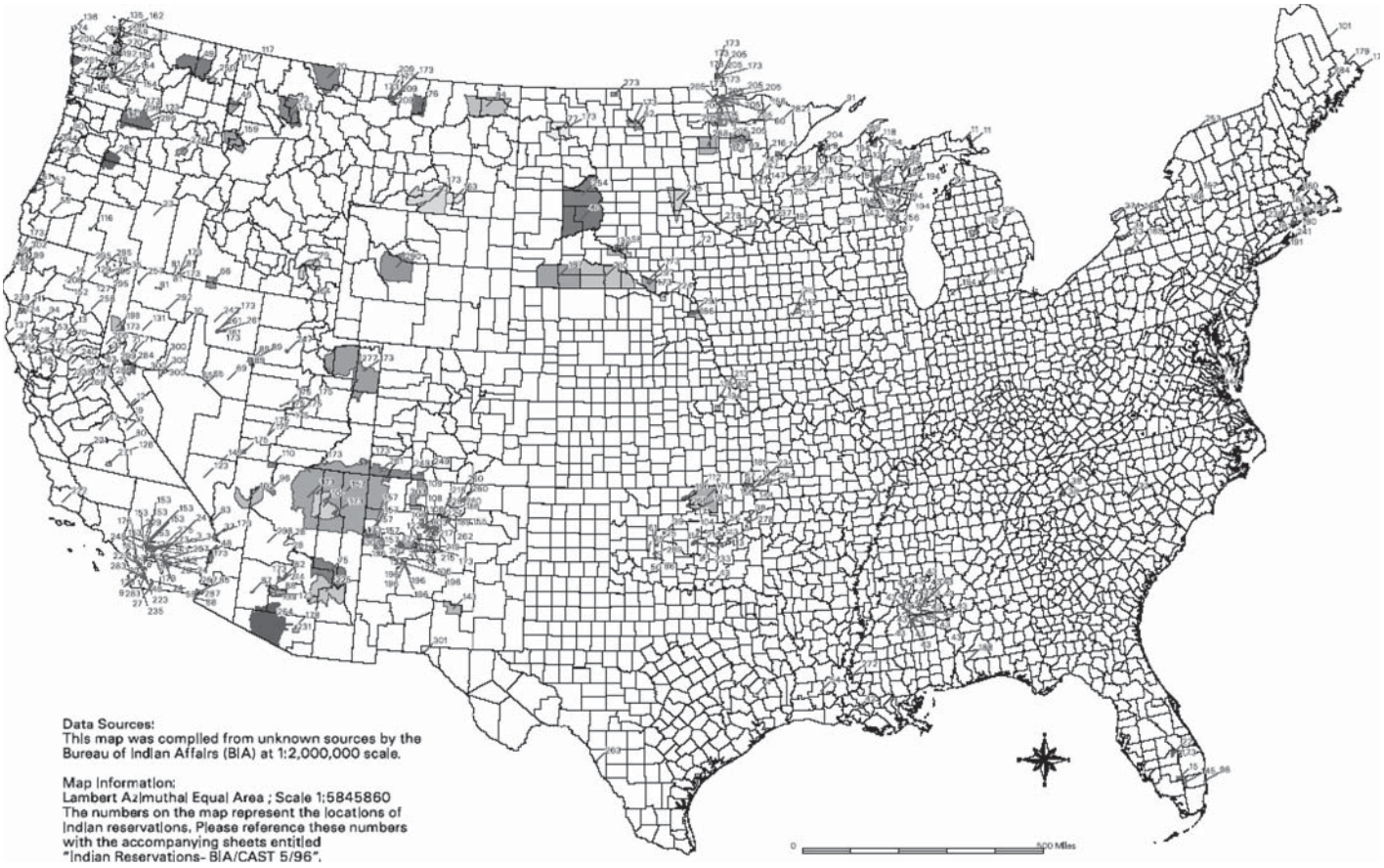
Native American tribes have the responsibility to collect state fuel taxes when a non-Native American purchases gasoline or diesel fuel from a tribal retail outlet. Battelle discussed this issue with the JFSMFTCP contact in Idaho and explained the only determining factor associated with motor fuel tax compliance is the relationship between the state and the tribal government (Walters, 2004). In some states, there is an open dialogue between the tribal governments and the state. In others, the dialogue is not as open and data on motor fuel sales is more difficult to obtain.

5.4.8.2 Model Approach

Two approaches could be used to estimate evasion due to Native American sales of motor fuel. Both rely on a comparison of estimated motor fuel sales and consumption by registered tribal members, combining elements of the supply and use approach and tracking, when possible.

5.4.8.2.1 Tracking. The tracking approach for estimating motor fuel sales is based on the examination of distributor reports to track motor fuel sales to reservations. The amount listed on distributor reports would be compared with motor fuel sales to detect evasion.

5.4.8.2.2 Statistical Analysis of Sales. In the absence of complete distributor reports, an alternative approach would



Source: Bureau of Indian Affairs.

Figure 5-7. Native American reservations in the continental United States.

be to construct a model where the number of gallons of motor fuel sold by individual Native American establishments would serve as the dependent variable, and a number of independent variables that could be used to estimate gallons sold would be identified and tested. Independent variables could include:

- The number of Native American Reservations in a state;
- The number of retail motor fuel outlets on reservations;
- The number of pumps located at each Native American retail outlet;
- State motor fuel excise tax rates;
- State populations; and
- Proximity to high-tax states.

Data provided by states with agreements would serve as the base data required to test the predictive capacity of the model. The model would be designed to test the correlation between the variables outlined above (and others tested during model development) and actual motor fuel sales for the Native American establishments reporting data to state taxing authorities. In turn, the model can be used to predict motor fuel gallons sold by Native American establishments not reporting to state taxing authorities.

Tribal member consumption would be estimated based on data relating to the number of registered members and estimates of average per-capita fuel consumption for state residents. Estimated tribal member consumption would be compared to modeled estimates of Native American motor fuel sales. The difference between these two estimates would represent EOE.

5.4.8.3 Data Needs and Limitations

State distributor fuel tax forms often include fields for reporting sales to Native American Tribes. Further, Native American retail outlets generally cannot obtain fuel from sources other than the distributors that are reporting to the state, with the exception of tribes that operate refineries. To the extent that data are provided in paper form or gaps appear in data collection from distributors, the data could be insufficient to support the proposed primary analysis.

Data required to support the EOE estimation methods are detailed in the Native American data element subsection of Section 5.5.

5.4.9 Daisy Chains

5.4.9.1 Overview of Evasion Technique

In a daisy chain scheme, a ring of artificial companies transact several fallacious purchases of fuel without paying taxes. The fuel is eventually sold at taxed rates to a legal retail operation. The daisy chain represents a multiflow fraud scheme that involves the creation of entities that use artificial trusts and accounts to avoid tax obligations. When investigators track the purchases of the fuel in an effort to track tax liability, one of the dummy companies, known as the burn company, dissolves along with any tax liability. This scheme could still be used in some states; however, its significance as an evasion technique has declined due to the movement of the point of taxation for the federal government and many states up the distribution chain to the terminal rack.

Hwang et al. (2003b) described the daisy chain as a long, indirect, and complex paper trail of motor fuel tax documentation, which makes it difficult for auditors to track and discover the evasion. This practice can be used for evasion at both federal and state fuel tax levels. Daisy chains are not successful when the points of taxation are at the retail or terminal rack level. Taxing at the retail level thwarts daisy chains because tax must be remitted once fuel is sold to the motorist. Thus, any amount of misdirection in the paperwork accompanying fuel shipments fails to hide tax liability because it is not incurred until the fuel is sold to the motoring public. At the terminal level, large terminal operators pay the tax when it breaks bulk and is purchased by distributors. The daisy chain works effectively only when the tax is at the distributor level; the distributor can purchase the fuel tax-free at the terminal rack, run it through the daisy chain, and then sell it at taxed rates to unwitting retailers at the other end (Figure 5-8).

In a study examining the optimum point of taxation for motor fuel excise taxes, Brand (1996) found that the movement of the federal diesel fuel point of taxation in 1994 reduced noncompliance significantly. This reduced the number of taxpayers from more than 50,000 to around 1,500. The study also concluded there was an immediate and significant increase in revenue due to increased motor fuel excise tax compliance.

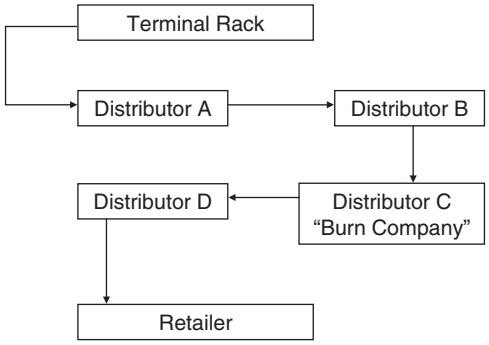


Figure 5-8. Daisy chain.

5.4.9.2 Model Approach

The model must account for the dampening impact on daisy chains when the point of taxation is either at the retail or terminal level or when tax is remitted high in the distributor level. The first step in the estimation of tax evasion due to daisy chains is the assessment of the state's motor fuel tax program to determine whether or not the program can be exploited by the daisy chain. In the event the assessment determines that motor fuel tax evasion may be occurring through the daisy chain mechanism, the next step in the model approach would employ some elements of the audit and inspections analysis by examining historical auditing records to determine the extent shipments are being received by retailers or transactions are made between distributors with companies not licensed by the state. This approach would broaden the daisy chain method to include transactions between reputable licensed companies and unlicensed criminal operations.

5.4.9.3 Data Requirements and Limitations

The proposed model depends in large part on sound distributor and/or retailer audit data. Alternatively, states that have implemented state motor fuel tracking systems would have the advantage of a more complete and potentially completely electronic set of distributor sales data. These records could be used to identify fuel sales and purchases by unlicensed, unlawful distributors. Errors in data reported by distributors and paper reporting in many states make this model approach more difficult, more time consuming, and less accurate.

Data required to estimate EOE are outlined in the first three general audit data element subsections of Section 5.5.

5.5 Detailed Data Recommendations

5.5.1 Introduction

This section presents detailed recommendations governing data collection in support of the EOE estimation approaches outlined in Sections 5.4.1 through 5.4.9. The data outlined, however, are not tied in all cases to a specific estimation approach or even an evasion method. Rather, the

data elements are categorized based on the specific types of investigations and audits generating the original data. These investigations and audits are those that states already perform, or could perform, as part of their regular enforcement programs. To understand the link between the data collection recommendations and EOE estimation, refer to the data requirements and limitations subsection of Sections 5.4.1–5.4.9. Modeling approaches also are outlined in those sections.

The remainder of this section details a small number of issues to consider when collecting data, including the quantity of information to be collected, the temporal element of data collected, how to define EOE for modeling purposes, and the importance of controlling for double counting.

5.5.2 Quantity of Information

When constructing a database to support the EOE calculation, it is important to consider the quantity of the information required. When conducting an analysis using the statistical sampling approach, it could require collection of hundreds of observations to generate estimates with margins of error of less than plus or minus 4 percent. This confidence level likely would be achievable for some audits and inspections, such as IFTA audits or on-road dyed diesel inspections. However, this level of precision likely would not be feasible for most other forms of audit or inspection given time and budget limitations. For other more costly elements that are often performed with less frequency, it is recommended that at least 30 audits or inspections be performed in support of the EOE estimation approach. In most cases, results from 30 observations could yield results that would be considered statistically valid.

5.5.3 Temporal Element of Data Collected

The temporal element also must be addressed when collecting data. Past models used to estimate evasion have generally been highly unstable, yielding results inconsistent from one year to the next. Estimated EOE under any model will vary from year to year based on data anomalies, inconsistencies in data collection techniques, real changes in evasion, enforcement activities, and changes in tax code. Analysts have the option of collecting data over an extended period of time to determine the impact of various tax code or programmatic changes (e.g., moving the point of taxation up the distribution chain); however, long-term data collection efforts are not required to estimate EOE. Thus, it is recommended that data sets used to estimate EOE cover at least four years when there was general consistency with tax codes, enforcement programs, and data collection techniques. To the extent there are inconsistencies in available data, it will be important to document the factors (e.g., changes in data collection techniques, responsibility for data collection being shifted from one public agency to another) that impact consistency in relevant data series.

5.5.4 How to Define EOE

EOE is a term developed for this study to describe the value to include as the dependent variable in any EOE model. The distinction between this term and evasion is that it does not attempt to attach intent to the act of failing to make a full tax payment. That is, an assessment may result due to an omission on the part of a taxpayer, an inadvertent error, or willful evasion. The intent of the taxpayer is often impossible to ascertain. For the purposes of this report, intent is not considered. It is also important to note that taxpayers generally have a mechanism to appeal the findings of a tax audit. In many instances, this appeal will lead to an adjustment in the assessment amount. To the extent that an appeal or any other audit review process leads to an adjustment to the initial assessment, the final assessment is what should be considered in the EOE calculation. Also, penalties and interest should not be included in the EOE calculation.

5.5.5 The Need to Control for Double Counting

It is important to control for double counting as necessary. For example, IFTA audits may include much more than simply IFTA-related EOE. IFTA audits may capture illegal blending, failure to remit, and other evasion methods used by motor carriers to evade taxes. To the extent these evasion methods are picked up through other EOE estimation approaches, the modeler should be careful to not double count the EOE. For example, one evasion study relied on a model to estimate cross-border distributor EOE (Balducci et al., 2006). The authors of this study also reviewed but did not use audit data that could have been used to examine cross-border EOE. As noted in the report, the use of both techniques would have resulted in double counting.

5.5.6 Data Recommendations

Data outlined in this section of the report should be considered an ideal case rather than a requirement. States need not collect all the data outlined in this section to estimate EOE. As more data are collected, EOE estimates will be more precise and more confidence can be attributed to the results. Many states collect little of the data outlined in this section or collect detailed

data on violators while collecting limited data on audits and inspections that do not yield assessments. For those states with limited existing data, this section could be used to design a data collection program to support future evasion studies.

5.5.6.1 Dyed Fuel Data Element #1

The following general data items are needed on dyed fuel inspections:

- Number of dyed fuel violations classified by the type of violation;
- Estimate of the total value of dyed fuel violations by violation type (misuse, dye removal; from fuel, mislabeling) not including penalties or interest;
- Estimate of the number of gallons associated with dyed fuel violations (misuse, dye removal from fuel, mislabeling);
- Triggers for inspections (e.g., tax evasion hint or report by a third party, random sampling, regular on-road inspection, or other . . . specify);
- Total number of inspections by type of inspection;
- Total number of dyed fuel gallons consumed in state;
- Total number of gallons inspected by type of inspection (on-road, site inspection); and
- Total taxable gallons of diesel burned on-road in state by all taxpayers.

5.5.6.2 Dyed Fuel Data Element #2

The following data items extracted from individual inspection data are needed for all dyed fuel inspections:

- General Inspection Information
  - Date inspection performed
  - Location (county, city) where inspection conducted
  - Highway number
  - Location of inspection (e.g., road inspection, site visit, weigh station)
- Driver Information
  - D.L. State
- Vehicle Information
  - Registered weight
  - Vehicle type (e.g., car, pickup, single-unit truck or combination)
  - Fuel tank capacity
  - Private or for hire
  - Commodity code
  - Interstate or Intrastate
  - Leased or owned
- Sample Information
  - Number of samples taken
  - Tank location and capacity
  - Name of fueling location
  - Terminal code
- Business characteristics of inspected companies
  - Years in operation
  - North American Industry Classification System (NAICS) code
  - Annual revenue
  - Number of employees
  - Motor fuel types
- Trigger for inspection (e.g., tax evasion hint or report by a third party, random sampling, regular on-road inspection, or other . . . specify)
- Type of operation inspected (e.g., retail gas stations, farm, construction, motor fuel carriers, logging, motor carrier, individual)
- Types of violations found if any (e.g., dyed fuel used on-highway, dyed fuel signs missing from pump station, distributor sold dyed fuel for consumption on the highway, no violation found . . . specify)
- If violation found, the following variables are needed
  - Type of enforcement taken
    - Civil (reason for considering civil enforcement)
    - Criminal (reason for considering criminal enforcement)
  - First, second, or third offense or greater
  - Number and tax value of gallons in which the assessment was based.

5.5.6.3 Refund and Tax-Exempt Fuel Data Element

The following refund and tax-exempt fuel data items are needed:

- General taxpayer information needed to estimate total motor fuel consumption and true tax liability
  - Summary of bulk storage data for both gasoline and undyed diesel
    - Annual total beginning inventory
    - Annual total fuels received into storage
    - Annual total ending inventory of fuel
    - Annual total dispensed into vehicles
    - Annual total dispensed into equipment
    - Annual total miles traveled in all jurisdictions reported by refund claimants for each year for both on- and off-road
  - Annual total miles traveled by claimants for each year on public roads within the state estimating evasion
  - Annual total miles traveled by claimants for each year off-road in state
  - Annual total taxed gallons within the state estimating evasion at the pump placed into equipment for gasoline and undyed diesel separately

  - Annual gallons for which refunds were applied within the state estimating evasion by fuel type
  - Number of registered off-highway vehicles/equipment and average fuel consumption classified by type of vehicle and type of fuel (examples provided below):
    - Government vehicles and equipment (federal, state, counties, and cities government agencies)
    - Agricultural equipment, (e.g., tractors and combines)
    - Commercial equipment
    - Logging equipment
    - Construction and mining equipment (e.g., graders, cranes, paving equipments, and earth moving equipment)
    - Industrial equipment (e.g., forklifts, aerial lifts, mining equipment and logging equipment)
    - Recreational vehicles and equipment (e.g., boats)
    - Residential and commercial lawn and garden equipment
    - Marine vehicles and equipment
    - Locomotive equipment
    - Airport Equipment
    - Aircraft
    - Pleasure craft
    - Other exempt uses
  - Number of special fuel registrations for out-of-state users for recreation or for religious, charitable, educational, or other purposes
- Individual refund audit data required
  - Annual total number of false refund claims classified by violation and fuel type
  - Total number of inspections by type of inspection
  - Audit data
    - Trigger for audit (e.g., tax evasion hint or report by a third party, random sampling, regular on-road inspection, or other . . . specify)
    - The IFTA EOE dollar value assessment (minus penalties and interest)
    - Gallons on which the EOE assessment was made by fuel type
  - Auditor information
    - Years in service
    - Rank
    - Detection rate for the auditor
  - Business characteristics of inspected companies
    - Years in operation
    - NAICS code
    - Annual revenue
    - Number of employees
    - Motor fuel types sold or used
  - If violation found the following variables are needed
    - Number of gallons on which assessment was made by type of violation and fuel type
    - Amount of the assessment minus penalties and interest by type of violation and fuel type
    - Type of enforcement taken
      - Civil (reason for considering civil enforcement)
      - Criminal (reason for considering criminal enforcement)
      - First, second, or third offense or greater

5.5.6.4 Import/Export Fuel Data Element

The following import/export fuel data items are needed:

- Monthly number of businesses requesting tax exemption due to exporting fuel to the other states
- Monthly gallons exported from state by type of fuel and the destination jurisdiction as reported to the state
- Monthly gallons imported to the state conducting the evasion analysis classified by type of fuel as reported by destination jurisdiction
- Monthly gallons exported and imported via modes of transportation other than tanker trucks (pipeline, barges, and rail)

5.5.6.5 IFTA Data Element #1

The following general IFTA data items are needed:

- Estimated total amount of gallons of fuel reported in IFTA forms by fuel type
- Estimated total miles traveled in the base state reported in IFTA forms by fuel type
- Total estimated miles traveled in the base state as percentage of the total miles traveled including travel in other jurisdictions by fuel type
- Number of IFTA decals purchased
- Number of IFTA decals returned (not used by the end of the year)
- Number of IFTA audits completed
- Number of IFTA audits resulting in an assessment
- Dollar value of IFTA assessments made by base-state on behalf of other jurisdictions classified by jurisdiction and fuel type
- Total dollar value of the EOE assessments made on behalf of the base-state classified by jurisdiction and fuel type
- Total dollar value collected on behalf of the base-state classified by jurisdiction and fuel type
- Dollar value of total IFTA tax collections
- The percentage of IFTA audits completed and assessed relative to the total number of IFTA registered motor carriers
- Total number of IFTA accounts
- Percentage of total number of motor carriers audited under IFTA
- Percentage of total gallons consumed by motor carriers audited under IFTA

5.5.6.6 IFTA Data Element #2

The following data items extracted from individual audit records are needed for all IFTA audits:

- Date IFTA audit performed
- Number of IFTA decals the motor carrier used
- Annual taxable miles traveled in state by fuel type
- Annual taxable gallons used in state by fuel type
- Annual total taxable miles traveled in other jurisdictions by fuel type
- Annual total taxable gallons used in the other jurisdictions (classified by jurisdiction) by fuel type
- Miles per gallon registered by motor carrier
- Base state percentage of total miles traveled
- The dollar value of the IFTA EOE assessment (if no assessment made then assessment amount equals zero)
- The dollar value of the IFTA EOE assessment made on behalf other IFTA jurisdictions (classified by jurisdiction)
- Other types of motor fuel tax EOE detected during the IFTA audit (specify the technique of evasion e.g., dyed fuel, failure to remit, importation violation . . . etc.)
- If available, any other relevant business information of the motor fuel carrier
  - Years in operation
  - NAICS code
  - Annual revenue
  - Number of employees
  - Primary commodity type hauled or type of operation (e.g., agriculture products, concrete and aggregate, forest products)
  - Number of safety violations
- Auditor information
  - Years in service
  - Rank
  - Detection rate for the auditor
- Trigger for audit (e.g., tax evasion hint or report by a third party, random sampling, red flag that triggered audit, or other . . . specify)

5.5.6.7 General Audit Data Element #1

General audit data needed:

- Percent of the total population audited by operation type (distributors, retailers etc.)
- Percentage of total gallons consumed by audited companies by fuel and operation type
- Trigger of audits (third party tip, random sampling, flagged return or other . . . specify) by fuel and operation type
- Percentage of all audits assessed from total completed audits by fuel and operation type
- Total number of audits by type (field audit or office audit)

5.5.6.8 General Audit Data Element #2

Individual general audit data for all audits performed by states taxing at the retail level:

- Date audit performed
- Type of audit (field audit or office audit)
- Trigger for the audit (third party tip, random sampling, flagged return or other . . . specify)
- Operational characteristics
  - Type of operation audited (truck stop, card lock fueling station, gas station)
  - Is the company licensed to sell exempt fuel?
  - What motor fuel products does the company sell?
  - Location(s) of station(s) audited
  - States in which the company is licensed to operate
- Type of violations found
- If violation found, the following variables are needed
  - Number of gallons on which assessment was made by type of violation and fuel type
  - Amount of the assessment minus penalties and interest by type of violation and fuel type
  - Type of enforcement taken
    - Civil (reason for considering civil enforcement)
    - Criminal (reason for considering criminal enforcement)
    - First, second or third offense or greater
- Business characteristics of inspected companies
  - Years in operation
  - NAICS code
  - Annual revenue
  - Location of company headquarters
  - Number of employees
  - Number of taxed gallons
  - Motor fuel types
- Auditor information
  - Years in service
  - Rank
  - Detection rate for the auditor

5.5.6.9 General Audit Data Element #3

Individual general audit data for all audits performed by states taxing at the distributor level:

- Date audit performed
- Type of audit (field audit or office audit)
- Trigger for the audit (third party tip, random sampling, flagged return or other . . . specify)

- Operational characteristics
  - Type of operation audited (distributor, importer, alternative fuel producer, bulk purchasers, special fuel dealers)
  - Is the company licensed to distribute exempt fuel
  - If feasible, determine the average number of times that loads change ownership prior to delivery
  - What motor fuel products does the company distribute
  - Is the distributor an importer and/or exporter
  - States in which the company is licensed to operate
  - Terminals from which distributor obtains motor fuel
- Types of violations found
- If violation(s) found the following variables are needed
  - Number of gallons on which assessment was made by type of violation and fuel type
  - Amount of the assessment minus penalties and interest by type of violation and fuel type
  - Type of enforcement taken
    - Civil (reason for considering civil enforcement)
    - Criminal (reason for considering criminal enforcement)
    - First, second or third offense or greater
- Business characteristics of inspected companies
  - Years in operation
  - NAICS code
  - Annual revenue
  - Location of company headquarters
  - Number of employees
  - Number of taxed gallons
  - Motor fuel types
- Auditor information
  - Years in service
  - Rank
  - Detection rate for the auditor

5.5.6.10 General Audit Data Element #4

Individual general audit data for all audits performed by states taxing at the terminal rack level:

- Date audit performed
- Type of audit (field audit or office audit)
- Trigger for the audit (third party tip, random sampling, flagged return or other . . . specify)
- Operational characteristics
  - Type of operation audited (position holder, importer, alternative fuel producer, terminal operator, vessel operator, pipeline operator, train operator)
  - Is the company licensed to sell exempt fuel?
  - What motor fuel products do they store, transport or sell?
  - States in which the company is licensed to operate
  - Terminals where company operates
  - Location(s) of terminal(s) where violations are discovered
- Types of violations found
- If violation(s) found the following variables are needed
  - Number of gallons on which assessment was made by type of violation and fuel type
  - Amount of the assessment minus penalties and interest by type of violation and fuel type
  - Type of enforcement taken
    - Civil (reason for considering civil enforcement)
    - Criminal (reason for considering criminal enforcement)
    - First, second or third offense or greater
- Business characteristics of inspected companies (does not include on-road inspections)
  - Years in operation
  - NAICS code
  - Annual revenue
  - Location of company headquarters
  - Number of employees
  - Number of taxed gallons
  - Motor fuel types
- Auditor information
  - Years in service
  - Rank
  - Detection rate for the auditor

5.5.6.11 Illegal Importation Data Element

The following data items extracted from individual inspection data are needed for all inspections targeting cross-border evasion:

- General Inspection Information
  - Date inspection performed
  - Location (county, city) where inspection conducted
  - Highway number
  - Location of inspection (e.g., road inspection, site visit, weigh station)
- Driver Information
  - D.L. State
- Sample Information
  - Number of samples taken
  - Tank location and capacity
  - Name of fueling location
  - Terminal code
- Business characteristics of inspected companies (does not include on-road inspections)
  - Years in operation
  - NAICS code
  - Annual revenue
  - Number of employees
  - Motor fuel types
  - States in which company is licensed to operate
  - Location of company headquarters

- Trigger for inspection (e.g., tax evasion hint or report by a third party, random sampling, regular on-road inspection, or other . . . specify)
- Types of violations found if any
- If violation found, the following variables are needed
  - Type of enforcement taken
    - Civil (reason for considering civil enforcement)
    - Criminal (reason for considering criminal enforcement)
  - First, second or third offense or greater
  - Number and tax value of gallons on which the assessment was based

5.5.6.12 Cocktailing and False Labeling Inspection Data Element

The following data items extracted from individual inspection data are needed for all inspections capturing cocktailing and false labeling:

- General Inspection Information
  - Date inspection performed
  - Location (county, city) where inspection conducted
  - Location of inspection
- Sample Information
  - Number of samples taken
  - Name of fueling location
  - Terminal code
- Business characteristics of inspected companies (does not include on-road inspections)
  - Years in operation
  - NAICS code
  - Annual revenue
  - Number of employees
  - Motor fuel types
  - States in which company is licensed to operate
  - Location of company headquarters
- Trigger for inspection (e.g., tax evasion hint or report by a third party, random sampling, regular inspection, or other . . . specify)
- Types of violations found if any
- If violation found the following variables are needed
  - Type of enforcement taken
    - Civil (reason for considering civil enforcement)
    - Criminal (reason for considering criminal enforcement)
  - First, second, or third offense or greater
  - Number and tax value of gallons on which the assessment was based

5.5.6.13 Native American Data Element

The following data items are needed to estimate evasion associated with Abuses due to the presence of Native American reservations:

- Number of Native American reservations in state
- Number of retail motor fuel outlets on reservations
- Number of pumps located at each Native American retail outlet
- Number of enrolled members located on each reservation where retail outlets are located
- Location of each retail outlet in relation to population centers and high volume roads and highways
- Type of retail operations (truck stop, casino/fueling stations, card lock station, gas station/convenience store)
- Data on retail sales of motor fuel by operation type, location, and number of pumps for non-Native American retail outlets

CHAPTER 6

Conclusions

6.1 Introduction

The vast majority of the financial support for our nation's transportation system is provided by revenues from motor fuel and other highway use taxes. Ensuring all motor fuel and highway use tax funds are collected, remitted, and credited to the Federal and State HTF is a priority; however, evasion of motor fuel excise taxes has made this priority difficult to achieve.

This report was completed as part of an NCHRP project designed to develop and demonstrate a methodology for identifying and quantifying state-level fuel tax evasion. This report provides background material related to state fuel tax policies and techniques used to evade these taxes in the past. The report analyzes methods used in the past to estimate fuel tax evasion and characterizes the data available for such research. The report focuses on developing reliable estimates for motor fuel tax evasion rates to enable states to identify and measure state fuel tax evasion. The methodologies presented allow individual states to tailor approaches that suit the needs of their states and evaluate potential solutions and enforcement options.

6.2 Motor Fuel Tax Evasion at the Federal and State Level

In 1993, the evasion rate for the federal gasoline tax was estimated to be between 3 and 7 percent and the diesel tax evasion rate was estimated at 15 to 25 percent (FHWA, 1992). At the time, this level of evasion translated to roughly $1 billion in annual lost revenue. These estimates largely were based on Congressional subcommittee testimony of state and federal representatives, as well as the testimony of convicted tax evaders. At the state level, estimates of annual motor fuel excise tax evasion have varied significantly, from as low as $600 million to as high as $2 billion (Weimar et al., 2002).

Since 1993, revenue for the HTF increased due to changes in legislation relating to enforcement and auditing, primarily directed toward diesel, kerosene and aviation fuels. Simple, unscientific estimates that compare the growth rates of revenue indicators (i.e., VMT) with the actual revenue growth suggest that these recent changes in motor tax policies have reduced evasion and enhanced collections (Baluch, 1996). However, the results of post-1993 joint audits performed under the FHWA Joint Federal/State Motor Fuel Tax Compliance Project (JFSMFTCP 1999) do not reflect broad–based motor fuel tax compliance. Historically, reliable estimates for motor fuel tax evasion rates and other highway user taxes have not been achievable.

The rise of elaborate schemes to evade motor fuel excise taxes was seeded by the unprecedented increases in state and federal fuel tax rates experienced during the 1980s and early 1990s. Between 1980 and 1994, federal and state fuel tax rates ascended steadily, from 4 and 9.8 cents per gallon to 18.4 and 20.8 cents per gallon, respectively. With these significant motor fuel tax rate increases, evasion of motor fuel taxes became a lucrative venture. In the mid 1980s, large volume schemes to evade fuel taxes, known as daisy chains, were uncovered by the IRS and state agencies. However, tax evasion schemes detected to date have not only included large conspiracies involving organized crime. Fraudulent practices were discovered at many levels and scales throughout the motor fuel supply chain. While large organized crime operations were involved in elaborately concocted evasion schemes, small retailers and distributors could simply not report all or some of their gallons sold. Even motor fuel consumers had profit opportunities through tax fraud. For example, consumers could easily purchase tax-exempt fuel and use it on-road. Federal and state agencies found themselves hard pressed to keep up with these multilevel and multifaceted enforcement problems.

The analysis of state motor fuel tax administrative and enforcement issues conducted for this study identified nine key motor fuel tax evasion methods facing states: false refund or credit, evasion of untaxed dyed fuel, abuse of the IFTA return process, evasion associated with exporting/importing fuel across state lines, illegal importation across international

borders, failure to remit, cocktailing and false labeling, abuses due to the presence of Native American reservations, and daisy chains. These evasion techniques are examined in detail in Chapters 2 and 5.

6.3 State Perspective on Motor Fuel Tax Evasion

The project team conducted 35 interviews with state and tribal tax administrators, industry representatives, federal agents, the API, the ATA, the FTA, and the Petroleum Marketers Association. The tax administrators interviewed for this study represented 24 states and a diverse set of administrative and enforcement characteristics (e.g., high- and low-tax states, states with international borders, and states with significant or modest enforcement programs). General conclusions derived from these interviews included the following:

- A number of states have moved the point of taxation to the rack. Most report an increase in revenue associated with the move.
- A number of states reported that attempts to move the point of taxation to the rack have run into industry opposition.
- States differ substantially in the volume of refunds, the documentation required, and the amount of auditing performed.
- A lack of uniformity between state tax systems creates potential for evasion. Tax rate differentials create the most significant issue, enhancing the potential for import/export fraud.
- In general, interviewees indicated there is substantial room for improvement in both the sharing of information across jurisdictions and within states.
- Many state representatives interviewed for this study reported that evasion tied to Native American fuel sales was not viewed as a problem because agreements were in place to address the issue. Other states that to date have not reached agreements with Native American Tribes view sales on reservations as a substantial problem.
- Most states view IFTA as an effective system, although there are some suggestions for improvement, such as an electronic reporting mandate.
- Many states have developed electronic motor fuel tracking systems and most find them to be effective.
- Many states follow FTA uniformity guidelines closely while others have a variety of reporting guidelines.
- Licensing requirements vary significantly between jurisdictions.
- A number of states perform relatively few audits of motor fuel taxpayers. This typically occurs because audit staff are responsible for multiple tax systems and view motor fuels as less important. In contrast, some states report extensive auditing efforts with dedicated motor fuel tax staff. A strong auditing program is viewed as an essential deterrent to motor fuel tax evasion.
- Many states have limited experience with prosecution of motor fuel tax evasion cases. A number of states expressed concern over whether prosecutors were knowledgeable about motor fuel tax laws, either because they had no recent experience or because they were more interested in other types of cases.
- States typically report high levels of returns to their audit and enforcement activities, generally $10–$15 per dollar spent on enforcement.

6.4 Motor Fuel Tax EOE Estimation Methodology

During the past 20 years, states and the federal government have devised a multitude of tools, strategies, and methods for estimating motor fuel tax evasion. Studies have employed a broad spectrum of approaches. Generally, these studies have used one or several of the following methods to estimate evasion: (a) literature review, (b) audit review, (c) analysis of border interdictions, (d) survey of tax administrators, (e) comparison of fuel supply with taxed gallons, and (f) econometric analysis.

From a conceptual standpoint, the literature review carried out for this study sought to find consensus among evasion studies completed to date to determine the most promising model or accepted practice. No such consensus or preferred approach was found. Rather, methods used in previous studies varied widely from a simple review of previous literature to complex econometric models. In a small number of studies, more than one method was employed and findings were compared to construct ranges of evasion estimates.

The most successful approaches were designed with flexibility in mind, capturing the unique characteristics of the state being examined (e.g., the variance in fuel tax rates in the state relative to its neighboring states, relative enforcement efforts). It is the uniqueness of these characteristics that poses challenges to the modeler, thus requiring a comprehensive approach that is mindful of the state-by-state variability in tax code, enforcement programs, and geographic location that largely determine levels of evasion.

This report provides a methodology flexible enough to estimate the EOE level for each of the aforementioned nine types of evasion using unique state-level data. The methodology provides a strategy that allows the sum of the individual types of EOE to equal the amount of total EOE. The strategy implies that no one approach can be used to accurately estimate overall motor fuel tax EOE in a state. The level and quality of compliance and enforcement differs by state and therefore, the approach to calculating EOE also must differ. The methodology is presented in Chapter 5.

6.5 Disseminating the Outcome of the Research Project

We would propose a two-step process to disseminate the outcomes of this project. The first step would include developing a website that included the report. The second step would include hosting sessions at the 2009 TRB Meeting and the 2008 FTA Motor Fuel Tax Section Annual Meeting.

A website similar to the one prepared for the Highway Economic Requirements System—State Version (HERS-ST) (HERS-ST 2005) could be developed that includes the project report and decision framework developed in Chapter 5 outlining the steps needed to calculate evasion based on the type and quality of data available for each state.

In the second step, sessions could be hosted at the 2009 TRB Meeting and the 2008 Motor Fuel Tax Section Annual Meeting. NCHRP staff or the Battelle team could host these sessions. It should be noted that none of these steps are a part of the NCHRP 19-06 scope; therefore, they are not funded.

References

Addanki, S., Cohen, Y., and Dunbar, F. Gasoline Tax Evasion. *National Economic Research Associates.* Washington, D.C., January 1987.

Alderman, Pam, North Carolina Motor Fuel Tax of the Department of Revenue. Personal communication, February 2005.

American Petroleum Institute. *Historical Trends in Motor Gasoline Taxes, 1918–2002.* Washington, D.C., 2002.

Anders-Robb, Cindy, Federation of Tax Administrators. Personal communication, October 2004.

Auerbach, Alan. On the Performance and Use of Government Revenue Forecasts. University of California, Berkeley and the National Bureau of Economic Research, July 1999. http://www.kerosun.com/irstax.htm

Balducci, P. Current Rates of Evasion in the Areas of Federal Motor Fuel and Other Highway Use Taxes: Task 7 Report. Prepared by the Battelle Memorial Institute for the Federal Highway Administration. Portland, OR. July 2004.

Balducci P., Weimar, M., Whitmore, S., Fathelrahman, E., Scovell, L., and Johnson, D. Determining the Current Rates of Motor Fuel Tax Evasion for the State of Montana. Prepared for the Montana Department of Transportation. Report FHWA/MT-06-007/8180. November 2006.

Baluch, S. Revenue Enhancement Through Increased Motor Fuel Tax Enforcement. FHWA, Office of Policy Development (HPP-13). Washington, D.C., January 1996.

Battelle Memorial Institute and National Renewable Energy Laboratory. Vehicle Technology Assessment for MPG Impact and Forecast Highway Revenue Forecasting Model (HRFM). *Fuel Module,* Columbus, Ohio, July 2001.

Bergstom, Sgt. Glen., Minnesota Department of Public Safety. Personal communication, March 7, 2005.

Billstone, Robert, Texas Comptroller of Public Accounts investigator. Personal communication, February 2005.

Bisson, B. and Gould, D. Methodology for Evaluation of Truck Weight Regulation Enforcement Programs. In *Transportation Research Record 1249,* TRB, National Research Council, Washington, D.C., 1989, pp. 16–17.

Bloomquist, Kim M. Tax Evasion, Income Inequality, and Opportunity Costs of Compliance. *Proceedings, 96th Annual Conference on Taxation,* National Tax Association, Washington, D.C., 2004, pp. 91–104.

Brand, Phil. Compliance: A 21st Century Approach. *National Tax Journal,* Vol. 49, No. 3, 1996, pp. 413–19.

Brimacombe, Joseph, R. Statement of Joseph Brimacombe, Deputy Director, Compliance Policy, Small Business and Self Employed Operating Division, Internal Revenue Service. Testimony before the Full Committee of the House Committee on Ways and Means. Washington D.C., July 17, 2003.

Burwell, Mary, Internal Revenue Service. Personal communication, March 8, 2005.

California Environmental Protection Agency, Air Resources Board. Report of Enforcement Activities for January 1–December 31, 2003. Sacramento, California. 2004, p. 44.

Casavant, K. and Lenzi, J. An Economic evaluation of the Fee and Fine Structure for Overloaded Trucks in Washington. *Transportation Quarterly,* Vol. 47, No. 2, 1993, pp. 281–294.

Center for Balanced Public Policy. *Motor Fuel Distribution System.* Draft report. Federal Highway Administration, Washington, D.C., March, 2004a.

Center for Balanced Public Policy. *Current Rates of Evasion in the Areas of Federal Motor Fuel and Other Highway Use Taxes: Motor Fuel Excise Tax Evasion Schemes.* Draft report. Federal Highway Administration, Washington, D.C., March, 2004b.

Chevron. *Diesel Fuels Technical Review* (FTR-2). Chevron Products Company, a division of Chevron U.S.A., 1998. http://www.chevron.com/prodserv/fuels/bulletin/diesel/L1_toc_rf.htm

Church, R. and Mergel, J. *Effectiveness of Violator Penalties in Compelling Compliance with State Truck Weight Limits.* Report No. FHWA-OP-00-032. Volpe National Transportation Systems Center, Cambridge, Mass., 2000.

Council of State Governments and Council of Governors' Policy Advisors. *Road Fund Tax Evasion: A State Perspective.* Lexington, Kentucky, 1996.

Crown, William H. *Statistical Models for the Social and Behavioral Sciences: Multiple Regression and Limited-Dependent Variable Models.* Praeger, Westport, Conn., 1998, pp. 143–148.

Cunagin, W., Mickler, W., and Wright, C. Evasion of Weight-Enforcement Stations by Trucks. In *Transportation Research Record 1570,* TRB, National Research Council, Washington, D.C., 1997, pp. 181–190.

Davis, Stacy C. *Transportation Energy Data Book, Edition 20.* U.S. Department of Energy, Center for Transportation Analysis, Oak Ridge National Laboratory, ORNL 6959, Oak Ridge, Tennessee, October 2000.

Denison, D. and Hackbart, M. *The Motor Fuel Tax Evasion Issue in Kentucky KTC-96-6.* Kentucky Transportation Center, Lexington, Kentucky, July 1996.

Denison, D. and Eger, Robert J. Tax Evasion from a Policy Perspective: The Case of the Motor Fuels Tax. *Public Administration Review,* Vol. 60, No. 2, April 2000.

Downs, H. *NCHRP Synthesis of Highway Practice 82: Criteria for Evaluation of Truck Weight Enforcement Programs.* TRB, National Research Council, Washington, D.C., 1981.

Due, John F. and Mikesell, John L. *Sales Taxation: State and Local Structure and Administration.* The Johns Hopkins University Press, 1983.

Eger, Roger and Hackbart, Merle. State Road Fund Revenue Collection Processes: Differences and Opportunities of Improved Efficiency. *Research Report KTC-01-17/SPR-99-192-1F,* Lexington, Kentucky, July 2001. http://www.ktc.uky.edu/Reports/KTC_01_17_SPR192_99_1F.pdf

Eger, Robert. *Wisconsin's Off-Road Fuel-Tax Collection Process: A Midwestern Comparative Analysis and Assessment.* Final Report SPR 0092-02-08. Wisconsin Department of Transportation, Madison, Wisconsin, 2002.

Eger, Robert J. III., Knudson, Deborah A., Marlowe, Justin, and Verbos, Amy. Agricultural Off-Road Fuel-Tax: A Midwestern Comparative Analysis and Assessment. In *Transportation Research Record: Journal of the Transportation Research Board, 1839,* Transportation Research Board of the National Academies, Washington, D.C., 2003, pp. 174–80.

Eger, Robert J. and Hackbart, Merl. Road Fund Tax Compliance: An Analysis of Enhancement Strategies. *Public Budgeting and Finance,* Spring 2005, pp. 66–83.

Estes, Captain Coral, Washington State Patrol. Personal communication, March 1, 2005.

Euritt, M. Economic Factors of Developing Fine Schedules for Overweight Vehicles in Texas. In *Transportation Research Record* 1116, TRB, National Research Council, Washington, D.C., 1987, pp. 31–39.

Federal Highway Administration. *Fuel Tax Evasion: The Joint Federal/State Motor Fuel Tax Compliance Project.* U.S. Department of Transportation, Washington D.C., June 1992.

Federal Highway Administration. *Joint Federal/State Motor Fuel Tax Compliance Project, Fiscal Year 1994 Midyear Report.* FHWA-PL-95-040. U.S. Department of Transportation, November 2, 1994.

Federal Highway Administration. *Joint Federal/State Motor Fuel Tax Compliance Project, Fiscal Year 1993 Status Report.* FHWA-PL-94-017, U.S. Department of Transportation, Washington, D.C., February 7, 1994b.

Federal Highway Administration. *Tax Evasion Highlights.* U.S. Department of Transportation. Washington D.C., March 1995.

Federal Highway Administration. *Federal Highway Cost Allocation Study Final Report.* U.S. Department of Transportation, Washington D.C., August 1997. http://www.ota.fhwa.dot.gov/hcas/final/four.htm

Federal Highway Administration. *FHWA Motor Fuel Reporting Information Committee Meeting Summary.* U.S. Department of Transportation, Washington D.C., December 10–11, 1998a.

Federal Highway Administration. *TEA-21 and Estimation of Highway Trust Fund Tax Receipts Attributable to Highway Users in Each State.* Office of Highway Information Management, U.S. Department of Transportation, Washington D.C., August 1998b.

Federal Highway Administration. *Highway Taxes and Fees, How They Are Collected and Distributed.* FHWA-PL-98-036, U.S. Department of Transportation, Washington D.C., May 1998c.

Federal Highway Administration. *Joint Federal/State Motor Fuel Tax Compliance Project Steering Committee Meeting Minutes.* U.S. Department of Transportation, Washington D.C., March 8, 1999a.

Federal Highway Administration. *Motor Fuel Tax Evasion Summary.* U.S. Department of Transportation, Washington D.C., December 20, 1999b. http://www.fhwa.dot.gov/policy/summ.htm

Federal Highway Administration. *Revenue Impact of Diesel Fuel Dyeing.* U.S. Department of Transportation, Washington D.C., December 17, 1999c. http://www.fhwa.dot.gov/policy/fueldye.htm

Federal Highway Administration. *Predicting a State's Special Fuels Usage.* FHWA draft report prepared by Battelle Memorial Institute. U.S. Department of Transportation, Washington, D.C., June 21, 1999d.

Federal Highway Administration. Comprehensive Truck Size and Weight Study, Chapter 7. *Enforcement of Truck Size and Weight Regulations,* U.S. Department of Transportation, Washington, D.C., 2000a. http://www.fhwa.dot.gov/reports/tswstudy/vol2-chapter7.pdf.

Federal Highway Administration. Addendum to the 1997 Federal Highway Cost Allocation Study Final Report. U.S. Department of Transportation, Washington D.C., 2000b. http://www.fhwa.dot.gov/policy/hcas/addendum.htm

Federal Highway Administration. *Highway Statistics.* Office of Policy Information. U.S. Department of Transportation, Washington D.C., 1981–2000.

Federal Highway Administration. *Joint Federal/State Motor Fuel Tax Compliance Project Steering Committee Meeting Minutes.* U.S. Department of Transportation, Washington, D.C., April 2, 2001.

Federal Highway Administration. *Joint Federal/State Motor Fuel Tax Compliance Project Steering Committee Meeting Minutes.* U.S. Department of Transportation., Washington D.C., April 8, 2002.

Federal Highway Administration. *Joint Federal/State Motor Fuel Tax Compliance Project Steering Committee Meeting Minutes.* U.S. Department of Transportation, Washington D.C., October 7, 2003b.

Federal Highway Administration. *Highway Statistics 2002.* Office of Highway Policy Information, Washington, D.C., November 2003a.

Federal Highway Administration. *Highway Taxes and Fees: How They Are Collected and Distributed—2001.* U.S. Department of Transportation, Washington, D.C., 2001. http://www.fhwa.dot.gov/ohim/hwytaxes/2001/pt8.htm http://www.fhwa.dot.gov/ohim/hwytaxes/2001/pt7.htm http://www.fhwa.dot.gov/ohim/hwytaxes/2001/pt9.htm

Federal Motor Carrier Safety Administration. *Roadside Inspection and Traffic Enforcement Effectiveness Annual Report.* Safety Program Effectiveness Measurement: Intervention Model, FMCSA-RI-04-029. Washington, D.C., 2004.

Federal Register. Vol. 69, No. 146, Friday, July 30, 2004 pp. 45587–45589.

Federation of Tax Administrators. *Survey of Native American Issues.* Motor Fuel Tax Section, Cheyenne, Wyoming, September 2002a.

Federation of Tax Administrators. State Table of Fuel Taxation Points and Allowances. December 2002b. http://www.taxadmin.org/fta/mf/allowance.pdf.

Federation of Tax Administrators. Motor Fuel Tax Section Uniformity Project. September 2003.

Federation of Tax Administrators. *Points of Taxation.* Washington, D.C., August 20, 2004a.

Federation of Tax Administrators. *ExSTARS/ExTOLE Presentation.* August 2004b. http://www.taxadmin.org/fta/meet/01am_pres/andersgen.pdf.

Federation of Tax Administrators. ExFIRS Background. August 2004c. http://www.taxadmin.org/fta/mf/exfirs_back.html

Feinstein, Jonathan S. *Statistical Analysis of Compliance Using NRP Data: Detection Controlled Models,* 2003.

Fepke, E. and Clayton, A. Quantitative Assessment of Effect of Enforcement Intensity on Violation Rates of Vehicle Weight and Dimension Regulations. *Transportation Planning and Technology,* Vol. 18, No. 2, 1994.

Festin, S. Summary of National and Regional Travel Trends: 1970–1995. Federal Highway Administration, Washington D.C., May 1996.

Gittings, G. and Narayan, B. Federal Highway Revenue Estimation: Cost Allocation Perspective. In *Transportation Research Record, 1558,* TRB, National Research Council, Washington, D.C., 1996, pp. 1–7.

Grenzeback, L. R., Stowers, J. R., and Boghani, A. B. *NCHRP Report 303: Feasibility of a National Heavy-Vehicle Monitoring System.* TRB, National Research Council, Washington, D.C., 1988.

Grundmanis, G. *Use of Weigh-In-Motion Collected Data In Planning, Pavement Design, and Weight Enforcement.* Task 4: Truck Avoidance of Enforcement Scales: Field Study Results From a Combined Enforcement/Planning Perspective, Wisconsin DOT and U.S. DOT, Madison, Wisconsin, 1989.

Gujarati, Damodar. *Basic Econometrics.* McGraw Hill, Inc., 1995. p. 572.

Hackbart, Merl and Ramsey, James. Estimating Tax Evasion Losses: The Road Fund Case. *Public Budgeting and Finance,* Spring 2001.

Hagquist, Ron and Doyle, Dawn. *Fuel Tax Hijacking: How State Governments Are Responding.* Government Finance Review, 1999.

Hallquist, Theresa E. A Comparison of Selected EIA-782 Data with Other Data Sources. *Petroleum Marketing Monthly.* Energy Information Administration, Washington, D.C., December 1999.

Halsne, Chris. Team 7 Investigators Catch Cheaters Buying Tax-Free Gas. KIROTV. 2002. http://www.kirotv.com/investigations/1871502/detail.html.

Harper, R. Comparisons of Independent Petroleum Supply Statistics. *Petroleum Supply Monthly.* Energy Information Administration, Washington, D.C., December 2000.

Heckman, J. The Common Structure of Statistical Models of Truncation, Sample Selection, and Limited Dependent Variables and a Simple Estimator for Such Models. *Annals of Economic and Social Measurement,* Vol. 5, 1976, pp. 475–492.

HERS-ST. Highway Economic Requirements System, State Version, 2005. http://www.fhwa.dot.gov/infrastructure/asstmgmt/hersindex.htm

Hildebrand, M. Enforcement of Highway Weight Regulations: A Game Theory Model. *Journal of the Transportation Research Forum,* Vol. 30, No. 2, 1990.

Hu, Patricia, Trumble, David, and Lu, An. *Fuel Used for Off-Highway Recreation.* ORNL-6794, Oak Ridge National Laboratory, July 1994.

Hwang, Ho-Ling. Draft Technical Memorandum on Literature Review of Existing Methods and Models on Revenue Estimation. Working paper. Oak Ridge National Laboratory, November 2000.

Hwang, Ho-Ling, Truett, Lorena F., and Davis, Stacy C. The Federal Highway Administration Gasohol Consumption Estimation Model. Oak Ridge National Laboratory ORNL/TM-2003/210, 2003a.

Hwang, Ho-Ling, Truett, Lorena F., and Davis, Stacy C. A Study of the Discrepancy Between Federal and State Measurements of On-Highway Motor Fuel Consumption. Oak Ridge National Laboratory ORNL/TM-2003/171, 2003b.

Internal Revenue Service. Statistics of Income Bulletin. Washington, D.C., 1993–2002.

Internal Revenue Service. Internal Revenue Report of Excise Taxes. Washington, D.C., 1981–1993.

Internal Revenue Service. Motor Fuel Excise Tax. *EDI Guide,* Washington, D.C., 1981–1993. http://www.irs.gov/pub/irs-pdf/p3536.pdf

Internal Revenue Service. Criminal Investigation Annual Report, 2001.

Internal Revenue Service. FY2004 Examples of Excise Tax Fraud Investigations. Accessed online January 2005: http://www.irs.gov/compliance/enforcement/article/0,,id=129060,00.html

International Fuel Tax Association, Inc. Last accessed June 2006. http://www.iftach.org/.

International Registration Plan. *International Registration Plan.* Arlington, Virginia, 2004.

Jack Faucett Associates. Adequacy and Effectiveness of Roadside Inspection Procedures: Relative Effectiveness of Level I, II, and III Roadside Inspections. DTFH61-90-C-00013, Federal Highway Administration, Washington, D.C., July 1992.

Jack Faucett Associates. *Fuel Efficiency, Alternative Fuels, and Highway Trust Fund Revenues.* Bethesda, Maryland, February 1995.

Jessup, Eric L. and Casavant, K. L. Evaluation of Violation and Capture Of Overweight Trucks: A Case Study. Washington Department of Transportation Report WA-RD 353.4, 1996.

Joint Committee of Taxation. Written Testimony of the Staff of the Joint Committee on Taxation Regarding the Revenue Estimating Process. JCX-1-95. Washington, D.C., January 1995.

Joint Committee of Taxation. Chairman's Amendment Relating to Extension of Highway Trust Fund Excise Taxes and Related Trust Fund Provisions. Revenue Title to H.R. 2400. Washington, D.C., March 1998.

Joint Federal/State Motor Fuel Tax Compliance Project. Nineteenth Steering Committee Meeting on March 8, 1999. Draft report, June 14, 1999.

Jorgenson D. *Growth, Vol. 1. Econometric General Equilibrium Modeling.* MIT Press. Cambridge, Massachusetts, 1998.

KPMG Consulting, Inc. Motor Fuel Excise Tax Revenue Leakage Analysis. Center for Balanced Public Policy, Washington, D.C., 2001.

Lantz, Brenda. *Analysis of Roadside Inspection Data and Its Relationship to Accident and Safety.* Compliance Review Data and Reviews of Previous and Ongoing Research in These Areas, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, North Dakota, 1993.

Lantz, Brenda. *Evaluation of the Differences between Spontaneous and Anticipated Roadside Inspections of Motor Carriers.* Compliance Review Data and Reviews of Previous and Ongoing Research in These Areas, Upper Great Plains Transportation Institute, North Dakota State University, Fargo, North Dakota, 1994.

Law, Russell. *Procedure for Determining Fuel-Tax Evasion and Underreporting Among Motor Carriers and the Results for Nevada Before and After Changing the Point of Diesel-Fuel Taxation.* Report for the Nevada Department of Transportation, July 27, 1999.

Lazzari, Salvatore. *The Tax Treatment of Alternative Transportation Fuels.* CRS Report for Congress. National Council for Science and the Environment, Washington, D.C., 1997.

McKane, David, Oregon Department of Transportation. Personal communication, February 16, 2005.

Malik, Mazen, Oregon Department of Transportation. Personal communication (e-mails) Salem, Oregon, 2002.

Marley, J. T. *Enforcement of Ontario's Fuel and Gasoline Tax Legislation.* Special Investigations Branch of the Ministry of Finance, Province of Ontario, Canada, November 1994.

Mingo, R., Chastain, R., Mingo J., and Cummings, S. *Diesel Fuel Fee Non-Compliance Study.* Report for the Oregon Department of Transportation, Salem, Oregon, March 1996.

Ministry of Provincial Revenue. *International Fuel Tax Agreement Operating Manual for BC Carriers-2004.* Province of British Columbia, 2004.

Mitstifer, Glen. Shortfalls in Highway Trust Fund Collections: Hearing Before the Subcommittee on Investigations and Oversight. Representing National Association of Truck Stop Operators, Washington, D.C., May 1992, p. 238.

Nebraska Department of Revenue. *Motor Fuels Update.* Fall 2004.

Nevada Highway Patrol, Central Command. *Safestat Report.* 2004.

New Jersey Commission of Investigation. *Motor Fuel Tax Evasion: Hearing Before the State of New Jersey Commission of Investigation.* Trenton, New Jersey, 1990.

New Jersey Commission of Investigation. Motor Fuel Tax Evasion. Trenton, New Jersey, February 1992.

North Carolina Department of Revenue. Lenoir Trucker Guilty of State Fuel Tax Evasion. Press release, December 12, 2002.

Office of the Inspector General. Federal Contractor Jailed in $684,000 Motor Fuel Tax-Evasion Scam. Department of Transportation press release, Washington, D.C., December 17, 2003.

Oregon Department of Transportation. Statewide Vehicle Miles of Travel (VMT) Study. Report FHWA-HEP-99-007. David Evans and Associates and Cambridge Systematics, 2000.

Oum, T., Waters, W., and Young, J. A Survey of Recent Estimates of Price Elasticities of Demand for Transport. *Planning and Research Working Paper,* Policy, Infrastructure and Urban Development Department, The World Bank, Washington, D.C., January 1990.

Paxson, D. and Glickert, J. Value of Overweighting to Intercity Truckers. In *Transportation Research Record 889,* TRB, National Research Council, Washington, D.C., 1982, pp. 33–37.

Penniman, Clara. *State Income Taxation.* The Johns Hopkins University Press, 1980.

Peters, Mary E. Statement of Mary E. Peters, Administrator Federal Highway Administration, Before the Committee on Finance United States Senate. *Hearing on Schemes, Scams and Cons: Fuel Tax Fraud.* Washington, D.C., July 12, 2002.

Pickrell, Don and Schimek, Paul. *Trends in Personal Motor Vehicle Ownership and Use: Evidence from the National Personal Transportation Survey.* Cambridge, Massachusetts, 1998.

Pickrell D. and Schimek P. Trends in Motor Vehicle Ownership and Use: Evidence from the Nationwide Personal Transportation Survey. *Journal of Transportation and Statistics,* Washington, D.C., May 1999.

RAILING. *User Guide for the 2002 Surface Transportation Board Carload Waybill Sample.* Cary, North Carolina, August 2003.

Raven, Ronald. *Deliver Us From Evil: Governmental Responses to Reports of Fuel Tax Evasion.* Washington, D.C., 1999.

Reistma, Wayne, Manager of Commodity Tax Auditing, Alberta Canada. Personal communication, 2005.

Reno, A. T. *NCHRP Report 164: Measures to Curtail State Fuel Tax Evasion.* TRB, National Research Council, Washington, D.C., 1990.

Reno, Arlee T. *Measures to Curtail State Fuel Tax Evasion.* The Urban Institute, Washington, D.C., October 1990.

Reno, Arlee and Stowers, Joseph. *NCHRP Report 377: Alternatives to Motor Fuel Taxes for Financing Surface Transportation Improvements.* TRB, National Research Council, Washington, D.C., 1995.

Revenue Canada. Chapter 18, Excise Duties and Taxes on Selected Commodities. *Report of the Auditor General of Canada,* Ottawa, Canada, 1996.

Runde, Al. *Motor Vehicle Fuel and Alternative Fuel Tax.* Informational Paper 40. Wisconsin Legislative Fiscal Bureau, Madison, Wisconsin, 2003.

Sansfaçon, Georges. Canadian/USA Motor Fuel Northeastern. Tax Compliance Initiative, IFTA, Presentation at IFTA Law Enforcement Seminar, October 2004.

Sinha K. and Varma A. Long-Term Highway Revenue Forecasting for Indiana. In *Transportation Research Record 1576,* TRB, National Research Council, Washington, D.C., 1997, pp. 46–55.

Stanley, T. D. Wheat From Chaff: Meta-Analysis As Quantitative Literature Review. *The Journal of Economic Perspectives,* Vol. 15, No. 3, 2001, pp. 131–150.

State of Alabama. 2005. Untitled webpage accessed online at: http://www.ador.state.al.us/motorfuels/diver_evade.htm

State of Arkansas. Receipts schedule. 2005. Accessed online at: http://www.arkansas.gov/dfa/excise_tax_v2/mf_pdf/r.pdf

State of Arkansas. Disbursements Schedule. 2005. Accessed online at: http://www.arkansas.gov/dfa/excise_tax_v2/mf_pdf/d.pdf

State of Mississippi. Distributor Information. 2005. Accessed online at: http://www.mstc.state.ms.us/taxareas/petrol/booklet.pdf

State of Virginia. Application for Bond. 2005. Accessed online at: http://www.dmv.state.va.us/webdoc/pdf/ft462.pdf

State of Virginia. Blender's Report. 2005. Accessed online at: www.dmv.state.va.us/webdoc/pdf/ft471.pdf

State of Washington, Department of Revenue. Research Report #2003-1. January 17, 2003.

State of Wisconsin. License Application. 2005. Accessed online at: http://www.dor.state.wi.us/forms/excise/mf-100.pdf

Statistics Canada. Standard Classification of Transportation Goods Classification 2003. 2003. Accessed online at: http://www.statcan.ca/english/Subjects/Standard/sctg/sctg-class.htm#35

Taylor, Tony, Manager of Field Operations, Audit and Inspection of the Motor Fuels and Tobacco Tax Branch of Finance in Ontario. Personal communication, February 2005.

Turner, Bob, Montana Fuel Tax Administrator. Personal communication, November 2004.

Texas Transportation Institute. Urban Mobility Database. http://mobility.tamu.edu/

Special Report 267: Regulation of Weights, Lengths, and Widths of Commercial Motor Vehicles. Transportation Research Board of the National Academies, Washington, D.C., 2002.

Special Report 225: Truck Weight Limits: Issues and Options. TRB, National Research Council, Washington, D.C., 1990.

U.S. Army Corps of Engineers. Waterborne Commerce of the United States, Calendar Year 2002, Part. 5. *National Summaries,* New Orleans, Louisiana, June 2002.

U.S. Bureau of Economic Analysis. National Income & Product Tables. 2005. http://www.bea.gov/bea/dn/nipaweb/SelectTable.asp?Selected=Y

U.S. Bureau of Labor Statistics. 2005. http://www.bls.gov/ces/home.htm

U.S. Bureau of Transportation Statistics. *BLS Handbook of Methods,* Chapter 2. U.S. Labor Department, Washington, D.C., October 2001.

U.S. Census Bureau. 1995 Statistical Abstract of the United States. http://www.census.gov/prod/1/gen/95statab/app3.pdf

U.S. Census Bureau. *U.S. Vehicle Inventory and Use Survey—VIUS—1997.* Washington, D.C., October 1999. Other 1992, 1987, 1982, are found under Truck Inventory and Use Survey.

U.S. Census Bureau. *Census 2000 Basics.* Washington, D.C., September 2002a.

U.S. Census Bureau. *Vehicle Inventory and Use Survey.* Washington, D.C., 2002b. http://www.census.gov/svsd/www/02vehinv.html

U.S. Department of Commerce, Bureau of the Census and the United States Department of Transportation, Bureau of Transportation Statistics 2003. *2002 Commodity Flow Survey* (Preliminary). Washington, D.C., December 2003.

U.S. Congressional Research Service. The Federal Excise Tax on Gasoline and The Highway Trust Fund: A Short History, CRS Issue Brief for Congress. March 29, 2000. http://www.cnie.org/nle/trans-24.htm.

U.S. Congress. Written Testimony of the Staff of the Joint Committee on Taxation Regarding the Revenue Estimating Process. JCX-1-95. January 9, 1995a.

U.S. Congress. Methodology and Issues in the Revenue Estimating Process. JCX-2-95. January 23, 1995b.

U.S. Congress. Description of S. 436 (The Intercity Passenger Rail Trust Fund Act of 1997) and of Present-Law Provisions Relating to Federal Excise Taxes Imposed on Transportation Motor Fuels. JCX-12-97. April 21, 1997.

U.S. Congress. Chairman's Amendment Relating to Extension of Highway Trust Fund Excise Taxes and Related Trust Fund Provisions. Revenue Title to H.R. 2400, JCX-15R-98. March 25,1998a.

U.S. Congress. Summary of Revenue Provisions Contained in Legislation Enacted in the 105th Congress. JCX-75-98. November 19, 1998b.

U.S. Congress. Present Law and Description of Proposals Relating to Federal Income Tax Provisions That Impact Energy, Fuel, and Land Use Conservation and Preservation. JCX-84-00. July 24, 2000.

U.S. Department of Energy. *Fuel From Farms: A Guide to Small Scale Ethanol Production.* May 1980, p. D-3.

U.S. Department of Energy. 1994 Residential Transportation Energy Consumption Survey. DOE/EIA-0464(94). Energy Information Administration, Washington D.C., 1997.

U.S. Department of Energy. The Transportation Sector Model of the National Energy Modeling System, Model Documentation Report. DOE/EIA-M070 (2000). Energy Information Administration, Washington, D.C., February 2002.

U.S. Department of Energy. *The Short-Term Energy Modeling System.* Energy Information Administration, Washington, D.C., February 2002. http://www.eia.doe.gov/emeu/steo/model/stem.html Accessed February 2002.

U.S. Department of Energy. The National Energy Modeling System: An Overview 2000. DOE/EIA-0581 (2003), Energy Information Administration, Washington, D.C., 2003.

U.S. Department of Energy, Energy Information Administration. *2002 Petroleum Marketing Annual,* Table 49. Prime Supplier Sales Volumes of Aviation Fuels, Propane, and Residual Fuel Oil by PAD District and State. Washington, D.C., 2002.

U.S. Department of Energy. *Petroleum Supply Annual 2003.* DOE/EIA-0340(03). Energy Information Administration, Washington, D.C., 2003a.

U.S. Department of Energy. *Fuel Oil and Kerosene Sales Report 2003.* DOE/EIA-0535(02). Energy Information Administration, Washington, D.C., November, 2003b.

U.S. Department of Justice. *New Yorker Sentenced to Prison and Ordered to Pay $1.3 Million in Restitution for Motor Fuel Excise Tax Fraud. Press release.* February 14, 2002.

U.S. Department of Transportation. *Revenue Impact of Diesel Fuel Dyeing.* Washington, D.C., 1995.

U.S. Department of Transportation. *Financing Federal-Aid Highways.* Washington, D.C., August 1999.

U.S. Department of Transportation. Minutes of the 20th Joint Federal/State Motor Fuel Tax Compliance Project Steering Committee Meeting. Washington D.C., April 2000.

U.S. Department of Transportation. Volpe Center, Analysis and Information. Program Measures Overview. 2005. http://ai.volpe.dot.gov/Help/Help.asp#ri1, accessed March 14, 2005.

U.S. Department of Treasury. Revenue Effects of Major Tax Bills, Office of Tax Analysis. Working paper 81. Washington, D.C., December, 1998.

U.S. General Accounting Office. Status of Efforts to Curb Motor Fuel Tax Evasion. Report to Congressional Requesters. Washington, D.C., May 1992.

U.S. General Accounting Office. *Tax Administration: Diesel Fuel Excise Tax Change.* (GAO/GGD-96-53). Washington, D.C., January 1996.

U.S. General Accounting Office. *Highway Funding: The Federal Highway Administration's Funding Apportionment Model.* (GAO/RCED-97-159). Washington, D.C., June 1997.

U.S. General Accounting Office. *Highway Funding: Problems with Highway Trust Fund Information Can Affect State Highway Funds.* Washington D.C., June 2000.

Virginia Department of Motor Vehicles. *Commonwealth Transportation Fund: Preliminary Revenue Estimates.* Richmond, Virginia, November 2000.

Walters, Dar. Personal communication, December 2004.

Washington Interagency Revenue Task Force. *Transportation Economic and Revenue Forecasts.* Olympia, Washington, February 2000.

Washington State Legislative Transportation Committee. *Fuel Tax Evasion in Washington State.* Olympia, Washington, 1996.

Washington State Patrol. *Fuel Fraud Task Force, Fraud Case Estimates for 2002 and 2003.* Olympia, WA, 2005. http://www.wsp.wa.gov/crime/fueltax.htm.

Weimar, M. R., Balducci, P. J., Roop, J. M., Scott., M. J., and Hwang, H. L. Economic Indicators of Federal Motor Fuel Excise Tax Collections. Prepared by Pacific Northwest National Laboratory and Oak Ridge National Laboratory for the U.S. Internal Revenue Service. August 2002.

Weinblatt, H., Stowers, J. R., Mingo, R. D., and Wheeler, P. *NCHRP Report 416: Alternative Approaches to the Taxation of Heavy Vehicles.* TRB, National Research Council, Washington, D.C., 1998.

Wisconsin Department of Transportation. *Wisconsin Department of Transportation Revenue Forecasting Model Documentation.* Madison, Wisconsin, July 2001.

APPENDIX A

Glossary

Additives: Substances added to diesel or gasoline fuel to improve its qualities or in the case of tax evasion untaxed substances which are added to increase the volume of the product sold. Substances include: methyl alcohol, ethyl alcohol (ethanol), tertiary butyl alcohol (TBA), isopropyl alcohol, normal butyl alcohol, isobutyl alcohol, methyl tertiary butyl ether (MTBE), tertiary amyl methyl ether (TAME), di-isopropyl ether.

Aviation Gasoline (Finished): A complex mixture of relatively volatile hydrocarbons with or without small quantities of additives, blended to form a fuel suitable for use in aviation reciprocating engines. Fuel specifications are provided in ASTM Specification D 910 and Military Specification MIL-G-5572.

Barrel: A volumetric unit of measure for crude oil and petroleum products equivalent to 42 U.S. gallons.

Biodiesel: A petroleum diesel fuel substitute that is manufactured from vegetable oils, animal fats, or recycled greases combined with alcohol (ethanol or methanol) in the transesterification process.

Blending: Mixing of two compatible fuels having different properties in order to produce an intermediate fuel.

Blendstocks: Any petroleum product component of gasoline: straight-run gasoline, raformate, alkylates, butane, pentane, hexane, hydrocrackate, toluene, straight-run naphtha, catalytically cracked gasoline, thermally cracked gasoline, coker gasoline, polymer gasoline, natural gasoline, pentane mixture, raffinates, isomerate, butenes, aviation gasoline.

Bulk: Any quantity of fuel sold or delivered except into fuel supply tanks of vehicles.

Bulk Facility: A facility that receives gasoline and/or diesel fuel by pipeline, rail, or barge and then delivers the fuel into a cargo tank or barge. The term does not include petroleum products consumed at an electric generating facility.

Cargo Tanks: An assembly used for transporting, hauling or delivering liquids, comprising a tank, which may be one compartment or may be subdivided into two or more compartments mounted on a wagon, automobile, truck, trailer or wheels, together with its accessory piping, valves and meters, excluding fuel supply tanks connected to the carburetor or fuel injector of a motor vehicle.

Daisy Chain: Daisy chain operations are a type of motor fuel tax evasion scheme common to a system that collects motor fuel taxes at the wholesale level. Perpetrators take advantage of the fact that, under this system, a licensed distributor may sell fuel tax free to another licensed distributor. Perpetrators establish a chain of companies and make a series of fuel sales on paper. The company in the chain that sells the fuel to an unregistered company would be responsible for owing the tax. This company – called the burn company – would dissolve before the tax was remitted to the revenue agency. Organized crime was commonly responsible for establishing these daisy chain operations.

Dealer: A person who is the operator of a service station or other retail outlet who delivers motor fuel into the fuel supply tanks of motor vehicles or motorboats.

Distillate Fuel Oil: A general classification for one of the petroleum fractions produced in conventional distillation operations. Products known as No. 1, No. 2, and No. 4 diesel fuel are used in on-highway diesel engines, such as those in railroad locomotives and agricultural machinery. Products known as No. 1, No. 2, and No. 4 fuel oils are used primarily for space heating and electric power generation.

Distributor: A person who regularly makes sales or distributions of gasoline which are not deliveries into the fuel supply tanks of motor vehicles, motorboats, or aircraft, or who refines, distills, manufactures, produces, or blends for sale or distribution tax-free gasoline in this state, imports or exports tax-free gasoline other than in the fuel supply tanks of motor vehicles, or in any other manner acquires or possesses tax-free gasoline.

Dyed Diesel: Diesel fuel to which color has been added to indicate that is not suitable for use in vehicles that are driven on highways and public roads.

Electronic Data Interchange (EDI) - The computer-to-computer exchange of structured information, by agreed message standards, from one computer application to another by electronic means and with a minimum of human intervention.

Electronic Funds Transfer (EFT): An electronic method used to remit funds directly from a bank account.

Ethanol: Ethanol can be produced chemically from ethylene or biologically from the fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues from crops or wood.

Excise Tax: A tax on the sale or use of specific products or transactions.

Fuel Oil: The heavy distillates from the oil refining process; used as fuel for power stations, marine boilers.

Gas Plant Operator: Any firm, including a gas plant owner, which operates a gas plant and keeps the gas plant records. A gas plant is a facility in which natural gas liquids are separated from natural gas, or in which natural gas liquids are fractionated or otherwise separated into natural gas liquid products or both.

Gasohol: A blend of finished motor gasoline containing alcohol (generally ethanol but sometimes methanol) at a concentration of 10 percent or less by volume.

International Fuel Tax Agreement (IFTA): A base state fuel tax agreement among jurisdictions to simplify the reporting of fuel taxes by interstate motor carriers. Upon application, the carrier's base jurisdiction issues credentials which allow the IFTA licensee to travel in all IFTA jurisdictions.

International Fuel Tax Association, Inc. (IFTA, Inc.): A national organization that maintains a base state fuel tax agreement among participating jurisdictions in order to simplify the reporting of fuel taxes by interstate motor carriers. Upon application, the carrier's base jurisdiction issues credentials which allow the IFTA licensee to travel in all IFTA jurisdictions.

International Registration Plan (IRP): A U.S. based plan that allows for the distribution of registration fees for commercial motor vehicles traveling inter-jurisdictionally through member states and provinces.

Kerosene: A light petroleum distillate that is used in space heaters, cook stoves, and water heaters and is suitable for use as a light source when burned in wick-fed lamps. Kerosene has a maximum distillation temperature of 400 degrees Fahrenheit at the 10-percent recovery point, a final boiling point of 572 degrees Fahrenheit, and a minimum flash point of 100 degrees Fahrenheit. Included are No. 1-K and No. 2-K, the two grades of kerosene called range or stove oil, which have properties similar to those of No. 1 fuel oil.

Kerosene-Type Jet Fuel: A kerosene-based product having a maximum distillation temperature of 400 degrees Fahrenheit at the 10-percent recovery point and a final maximum boiling point of 572 degrees Fahrenheit and meeting ASTM Specification D 1655 and Military Specifications MIL-T-5624P and MIL-T-83133D (Grades JP-5 and JP-8). It is used for commercial and military turbojet and turboprop aircraft engines.

Motor Gasoline (Finished): A complex mixture of relatively volatile hydrocarbons with or without small quantities of additives, blended to form a fuel suitable for use in spark-ignition engines. Motor gasoline, as defined in ASTM Specification D-4814 or Federal Specification VV-G-1690B, is characterized as having a boiling range of 122 to 158 degrees Fahrenheit at the 10 percent recovery point to 365 to 374 degrees Fahrenheit at the 90 percent recovery point. “Motor Gasoline” includes conventional gasoline; all types of oxygenated gasoline, including gasohol; and reformulated gasoline, but excludes aviation gasoline.

Naphtha: A generic term applied to a petroleum fraction with an approximate oiling range between 122 and 400 degrees Fahrenheit.

Naphtha-Type Jet Fuel: A fuel in the heavy naphtha boiling range with an average gravity of 52.8 degrees API, 20 to 90 percent distillation temperatures of 290 degrees to 470 degrees Fahrenheit, and meeting Military Specification MIL-T-5624L (Grade JP-4). It is used primarily for military turbojet and turboprop aircraft engines because it has a lower freeze point than other aviation fuels and meets engine requirements at high altitudes and speeds.

Pipeline Terminal: The storage and loading facilities at pipeline outlets, usually of the major oil companies.

Rack: A dock, a platform, or an open bay with metered pipes, hoses or both that is used for delivering motor fuel or special fuel from a refinery or terminal into the cargo area of a motor vehicle, rail car, marine vessel, or aircraft for subsequent transfer or use into the engine fuel supply tank of a locomotive or any self-propelled vehicle.

Rack Sales: Wholesale truckload sales or smaller of gasoline where title transfers at a terminal.

Refiner: A firm or the part of a firm that refines products or blends and substantially changes products, or refines liquid hydrocarbons from oil and gas field gases, or recovers liquefied petroleum gases incident to petroleum refining and sells those products to resellers, retailers, resellers/retailers, or ultimate consumers. "Refiner" includes any owner of products which contracts to have those products refined and then sells the refined products to resellers, retailers, or ultimate consumers.

Refinery: A plant used to separate the various components present in crude oil and convert them into usable products or feedstock for other processes.

Reseller: A firm (other than a refiner) that carries on the trade or business of purchasing refined petroleum products and reselling them to purchasers other than ultimate consumers.

Reseller/Retailer: A firm (other than a refiner) that carries on the trade or business activities of both a reseller and a retailer; i.e., purchasing refined petroleum products and reselling them to purchasers who may be either ultimate or other than ultimate consumers.

Splash Blend: To blend or mix two or more products together by merely adding one product to the other such as alcohol to gasoline in a cargo tank compartment or even a service station underground tank.

Tax Avoidance: An action taken to lessen tax liability and maximize after-tax income.

Tax Evasion: A failure to pay or a deliberate underpayment of taxes.

Terminal: Storage facility used in the wholesale segment of the industry usually comprised of a number of large-capacity tanks.

Wholesale or Jobber: A person who purchases tax-paid gasoline for resale or distribution at wholesale.

APPENDIX B

Interview Protocol

Project: National Cooperative Highway Research Program (NCHRP) "Identifying and Quantifying Rates of State Motor Fuel Tax Evasion."

Interview Introduction
We are conducting research for the National Cooperative Highway Research Program (NCHRP), "Identifying and Quantifying Rates of State Motor Fuel Tax Evasion," that is intended to document methods of fuel tax evasion, examine differences between states in administration and enforcement that may affect fuel tax evasion and create a methodology and model designed to estimate motor fuel excise tax evasion rates which will be made available to the states as a tool for use in their tax evasion programs.

State Enforcement and Auditing Practices
How does your state collect motor fuel taxes? What point in the distribution chain does your state tax motor fuel? In the last 10 years, has your state moved the point of taxation? If so, what was the impact of this shift? If not, have you considered changing the point of taxation?

What information do you require on your motor fuel excise tax forms? What sort of documentation must accompany motor fuel tax forms?

How does your state enforce and audit fuel tax collections? How many motor fuel tax auditors and enforcement officers does your state employ full-time? Part-time?
How have collection and enforcement procedures changed over time?

Has your state been involved in joint audits with other states? With the IRS?

How are gasohol and blended fuels treated?

Do you use paper, electronic, or some combination for tax payments?

Are refunds issued for non-taxable uses or some other purpose? If refunds, how are they administered? What information is required on refund claims?

What is the perceived revenue impact, or return on investment, of your enforcement programs? Which program elements are most successful? Have you found any correlation between new enforcement / compliance programs and evasion? For the recent past, can you provide gross and net assessment revenue (recoveries) by year by major fuel type?

What are the major issues that arise when auditing motor fuel excise tax returns? How would you characterize best practices as they relate to motor fuel tax auditing? If you do not follow best practice, why not (e.g., laws, cost)?

What are the penalties (civil and criminal) and fines for late payments, fraud and other forms of non-compliance?

Are you aware of any studies relating to state enforcement and auditing practices?

What are the overhead (e.g., administrative, compliance, enforcement) costs associated with your motor fuel tax programs, and what percentage of total tax collections do these costs represent? Can these estimates be verified in budget or other documents?

What is the perceived impact of public awareness and involvement programs on evasion? Has your agency/company ever provided any public service announcements or education (e.g., on who should pay, no dyed fuel on road, or other aspects of your fuel tax program)?

Evasion Techniques and Methods for Measuring and Curtailing Evasion

What evasion techniques are you aware of from experience?

What evasion techniques have you heard about as either occurring in other places or as conceptual possibilities?

Are you aware of any studies that document motor fuel tax evasion techniques?

Are you aware of any court cases or other public records that highlight innovative evasion techniques or the extent of evasion?

Looking at specific enforcement issues, does your state perform on-road inspections for dyed fuel? How are on-road inspections conducted in your state? Do you ever, or have you in the past, been involved in joint inspection efforts with IRS?

Has the dyed fuel requirement been effective? Consider both the inherent effectiveness and the level of enforcement in answering this question.

Is a lack of uniformity or variation in tax rates / systems between your state and other neighboring states creating an opportunity or incentive to evade taxes in your state?

Does your state coordinate with other government agencies, including inter- and intrastate as well as local and federal, regarding enforcement? Do you share information with your neighboring states? In what format (paper, electronic, etc.)? If you receive information from your neighboring states, what do you do with it? What would you do to improve coordination?

Is the International Fuel Tax Association (IFTA) reporting program effective? How could it be improved?

Which specific state enforcement and compliance programs/practices are especially effective in reducing evasion?

How can enforcement be improved in your state?

What is the impact of organized crime on evasion?

Industry Compliance

Describe the process that your business undertakes to remit tax payments to state(s)?

What has your industry done to improve excise tax compliance?

What procedures must you go through to implement state motor fuel excise tax policy?

What is the availability and shortcomings inherent in data reported to federal and state agencies?

What discrepancies exist between how data are prepared for various state and federal agencies?

What reports must be filed with federal and state agencies?

What are the costs associated with complying with state/federal programs, expressed as a percentage of total tax payments? What drives these costs? How could these costs be minimized?

What could state/federal agencies do to reduce compliance costs? What could state/federal agencies do to improve compliance and reduce evasion?

Data

Can you provide a general overview of data sources (e.g., motor fuel, economic, transportation) useful in tracking fuel usage?

What are the methods of collection and data frequency?

What agencies are responsible for data collection?

How good is the data on fuel production, use and collections? What problems do you see with reporting practices, accuracy, availability, etc.?

Does your state employ a motor fuel tracking system? Is this system effective?

What is the availability and shortcomings of data in excise tax reports provided to federal and state agencies?

Are there discrepancies in how the data are prepared for various state and federal agencies?

Have there been changes in how motor fuel tax data have been reported over time? Why were they implemented?

Tax Codes

What are the most important provisions of your state tax code related to fuel tax evasion? If you could change your state tax code to minimize evasion, how would you?

Are there recent tax code changes or proposed legislation related to motor fuel and other highway taxes in your state? How have or would these changes address evasion?

Are there significant gaps or loopholes in state tax codes that could be used to evade the motor fuel tax reporting, assessment or collection process?

How could tax codes be updated to curtail motor fuel tax evasion?

Has your state prosecuted any fuel tax evasion cases? Please provide details.

Do your state's prosecutors have a good understanding of motor fuel tax law?

Variables Used to Estimate Demand for Fuel and Model Evasion

If fuel is sold on Native American lands, is it reported? Does your state have motor fuel tax agreements in place with Native American Tribes? If not, what needs to be done to achieve such agreements?

Do motor fuel tax rates in neighboring states and/or enforcement in those states affect your motor fuel tax collections? Does your proximity to international border affect collections? How?

What is the relationship between the point of taxation and evasion?

Does your state use a statistical model to forecast revenue? Would you share that model, or the name of a contact person who uses the model, with the research team?

Perceptions of Evasion

Has your state computed an estimate of evasion? Do you know of any previous studies that estimate evasion?

How well do you think evasion is currently estimated? How might it be better estimated?

Do you think evasion issues in your state are different from that in others? Why?

Conclusions

Recap of requests for specific information and data

Arrangements for further contacts with agency personnel

Scheduling next discussion meeting(s) Any questions/concerns?

APPENDIX C

Interview Responses

This appendix contains edited and paraphrased summaries of many of the interview responses related to topics in this report. The responses generally are grouped according to the question in the interview protocol, but the nature of the interview process means that useful comments came from a variety of points in the interviews. Since the interviews did not allow for direct quotation, all responses should be viewed as the interviewer's interpretation of the comments and should be considered suggestive of issues rather than as verified information. The paraphrased items are in regular text and the general comments are in italics.

C.1. Responses Related to the Point of Taxation and Refunds

Point of Taxation

A number of states have moved the point of taxation to the rack. Most report an increase in revenue associated with the move, but some do not.

Texas shifted the point of taxation to the rack in January 2004. Texas has not seen a spike in collections since moving the point of taxation to the rack but the point of taxation was already close to the rack.

Florida collects most of the gas tax at the rack but not all. Counties in Florida have the option to add their own tax, and the state has an additional tax that it imposes if the county imposes a tax. All tax for the state and the minimum amount collected for any county is collected at the rack. Any additional county tax is collected upon delivery to a service station or end user. Diesel has one uniform tax, which was done to join IFTA. Before that the tax was the same as for gasoline. Before moving to the rack, the point of taxation was at wholesale. Wholesalers could buy fuel without paying the tax. Taxing at the rack has been an improvement in revenue collection but it makes it easier to bootleg from Georgia. It used to be easier to spot Georgia fuel coming into the state than it is now. Also, it is harder to catch un-taxed kerosene coming into the state. The benefit of taxing at the rack is that it has essentially eliminated bad debt and failure to file. Florida used to lose $2 or $3 million per year in bad debt.

The point of taxation has not been changed in Mississippi but the tax is actually above the rack. They collect at distributor for gasoline (first receipt: pipeline, tanker, before terminal, many

would call first importer tax). Tax on gasoline is collected twice. First collection is on entry into the state. Payment is due immediately, not at a later time. Then the distributor will pay on the 20th of the next month. This procedure gives automatic volume reconciliation. It allows the state to check volume from majors against volume from distributors. The next month the majors will get credit for taxes paid. If new tax is above the credit, they must pay. Otherwise, the credit moves forward. Tanker trucks can bring fuel in without reporting, so they are not in the system.

Distributors can sell to other bonded licensed distributors without tax, but after the third sale, the tax must be paid. Mississippi and Tennessee rivers mean that large amounts of fuel move through the state. Even federal information is below the rack since it is collected as fuel comes across the rack. If people communicate properly, coming off the barge and going into the terminal is an excellent checkpoint. It is a little less than a refinery report but a good crosscheck mechanism. Must receive and use information to stop evasion. DOT sees things that accountants and auditors do not. A dishonest terminal operator may sell taxable fuel going into a terminal as something else. One called it rocket fuel. If you cannot prove it is used in a vehicle, then it is not subject to tax.

North Carolina moved the point of taxation to the rack in 1996. Prior to 1996, they were a distributor-level tax state. The change reduced the number of taxpayers from 1,400 to 300. It was noted that at the distributor levels, states deal with exemptions and tax-free exchange of products. Much of the evasion occurs when tax-free products are exchanged. The daisy chain was prevalent in the late 80s and early 90s. Before changing to the rack, the gasoline tax was on the distributor at the time of pull from terminal, so there was no ability to daisy chain for gasoline. The move to rack was a bigger difference on diesel because tax-free sales were allowed, and daisy chains were possible. Transactions at the rack allow for greater transparency and improved compliance. Tax at the rack has worked quite well. They used to have distributors who would not pay. Accounts receivables and write-offs of uncollectible debt are way down.

South Carolina moved to the rack for both starting in May of 1996. There was an increase in revenue, but not as high as it might have been. They get a lot of fuel from North Carolina, which had already shifted to the rack, and the North Carolina shift helped South Carolina.

Minnesota reported that they still tax the distributor, but on Sept 1, 2004, they changed the point of taxation from the last licensed distributor to the first distributor and saw an increase in collections. The change eliminates the possibility of a daisy chain. They are not convinced that a move to the rack would save money or taxes. They also feel they face a lower risk due to a smaller tax due in case of bankruptcy.

Pennsylvania moved from retail to the distributor level in 1997. The number of accounts was reduced from 20,000 to 600 but there was not much revenue change.

Wisconsin reported moving to the terminal rack about ten years ago and seeing an increase in revenue. They find this to be important but noted that exemptions and refunds create problems as well.

A number of states reported that attempts to move taxation to the rack have run into industry opposition.

Alaska taxes at the distributor level and has since 1970. Changing the point of taxation has been discussed internally, but issues with refunds and quirks in the physical distribution system prevent a shift.

Arkansas attempted to shift its point of taxation to the terminal around 1997. The first receiver (distributor) has been the point of taxation for many years. Electronic filing was instituted instead. They report that distributors are opposed to a terminal tax due to loss of the float. They think they are doing fine in terms of evasion but are amazed at the reported increase for states moving to rack. They do not believe that they would get much of a revenue increase.

Idaho also reports industry resistance to moving taxation to the rack. Idaho is a first receiver state; fuel is taxed when it is sold to the supplier. The tax was moved to the first receiver status in 1996 and there was a 19 percent increase in revenue. Distributors like the float and resist moving the tax to the rack. However, the tax at first sale removed the possibilities of distributors playing shell games and achieved many of the benefits of taxing at the rack.

The amount of the float was not an issue for Washington State when moving the point of taxation up to the rack because the float exists for distributors. Although Washington taxes at the rack, distributors are only required to remit taxes two days prior to the tax being due from the terminal operator, so the float continues.

Nebraska reports that the tax is at the wholesale level but it is most often paid at the distributor level. Major legal changes in 1992 changed the point of taxation to receipt by wholesaler rather than sale by wholesaler. The industry does not want the tax at the rack and has fought strongly on the point. The state would like to change it to tax at the rack but they believe that if they move to tax at the rack they would also have to do other things. Some states tax at rack and do not do audits or field work. Their agreement with the industry is to not try to change the point of taxation any more. They are comfortable with this as long as they have the resources to audit. Nebraska does not see evasion as a key issue. They see evasion as more a question of how well the taxing method is enforced.

New Jersey taxes at the distributor level for gasoline and the seller/user (retail) level for diesel. New Jersey has drafted legislation to move the point of taxation to the rack level because there are fewer taxpayers. There are presently 7,500 to 8,500 licensees. Taxing at the rack level will reduce the number of taxpayers into the hundreds.

The FTA interviewee does not think there is a best way to collect the tax. The view was expressed that it does not matter at which point the tax is levied but there must be on-road and in-house enforcement. The interview analysis seems to confirm this conclusion with the additional conclusion that the structure of the tax system may be as important as the level at which the tax is levied in determining the potential for evasion.

States differ substantially in the volume of refunds, the documentation required, and the amount of auditing done.

Alaska requires the original invoice for fuel purchased and, if fuel is re-sold as exempt, they require a sales invoice. They also require an explanation of the off road equipment where the fuel is used.

Arkansas has a refund program but it is very limited. Volunteer fire departments are the only ones who can apply for a refund but few do. Local governments can use dyed fuel and most volunteer fire departments have arrangements with local governments to buy dyed fuel. There were only eight refunds in one year.

Florida issues refunds for diesel but not gasoline. The refund process has two primary categories. The ultimate vendor credit allows vendors to sell fuel tax-free and take a credit, e.g., for sales to farmers, kerosene for home heating, sales to the federal government, or export. If a construction company buys clear fuel, there is a tax return that they can file (refund document). It requires a schedule of all fuel purchased. A use tax is deducted from the fuel tax refund since sales tax is due on off-road use of fuel. Some states require payment of the sales tax and then process the refund but Florida has all of the taxes in the same department. They can also transfer the money between funds for payments to local governments. They can require receipts but they usually only look at them during an audit. The schedule has the FEI number of the vendor, so they can track the fuel if there is a question.

Idaho requires receipts or withdrawal records if the fuel is taken out of bulk.

In Indiana, taxpayers can file a separate form or schedule for refunds or on amended return. They require invoices and receipts.

Minnesota only allows farmers to buy gasoline tax free. Construction companies, loggers, and resorts with boats can file for a refund as soon as the fuel is consumed but within one year of invoice. The power take-off refund can be for gas or diesel and must have original invoices. If questioned, it goes to auditor in that area. Distributors do not have to file invoices.

Montana issues refunds for both non-taxable use and for other non-taxable fuel such as airlines (partial refund), railroads and government agencies. Refunds are issued both for gasoline and diesel for off-road use. Taxpayers must document off road use and tax paid. Commercial airlines aviation fuel is taxed at $.04 per gallon and can obtain a refund of $.02 per gallon. This is a statute and they process the refund claims.

Nebraska issues many refunds. You can receive a refund for taxed clear fuel if you can show it was a non-taxable use. Refunds are often audited. The gasoline refund was set up to be a credit on income tax returns. Under the income tax, it was not necessary to submit much documentation. Last year it was changed to a direct refund. There are more requests for refunds on gasoline than diesel. The change makes it one law and brings the gasoline refund process in house with closer scrutiny.

In New Jersey, receipts must accompany refund applications. Refund claims are reviewed based on a random sample. New Jersey does not believe that evasion through refunds is a significant problem. Refund claims are thought to be 99.9 percent correct.

New York requires the refund application, receipts, and a declaration of the purpose for which the fuel was used. If a red flag is raised, there is follow-up with the applicant. Additional information is often required. Each application is reviewed. Refunds are relatively insignificant in percentage terms.

Refunds are a large concern for North Carolina. North Carolina refunds over $50 million annually. They require backup receipts and a statement of the sort of operation for which the fuel was used. There are a number of companies / individuals who can claim refunds. In the last five years, the number of refund applicants has grown significantly. There are a number of exemptions and North Carolina views this as a significant source of evasion and wants to shift to the tax or dye scenario.

North Dakota provides refunds for gasoline to the consumers – agricultural use is the biggest type, construction also results in refunds. They audited three years of refund applications but stopped doing so because the audit returns were so insignificant. There were only two assessments during the three years. Diesel is either taxed or dyed.

For aviation fuel, there is an 8 cent per gallon tax. If it is taxed as diesel, the user can apply for a refund but then must pay the sales tax as well.

In Oregon, a refund claim related to gasoline is submitted that includes the number of gallons, the purposes for which the gallons were used and why a refund is due. An auditor reviews each claim. The auditor has an information sheet that provides estimates of how much fuel is burned for various agricultural activities. That is, a farmer should not ask for a refund on thousands of gallons of gasoline when they own a 10-acre farm. The person seeking the refund must submit original purchase receipts. The claims are entered into the system and a desk review is conducted. They often ask for more documentation. Every single claim goes to an auditor although small claims do not get a thorough review.

South Carolina allows refunds for off-road use. The applicant must be registered and must provide copies of invoices. Audits can go back up to three years.

South Dakota has a refund program for off-road commercial and agriculture (mostly farmers). You must submit a claim form and the original fuel tickets with data on seller and gallons purchased. It is not audited. It is accepted as reported but they must report acreage and other relevant information. They contact the claimant if it seems unreasonable. They would like to be able to audit but it is politically sensitive. There are fewer and fewer claims each year due to farm consolidation and reduced agriculture.

Texas has few tax exempt uses for gasoline – school districts and the federal government. Initially, Texas allowed for refunds under the diesel program because dyed fuel was not always available. As of 2004, it must all be taxed or dyed.

Utah requires an application, receipts, and the purpose for refunds. Off-road uses generate refunds for diesel fuel but all gasoline is taxable except for agricultural use. In Utah, exempt uses are often refunded through the IFTA return but they can also file a direct refund request with documentation. For example, power units used for cement mixers can be filed through IFTA. The IFTA option can only be used for off-road use in the state where the return is filed.

In Washington, fuel invoices are sent in with refund requests and the reports include equipment lists (including non exempt equipment) and identify exempt uses. Random checks are conducted and unusual records are flagged.

Wisconsin allows refunds. Three of the auditors are refund specialists. There are both off-road and vendor refunds (the end user can sign an exemption certificate and get fuel tax-free from the wholesaler). The vendor has to list fuel use by about nine types but no other documentation is required. For agriculture refunds, you must submit the original receipt and information on the equipment used. For non-agriculture refunds, you must also submit invoices and the amount of fuel used in each piece of equipment. Refunds are usually just for gasoline but some are processed for diesel -- e.g., diesel sold for heating oil.

In Canada, gasoline refunds are very limited. Commercial operators can get refunds for non-road use. There is no refund for diesel. It is either dyed for off-road use or taxed.

The Navajo Tax Commission allows refunds for agriculture or for Navajo government use. Receipts must be filed for a refund.

FTA believes that there should not be refunds. All fuel should be taxable but that will not happen. With refunds, if you require electronic filing and track fuel, you could use this information to trace back refund requests. Information from the supplier should already be in the database so the filer could not provide phony invoices and you would know that the tax was collected.

Chevron sees refunds as a huge issue because in some states the supplier has to give the refund to the customer and then file with the state. They believe the refund should be the responsibility of the end user, but there are many differences across the country. They often have to apply on behalf of the customer. If the supplier must apply, it limits the number of requests the state must deal with but the suppliers think the end consumer should be applying. The focus is on what the end user did with the fuel. Refunds are viewed as a problem nationwide and may be one of the great sources of tax evasion. The process is the problem. The year before last, the biggest evasion case in Texas was a state employee creating fictional refund claims. Often, only the first refund claim is checked carefully. The state employee would then enter false ones. It happened in other states as well. Issuing refunds as an income tax credit reduces fictional ones but not all states have income taxes.

The Petroleum Marketers Association does not think states do as well with refunds as they wish. For states taxing at a low point of distribution, there are almost no refund issues, just a few consumer ones. This works fine from the industry perspective. As you raise the level it raises refunds dramatically. The state must adjust and set up a system. The system should be worked out with taxpayers.

The IRS has a claims process for refunds. If you are a taxpayer and file an IRS Form 720 you can take the refund as an offset. Otherwise, you must file separately for a refund and have proof of purchase and proof of use.

The ATA finds that filing for refunds is a large concern for trucking companies at the state level. There is an occasional complaint that the IRS can be slow to make a refund, but it does not seem to be a big issue. Most major carriers farm out state refund claims to third parties, who charge a percentage of 35 percent to 50 percent. The size of what they let collectors keep is an indication that states can be difficult to deal with on refunds. States probably over collect the fuel tax due to the difficult process for refunds.

C.2. Responses Related to Coordination Issues

Variation in Tax Systems between States

The interviews confirmed that differences in tax systems create potential for evasion.

Arkansas definitely perceives this to be a problem. Missouri and Tennessee have destination state taxes. The tax is charged for whatever state is listed when the fuel leaves the terminal. Arkansas loses revenue when a load is pulled with a low-tax destination and the destination is later changed to Arkansas. It might not be true intent to evade the tax, but that is the consequence. Drivers know a tax was paid but do not pay attention to the state. Also, if you are not a licensed exporter in Missouri or Tennessee, they will charge their own state tax, but the fuel may be exported anyway. Arkansas would like to have this data in electronic form.

Indiana finds that differences in tax rates are not big enough to make it worthwhile to bootleg. Points of taxation differences may be a problem. They pass a lot of information between states and need strong laws. States have come a long way since 1989 when uniformity began. However, uniformity also requires industry cooperation. Electronic filing is more important than uniformity. If you know what neighboring states do then you can deal with it. Agents must know what goes on in their state. Track fuel in a timely manner and you can deal with it. Electronic filing is important but many big oil companies do not file electronically unless mandated. There is an expense to the company but it is important to the states. Industry has to want some of these things to happen.

Taxes in Mississippi are lower then in some surrounding states but they tax more fuel types, such as jet fuel and dyed diesel. Jet fuel out of Louisiana is not taxed. They levy a 5.7 cents tax on dyed diesel but not in other states. The State Tax Commission does not communicate with other states on amounts of fuel exported. They found one instance of over half a million gallons reported going to another state but it turns out it was not a licensed distributor in the other state. Uniformity creates an avenue for communication.

North Dakota noted that the information is presented differently from state to state and this makes it more difficult to cross-reference. For example, Minnesota is a destination state. Minnesota doesn't require all the racks to report data, but North Dakota does because they are an origin state.

However, some states feel that they have addressed exchange of information with other states to mitigate tax evasion.

Texas is not totally uniform with bordering states, and agreements are in place to allow them to share information. If fuel is purchased in a border state and destined for import to Texas, agreements are in place to require the border state to collect the tax and transmit it to Texas. Thus, the lack of uniformity is not seen as a significant issue. Texas runs discrepancy reports and is also attempting to develop a motor fuel tracking system. There was one large case of evaders who were claiming fuel for export to New Mexico and then selling the fuel in Texas.

In Canada, the coordination issue is somewhat different than it is in the United States. They have uniform returns across the provinces but the federal returns are different. The national government and the provinces collect different data due to the different bases for the taxes. The provincial taxes are retail taxes while the federal tax is an indirect tax on the manufacturer rather than a retail tax.

Other comments seemed to reinforce the perception that differences in tax rates and tax systems create the potential for evasion, but that the key to actually stopping evasion was sharing information.

The interviewee with OIG of the US DOT reported that the FHWA had the first motor fuel tax evasion meeting in October 2004. Twenty-four states were represented. Each state operates differently but they also do not feel that they have the resources to address the problem. More uniformity in regulations and audits would be helpful but it is even more important to share information. States could have the same problem with the same companies but they would not know it because the information is not shared. Mississippi has the DOT involved while Louisiana has the DOR. At the federal level the DOT is responsible for criminal investigations while the IRS has the responsibility to collect the taxes. Each state has different revenue laws. Some will share information with the federal DOT and some will not. It is neither consistent nor uniform. There needs to be an information sharing strategy between states. Some states have established communications with neighboring states but many companies work across the nation. States need a mechanism that allows for information going to the right people who will act on it as well as seeing that it is sent. Information often goes to those who cannot act on it.

Variation in Tax Rates between States

Tax rate differentials seem to create the biggest problems for high-tax states.

Florida noted that we would hear a great deal about Georgia, Wyoming, and New Jersey, and Oregon for diesel. Interviews did indeed verify this perception. We interviewed respondents in several states near Wyoming, and there was general concern that Wyoming's low tax rate created a potential for tax evasion. Montana perceives a problem due to the sizable difference in tax rates between Montana and Wyoming. It is reportedly easy to pay the Wyoming tax and sell the fuel in Montana. Wyoming sends export information; but if the Wyoming tax is paid, they do not expect the fuel to be exported, and do not report it. Hence, there is no paper trail. This makes it hard for Montana to monitor imports. There is no sharing of information between Montana and Wyoming on fuel that is tax-paid.

Utah also views Wyoming as being such a low-tax state that import/export schemes are a significant issue, with fuel purchased in either Utah or Wyoming. There are five refineries in Utah, and they are not a significant importing state. An exporter could claim an export to Wyoming and pay the Wyoming tax, but leave the fuel in Utah. There is no reporting at the retail level, so an unlicensed retail outlet also could purchase fuel in Wyoming without being exposed.

Nebraska has a concern because of both Wyoming and Missouri, a couple of states with low rates. Nebraska used to have rates much higher than most of the surrounding states, but some of their neighbors have raised rates so the difference is less of an issue than in the past. Despite the low-tax neighboring states, it is not perceived to be a big problem as long as enforcement is kept up.

South Dakota is another neighbor of Wyoming that does not seem overly concerned by the rate difference. They noted that Wyoming has a lower tax, and they engage in some enforcement efforts along the Wyoming border. However, it is not considered a big issue. Both Nebraska and South Dakota noted that enforcement can offset the rate difference. For example, South Dakota is looking at a business they believe is bringing fuel into the state and not reporting it. They believe that only surveillance can identify this fuel. They will need to set up special reviews of BOLs and other reports but it can be done.

Washington has a problem because Oregon does not tax most diesel fuel, and the tax that is levied is at the retail level. The Oregon system has been improved in the last two years. If you are exporting to another jurisdiction from Oregon, you must be licensed in the import state. To import into Oregon, you must be licensed in both jurisdictions. Recently, Oregon enacted the change and that significantly assisted in deterring evaders in Washington. Before, companies were licensed in Oregon and exporting to Washington without paying tax. Washington shares export schedules with border states, and believes that careful tracking of fuel into and out of the state reduces the potential for evasion.

Several other states noted that tax rate differences were a concern.

Wisconsin reported being a high-tax state and having problems with the reporting of where fuel was delivered (e.g., Minnesota at $.20 versus their $.291). Kansas has a higher tax rate than Oklahoma, so they believe it is profitable to divert fuel by an exporter claiming fuel is going to another state while selling it in Kansas.

New Jersey is another low-tax state, and it recognizes that its low rates present challenges. Export information is shared with neighboring states, as requested by other states.

Georgia is also noted for its very low rates and the problem that causes for other states. North Carolina is the high-tax state in their region. The North Carolina fuel tax is 24.3 cents per gallon while Georgia is at 8 cents per gallon. Hence, North Carolina is a good state for evaders to divert motor fuel to after paying the tax in Georgia, and North Carolina sees this as an important problem.

Florida also borders Georgia. They have a problem with bootlegging from Georgia, where the Georgia tax is paid, and the fuel then goes to Florida. They even have unlicensed trucks picking up a load and bringing it into Florida, or reverse bootlegging where they claim the fuel is for Georgia but it stays in Florida. Florida has taken actions to limit the loss of revenue. They believe that the most revenue impact comes from perfecting legislation rather than from enforcement. The interviewee stated that dealing with evasion through enforcement is usually too late. Under their old laws, if they found that fuel came from Georgia, they might not be able to collect the tax anyway. They changed the laws to be more effective. One provision makes it mandatory for the seller to itemize state and local taxes paid. The purchaser owes the tax if the invoice does not have itemized detail. This causes retailers to force vendors to pay the proper tax. Invoices used to say all state and local taxes paid, but they were paying the Georgia tax not the Florida one. A seller in Georgia could evade the Florida tax, and it would be hard to prosecute in another state. The change in the law allows for easier enforcement.

Another problem noted was that many states with taxes at the rack have destination state taxing but distributors must be licensed. Under current law, Florida does a full criminal background check on every registrant. A licensed distributor can pay the Georgia tax but must have records to show where the fuel is actually delivered. Florida has a failure-to-provide-records penalty of $5,000. If you file and report a fuel delivery in the wrong county, the penalty is up to 100 percent for underpayment.

Florida requires everyone who hauls fuel to report. Most states do not. There are so many transactions that there are likely to be errors. Sometimes there are problems with the terminal records. For example, the terminal has a barge scheduled from Texas so it shows the fuel in inventory, but it was not actually delivered, so there is a discrepancy. Carrier records can be very helpful in tracking fuel or proving evasion.

International Borders

International borders are perceived to be a problem by some of the interviewees but it did not seem to be as much of a concern as borders with other states. The key issues were the same as for state borders.

Montana borders Canada and sees this as a big problem. They are getting information from Treasury about what crosses the border but it is not currently usable because the data is in tape form, and they are not currently able to process it. They are in the process of building a system to translate tapes to track fuel.

North Dakota also is concerned about border crossings. North Dakota lacks the staff to investigate customs data and data from other states. North Dakota does receive detailed information from Saskatchewan, and Saskatchewan did find a North Dakota distributor evading the Saskatchewan tax. In this case, the fuel would cross the border to North Dakota and then go back to Saskatchewan.

Mississippi is very concerned. They are on the Gulf Coast and international freighters can come into the Gulf and lighter (offload to barge from seagoing vessel – 80 to 100 barges and one barge

can fill 60 tanker trucks). Fuel being offloaded is seen and a record is made but do they know anything about fuel tax evasion? A barge can go to Cairo, Illinois before there is mandatory reporting of the barge cargo.

On the other hand, other interviewees did not perceive the border with Canada to present a problem. Wisconsin shares a border with Canada but does not believe there is a problem due to Lake Superior. Washington addresses British Columbia issues with customs documentation.

Minnesota gets some fuel coming from Canada. It is a bigger issue for diesel and they track it. They now have formal tracking agreements, and get information from Inland Revenue on exports from Canada to Minnesota. Customs data is old, and there is a disclosure issue since their state data is all public information

Ohio is on Lake Erie, and it also borders Canada. They keep in contact with folks in Canada, but it is not much of an issue. If anything, fuel is going from Ohio to Canada.

Alaska perceived the issue to be a problem in the other direction. Canada has a higher tax rate, so there may be some fuel from Alaska going there but there is no direct evidence.

The Canadian Fuel Tax Council did not see border differences as a significant issue. Differences across provinces are only around a penny or less a liter. There are a few pennies to be made across borders between the United States and Canada, but their high tax rates make evasion more attractive in Canada than in the United States. Import/export scams (buy fuel and claim to export but not export) are a problem. Not as much of this scam is occurring at the international borders because the United States has stepped up enforcement efforts. However, it is easy to find unmanned border crossings. Efforts have been stepped up along these unmanned areas due to 9/11. One area to be aware of is a large Native Canadian reservation in Quebec where there are allegations with respect to smuggling across the U.S. border at this location.

FTA noted one border case with Revenue Canada. A trucker would start to fill and then stop and restart. The trucker would then prepare two BOLs, one for 2,000 gallons and one for 8,000 gallons. He would simply declare the 2,000 gallons when going into Canada. This is a problem for tax at the rack states. Nobody looks at actual weight versus what is declared. Weigh stations do not look at what is on the BOL. Also, if the truck is supposedly coming back empty they are not weighed and may have some fuel being returned.

Mislabeling has also been experienced. There was one report of gasoline labeled as mineral spirits that came from Canada.

The Mexican border does not appear to be an issue in terms of evading U.S. taxes because fuel is more expensive in Mexico.

One interviewee noted that there are new federal laws, effective January 1, 2005, that should further reduce border tax evasion. They require customs agents to collect taxes, as well as customs duties, on fuel.

Inter-Governmental and Intra-Governmental Cooperation

In general, the interviewees indicated that there is substantial room for improvement in both sharing information across jurisdictions and within states.

FTA sees information sharing as a significant problem for most states. Eighty percent of the states share import/export schedules but only 10 percent do it electronically. Other types of cooperation have turf problems. DOT does not want to work with revenue, etc.; and the other interviews largely confirmed this problem.

Some states felt that they received adequate information from other states and acted upon it. For example, Alaska noted they exchange paper import/export reports with Washington pretty regularly, with Washington mostly reporting to them. There are not many, so they follow up. Also, they occasionally get information from Oregon and maybe California. Michigan insists on sending detailed reports, including cars shipped with a couple of gallons of fuel in their tanks.

The Navajo Tax Commission has information on the Intergovernmental Agreements with Arizona, New Mexico, Utah, Texas, Nevada, and California that cover mostly paper information sharing. Arizona keeps its information in Excel files by county and fuel type, but New Mexico saves its information on paper. Information from New Mexico was used to catch discrepancies for one distributor. The tax by the Navajo Nation has helped the neighboring states. Complete reporting by distributor, carrier, and retailer is very helpful. They caught two non-reporting distributors.

Other states had varying perceptions of the amount of data shared and its usefulness. Arkansas noted information sharing as a goal, but it is not currently done. They are putting together procedures. Florida will share information, talk on the phone, hold task force meetings, and will share information on people applying for licenses. All fuel tax information is public information and posted on the web. It is a tremendous tool to be able to readily access the information. However, almost all of the information they receive is either paper or verbal. They hope to go electronic at some point. They expect to have the system running by February or March of 2005. They do not exchange a lot of information because it is in different formats. Everything they receive from other states is on paper.

Other states reported similarly that they share information but that it is often on paper and difficult to use. For example, Nebraska reported that much information is traded with neighboring states, but many provide the information on paper. One neighboring state has a large terminal near the border and sends all of the information by paper. Nebraska keys in all of the paper information. This way it is available for auditors and can be used to cross match with in-state reports.

There were varying perceptions of intra-state cooperation and sharing of information. Arkansas reported an internal problem since some states provide import/export data to the Arkansas Motor Fuel Tax section but the Highway Department does not get it. Yet it is the Highway Department that is responsible for audits. Integration of functions can alleviate some of these problems. In

Washington, licensing and collection are all done within the bureau of licensing. It is a joint operation and co-located, so they report no problems with information transfer.

Montana reports it shares information between neighboring states, but believes there needs to be better coordination and communication between the IRS and Montana.

In general, there are different perceptions of the relationship between the federal government and the states. IRS states that they share information with states and work with states on dyed fuel. However, other federal agencies and the states do not perceive IRS as being cooperative outside of the dyed fuel program.

A representative of the U.S. DOT-OIG has a variety of comments relating to the sharing of information at the federal level and between the states. In the past year, they have talked to state motor fuel revenue or enforcement officers. Through these contacts, they are starting to get more information on allegations from the states. States will provide information on the problem and ask if DOT would like to be involved. DOT-OIG will determine if another agency should be involved and ask them. They then either coordinate or go it alone. An OIG investigation in Florida expanded to the police, postal service and EPA because as the investigation went on they saw more problems. They ended up with a better investigation to prosecute. OIG would like to see all motor fuel allegations coordinated with appropriate agencies. They believe IRS should coordinate with OIG even if OIG isn't directly involved; they believe they should be aware of what is happening. Currently, there is no process that requires it. OIG is working with the IRS and states to see if they can do it better. OIG believes it will improve criminal investigations and tax audits. Not all investigations have to be criminal as audits are important too. Many companies have a presence in many states. If an entity is caught in one state, it would be good if other states were notified to take a look.

Native American Issues

A variety of states reported that either there was no problem with Native American sales or that they had appropriate agreements in place.

This is not perceived to be an issue in Florida since fuel is taxed at the rack. Native Americans are immune from tax on their personal use and can apply for a refund. In keeping with Supreme Court requirements and an Oklahoma case, the tax is specified as a tax on the consumer, not the tribe. Florida law specifies that the incidence is on the consumer even though the tax is collected at the rack. Hence, non-tribal customers are subject to the tax.

Indiana has no Native American land.

Minnesota reports no problem. They have signed agreements with all tribes and share the money.

Mississippi has no issues. The Choctaw Indians have casinos as an important revenue source, so the fuel tax is not an important issue.

Nebraska has three tribes and has agreements in place with two of them for three years. Agreements are reported to work well, and the other tribe is very remote and sells little fuel. Before the agreement, there was a public perception that one tribe was not paying the tax due. It seems to have been more perception of a problem than a real problem. The tribe sells in several states both on and off the reservation. Now they pay the full tax for off reservation sales and a partial tax for on reservation sales.

North Carolina has an agreement. The number of vehicles licensed on reservations to enrolled members is used to estimate reservation use and calculate a refund.

South Carolina has no fuel sold by tribes.

Texas has three tribes but does not perceive fuel taxes to be a problem.

Montana has agreements with six of seven tribes and believes that it is very effective to have such agreements. They help with enforcement.

Utah has two Native American tribes and agreements are in place. One tribe purchases the fuel tax paid and then gets a monthly refund for tribal sales. The Navajo tax is 18 cents/gallon, and they levy taxes of 24 cents/gallon total and then provide the difference (6 cents) to Utah.

Other states view sales on Native American reservations as a substantial problem.

North Dakota believes that there is significant evasion from a single station that sells fuel at a casino by a tribe based in South Dakota. They also have a blending plant, and North Dakota has no agreement with the single plant. The upper limit on the impact of this single station is estimated to be $100,000.

South Dakota has tax agreements with four tribes. Under the agreements, the tribes report total sales less exempt sales. They receive a refund based on an estimate of all taxes paid by tribe members based on population. However, there is no agreement with three tribes, and one of these three owns its own stations. The state requires refund claims for taxed fuel, but the one tribe may be importing untaxed fuel. The U.S. Supreme Court ruled that fuel sold on a reservation to tribal members is exempt from tax. South Dakota sees it is a taxable transaction until the fuel is sold to a reservation member but the tribe can buy in bulk and bring it directly onto the reservation and then sell to non-tribal members. This tribe views all sales as non-taxable. South Dakota is concerned about possible court positions on this.

Some states are not sure of the impact.

There are eleven tribes in Wisconsin but not all have fuel stations. Tribes are selling in some cases and can claim exemption but the state cannot audit them, so there may be abuse.

While some tribes have taken an adversarial position, the Navajo Tax Commission has motor fuel tax agreements with three neighboring states and information agreements with three others. Their rates are the same as Arizona (18 cents). New Mexico's rate is 17.5 cents and Utah's

24.5 cents, but the differences are not seen as a problem. All reports seem to indicate that this arrangement is working well.

The ATA is concerned that there are Native American truck stops that advertise along highways and sell a lot of fuel to mostly independent operators in which they indicate that tax is paid. However, the tax is paid to the tribe and not the state. The driver may not be aware of the fact that the tax is paid to the tribe and not to the state and the company then could pay penalties on an audit. They would like to see a list of Native American truck stops by state so they can warn drivers and companies. It isn't always obvious from the name of a truck stop that it is Native American owned. Companies can identify where drivers bought fuel and whether tax was paid if they have a list.

Canada also has a problem with Native Canadian Tribes creating an evasion opportunity. Taxed gallons are going into the reservation and huge refunds are being issued to individuals. There are no opportunities to audit the Canadian tribes.

IFTA

Most states find IFTA to be an effective system, although there are some suggestions for improvement, such as all electronic reporting. The biggest disagreement was on the effectiveness of the 3 percent audit rule, with some states arguing that it diverts resources from more productive activities while others argue that states failing to maintain the audit standard are undermining the whole system.

Alaska is exempt.

Arkansas finds IFTA is effective because it has simplified tax reporting for truckers. Audits have been effective. It could be improved by having the IFTA auditors in the highway department. When the auditors are in a general revenue department there is little emphasis on these audits because of low revenue.

Idaho reports that roughly 30 percent of the jurisdictions aren't meeting the 3 percent annual audit requirements. Idaho takes IFTA compliance very seriously but some states may not be as thoughtful.

Mississippi believes that IFTA has been effective but they need to pay yearly rather than quarterly. This is addressed in the JOBS bill. Truckers can make the first quarter payment to get a sticker (good for a year) and not make any more payments.

Montana believes it has been effective, but that everything can be improved. In this case, it would be more effective if all reporting were done electronically. States can determine how to collect the data.

North Carolina believes IFTA is effective and the base-state concept is effective. They would like to see IFTA establish a national database that identifies companies that owe funds or have been found to be in violation.

North Dakota noted one situation where an individual was using IFTA to evade fuel taxes. The person claimed that the fuel tax was paid through IFTA when pulling from their own supply. IFTA is handled through the DOT but fuel tax is collected by DOR. The DOR does exchange information with the DOT so they do not view this as a significant problem.

Ohio enforces it from a criminal standpoint along with the highway patrol. They copy down IFTA numbers to check with other states to see if the mileage is shown in Ohio. They find a few not reporting.

Oregon DOT compares IFTA reports to weight-mile reports for accuracy. IFTA reports are collected for Oregon-based carriers although Oregon collects little fuel tax.

South Dakota believes that IFTA is only effective within the audit program. They believe it would improve by getting outside information. For example, tax return information could be compared to IFTA reports or reports of sighting of trucks to see if IFTA mileage is reported.

Canadian Fuel Tax Council views IRP and IFTA as a successful invention. Prior to IFTA, Quebec would audit truckers all over North America. Interviewees did suggest that perhaps there could be more penalties if states/provinces are not performing adequate inspections. IFTA audits around 3 percent of the taxpayers and that is a fairly low number but he still believes that this is reasonable.

The Navajo Tax Commission does not participate in IFTA.
FTA believes the program has been effective but that the rules on auditing are confusing. States end up putting too many resources into IFTA audits that do not generate much money. The percentage of audits should be reduced and redirected to other audits.

The Petroleum Marketers Association notes that in the early 1980's, trucking firms in the North American Gasoline Tax Conference began a movement to get uniformity in how they report taxes across the country. Two regional experiments came out of this. The one in the West became IFTA; it was an attempt to simplify and unify rules on highway use and to change one basic precept of the tax, moving to the base state concept rather than each jurisdiction administering its own tax. By 1993, there were about 20 states that were voluntary members. A rival association, RIFTA, had three states. Then Congress mandated that all states join one by 1996. They merged and all states (except Alaska and Hawaii) were forced to join. It has been a success in bringing uniformity, lowering cost, and increasing revenue. Think of tax revenue as a pie with 49 slices (states plus DC), and the tax system is moving pieces; it redistributes revenue rather than raising revenue.

The ATA views IFTA as enormously effective. It has made a good deal of difference by cutting out casual evasion by pretending that you do not know you need to file for the fuel use tax. An increase in compliance was reported by all states as they joined IFTA. It could be further improved by getting all states in the IFTA clearinghouse (on line exchange of information from carriers that are filing). Only about 2/3 of states participate. It is a simple program that needs some upgrading. Once in, states must look at the information people send them and make sure they send good data. It probably requires one full time auditor.

C.3. Responses Related to Fuel Tracking Systems, Licensing, and Forms

Some states have electronic tracking systems and they generally find them effective. They are particularly effective if all filing is done electronically but some states still use paper and key in all of the data while others use paper and do not enter much of the data.

Alaska has had all electronic filing since January 2000 but it does not have a tracking system.

Arkansas has an electronic tracking system and thinks it is very effective because they can follow load-by-load movement of fuel. The biggest problem is unreported fuel that starts outside of the state. They contract with ACS State and Local Solutions for their tracking system.

Florida had a tracking system but they needed a new one when they moved the point of taxation. They are in the process of putting the new system in place. In order to have an effective tracking system, you must have all returns electronic and you must perfect the data. The system must reject incorrect transactions. Otherwise, you have too many issues to resolve. Tracking is relatively simple if the data is perfected.

Indiana has a system but believes it is not as effective as it could be if all records were submitted electronically.

Kansas has had an automated system for seven months and it was done manually before that. The new system kicks out discrepancies and is very effective.

Nebraska has an electronic system and it is effective. Their biggest challenge is that suppliers report differently than buyers report, especially due to blending. This creates problems for the tracking system.

Montana developed an in-house motor fuel distributor processing system over the last year and started using it in December. Up to then cross matching was done by hand. With the new system they can cross match using the system. They are currently in a transition period. The new system cannot deal with prior year returns, and the statute of limitations is three years. Hence, they are checking previous years. Electronic filing is not mandated; it is voluntary.

Mississippi just instituted an electronic tracking system. In 1999, revenue was dropping. They found that in 1992, the legislature had moved weight enforcement officers and put language in statute that DOT would furnish personnel and resources for fuel tax enforcement but none were provided. So they developed a group in 2000. They saved up over six years of TEA-21 and added some of their own funds to pay for the tracking system. They contracted with ACS. Last month was the first with electronic reporting, with 65 percent reported with no problem. The number should increase to 90 percent fairly rapidly. They require electronic reporting for taxpayers with over 25 loads per month. There are a few operators below this limit. State fuel tax receipts were $276 million in 2000, and had increased to over $400 million last year. Some was due to increases in miles traveled but mostly due to enforcement.

North Dakota is in the process of creating an electronic data interchange (EDI)/Excel system, with the Excel spreadsheet downloaded onto EDI. From paper returns, information will be entered into an Excel spreadsheet. EDI is voluntary for the schedules. Historically, the face sheet has been entered.

North Carolina is looking to create a motor fuel tracking system – an RFP has been issued.

Pennsylvania does not have a system but all paper data is keyed in.

South Dakota has the software but not the data. The main area of tracking is the monthly terminal data. The system is used to track reporting inconsistencies but they just started.

Washington is trying to do more electronically. They still only code the main information. The rest is put on microfilm and used for audits.

Oregon gets all reports in paper format and they are keyed into the computer system. The motor fuel reports contain three pieces of information:

- tax report (total gallons, reductions and taxable gallons and tax);
- inventory reconciliation; and
- supplemental schedules detailing where the fuel is purchased, tax paid and distribution schedule.

Oregon DOT has reviewed electronic funds transfer (EFT) filing but no funds have been made available. An analysis has been done by the information technology (IT) experts at ODOT; and, based on this analysis, ODOT estimates that it would take several years to recover costs. The payback period on the investment would be high. ODOT contacted other states to examine the impact on collections of shifting to EFT and EDI reporting but no states were capable of producing an estimate of the impact of EFT and EDI on collections.

In New York, beginning inventories, purchases (in-state, out-of-state), ending inventory, inventory adjustments, total gallons sold and exempt use of the fuel are all included in the motor fuel tax form. Supporting schedules that list out payments show specific shipments of fuel. Pre-paid sales tax is cross checked with fuel tax information. The reports are keyed into the computer system. A whole unit does data entry.

In Utah, gas taxes are collected at the distributor level and diesel fuel taxes are at the rack. Reporting is done through paper filing. EFT is allowed for payment but all reports are paper. The face of the return is keyed into the system but the detailed supporting documents are not. There are numerous missing returns and missing schedules because, with the paper returns, the face sheet is keyed into the system and the schedules are filed away. There is a law on the books that if there are incomplete returns, a penalty could be leveled. However, this is not enforced because schedules are not input into the system. It is a manual system that is also incomplete. It can be 2.5 years before they request missing schedules due to an audit.

Wisconsin does in-house tracking.

Canada does not have a tracking system. They had considered setting up an agreement with the U.S. to access ExSTARS but they have been hesitant to date due to the complexity arising with international agreements/compacts.

FTA believes that tracking systems are definitely helpful. Arkansas is a good example. They have a full tracking system that works very well. They can call up information easily and can find all sources for a company audit. They have used the system for four years and it is going well. It has provided a high return on the investment.

The Petroleum Marketers Association notes that ExSTARS is not a tracking system. It is a 1099 system, an information reporting system that can be used to monitor returns. It takes a while for a 1099 system to be brought up. The IRS wins the battles over time but it takes time to work. States that piggyback will get good audit selection data.

The ATA finds that almost all of the states require the appropriate data but they should pay attention to what they ask for. Schedule C is required (fuel shipments) but not looked at in many cases. One of the major areas for evading the fuel tax is paying the wrong state tax. If fuel is taxed at the rack, then you can steal fuel and save the price plus tax but you do not have to steal the fuel to take it across state lines to save the tax.

Licensing

Some states have strict licensing requirements while others have almost no standards.

In the late 1980s, Texas put a great deal into auditing marketers and changed the permitting process. At the time, getting a permit only required a $1,000 cashier's check and an application. Jobbers could purchase fuel without a license. In 1989, Texas changed the permitting process so that an enforcement officer was actually sent to the site, examined the facility and communicated with the licensee.

In North Carolina all are bonded. Bond requirement is $2 million for all majors (still would not cover one month's tax). Accounts receivables are low because taxes are paid at central locations and they do not have distributors defaulting. Distributors are licensed. An intra-state license is optional. If the distributor is licensed then they pay tax to the supplier at the time the supplier is supposed to pay. If distributor defaults, they refund the tax to the supplier and hit the distributor bond.

For Washington, taxing at the rack was the most significant change to the program. The number of motor fuel excise taxpayers declined from 1350 licensees to 260. The licensing process has been changed. The Department of Licensing (DOL) now requires significant documentation, including fingerprinting cards.

The intent to revoke and immediately suspend licenses if unlawful activities appear to be occurring acts as a strong deterrent for some taxpayers. Most states go through an administrative process that takes months. DOL can put a company out of business if evasion is occurring and the business appears unwilling to regularly comply. The potential to use this mechanism puts

fear into evaders. DOL can pierce the corporate shield and go after personal assets if evading is occurring, and the officer who is listed on the application is held liable. When individuals are applying for licenses, the names of the officers are checked to ensure that they don't owe money from other companies.

On the other hand, Utah would like some revocation ability for licenses. They find that the up-front filing is too easy -- $30 plus application. They believe that fraudulent out-of-state companies move to Utah to take advantage of the easy licensing procedures. They cannot refuse a license due to a license revoked in another state.

There are also differences in whether imports and exports require licenses in the other state.

Motor fuel is exported to other states from Oregon. Exports are tax-exempt. There is a new law requiring that if fuel is exported, the company must be licensed as a fuel importer in the destination state. This is to stop companies from reporting bogus exports and selling the motor fuel tax-free. Oregon shares the names of the importer with the state into which it is imported.

Taxpayers have some problems with the use of electronic reporting.

Chevron finds that electronic data allows for more processing by the states -- e.g., late transactions. Normally a light-products terminal is open 24/7 and the accounting staff goes home at 5:00 p.m. So, some transactions are posted the next day. Some states now pick this up as a late payment.

C.4. Information and Documentation for Motor Fuel Excise Tax Forms

Many states follow uniformity guidelines closely while others have a variety of reporting guidelines.

Alaska's forms are loosely based on uniform forms. They tried to be as uniform as they could, but there was some resistance from the community. The uniformity standard is to ask for load-by-load information but they could not get it. So they get totals by customer and supplier. Documentation is requested for specific items for refund or credit -- e.g., if a distributor uses some fuel for off-road use. They might request invoices. For refunds, invoices for tax paid are generally required. In the past they have gotten reports from the DOT on airports, with information on gallons by airlines, to check the accuracy of the jet fuel numbers. They get customs data and use it as time permits.

Arkansas follows FTA uniformity on their schedules. They have a unique situation, border zone rights for gasoline. Certain border cities have lower tax rates for gasoline.

Idaho is in conformance with the FTA standards. There are three types of returns: paper, EDI and a diskette system (IDA Fuel). The floppy disks are sent in. There are 240 distributors: 80 file EDI or diskette (85 percent of the data are filed EDI) and the rest file paper returns.

Minnesota has forms which are filed electronically, everything as of July 1st. The try to tie into uniformity as much as possible but they use a limited number of product codes. They do not go as specific as some. The state will go to mandated bio-diesel as of August 1st, but they will not use the bio-diesel code unless it is pure since the law does not require separation and it is taxed at the same rate. BOLs will be matched on the new electronic tracking system. It will probably be fully working in six months. Now they pull manifests to match. Mis-reporting is the biggest problem. Data is coming in electronically. If over 1 million gallons per year, they must put detail in the manifest but others do not (about 5 percent send summary). Local governments may have to pay tax on dyed diesel.

Montana requires the same information that is suggested by FTA uniformity guidelines. The taxpayer can file by paper, through EDI, or through the web. Paper gets entered into the system. It is an ACH system. For paper returns, they enter the summary data and cross match the schedules by hand. With the new system all schedules are entered. With transition and no mandate, they are trying to convince the big ones to do it voluntarily. Some taxpayers do not have access for electronic filing. There are approximately 130 licensed distributors and about 63 percent file electronically. Before the new system it was about 30 percent. Two of the large companies are still using paper forms. One company has indicated that it will not go electronic until the state mandates it. The licensed distributors file monthly but any unlicensed purchaser must buy the fuel tax paid.

Nebraska follows uniformity. They could not cross match data from paper returns. They put much effort into electronic filing and it is now required.

In Florida, suppliers must report all loads purchased or sold, but a wholesaler can summarize sales to retail stations by county. They collect both using paper and electronic on a monthly basis. They have statutory authority to require everyone to file electronically, but they could not process it, so they do not require it. About two-thirds file electronically. With conversion to a new system, they will require all electronic filing. They provide filing software for wholesalers. If they have fewer than 100 transactions per month, it costs less for them to handle the paper than to pay for the software, so they probably will still accept paper from small filers.

Kansas taxes at the distributor level, and they require monthly returns from distributors only. They receive reports from retailers but no tax is paid. Their reports require net gallons of gasoline, gasohol, and special fuels received. They file net instead of gross and include receipt and disbursement schedules. Schedules of manifest show imports, exports and other items. They try to follow uniformity but may not match exactly. There are often small differences among states based on individual state statutes.

North Carolina requires receipts, disbursements and reporting schedules. Taxing at the rack reduced the number of taxpayers from 1,400 to 50. The next two fiscal years added 2 percent additional growth ($40 million) over motor fuel consumption. At the same time, there were other joint audits/investigations and greater federal efforts.

South Dakota has fifteen different license types - not all pay tax (about seven for tax and formal reporting). Suppliers file returns (all fuel from terminal). Many out-of-state suppliers are

licensed but it is not required. The tax from an out of state supplier can be collected by the supplier or paid by the customer. Big suppliers collect the tax for convenience.

Washington receives a monthly paper return with monthly report schedules with load-by-load comparisons. Summary information is keyed into a database and more detailed records are kept for exempt users. They have no motor fuel tracking systems. Imports/exports could be tracked, with the exception of those coming in from Oregon. There are discrepancy reports involving differences between reported sales and purchases of tax-free fuel in Washington.

Wisconsin is a terminal rack state. There are sixty suppliers and 120 restricted suppliers (companies on borders). There is no reporting at retail or wholesale. They moved from wholesale to the rack about ten years ago and got an initial bump up in revenue. They require the BOL, date, gross and net gallons and origin-destination. The documentation is just the return as they do not require back-up data. Paper and electronic filing are used, with the same information on each. Suppliers are 100 percent EDI and it is encouraged among restricted suppliers (around 20 file using EDI and 100 use paper).

In Canada, both at the provincial and federal level, the returns are paper. The provinces must always tax the consumer. Thus, the payment is collected at retail but followed through the distribution chain and submitted to the federal agency. The wholesaler remits the tax but is reimbursed down the distribution chain. There are no refunds for the diesel tax but there are for the gas tax.

The Navajo Tax Commission requires that the distributor, carrier, retailer, and refiner all provide reports. Required information includes where the fuel was picked up, where delivered, type, etc., by county. They tax dyed fuel. They would like to review federal data but cannot. They would like to coordinate more with Arizona and New Mexico, but they only have one data person. States do not share export data (they would like information from two refineries in New Mexico).

FTA believes that returns should be filed electronically. States cannot keep track of the information by paper. All information should be required to be electronic. States could set up a web page to enter information for small companies. Mom and Pop operations used to complain, but it does not seem possible for them to currently operate without computers.

The Petroleum Marketers Association believes that states need to follow the suggestions of the FTA uniformity committee. If they ask for documentation following this standard, they have a better chance of getting the information they want and of getting it electronically. More uniformity makes it easier for clients to comply and provides more useable data to the state.

The IRS currently has some filing done on paper. It is a monthly system through the electronic filing process. When first conceived, they thought it would be authorized for all electronic, but Congress left a paper option. This will end in 2006 for anyone with more than 25 transactions per month. This should increase accuracy. The goal is for the IRS to have electronic filing available for all returns, but the budget is not there and they do not know when it will be implemented. The primary data system is ExSTARS now. It is the main information source that

they have. They would like to expand with additional information on products that can be blended. Within ExSTARS they do not have accounting of fuel until it is first entered into a terminal. There is a belief that there is a possibility for some leakage from refinery to terminal primarily by offloading from barges. They have had some cases, but they cannot quantify it. It appears to be isolated instances.

C.5. Responses Related to Enforcement Issues

Public Awareness and Involvement Programs

Some states are very active in outreach and/or public relations.

When Florida implemented tax at the rack, they did workshops all over the state with marketers. They do public outreach with any major law changes, and they have people in their office to do workshops on an as-needed basis. They always have booths at the marketers' conference and tax workshops. For any major changes in the tax, they do TV commercials. Outreach is very effective, and they have a good relationship with the marketers. They believe that the best way to get results is for everybody to work together. Evasion is worse for legal sellers than it is for the state. They have pressure from marketers for them to increase audits.

Idaho has established a distributor advisory group. They make presentations to the petroleum industry and they contact the industry whenever there is a change in tax codes or reporting procedures. They communicate well with the trucking and petroleum industry. Idaho puts a lot of time into training for the CPAs who do the income taxes and fuel tax refunds through the income taxes. They have e-filing for the distributors and truckers.

Because Idaho performs so much cross checking and motor fuel tracking and enforcement, distributors turn in trucking companies and other distributors who cheat the system. They do this because they believe that the evasion will be caught and they could be assessed.

Indiana believes the DOR public affairs department does a good job, especially when there is criminal prosecution. The real problem is that most people do not understand that the tax is only one piece of what is stolen. Successful defrauding of the fuel tax also defrauds federal highway dollars. The state loses fuel tax money and loses federal highway dollars.

Minnesota has presented information to various industry groups. For example, well drillers are allowed a specific type of refund and they will present to them. They also present to farmers groups, and remind them about tax requirements. Petroleum marketers know who their auditor is. If there are any major changes, they offer training classes.

Mississippi feels it is very important to inform other agencies of what they are looking for, e.g., wildlife and marine enforcement are in the field and help with information. They need to let you know if they see a big freighter offloading into barges. They have a paper going out twice a month to farmers and contractors, and run a dyed diesel alert in the paper. Mississippi DOT is working with the IRS and provides an 800 number. It works well. They are always working

with contractors and rental equipment. Many users are coming in from other states where they get away with dyed diesel violations.

Montana perceives that their outreach impact is good. There is an 800 number to report dyed fuel users, and they run ads each year for a dyed fuel campaign, usually in spring and summer, on both radio and TV. DOT goes to fairs explaining safety. This year, they also provided trinkets, like stress balls, with information that dyed fuel is not for road use.

North Carolina has an on-going program of education. They conduct seminars for taxpayers that discuss current laws and changes to laws.

Ohio tries to make sure the public is aware. They have used local media sources to disseminate information regarding motor fuel excise tax collection issues.

Washington has a tax evasion poster that they send out every other year to distributors. The poster displays information about the types of evasion and the penalties concerning evasion. They offer seminars but the irresponsible companies do not show up for the training. Only around 5-10 percent of all distributors show up for training. Problem returns may result in an auditor heading out and doing some training on-site with the offending company. The forms and instructions can be downloaded off the internet. Notices are sent out whenever there is a tax change. Every licensee gets an overview of the tax codes. They have had the press attend searches, showing how the tax can be evaded. The media has placed a camera at a card lock station to document use of dyed fuel. They also have a tip line, which is publicized and used quite often.

Some states provide information on a sporadic basis or when there are major changes in the tax laws.

Nebraska has not performed public service announcements. They used to publish a poster and had an 800 number for reporting dyed diesel. Now, education is provided when out visiting retailers.

New Jersey performs outreach on an as-needed basis. When significant changes occur, they meet with relevant trade associations, which in turn meet with their clients.

North Dakota does seminars (with major changes in tax code) and newsletters.

Alaska conducted a few all-day workshops a few years ago for taxpayers. They were helpful, and they received good feedback, but they are not performed regularly. Also, they sent newsletters when the fuel tax program changed.

Arkansas wishes they had an actual education program for motor fuel tax licensees. They are making plans to implement something. Otherwise, it is just word of mouth. They have no public education programs but an information packet is sent to every new account.

Oregon has conducted no significant public outreach programs, except in terms of information provided to operators of diesel vehicles.

South Dakota provides some education, but most of the information is on the sales and use taxes rather than the motor fuel tax. They hold occasional seminars and there is a manual.

South Carolina has met with petroleum marketers but does not do so on a regular basis.

In 1999 and 2003, after law changes, Texas conducted seminars to educate taxpayers. Also, they send information out regarding the changes to the law. Texas once had a fraud hotline but there were only two calls.

Utah does not do ongoing training for the fuel tax. There are forms and instructions located on the internet. Significant changes to the tax code result in the generation of notices that are sent to the taxpayer.

Wisconsin does not have much advertising or media coverage. There are press releases on large evasion cases. They are very pro-active with registered taxpayers on new forms.

In Canada, neither the federal nor the provincial agencies have invested a great deal of effort into public awareness and involvement campaigns.

FHWA has financially supported an FTA training course. They had a fuel tax evasion highlights program. There were once five individuals in the office but now they are down to just one.

The Navajo Tax Commission has a Tax Compliance Department that has five staff to inform and contact but they do no advertising.

FTA believes education is very important. It is easy to do and there is a deterrent effect.

Chevron finds wide variation in terms of engagement of tax specialists within the industry. Some are very open, while others are almost secretive in what they are trying to accomplish. Some states will reach out to industry for changes in laws but others will not. California, Arizona, Texas, and New Jersey do this. Other states only do the minimum outreach required by law. The industry can help states avoid errors. Chevron likes to see press coverage when there is prosecution for evasion because of the great deterrence effect.

The Petroleum Marketers Association believes that states that have made an effort for public outreach get results in positive benefits for the state. Some do outreach and others do not when their law is changed. Outreach gets a good response. Those who simply publish in a code of regulations experience poor compliance and receive a poor reaction. In-field education seminars pay dividends.

The IRS believes that outreach always has a benefit but that it is hard to quantify. Regardless of information, there will be tax evasion, and outreach is not a solution. People have intent and will continue despite outreach.

The ATA believes that on the whole, states do a fairly good job of informing truckers, even with small fleets, through IFTA mostly. The smallest operators are hard to contact on anything, but operators with ten vehicles or more are generally well informed.

Tax Forms

Many states report that they try to follow the FTA uniformity guidelines.

Alaska's forms are loosely based on uniform forms. They tried to be as uniform as they could but there was some resistance from the community. The uniformity standard is to ask for load-by-load information, but they could not get it, so they get totals by customer and supplier. Documentation is requested for specific items for a refund or credit, e.g., if a distributor uses some fuel for off road use. Sometimes they request invoices. For refunds, the applicant is generally required to show invoices for the tax paid.

Arkansas follows FTA uniformity on schedules, motor fuel tax forms and instructions. They do have a unique situation, "border zone" rights for gasoline. The tax rates for gasoline are lower in certain border cities.

Idaho is in conformance with the FTA standards. There are three types of returns: paper, EDI and a diskette system (IDA Fuel). There are 240 distributors: 80 file EDI or diskette (85 percent of the data are filed EDI) and the rest file paper returns.

Montana gets the information that is suggested by FTA uniformity guidelines.

Nebraska also follows uniformity. They put a great deal of effort into getting electronic filing, and it is now required. They could not cross match data from paper returns.

Other states responded with specific information on the type of information that they collect but did not specifically indicate that they follow uniformity guidelines. Nevertheless, there are likely to be some attempts to do so.

Kansas receives information on net gallons of gasoline, gasohol, and special fuels received. They file net instead of gross and include receipt and disbursement schedules. Schedules of manifest show imports and exports. They try to follow uniformity but may not match exactly. There are often small differences among states based on individual state statutes.

In Florida, suppliers report all loads purchased or sold. Wholesalers can summarize sales to retail stations by county.

New York collects information on beginning inventory, purchases (in-state, out-of-state), ending inventory, inventory adjustments, total gallons sold, and exempt use of fuel. All are included in the motor fuel tax form. Supporting schedules that list out payments show specific shipments of fuel. Pre-paid sales tax is cross checked with fuel tax information.

North Carolina requires receipts, disbursements and reporting schedules. Taxing at the rack reduced the number of taxpayers from 1,400 to 50. The next two fiscal years added 2 percent additional growth ($40 million) over VMT motor fuel consumption. At the same time, there were other joint audits/investigations and greater federal efforts.

North Carolina is looking to create a motor fuel tracking system – an RFP has been issued.

South Dakota has fifteen different license types. Not all pay tax (about 7 for tax and formal reporting). Suppliers file returns (all fuel from the terminal). Many out-of-state suppliers are licensed but it is not required. The tax can be collected by the out-of-state supplier or by the customer. Big suppliers collect the tax for convenience.

Washington requires bills of lading, dates, gross and net gallons, and origin-destination. The documentation is just the return; they do not require back-up data. Paper and electronic are used with the same information on each. Suppliers are 100 percent EDI and it is encouraged among restricted suppliers (about 20 use EDI and 100 paper).

In Canada, the returns are paper at the provincial and federal level. The provinces must always tax the consumer. Thus, the payment is collected at retail but followed through the distribution chain and submitted to the federal agency. The wholesaler remits the tax but is reimbursed down the distribution chain. There are no refunds for the diesel tax but there are for the gas tax.

The Navajo Tax Commission requires that the distributor, carrier, retailer, and refiner all provide reports. They require information as to where the fuel was picked, where delivered and type. They tax dyed fuel.

FTA believes that you should be able to track fuel from top to bottom. Moving the tax to the rack loses much of the information. Both taxable and exempt must be tracked with all documentation (e.g., trucker identification number). This information can be used for on road enforcement as well. If it is in the database, on road enforcers should be able to access and add to the information. In ExTOLE, there is a module for on road information and all states have access to that information. Only six are using it. IRS did some training in late 1990's but nothing since.

Petroleum Marketers Association believes that states need to follow the suggestions of the FTA uniformity committee. If they ask for documentation following this standard, they have a better chance of getting the information they want and of getting it electronically. More uniform forms are easier for clients to comply with and provide more useable data to the state.

The ATA represents fuel drivers and has not had any complaints. Drivers must now get a state license to transport fuel. Some were surprised about the licensing. Most just pay the tax. The industry wants enough money to build and maintain roads and they want all to pay their share.

C.6. Responses Related to Audits

A number of states admit to little auditing effort with respect to motor fuel taxes. This is typically because the auditors are responsible for all taxes and view motor fuels as being relatively unimportant.

Florida does very little auditing. They did a lot before moving to the rack but not much now due to confusion as to who to audit. Currently, they do mostly e-auditing and are starting a project to do electronic software audits for fuel. They are a functional agency with 550 auditors and 50 other analysts, mostly sales tax. Nobody just does fuel.

Alaska has an audit staff of one part-time auditor for motor fuel taxes. Motor fuel taxes were three percent of total collections in 2003 and are expected to go down as a percentage due to a cigarette tax increase. Motor fuel does not get a lot of attention, especially with Alaska's low rates and most state revenue coming from big oil companies with severance and income taxes. Also, money that flows into their DOT does not allow for more federal match. They have a minimum guarantee. Other states have an incentive to collect more taxes to get more federal money but they do not.

In Mississippi, the auditing is done by the DOR, and there are no assigned fuel tax auditors. They are collecting $33 to $35 million per month in fuel taxes, but if DOT wants an audit, they must go to the audit section and find someone.

New Jersey performs most audits at the seller/user level. When sales tax audits occur, they look at the motor fuel taxes as well. There are selection criteria that indicate that an audit should occur: 20 percent decrease in taxable sales or failure to file a return for a certain period of time. Audits also occur through other audit findings or tips from competitors. If there is a criminal investigation, they use the state police.

New York has forty-five auditors who focus on IFTA, Tobacco, Cigarette and Alcohol taxes.

In contrast, some states report extensive auditing efforts focused on fuel taxes.

In Arkansas, the audits are done at the Highway Department. There are a group of field officers for the Department of Finance and Administration but they have not been active in motor fuel for many years. In 1979, The Highway Department was given the authority to audit. They currently have seven auditors that can audit both IFTA and motor fuel, but only four work actively in motor fuel. The method of audit is very different since electronic filing was required as of January 2000. Because they already had a motor fuel tracking system, they can audit with a cross match process. Their state constitution only allows for an audit every three years, so they do a review monthly and only audit when problems are noted. They effectively audit every month by cross check. Their seven auditors act as agents of the Commissioner of Revenue. Hence, they can look at records that the Highway Department does not have access to.

Idaho reviews 100 percent of the terminal, pipeline and distributor reports and they use an electronic program that compares reports and identifies discrepancies. When a discrepancy

occurs that cannot be resolved, an assessment is sent out to the company. The company must justify the discrepancy. Auditors check discrepancy reports for a 3-year period and will take unresolved discrepancies to the company. The auditor resolves internal controls, ensures dyed diesel sales are appropriate, and other similar tests.

Indiana has approximately 20 field auditors assigned to fuel tax.

Nebraska has eleven auditors and two audit managers that work full time on audits. In addition, they have a group of employees who are account representatives that follow specific accounts. They get information reports from terminals. They also visit retailers. They do not require returns but they visit to make sure that all fuel can be verified and has Nebraska tax paid on it. The goal is to audit every company in a border county every three years and every five years for others. Site visits give them a chance to look at records and to educate and answer questions. In addition, there is one full-time investigator for motor fuels who is on the road constantly and checks terminals.

North Carolina audits all major carriers every two years. Other accounts are randomly selected for audit. All reports are filed in paper format and are keyed into the computer system. North Carolina is conducting on-road inspections, checking for diversions and dipping tanks. North Carolina can seize the truck and the product in the case of diversions. There is a 5-person enforcement staff that dips tanks, examines rail shipments, audits airports and examines barges. Post 9/11 jet fuel sales did not drop off even though there was a drop off in air travel. Jet fuel is not taxed in North Carolina and they view this as a significant potential source of evasion.

North Dakota chooses accounts for audit based on problems with a specific account or as a random check. None are routinely audited due to size.

Step 1: Send out a letter.
Step 2: Field auditor is assigned.
Step 3: Contact taxpayer and tell them what information is required.
Step 4: Check the cross-checking to verify discrepancies.
Step 5: Compare tax return to information presented on-site.

There are some desk audits but it is very limited. According to statute, the highway patrol would have to perform the inspections and surveillance for an investigation, but they do not view it as a significant source of revenue.

Pennsylvania uses field audits. They try to audit once every three years, so they audit about 250 per year. They also spot check and review new accounts with desk audit. They use cross-matching as well.

South Dakota has three full-time agents and six auditors. An agent's role is education and license or compliance services. It is less extensive than an audit, with more education. There is not normally an assessment. If the agent finds problems, then they will audit.

Texas has no income tax, so the focus is on sales tax audits. There is no sales tax on fuels but there is on blend stocks. There are around 1,000 taxpayers in Texas at the rack level. The most significant taxpayers are selected for audit every year. The smaller taxpayers are audited based on: a) a complaint filed about the company, b) an anomaly in their report, c) a random selection process. There is no tax on aviation fuel in Texas.

Utah has eight auditors and one technician. They handle all the auditing and enforcement. No surveillance is conducted. Field audits are performed to follow-up on discrepancies. Manual cross-references are conducted at least three months per year (three separate one-month periods). This means that every load for every company for three of the months will be reviewed. Where discrepancies exist, Utah will use this information as an audit lead.

Washington notes different collection types:

- Non-audit collections (e.g., late payments).
- Audit collections (errors caught during audits).
- Evasion collections. Evasion collections result from enforcement officers who catch blatant attempts to evade taxes. The evasion unit is staffed with law enforcement officers and they handle criminal activities. Once there were eight detectives. Now there is only one officer.

Wisconsin audits based on monthly reports. They have six office auditors and eight field auditors. Major suppliers are on a two-year audit cycle. Restricted suppliers are on a four-year cycle, although audits are conducted more often if there are problems. These can result from third party tips, other state information, or internal error checks based on data from carriers and suppliers.

The Navajo Tax Commission conducts field audits and reviews data as it is received. Seven field audits have been done already (the audit program is two years old). They have seven auditors for all six taxes that they levy. They have not recovered much from audits done so far.

FTA believes that states should have dedicated staff auditing just for fuel tax. In twenty-two years they have seen all types of audits, and motor fuels are always left behind. The size of the audit staff depends on the state and volume. States should use more weight and safety enforcement officers for fuel tax enforcement, especially with tankers coming with fuel. Montana increased gas tax collections by 10 percent by taking a copy of the BOL. State weigh-station and on-road enforcement not at scales should check for BOLs and send the information to the fuel tax collectors.

Cooperation depends on where motor fuels tax collection is housed. If it is housed in a revenue department and there is not a good relationship, then nobody looks at weigh stations. With DOT, weights and measures are the same agency and they understand the program, they also get the revenue. It does not cost more, but with a Revenue Department, there may be a turf issue. FHWA is trying to get DOTs to talk to revenue departments. There is money at federal level for state enforcement efforts.

Chevron views audits as an integral part of the business process. Depending on the base price of fuel, taxes can be 25 percent of the sales price. Audits tend to look more at the process of how the data was collected. Quirks in state laws seem to cause most problems.

The Petroleum Marketers Association thinks audit practices are going in the wrong direction. In the old days, states tended to use full-time fuel-tax auditors. Over time, state "best practices" have been to move to a centralized functional approach, with auditors looking at all taxes. This is a move in the wrong direction. The quality of audits is down and the number of problems is up. This is avoidable with special purpose auditors. The current system is spread thin in terms of auditor knowledge of the many taxes they must monitor. Fuel requires specialized knowledge to do a good job. Auditor knows too little detail about the specifics. They make assessments based on general knowledge. Many assessments that could have been settled at audit now go to appeal.

The IRS is in the process of trying to put together agreements with some states for a Joint Operating Center for National Fuel Compliance. North Carolina, Texas, and California are working with them to take the concept from idea to reality, a national clearinghouse for fuel across the country.

As of today, the IRS has 238 agents across the country doing excise tax audits. They are in the process of creating a fuel tax territory, a national organization with 50 agents only doing fuel tax. Now there are 40 other taxes that they try to enforce.

Joint Audits

Few states engage in joint audits either with each other or with the IRS. Most do not view them as productive as audits but rather for the information exchange.

Alaska has not done joint audits with other states. They did one with the IRS, but they did not believe that it worked well.

Arkansas reports that they have not done a joint audit but they have worked on two where they exchanged information with Louisiana and each did a separate audit.

Florida used to do joint audits with the IRS but has not done so for a long time. None are done with other states, although they do exchange information, e.g., with Georgia.

Idaho reports that it frequently does joint audits.

Indiana does both, but more with states than with federal agents. States are interested in different elements than the federal government. For example, the federal government is not interested in state to state movement of fuel but states are.

Minnesota has done joint audits with Iowa and Wisconsin, and they are gathering information with South Dakota due to an Indian Reservation. Fuel goes from North Dakota to South Dakota

with no one willing to admit where it comes from. They do not have a great deal of interaction with the IRS except for 637H data on jet fuel without any tax on it.

Mississippi does joint enforcement all the time. They will call Louisiana and tell them they will stop everything carrying fuel. They fill out a fuel tax form for each truck, with all information on cargo, obtain information from fuel manifests (licensed distributor required), and find out where it's going or if it's being blended. The state has 200 officers for weight enforcement, drug interdiction, safety and fuel tax. They enforce more laws than any other state. Commercial vehicles include barges, rail and trucks.

Nebraska reported doing a few joint audits with other states and the federal government. They did not work very well, especially with the IRS. They are not concerned with which state fuel goes to.

New Jersey finds joint audits help by: a) keeping the lines of communication open between the states, b) serving as a tool to keep your audit person aware of what's happening in other states.

North Carolina does participate in joint audits, mostly with other states, such as Virginia and Tennessee. With the IRS, it involves more joint enforcement programs, such as terminal audits and port audits. They also stop trucks to see if the BOL has a destination state. There is a $5,000 penalty if fuel is offloaded in the state without a listing on the BOL. They executed a project with $800,000 assessed.

North Dakota performed one joint audit with Minnesota.

Texas works effectively with the IRS and is the head of the regional Joint Federal/State Tax Force. Texas has agreements with other states and the IRS. Also, the FTA meetings allow for more coordination and discussion.

Utah is not involved with the IRS but they do joint audits with other states. The focus of this effort is the import/export schemes relating to interstate transportation of motor fuels. Utah provides export information to the other states (recently started). Some neighboring states provide these forms to Utah.

Wisconsin does about one per year, but does not view them as productive.

Canadian provinces all have agreements to share information, and some do perform analyses between the various data. Export/import data are collected from the feds but shared with the provinces. Some provinces don't check to see if the exporters are licensed in the province that they are importing into.

The Navajo Tax Commission looked at joint audits with Arizona but has not done any yet. They share information. Nothing is done with the IRS because they are not recognized. They would like to share information but the IRS cannot share with a tribe.

FTA believes joint audits are a good idea in concept; but when the IRS is involved, states do most of the work and the IRS does not share with the states. IRS must have a change of frame of mind with joint audits. They must do it together and not shut states out once the data has been collected. IRS often ends up with all of the money. IRS takes their money first so states may get nothing if not all that is owed is collected. Joint audits with other states work well. Only a few do it.

Chevron has never seen a joint audit in the sense of true audits. It would be difficult due to differences in taxes. Probably could not be done but it is done on targeted issues. Not sure joint audit would be preferred method for either the IRS or the industry or whether it would be productive.

The Petroleum Marketers Association representative has defended a few joint audits. In general, they are just another audit. There should be benefits to states with multi-state audits, but state auditor knowledge of interstate commerce, both exemption and taxation, tends to be poor so the audits do not work well. This is more a criticism of state audit training than of the auditors since the states focus on their own tax structure. Auditors receive minimal training on nexus. (Nexus requires that a state can only tax a business with a physical presence in the state. For example, a state could not force a terminal in an adjacent state to collect tax for it unless the terminal also had operations in the first state.) The focus is on how to use it to get "our" tax rather than on true exemptions in interstate commerce and how neighboring state systems impact on their state. Knowledge for state auditors is minimal, and federal auditors have no knowledge of interstate commerce because it is irrelevant for them.

The IRS views joint audits as a mixed bag. Some were less effective when a state does not have the same taxing point. If a state is taxing at retail, it does not work well. They question benefits that would be achieved. A joint operating center would increase participation. They would like to have more cooperation and coordination. They work with 50 sovereign entities and need to be sensitive to their needs.

Audit Issues

The most important item mentioned in this section was the auditing of fuel that crossed state borders. A number of states identified it as the most important audit issue. The industry representatives were mostly concerned with auditors having good training and being prepared

In Alaska, the particular problem is to hold the distributor liable for improper tax-exempt sales. The state must prove that the fuel was used for a taxable purpose. They would have to check with the user and then go back to the distributor if the fuel was sold as tax exempt. It is a quirk of the way the statute is written. They would have to start over to get good legal structure since current laws are problematic. Most administrators would implement best practices if they knew what they were.

For Arkansas, the major issue is cross border information. They do not receive information from other states in a format they can use. It is hard to get information on imports and exports. As far as best practices, they chose not to make many pieces of data mandatory and now they wish

they had. There are many errors, such as a wrong federal identification number. There are more errors caught due to electronic reporting, but it may create opportunities for more errors due to the filing method.

For Florida, the issues are Georgia and cocktailing or blending. One thing they do is require everyone who hauls fuel to report. Most states do not. Carrier records can be very helpful in tracking fuel or proving evasion.

Indiana noted that the number of invoices and amount of documentation are a major issue. There is a lot of paper to process. Movement of fuel across states is also very important.

Mississippi sees the big questions as third party information and how it is used. It is a big issue. States should have DOR communicating with other agencies. Transportation reports can be used to document taxes and fuel use but auditors may not know this. Auditors can go to retail outlets and check. Fuel tax audits takes longer and are harder than other audits, and DOR agents are skeptical of their returns.

For Nebraska, imports and exports are their biggest concern. They have good data from Nebraska terminals, but not on others. Also, they had to collect an environmental fee that took up much of their audit time. This is being changed.

New Jersey investigates the entire business operation. For example, if there is a service station that shows a small amount of diesel fuel but they show a great deal of information from gross receipts or the cost of goods, the gross receipts may show something. Records from the gross receipts tax returns are then compared with motor fuel tax returns. New Jersey stresses with the auditors that they should review applications, forms and historical business practices before they actually meet with the taxpayer.

North Carolina listed returns not filed correctly, prior period adjustments, and lack of adequate records as the major issues. They are willing to prosecute but find that motor fuels cases are difficult to prosecute. If an audit is completed, it is civil rather than criminal.

South Carolina sees verifying exports and exemptions, making sure low sulfur dyed fuel is not used on road, and checking on diverted products as important audit issues. Also important to verify taxes were actually remitted.

For South Dakota, the major issue is tracking fuel. The terminal has fewer licenses and they can focus on big taxpayers, but they lose track of some. They cannot enter all of the tracking information. Importing can easily be misrepresented. Also, there is some fraud.

For Wisconsin, the biggest audit issue is gallons originating in one state and going to another one. This represents 50-75 percent of adjustments. Monthly export schedules are sent to neighboring states.

FTA believes the biggest problem is information. Agents must have audit information and other compliance data. Otherwise, it is almost impossible to follow the information. Auditors need proper tools.

From the Petroleum Marketers Association perspective, the quality of the auditor and prior preparation are the most important issues. An auditor must have some idea of both how the laws work and how the industry works. Often, the industry must train the auditor, and they do not like that. Also, the auditor must do prep before showing up. The auditor must have some idea of how the industry does business and how the product moves in his state. Also, it is important to abandon worst-case practices that some states employ. They say you will be billed for the audit if the auditor must visit you. To prevent this you must send records to the state. Oil is not an intrastate activity. The top eight taxpayers for federal taxes pay 38 percent of the deposits to the federal trust fund. They will also pay the most to any particular state but the chance of their being located in that state is small. When the auditor goes to that taxpayer's facility and bills for time and travel, it is just wrong. Having the taxpayer ship their records to the state is equally wrong. They do not know what the auditor will want to see, but also there is no one to explain how to interpret what is provided. Often the taxpayer would be sending a tractor-trailer load of paper.

The Petroleum Marketers Association believes that compliance costs are huge for the industry. In jurisdictions that allow either a collection allowance or a reasonable float, the overhead costs are largely offset. However, about half of the states allow no collection allowance and some have very short collection periods. In these states, the collection overhead costs are huge. They could be as much as 5 percent of collections for a big operation or 50 percent for a small operation. For some operations, like trading company operations, cost of compliance is greater than the tax paid. Generally they do not pay any tax but they must file many reports and forms.

For the IRS, the biggest audit issue is the actual use of fuel. The closer the tax is to the end user, the more difficult it is to audit. Moving the point of taxation to the terminal rack is recommended. The major issue is to identity fuel as taxable versus non-taxable. Audit does not track what happens to the product after it leaves the terminal.

C.7. Prosecution of Motor Fuel Cases

Most states have limited experience with prosecution of motor fuel tax evasion cases. A number of states expressed concern about whether prosecutors were knowledgeable about motor fuel tax laws, either because they had no recent experience or because they were more interested in other types of cases.

Arkansas did prosecute a couple of cases in the early 1980s of specific loads of fuel from out of state. One was upheld and one was not. Arkansas does not believe that prosecutors have a good understanding of motor fuel tax law.

Florida has not prosecuted any fuel tax cases in the last seven or eight years. They used to prosecute almost monthly with the retail tax. Prosecutors probably do not have a good understanding of the fuel tax laws since no cases have been prosecuted recently.

In Idaho, the Attorney General's office prosecutes the evasion cases and the staff has an understanding of the issues.

Montana, Nebraska, South Dakota, Utah, and Wisconsin expressed various degrees of concern about whether prosecutors had the knowledge and / or willingness to pursue motor fuel evasion cases.

In New Jersey, all of the fraudulent activity is turned over to the criminal investigations unit. To obtain an effective motor fuel tax prosecution program, an agency needs a lawyer that is dedicated to motor fuel excise tax division. More specialization allows for great knowledge and improved focus.

North Carolina has not had cases recently. Some were sent for investigation but not taken.

Ohio has prosecution with dyed fuel. No multi-million dollar cases, but smaller cases help keep it open.

The Utah tax commission has referred two cases to the criminal unit, but the criminal unit has not responded. The tax commission finds the evidence of evasion during an audit and this fact is viewed as a tainted lead.

The FTA believes that prosecution is a problem because prosecutors go after glamorous crimes. The best thing for motor fuel administrators is to contact prosecutors and educate them on the issues. Texas has the best practice. All county prosecutors have training.

Chevron notes that the industry is perplexed by the lack of state prosecution. Industry would support stiffer penalties to make it worthwhile to prosecute tax evasion cases, and that would really deter evasion.

C.8. Responses Related to Motor Carrier Enforcement

Dyed Fuel Inspections

In general, the interview responses indicate that dyed fuel inspections take place but there seems to be substantial variability in terms of how these are conducted in each state. Some of the interviews reveal a very minimal staff while others indicate an aggressive enforcement program. Coordination with the IRS seems common. Light vehicle use of dyed diesel can be inspected by the IRS but most states do not check.

In Arkansas, there are two highway police investigators that concentrate on dyed fuel testing. They require import/export permits on fuel crossing state lines and have enforcement at weigh stations. Weigh station enforcement has varied. They hope to have more officers trained as part of their regular duties.

In Kansas, they used to have dyed fuel inspection programs with their own inspectors and the Highway Patrol and had good success. In 1999, the DOR was reorganized and the funding for

fuel inspectors was lost. Since then they have to rely on the Highway Patrol, weights and measures and the IRS. Overall, it is less effective.

In Texas, road blocks were used to conduct on-road inspections where dipping of tanks was completed. At first, Texas would catch 16 or 17 evaders per 1,500 inspections. Texas now focuses on responding to complaints. The Texas permit is viewed as a privilege, thus subjecting a company to the regulations. Texas can inspect facilities, especially if a compliant has been filed. An example is a tow trucking operation where dyed fuel was used by the tow trucks on-road.

In Canada, Quebec has several inspectors and Ontario is adding on-road inspectors. However, some of the provinces are spending less on on-road enforcement programs. There is a constitutional question concerning whether or not there is a probable cause to perform the inspection. However, if you view black smoke coming out of the tail pipe, there may be grounds to stop and inspect the truck. Or, if you view someone purchasing tax exempt fuel at a card lock station illegally, an inspection can follow.

Arkansas had two officers. They are down to one now due to retirement. The year 2004 had the lowest number of tests. They are training two officers per district in five districts. When they all are trained there will be ten regular officers who can test and the audit officer will coordinate activities.

Florida's DOR does not perform inspections. The DOT examines a limited number and agriculture operations but they do not have sworn officers in their agency. They coordinate with the IRS. They try to work from an audit standpoint but it is difficult with small trucks. The IRS finds a lot of pickup trucks with dyed fuel but Florida does not investigate light vehicles. They receive information from the IRS but only the IRS checks for dyed fuel in small vehicles for Florida.

Indiana stops vehicles to test for dye and they can stop small vehicles. They find some violations. They used to do joint audits with IRS but have not performed any in some time.

In Minnesota, dyed fuel is growing in terms of emphasis. The state has thirty commercial vehicle inspectors, some state police, and others certified to perform inspections. Weigh station testing is viewed negatively. Mobile enforcement is preferred.

Montana noted that inspections are performed through weigh stations and roving motor carrier safety officers. However, the primary function of these enforcement officers is safety, not fuel. They do routinely dip, and they have a quota for dipped tanks each month. In Montana, for vehicles over 26,000 pounds you do not have to have a reason to dip; but you must have probable cause for vehicles under this weight.

Nebraska said that years ago, the federal government provided money to the states. The state spent the money on equipment for carrier enforcement. They have an agreement for a certain number of checks every month. They are usually done with portable scales, rarely on interstates

or at weigh stations. Word of mouth regarding inspections is awesome. Their program is effective but they could do more. Temptation gets higher with higher prices.

North Carolina DMV officers are certified investigators. They have red alerts every month with concentrated enforcement, off of main roads. This generates a substantial number of dyed diesel penalties.

There is a criminal penalty for dyed fuel in Ohio. It is a first degree misdemeanor, six months and $1,000 maximum on the first conviction plus penalty at the same rates as the IRS. Violators can pay up to $2,000 to Ohio.

South Dakota had one joint IRS dyed fuel enforcement effort. They also looked at shipping papers but the IRS picked poor locations (did not consult with state). They feel it was a waste of time and hope for more cooperation in the future.

Some states rely on IRS to do all inspections and enforcement

Idaho does not perform on-road inspections but rather relies on the IRS inspection program. If someone is caught by the IRS and does not report to the Idaho DOT, the person is assessed a 7-year backlog for all dyed fuel uses. The person must prove that the 7 years worth of dyed fuel was used for tax-exempt purposes. The State Police and other referrals are also used to catch evaders.

Wisconsin is capable of dyed fuel enforcement, but it is not done often. It is only done when there is probable cause. They have worked with IRS once or twice. Carrier enforcement people do not want responsibility. Sometimes they will sample and notify but this is not common.

The IRS agents can randomly stop trucks. There are 140 to 150 officers across the country charged with enforcing the dyed fuel laws. They inspect on roadside primarily at state identified weigh stations or will work with state officials that stop trucks. They will check on whether fuel is dyed properly and will check retail stations, storage facilities, farms, and businesses with storage tanks.

Effectiveness of Dyed Fuel Programs

In general, the consensus is that dyed diesel programs are effective although how effective is not known.

In Nebraska, they adopted dyed diesel in 1995, and diesel fuel tax collections went up.
The State of Idaho performed a study on total tax evasion. They found 1 percent of the evasion by distributors and 6-12 percent evasion of dyed diesel. That is 6-12 percent evasion based on dyed diesel gallons.

ATA stated that trucking companies are not the problem. Dyed diesel violations usually result from construction firms or farmers.

Arkansas cannot put a dollar estimate on dyed fuel abuse but there is a lot of farming. Mostly they find pickup trucks but not large trucks. Word of mouth spreads quickly when they are in an area. They can stop pickup trucks to check. They do not stop eighteen-wheelers just for a fuel check.

Florida said that dyed fuel was effective primarily because it facilitated the ability to tax diesel fuel at the rack. Without dyed fuel, everyone would have to buy taxed fuel and file for refunds. This would never have passed. Putting the tax at the rack and dying diesel fuel works. It stops many people due to the high penalty. For a first offense, one can pay a $1,000 federal and $1,000 state fine. Thus, even a small enforcement level can be effective. Word spreads if someone pays the penalty.

In Kansas, it was effective when they had inspectors to enforce it but it is less so now. They need dedicated inspectors. They obtain data from the IRS. The IRS works with the Highway Patrol. A few officers will stop trucks just to check, but most only check when there is another violation.

Montana said that dyed fuel has been effective to some extent. One thing that happened is that government agencies can run on dyed fuel and the agencies used a credit card. The credit card was bid out to a non-oil company and they did not take the federal tax off. Thus, governments ended up paying the federal tax, and government agencies then got dyed fuel at retail stations. Now there is ready access to dyed fuel on the highways and this created a problem. The second area of concern relates to dyed fuel delivered to farms but used in pickups.

South Dakota noted that dyed fuel enforcement was effective. IRS enforcement helped but they needed state enforcement. The Motor Carrier Services enforcement section of the State Highway Patrol deals with all motor carrier issues.

Wisconsin said that it is effective because of the IRS and the severity of the penalty. They do not think it is a huge issue but evasion does occur.

FTA said that it has been effective but lack of on road enforcement is a problem. They also see a need for enforcement on light vehicles.

API did not have any statistics but understands that it is very effective. After tax or dye rules, kerosene numbers shot up. So people were taking kerosene and saying it was for non-taxable uses. Kerosene was brought into tax or dye in 1997, so it has been eliminated as a problem.

IRS said that dyed fuel enforcement is effective. When first in use, it produced close to $1billion per year. Fuel dyeing began in 1994 and there is still evidence of people using it when they should not, so continued enforcement is needed.

OIG said that they can only comment based on interaction with the states. There are two working groups that the OIG representative attends. Southeastern AASHTO feels there is still a problem with dyed fuel. There are not enough resources to have an impact with dyed fuel. North Carolina is trying to be more proactive in motor fuel tax evasion. Representatives went

and inspected 24 stations that sold dyed fuel, and all 24 failed the test. North Carolina has concrete data and is documenting what they are doing.

Chevron indicates that there is a tremendous deterrent effect by dipping for red dye at weigh stations. Some states do this consistently but others do not. Some try to compare what is in tanker to the BOL. This is useful for the deterrent effect even if it produces little revenue.

Returns on Enforcement Activity

States typically report high levels of returns to their audit and enforcement activities.

Arkansas has assessed $6.9 million since they obtained their motor fuel tracking system. Every tax return has been checked for 4 years. It would have been impossible with paper returns and regular audits. They can't put a value on the improved reporting due to better tracking or on compliance because of the tracking system but they know it has had a significant effect on problem accounts. Some taxpayers may have gone bankrupt because they were forced to pay the tax due but the state stopped the loss of revenue.

Indiana believes that there is a benefit to states for auditors and investigators in the field whether they generate revenue or not. States must have a presence in the field to maintain voluntary compliance. When they find a scheme or a situation of fraud, it creates a lot of interest if prosecution occurs. They not only get money from the prosecution but also gain in terms of public perception. Others are less likely to evade.

The Mississippi figure is probably close to the national average, $10 per dollar spent on enforcement. One group in Jan 2004 created a snapshot of what was moving in the state by stopping every truck and filling out forms. Word of this snapshot traveled quickly and the states experienced a 13.5 percent increase in tax collections over the previous January. Another time they went to major truck stops (over 1.5 million gallons per month) and convenience stores and asked to see manifests of fuel from the month before (should have been reported). Following this inspection, the state experienced a 19 percent increase in motor fuel excise tax collections over the previous March and April. On road enforcement increases tax compliance. The state passed a law regarding barges and now these barges can only offload fuel at registered IRS terminals. There are penalties for the captain and owners if it is offloaded at other places.

Before the law change, they flew over the Mississippi river with the FBI and found 50 facilities with tank farms or other facilities to offload fuel. A barge must be equipped with pumps to offload fuel (takes up to six hours). They would like to check certain areas at night but do not have the resources yet. Sometimes, the loads are labeled as something other than fuel when offloaded. There is around $1 million in tax liability per barge load (federal plus state taxes). They have pictures of old tank farms once used for crude oil storage. They stored crude on its way to a refinery but it can be reversed now. Initially, they flew the Mississippi looking for roads to offload fuel onto trucks. Instead, they found the tank farms and recent improvements. They think it is a big problem and just spent $600,000 for a helicopter to work on the issue.

Nebraska has put a big effort in tracking and cross matching. Error listings were huge with paper. They are now using electronic filing and working to obtain cleaner files from taxpayers. They refund almost as much money due to cross matching as they collect but the perception is that it makes a difference. If people are not caught, then there is an incentive to increase evasion over time. Voluntary compliance has improved due to this deterrent affect.

During the last 6 years, Oregon DOT has focused primarily on the big budget item – the gasoline tax. Occasionally, they discover retail diesel outlets that don't know they must collect taxes. There are ways to calculate return on investment in terms of the auditing efforts and one is simply using recoveries as the numerator and total tax collection as the denominator. Most recoveries are due to oversight. ODOT doesn't catch many fraudulent tax forms. They share lists of potentially high-risk taxpayers with other states and the IRS. Because Oregon doesn't collect diesel taxes on heavy trucks, motor fuel tax evasion is not perceived as a significant problem in Oregon.

Net recoveries in Oregon for the 1999-2001 biennium for the motor fuel tax (gasoline, gasohol) were $922,000. Use fuel tax audits generated $1.1 million. For the 2001-2003 biennium, fuel-use tax recoveries were $900,000 and around $670,000 for motor vehicle fuel. Use fuel tax is easier to avoid and evade.

Wisconsin believes that the audit staff is effective with $250,000 to $1 million collected per quarter, mostly due to errors and omissions.

The Navajo Tax Commission audits find that their enforcement efforts are effective; and estimates an evasion rate of about 3-4 percent.

FTA thinks the return to audits is high in general. States used to have to report data to the federal government and will have to report when federal money is again available. They were finding high returns on audits. States with actual convictions got very high returns. Reporting is not required today but it will be in the new highway bill.

The IRS return on its fuel program is $14 per dollar spent. No additional data is available.

DOT OIG has two ongoing cases that are significant. They are likely to obtain a strong return on investment in terms of fines and recoveries but do not know yet. They expect that some of the new cases are bigger then they first appeared.

APPENDIX D

Annotated Bibliography

Report: Addanki, S., Cohen, Y., and Dunbar, F. January 1987. *Gasoline Tax Evasion*. National Economic Research Associates. Washington, D.C.

This study applies two approaches to estimating evasion of the federal gasoline tax: a comparison of nationwide gasoline consumption to gallons on which federal excise taxes are collected and a regression analysis trending Internal Revenue Service (IRS) taxed gallons to Federal Highway Administration (FHWA) and Energy Information Administration (EIA) data.

The first approach to estimating evasion compared estimates of nationwide gasoline consumption from 1979-1986 to estimates of gallonage on which excise taxes were collected. The findings of this analysis suggested that there was little evasion from 1979-1982; however, following a tax rate increase in 1983, there was much greater evasion from 1984-1986. During the 1979-1982 time period, there was an estimated 1.8 billion gallon shortfall – which could have been a direct result of exemptions to fuel taxes – but the shortfall grew to over 7.1 billion gallons during the 1984-1986 time period. The 5.3 billion gallon increase in the shortfall correlates to $480 million in annual forgone revenue due to evasion.

The second approach trended IRS data relating to gallons taxed to sets of consumption measures for the period 1974-1982, and then used the trend line to predict taxed gallons from 1984-1986. The predicted amount of fuel consumed was then compared to the amount of gallons taxed. The difference between the predicted values and actual collections during the 1984-1986 time period was 5.6 billion gallons per year, resulting in an annual evasion estimate of $510 million.

A separate model was developed for application in New York State. The model estimated that unreported gasoline sales ranged from between 14.5 and 20.9 percent of reported sales. That range of evasion amounts to $168.4 and $254.5 million in annual lost state and local tax revenue due to evasion.

Report: Auerbach, Alan. July 1999. *On the Performance and Use of Government Revenue Forecasts.* University of California, Berkeley and NBER, http://www.kerosun.com/irstax.htm

This paper analyzes and evaluates the performance of government revenue forecasting models, specifically focusing on the forecasts performed by the Congressional Budget Office (CBO) and

the Office of Management and Budget (OMB). Performance evaluation is based on the bias and efficiency of the forecasting models as well as how accurate CBO and OMB estimates are compared to private revenue forecasts. Auerbach concluded that the performance of government revenue forecasts doesn't differ substantially from private forecasts. However, government forecasts were found to fail various statistical tests of efficiency.

Report: Battelle Memorial Institute (BMI) and National Renewable Energy Laboratory (NREL). July 2001. "Vehicle Technology Assessment for MPG Impact and Forecast Highway Revenue Forecasting Model (HRFM)," *Fuel Module*. Columbus, Ohio.

This study analyses the potential effects on fuel economy resulting from recent EPA emissions' requirements, new vehicle technologies likely to be implemented in the next 20 years and pressure to reduce U.S. consumption of foreign petroleum. This information is required to update the fuel economy inputs to the Highway Revenue Forecasting Model. The four vehicle types classified and explored by this report are passenger cars, light trucks and SUVs, medium-duty trucks, and heavy-duty trucks. Fuel economy for each vehicle class is estimated for near-term, mid-term and long-term time frames, subject to certain assumptions.

Report: Balducci, P. July, 2004. *Current Rates of Evasion in the Areas of Federal Motor Fuel and Other Highway Use Taxes: Task 7 Report*. Prepared by the Battelle Memorial Institute for the Federal Highway Administration. Portland, OR.

This report identifies and provides an analysis of data sources currently available and relevant to motor fuel tax evasion. A general overview for each source of data is given as well as its source, collection frequency, method of collection, limitations and availability. This data is classified into three specific types: motor fuel volumes, tax collections and travel data. Data sources reviewed include Federal Highway Statistics, the Petroleum Supply and Reporting System, the Waybill Sample, the American Petroleum Institute's Weekly Statistical Bulletin, Waterborne Commerce of the United States, the Commodity Flow Survey, the Statistics of Income Bulletin and the Transportation Energy Data Book.

Report: Baluch S. January 1996. *Revenue Enhancement through Increased Motor Fuel Tax Enforcement*. Washington, D.C.

This paper assesses the revenue productivity of motor fuel tax enforcement legislation and motor fuel tax compliance programs. The report notes that in 1994, FHWA estimated federal and state fuel tax evasion at $3 billion annually. Further, the paper presents the findings of an analysis conducted by FHWA to determine diesel fuel tax revenue growth attributable to increased compliance efforts. The paper attributes $600 - $700 million in revenue growth experienced in 1994 to improved compliance from enforcement efforts.

Report: Battelle Memorial Institute and National Renewable Energy Laboratory. July 2001. "Vehicle Technology Assessment for MPG Impact and Forecast Highway Revenue Forecasting Model (HRFM)," *Fuel Module*. Columbus, Ohio.

This report documents the update of the fuel module of the Highway Revenue Forecasting Model (HRFM). The HRFM was developed in 1981 as a means for the federal government to develop both short and long-term estimates of federal fuel tax collections. The model has been updated three times since 1981. The principle objectives of the HRFM model update were to assess the

potential impact to fuel economy resulting from market penetration of alternative fuels, pressure to reduce dependence on foreign petroleum consumption and new emission control requirements required by the U.S. Environmental Protection Administration (EPA).

The study constructed forecasts of future fuel economy growth by vehicle type. Passenger car fuel economy was forecasted to grow by 1.8 percent annually during the near term (1999-2005), 0.5 percent annually during the mid-term (2005-2010), and 1.5 percent annually during the long-term (2010-2020). Light truck and sport utility vehicle MPG was forecast to grow by 0.5, 2.0, and 1.5 percent annually during the near, mid and long-term, respectively. Medium-duty truck MPG was forecast to grow by 1.5, 0.5, and 1.0 percent annually in the near-, mid-, and long-term, respectively. Finally, heavy-duty truck MPG was forecast to grow by 0.75 percent annually in the near-term, 0.5 percent annually in the mid-term, and 0.5 percent annually in the long-term.

Testimony: Brimacombe, Joseph, R. July 17, 2003. *Statement of Joseph Brimacombe, Deputy Director, Compliance Policy, Small Business and Self Employed Operating Division, Internal Revenue Service. Testimony before the Full Committee of the House Committee on Ways and Means*. Washington, D.C.

This testimony presents motor fuel excise tax compliance issues and trends as perceived by the IRS, as well as strategies used to address compliance issues. Among the major evasion issues noted was the misuse of dyed diesel, boot legging, smuggling and cocktailing. The removal of tax exempt aviation fuel from the rack was also listed to be a major issue. Untaxed aviation isn't dyed and therefore incentives exist to use it for taxable aviation purposes and for on-road diesel trucks resulting in lost revenue from federal and state aviation and diesel taxes.

This testimony also discusses IRS strategies and efforts currently underway to curb fuel tax evasion. The Excise Summary Terminal Activity Reporting System (ExSTARS) has been a main focus of IRS efforts towards reducing evasion forms such as misuse of dyed fuel. Fuel finger printing is another technology that can address smuggling, bootlegging and cocktailing. A chemical figure print can be taken at a retail station and can be compared to the finger print taken at the terminal rack where the fuel came from. Another technology that the IRS is currently developing with the aid of the United States Departments of Energy's Pacific Northwest National Laboratory (PNNL) is an Acoustical Identification Device (AID) that can be used to identify the contents of containers. The AID device can be used to identify smuggling at borders and would be much more efficient than the stop and sample method currently being employed. Finally, the IRS has developed a registration process for taxpayers that engage in tax free transactions of motor fuel.

Report: Center for Balanced Public Policy (CBPP). March, 2004a. "Motor Fuel Distribution System." Draft Report Prepared by the Center for Balanced Public Policy for the Federal Highway Administration. Washington, D.C.

This report provides a detailed description of the distribution process for gasoline, diesel, aviation fuels, and other non-petroleum fuels. Physical features in the motor fuel distribution process such as refineries, terminals, bulk plants, barges and pipelines are described in general and specifically for the US. This is also done for non-petroleum products like biodiesel. Further, certain features of the nonphysical parts of the distribution system are described, such as exchange agreements (fuel transfers on paper) between oil companies and 637 registrations

(registration for entities using fuel for tax exempt purposes). Finally, the report includes a brief summary of federal tax law related to point of taxation for gasoline, diesel, and aviation fuel.

Report: Center for Balanced Public Policy (CBPP). March, 2004b. "Current Rates of Evasion in the Areas of Federal Motor Fuel and Other Highway Use Taxes: Motor Fuel Excise Tax Evasion Schemes." Draft Report Prepared by the Center for Balanced Public Policy for the Federal Highway Administration. Washington, D.C.

This report presents a comprehensive analysis of known motor fuel tax evasion schemes and other undocumented but possible evasion schemes. The CBPP report outlines 8 broad evasion methods: refunds and credits schemes, non-filing schemes, removals from bulk systems, imports and exports, daisy chains, dyed diesel and kerosene, false labeling and blending schemes. Within these categories, 35 actual or potential evasion techniques are described in depth. Each technique description includes affected fuels, distribution sector involved, factors contributing to the scheme and actual documented cases. The study notes that while categorization of techniques is useful in order to identify elements of an evasion scheme when it is encountered, it is not always the case that evasion schemes fit into neat categorical groups. In reality, evasion practices are usually very complex and involve elements of several evasion methods.

Report: Council of State Governments and Council of Governors' Policy Advisors (CSG&CGPA). 1996. Road Fund Tax Evasion: A State Perspective. Lexington, Kentucky.

This report presents the findings of a joint project undertaken by the Council of State Governments (CSG) and the Council of Governors' Policy Advisors (CGPA). The study classifies and describes evasion techniques, including failure to file information, filing of false information, filing of false exemptions, and failure to pay assessed taxes. The report documents the findings of three separate analyses of state fuel tax evasion conducted for this study. The three approaches used in this study to estimate evasion were a literature review and examination of prior research relating to tax evasion, a survey of state tax administrators, and the development of a statistical model. From the literature review, it was estimated that state fuel tax evasion was approximately $1.5 billion annually. The survey-based approach resulted in a $1.2 billion evasion estimate. Finally, the statistical model estimated $952 million in annual losses due to evasion. The basis of the model was to estimate anticipated motor fuels consumption, and then to compare the estimate to actual taxed gallons. Any disparity between the estimated consumption and tax gallons was assumed to be due to evasion. Variables used in the motor fuels demand model were: income/wealth, population characteristics, price variables, geographic dispersion variables and other variables.

Report: Davis, Stacy C. October 2000. *Transportation Energy Data Book, Edition 20*. U.S. Department of Energy, Center for Transportation Analysis, Oak Ridge National Laboratory, ORNL 6959, Oak Ridge, Tennessee.

The Transportation Energy Data Book is an annual compilation of statistics relating to transportation activity and factors that influence transportation energy use. The annual Transportation Energy Data Book focuses on petroleum production, energy use, transportation-related environmental externalities, vehicle data and non-highway modes. ORNL compiles data

from several sources, including: Federal Highway Administration, Environmental Protection Agency, Energy Information Administration, National Personal Transportation Survey, Bureau of Economic Analysis, Bureau of the Census, R.L. Polk Company and Eno Transportation Foundation. The Transportation Energy Data Book is compiled by the Oak Ridge National Laboratory under contract with the United States Department of Energy.

Report: Davis, S., Hu, P., and Schmoyer, R. 1998. *Registrations and Vehicle Miles of Light-Duty Vehicles, 1985-1995*. ORNL-6936. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

This was a follow-up study to one performed by Davis et al. in 1994. The previous study estimated the amount of motor fuel used for off-highway recreation at the state level by vehicle type. In this study, recreational fuel was defined as federally taxed gasoline, gasohol, diesel fuel or special fuel used in recreational motorized vehicles on recreational trails of backcountry terrain. The project assisted FHWA in the determination of how the amounts transferred to the Trails Trust Fund could be apportioned equitably to individual states. This study reevaluated the model developed from the 1994 study. More current and accurate data sources were used to produce updated estimates for FHWA.

Report: Denison, D. and Edger, Robert J. III. April 2000. "Tax Evasion from a Policy Perspective: The Case of the Motor Fuels Tax". *Public Administration Review* Vol. 60, No. 2.

This article examines fuel tax evasion from a policy perspective. Evasion techniques and federally implemented measures to fight fuel evasion are broadly described. Measures to increase fuel tax compliance by state legislators are examined in 16 southern region states. Four policy instruments are specifically explored: tax collection points, penalties and punishments, liability for fuel tax, and visibility and enforcement.

There is a wide variety of collection points for the 16 southern states examined at the time of this article. Many states collect taxes at the terminal rack. Others license, bond and collect taxes from wholesalers. There also exists a wide assortment of penalties for fuel tax evasion between the southern states. Some states consider fuel tax evasion to be a felony while others deem it as a misdemeanor. It was noted that there is significant debate as to the effectiveness of penalties and punishments for deterring tax evasion. Most of the southern states hold corporate officers accountable for the tax activities of the entity. Finally, the majority of the 16 states examined for this study enforce dyed fuel restrictions and impose penalties for misuses of dyed fuel.

Report: Denison, D. and Hackbart, M. July 1996. *The Motor Fuel Tax Evasion Issue in Kentucky KTC-96-6*. Kentucky Transportation Center. Lexington, Kentucky.

This study was conducted in cooperation with the broader CSG/CGPA study of state fuel tax evasion. The report presents an overview of the Kentucky highway tax structure, details fuel tax evasion methods, and documents efforts aimed at reducing fuel excise tax evasion in Kentucky. The report uses the data and methods developed in the CSG/CGPA study to estimate fuel tax evasion in Kentucky. These methods include a survey of state fuel tax administrators and an

econometric analysis. Based on these methods, this study estimates that evasion of Kentucky fuel taxes costs the state highway fund approximately $26-$34 million annually.

The report also makes several recommendations for improving motor fuel tax compliance including: participating in regional task forces, implementing an 11-point federal plan for reducing evasion, assessing the marginal costs of additional field auditors, modifying the state motor fuel tax administration model to bring it in line with the federal model, educating the public, conducting a study to precisely determine the level of fuel tax evasion in Kentucky and assessing evasion of other highway user taxes (e.g., registration fees, weight-distance taxes and other highway user fees).

Report: Eger, Robert J. 2002. *Wisconsin's Off-Road Fuel-Tax Collection Process: A Midwestern Comparative Analysis and Assessment*. Final Report SPR 0092-02-08 Prepared for the Wisconsin Department of Transportation. Madison, Wisconsin.

This report examines the potential for evasion resulting from Wisconsin's fuel tax exemptions for various off road uses. To address this issue, the report is organized into three sections. First, a statistical analysis of tax-exempt fuel consumption and refunds is conducted for Midwestern states. Second, an analysis is done comparing Wisconsin's motor fuel tax law to other states in the region. Last, the study provides a series of policy options to improve the enforcement of Wisconsin's motor fuel tax law.

The statistical analysis involves comparing Wisconsin's off-highway gasoline rebates to other Midwestern states. Using monthly panel data from 1994 to 2000, the study first compares Wisconsin's gasoline refunds to its border states: Illinois, Iowa, Michigan and Minnesota. A second analysis is conducted combining the same data for the same time period into annual data. These analyses segregate refunds into three categories: agricultural refunds, industrial refunds and refunds for gasoline used for marine purposes. Controlling for a number of factors including average acres of farms, fuel tax, and industrial value, this study estimates that Wisconsin's agricultural use of gasoline, as inferred by amount of refunds, is 1,600,000 gallons higher per month and 16,000,000 higher per year compared to other Midwestern states. This analysis indicates that evasion from agricultural gasoline is likely occurring in Wisconsin. To the extent that refund fraud is what explains the incidence of much greater refunds for agricultural use of gasoline, the resulting losses in revenue for the state of Wisconsin are upwards of $425,000 monthly and $4,000,000 annually. The opposite is the case for the analysis of industrial gasoline refunds. Based on the findings of this report, Wisconsin has approximately 900,000 gallons lower in monthly instruction gasoline refunds than average Midwestern states. For marine use of gasoline, Wisconsin is average with respect to its border states.

Based on an analysis of Wisconsin's tax law regarding motor fuel tax exemptions, a series of policy options are proposed in this report to improve Wisconsin's enforcement of motor fuel taxes. First, the study found that exempt purchasers of gasoline file paper work with the supplier and the supplier was responsible for paying the tax and relate the exemption information to the state. The study recommends that statutes be amended to presume that motor fuel is used for highway vehicles so that refund applications get filed directly with the state. The deduction for tax free use of fuel would be removed and suppliers would be required to collect and remit tax.

The purchaser would now be responsible for filing the tax refund. Second, it was recommended that the amendment should be accompanied by a permit process for claimants to provide substantiation of exempt usage of fuel. Third, the study recommends that the state of Wisconsin gather additional information about claimants to facilitate audits, collections and enforcement processes. Lastly, the study recommended that criminal fuel tax evasion be penalized as a felony and fines should be enhanced for repeat violators.

Report: Eger, Robert J. III. and Hackbart, Merle. July 2001. State Road Fund Revenue Collection Processes: Differences and Opportunities of Improved Efficiency. KTC-01-17/SPR-99-192-1F Kentucky Transportation Center. Lexington, Kentucky.

This report presents an appraisal of the effects of enforcement and audit practices on fuel tax assessments and makes recommendations to improve the efficiency of these processes in Kentucky. To assess the affect of administration processes on assessments, three models are estimated using regression analysis. One linear model is estimated for assessments per million VMT for trucks in FY 1997. Two models are estimated for FY 1997, one model in linear form and another in log-log form. The independent variables used for these models include the number of auditors in each state, the state excise tax rate, income per capita, miles of state owned urban road, miles of state owned rural road, amount of federal tax awarded to each state, and whether the state collects taxes through the revenue department. Since the authors were interested specifically in Kentucky and the region around Kentucky, a dummy variable was added to these models to include Kentucky and all states bordering Kentucky. Cross-sectional data used to model tax assessments in this study was attained from a survey of tax administrators for each state.

The number of auditors in a state was found to be statistically significant for all the estimated models. The log-log model specifies auditors as elastic with respect to assessments. That is, a 10 percent increase in the number of auditors corresponds to 19.58 percent increase in assessments. Federal tax apportioned to each state is found to be statistically significant in both linear models. For all models, there are no statistically significant differences between Kentucky region states and other U.S. states. Likewise, there is no evidence from any of the models that assessments are affected by whether a state collects tax revenue from a revenue department or any other state agency.

This study recommends six policy prescriptions to make the fuel tax administration process more efficient. Some of these recommendations do not result from the statistical analysis of this study specifically but rather are the result of general knowledge of the tax evasion problem as it relates to the circumstances facing Kentucky in particular. First, the authors recommend uniformity between Kentucky and its border states. Second, it is recommended that Kentucky consider increasing their registration fees because of opportunities for evasion due to higher fees in other states. The third recommendation is to consolidate Kentucky's two audit groups into one since the statistical models showed no correlation between what agency performs audits and actual assessments. The consolidation may be more efficient than handling fuel tax compliance split between two separate agencies. Fourth, it is recommended that Kentucky increase its audit staff since the statistical analysis showed significant positive correlations between auditors and assessments. Fifth, the authors recommend that Kentucky evaluate multiple year estimates of

assessments to enable a time-trend analysis to analyze the effects of administration and audits on assessments. Finally, the authors recommend substantiation of their results through further model development and better data.

Report: Federal Highway Administration, U.S. Department of Transportation. August 1997. *1997 Federal Highway Cost Allocation Study*. Washington, D.C.

The federal Highway Cost Allocation (HCAS) study assesses the equity and efficiency of the federal highway tax structure by comparing the costs that each vehicle class imposes on the road system to the share of revenue deposited in the Federal Highway Trust Fund (HTF) attributed to each user class. Travel, revenue and engineering data are used to calculate the cost responsibility of each highway user class. The travel data generated for the 1997 Federal HCAS were used to estimate total tax revenue (including fuel tax revenue) for each vehicle class. The base period of the study was 1993 to 1995. The Federal HCAS calculated equity ratios for each vehicle class by comparing cost responsibility to total revenue attributed to each class of vehicle. Equity ratios of less than 1.0 demonstrate that costs imposed on the road system by a class of vehicle exceeds revenues attributable to that class of vehicle. The equity ratio for passenger vehicles was estimated at 1.0, whereas the equity ratios for single-unit and combination trucks are 0.8 and 0.9, respectively. The study found that the equity ratio for single-unit trucks weighing in excess of 50,000 pounds was 0.5 while the equity ratio for combination trucks weighing in excess of 80,000 pounds was 0.6.

The Federal HCAS also presents an overview of the Highway Revenue Forecasting Model (HRFM). FHWA developed HRFM in 1981 as a means for the federal government to obtain both short and long-term estimates of federal fuel tax collections. The model has been updated three times since 1981. The HRFM was used in the 1997 Federal HCAS to attribute federal highway user revenues to 20 vehicle classes and 30 weight categories. Within the HRFM, fuel tax revenues for individual vehicle classes are based on: vehicle fuel efficiency (i.e., miles per gallon or MPG), vehicle miles of travel (VMT) and the operating weight of the vehicle. The MPG estimates are developed for each vehicle class based on a typical engine type, transmission and vehicle performance characteristics, operating weight groups, and vehicle fuel types. Key input data for the MPG estimates come from the Vehicle Inventory and Use Survey [(VIUS; prior to 1997, VIUS was named the Truck Inventory and Use Survey (TIUS)], several publications by the EPA for new vehicle fuel efficiencies, and information from the United States Department of Energy, American Trucking Association, the United States Department of Transportation (U.S. DOT), as well as other private sources (e.g., Polk Company data). Given the number of different sources, engineering judgment and adjustments have been necessary at times to resolve inconsistencies among data and to weight the relative importance of each factor to the MPG. The HRFM estimates the gallons of fuel consumed by dividing VMT by MPG for each vehicle class and operating weight category, and the revenues are then a function of tax rate and gallons of fuel consumed.

Report: FHWA, Federal Highway Administration, U.S. Department of Transportation. December 20, 1999b. *Motor Fuel Tax Evasion Summary*. Washington, D.C. http://www.fhwa.dot.gov/policy/summ.htm

This is a brief summary of fuel tax evasion and efforts to curb fuel tax evasion. It includes estimates of federal fuel tax evasion, major federal legislation relating to fuel taxes. and estimates of the benefit of state and federal enforcement practices.

Report: FHWA, Federal Highway Administration, U.S. Department of Transportation. December 17, 1999c. *Revenue Impact of Diesel Fuel Dyeing*. Washington, D.C. http://www.fhwa.dot.gov/policy/fueldye.htm

This is a brief summary of the federal diesel fuel dyeing program. It includes estimates of revenue losses resulting from evasion of diesel taxes and the revenue impact of, and how sates have responded to, the federal diesel dyeing program.

Report: Federal Highway Administration, U.S. Department of Transportation. Office of Highway Information Management. August 1998b. *TEA-21 and Estimation of Highway Trust Fund Tax Receipts Attributable to Highway Users in Each State*. Washington, D.C.

This report provides an overview of the process used to attribute federal fuel tax revenues to states. It also documents several budget provisions set forth in the Transportation Equity Act for the 21st Century (TEA-21) that will increase the need for improved accuracy in the allocation process.

The report notes that during the attribution process, FHWA attempts to allocate fuel tax revenues to states based on where the fuel is consumed rather than where federal fuel taxes are collected. Because federal fuel taxes are collected at the terminal rack, fuel tax returns are generally filed by oil companies. FHWA estimates of highway use of gasoline are based on reports submitted by state fuel tax agencies. The factor used to attribute fuel tax revenues to states is the ratio of highway use of gasoline within each state to the highway use of gasoline in all states.

The accuracy of the apportionment estimates has varied on a state-by-state basis. Total highway account excise tax receipt forecasted in TEA-21 lagged below actual receipts by 4.2 percent in 1998, 3.5 percent in 1999 and 7.5 percent in 2000. However, actual receipts of highway excise taxes in 2001 exceed TEA-21 forecasts by 6.0 percent.

Report: FHWA, Federal Highway Administration, U.S. Department of Transportation. August 1997. *Federal Highway Cost Allocation Study Final Report.* Federal Highway Administration. Washington, D.C
http://www.ota.fhwa.dot.gov/hcas/final/four.htm

To evaluate highway-related costs attributable to various types of vehicles, FHWA performs periodic highway cost allocation studies. The primary purpose of these studies is to evaluate the equity of federal highway user fees by examining which user fees cover highway cost responsibility for different vehicle classes. Those paying more than their share of highway costs are, for all intents and purposes, subsidizing the operations of others. To discern how fair federal highway fees are, equity ratios are calculated for each vehicle class by comparing total revenue for each vehicle class to the costs each vehicle class impose on the highway infrastructure. An equity ratio of 1.0 means that a particular vehicle class is exactly covering its share of the cost

responsibility. The most recent analysis found that the equity ratio for combination trucks weighing less than 50,000 lbs. was 1.4 while the equity ratio for combination trucks weighing more than 100,000 is 0.4.

Report: Federal Highway Administration, U.S. Department of Transportation. June 1992. *Fuel Tax Evasion: The Joint Federal/State Motor Fuel Tax Compliance Project*. Washington, D.C.

This study provides an overview of the fuel distribution system and federal excise tax structure. Further, the study estimates total federal gasoline tax evasion at between 3 and 7 percent ($466.1-$1,087.5 million) and diesel tax evasion at between 15 and 25 percent ($645.2-$1,075.3 million). These estimates are based on a review of previous studies, congressional testimony, and IRS auditing records. The study also reviews and analyzes several tax evasion schemes and provides information relating to specific examples of tax evasion, as detected through auditing efforts. Finally, it identifies several techniques to close current avenues for evasion, thus reducing losses to the federal government.

Survey: Federal Highway Administration, U.S. Department of Transportation. Various Years (a). National Personal Travel Survey. Federal Highway Administration. Washington, D.C.

The Nationwide Personal Transportation Survey (NPTS) consists of a periodic survey of household-level data on demographics, motor vehicle ownership and vehicle travel. The NPTS was conducted in 1969, 1977, 1983, 1990 and 1995. The survey is produced by the United States Department of Transportation.

The 1995 NPTS was based on three types of survey methods:

Vehicle-Based Estimates – Vehicle miles of travel for household motor vehicles were generated based on owner estimates of travel and annual odometer readings. Average travel per vehicle was multiplied by the number of household vehicles to generate annual VMT.

Driver-Based Estimates – Respondents were asked to estimate the annual number of miles they travel in all vehicles, including commercial during a 12-month period. Because this estimate includes commercial vehicle miles of travel, the driver-based estimate significantly exceeds vehicle-based estimates.

Trip-Based Estimates – Trip diaries were used to estimate travel for all purposes, including commercial driving. Respondents were asked to itemize their trips in diaries during the previous day. Further, respondents were asked to note any trips in excess of 75 miles during the two weeks proceeding completion of the survey.

For each respondent, VMT and trip information is matched with demographic and ownership data to analyze trends in vehicle ownership and usage for groups varying by age, gender and economic standing. As noted in Appendix B, the divergence between the 1995 NPTS VMT estimates and the 1995 FHWA VMT estimate for passenger vehicles ranges from 3.5 percent (personal estimates) to 0.6 percent (odometer readings).

Report: Federal Highway Administration, United States Department of Transportation. 1981-2000. *Highway Statistics*. Federal Highway Administration, Office of Policy Information. Washington, D.C.

FHWA annual highway statistics presents annual estimates of vehicle miles of travel (VMT), vehicle fuel economy, lane-mileage, state and federal highway revenues and expenditures and a number of other transportation-related indicators.

FHWA presents VMT estimates for six vehicle classes (automobiles, motorcycles, light trucks, single-unit heavy trucks, combination trucks and buses) on an annual basis. FHWA also presents annual VMT estimates for each state and each functional class road system, as defined in the Highway Performance Monitoring System (HPMS) data system. HPMS VMT estimates are based on traffic counts performed by states using roadside traffic monitoring devices (e.g., pneumatic tubes, inductive loops and manual counts).

Average annual daily traffic (AADT) is reported by states for each section of Interstate, National Highway System (NHS) and other principal arterial. VMT for each road segment is the product of AADT and centerline miles. That is, to estimate annual travel along a 50-mile segment of roadway with eight interchanges, a state could place one vehicle recording device on each of the seven stretches of roadway between each pair of interchanges and count the number of vehicles crossing those devices each day throughout the year. The number of vehicles counted at each roadway segment would, in turn, be multiplied by the corresponding centerline miles for each segment, such that if the distance between the first two interchanges was 10 miles, a one-year vehicle count of 100,000 cars would be multiplied by 10 to produce a VMT estimate of 1,000,000 for that first highway segment.

For minor arterial, rural major collectors and urban collectors, VMT estimates are based on sample AADT counts, centerline miles, and expansion factors based on seasonal travel fluctuations for each roadway segment. AADT and travel reported by states are edited by HPMS software to remove unusual and erroneous data. FHWA also consults with states to smooth data and remove invalid values.

FHWA requires states to perform counts on the entire HPMS system every three years. Where no data are collected during a single year, permanent vehicle counting station data and historical trend analysis are used to produce VMT estimates.

Fuel economy data are presented in Highway Statistics on an annual basis. National fuel consumption is constructed from state fuel tax records. Total fuel consumption, and thus, miles per gallon (MPG) data for individual vehicle classes are derived by FHWA from states reports, the Vehicle Inventory and Use Survey (VIUS) (USCB 2002b) and other independent sources of data.

Meeting Minutes: FHWA. Federal Highway Administration, United States Department of Transportation. Various Years. Joint Federal/State Motor Fuel Tax Compliance Project Steering Committee Meeting Minutes. Washington, D.C.

These are minutes of the annually held Joint Federal/State Motor Fuel Tax Compliance Project Steering Committee Meetings. These minutes generally contain a summary of reports made by individual states, regional motor fuel tax task forces, IRS, FHWA and other visiting organizations or individuals. Reports typically include discussion of any new legislation, tax compliance efforts, new studies and adoption of fuel tracking systems or electronic reporting systems.

Report: Francis, Brian. 2000. *Gasoline Excise Taxes, 1933-2000.* Statistics of Income Bulletin. Washington, D.C.

This report gives a history of federal gasoline excise taxes. It contains discussion of the highway trust fund, tax rates, legislative changes relating to gasoline taxes and historical federal gasoline tax collections.

Presentation: FTA, Federation of Tax Administrators, ExSTARS/ExTOLE Presentation. August, 8 2004b. http://www.taxadmin.org/fta/meet/01am_pres/andersgen.pdf

This presentation gives a brief overview of the ExSTARS and ExTOLE subcomponents of ExFIRS. Specifically, these systems are discussed in terms of their main functions, stage of development, usefulness to states and major benefits.

Report: FTA, Federation of Tax Administrators. ExFIRS Background. August, 8 2004c. http://www.taxadmin.org/fta/mf/exfirs_back.html

This document briefly summarizes the ExFIRS system. The report discusses ExFIRS historical development, purpose, benefits, subsystems and limitations.

Report: Federation of Tax Administrators. September 2003. *FTA Motor Fuel Tax Section Uniformity Project*. Washington, D.C.

This report provides documentation of ongoing efforts of the FTA Motor Fuel Tax Section Uniformity Committee. The Uniformity Committee adopted an 11-point plan in an effort to make administration of fuel taxes more efficient and more consistent between states, to improve information exchange and to encourage cooperative efforts between states to reduce evasion.

The major points in this plan include: uniform definitions for imports and exports, federal identification codes that distinguish entities for reporting and information exchange, total accountability of fuel by licensing of all resellers and requiring third party reporting on the movement of fuel, uniform electronic reporting systems and trainings for auditors and investigators.

There is a subcommittee for each point of the 11-point plan. This report documents the purpose and progress of each subcommittee. Items that document the subcommittees' advancement included in this report are uniform definitions, tax administration forms and schedules and sub-schedules. Also included in the report is a model legislation checklist for states seeking to change their administrative procedures to curb fuel tax evasion.

Report: Festin, S. May 1996. *Summary of National and Regional Travel Trends: 1970-1995*. Federal Highway Administration. Washington, D.C.

This report analyzes trends in VMT data in the United States and five regional areas during the 1970 – 1995 timeframe. Travel data are summarized by time increments (annual, monthly, weekly and daily), and the distribution of travel is compared among days, months and years. The study found that nationwide VMT has grown by an average of approximately 3 percent annually during the study timeframe, and that urban travel comprises 60 percent of total travel. The report also documents the phenomenon known as peak spreading, where peak travel times expand during morning and evening periods of high traffic.

Model: Fleming, D. August 2001. Personal Communication with David Fleming of the Maryland Department of Transportation on the State of Maryland's Motor Fuel Tax Revenue Estimation Methodology.

Maryland has designed a model to estimate revenue generated by the state's motor fuel tax. The model uses regression analysis to estimate future annual gallons of motor fuel purchased. The Maryland Department of Transportation (MDOT) uses data prepared by the economic forecasting firms DRI/WEFA and Economy.com to support its model. The model uses a two-variable, Real GDP and the Implicit Price Deflator for Gas and Oil, equation to forecast motor fuel tax revenue. Since 1990, the forecast has, on average, been accurate within 0.9 percent of actual receipts. The annual variance did not exceed 2.5 percent during the 1990 – 2001 timeframe.

Report: General Accounting Office. June 2000. *Highway Funding: Problems with Highway Trust Fund Information Can Affect State Highway Funds*. Washington, D.C.

This report describes the relationship between highway user tax receipts and funds available for federal highway funding programs. It reviews Treasury's process for allocating tax receipts and FHWA's process for attributing collections to individual states. It assesses the appropriateness of the mechanisms and assumptions used in the collection and application of the data used to distribute federal-aid funds to states. Finally, it provides recommendations to improve the accuracy of federal funding distributions to states.

The report also provides an overview of the process for attributing revenue to states. The Treasury does not provide data on receipts at the state level to FHWA. To disaggregate data and distribute funds to states, FHWA relies on travel and fleet fuel efficiency data provided by individual states to estimate state-level contributions to the Highway Account (HA) of the federal HTF through what is known as the "attribution process". The Treasury's process for allocating tax receipts to the HA is analyzed within this report and problems with accuracy and timeliness of the data used in the process are identified.

The report notes that a recent analysis conducted by the IRS recommends that the Treasury not require individual taxpayers to provide detailed information at the time they make deposits due to compliance costs. The IRS study also recommended: a) offering incentives to encourage

taxpayers to provide more detailed data at the time of deposit, and b) reviewing the issue in several years to determine if technological and data collection methods have advanced in a manner that makes the collection of more detailed data less burdensome from a compliance standpoint and, thus, more feasible.

The report contends that the reliability of the data and methods used in the FHWA attribution process are questionable. The reliability, accuracy, and consistency of the data submitted to FHWA by the states is not verified through an independent review or audit, and the responsibility for implementing and verifying the attribution process rests with only two individuals at FHWA. The report also provides several recommendations to the Secretary of the Treasury for improving the accuracy and reliability of the data used in the federal fuel tax allocation process.

Report: U.S. General Accounting Office. June 1997. *Highway Funding: The Federal Highway Administration's Funding Apportionment Mode* l. (GAO/RCED-97-159). Washington, D.C.

This report presents the findings of a technical review of the highway funding apportionment model designed for FHWA to perform formula allocation procedures during the development of TEA-21. The findings of the study conclude that the model captures the structure of the federal highway funding allocation process and is adaptable for use in evaluating new and proposed apportionment formulas. The report also notes that the data used for the model are questionable and are not properly certified by FHWA. The report makes recommendations for improving the model and accuracy of the data used in the model.

FHWA offices charged with developing data for use in the allocation model are required to certify that the data are correct. In some cases, proposed apportionment formulas require the use of data not presently used in the federal highway allocation process. In these instances, the data may not be certified or properly scrutinized.

Report: U.S. General Accounting Office. January 1996. *Tax Administration: Diesel Fuel Excise Tax Change*. (GAO/GGD-96-53) Washington, D.C.

This document reports on the effects of the federal diesel fuel dying program established by the Omnibus Budget Reconciliation Act (OBRA) of 1993. It further discusses whether prominent concerns by stakeholders were addressed by the IRS regulations implemented in that program.

The report states that diesel excise tax collections increased by $1.2 billion, or 22.5 percent, in the first calendar year after the diesel fuel dying law took effect. This increase does not include the increase in revenue due to the tax rate increase. It also reports that the Treasury Department estimates that increased diesel tax compliance resulting from the dying program is estimated to be $600 to $700 million. The report notes that even though tax collections had increased from the diesel fuel dying program, many opportunities still exist to cheat the system (i.e. refund fraud).

The report remarks that the IRS at that time had only addressed stakeholder concerns about dying requirements by using red as the dye color and declining to use colorless markers at that

time in response to several stakeholder complaints that such a system would be too burdensome. The study also points to a number of unaddressed concerns. One unaddressed concern was the fact that kerosene hadn't been dealt with in the OBRA legislation and kerosene could still be used in blending evasion schemes. Further, many stakeholders felt that the concentration of dye was too high and would adversely affect transportation and holding equipment. Recreational boaters were concerned that they would not have easy access to dyed fuel because boating marinas commonly only had one storage tank that would be used for undyed fuel for commercial uses and the costs of adding another for dyed fuel are too great.

Report: U.S. General Accounting Office. May 1992. *Status of Efforts to Curb Motor Fuel Tax Evasion,* Report to Congressional Requesters. Washington, D.C.

This report notes previous estimates of evasion, and focuses on the $1 billion total federal gasoline and diesel tax evasion estimate often cited in the literature. The report also provides an overview of the fuel distribution system in the United States and describes methods for evading federal fuel taxes. The inability of the federal government to identify and quantify total fuel tax evasion is discussed and an Appendix is dedicated to examining the numerous problems inherent with estimating evasion. The report notes the many anti-evasion techniques employed by the federal government to date, including moving the point of tax collection to the terminal rack and dyeing non-taxable fuel. The effectiveness of IRS compliance efforts is analyzed. Also, state initiatives with potential for application at the federal level are reviewed. Finally, the impact of compliance efforts on industry is also examined.

Report: Gillen D. 2000. *Estimating Revenue from User Charges, Taxes, and Fees: Identifying Information Requirements.* Resource Paper, Transportation Economics Research Committee. Washington, D.C.

This paper provides a comprehensive overview of highway finance systems at the state level and addresses the role of revenue forecasting. The report also reviews and assesses several methods used by states to forecast fuel tax revenues.

The author suggests that analysts need better data and methods to accurately measure vehicle miles traveled, vehicle fuel efficiency and fuel consumption. Better analytical tools are needed, particularly those that can anticipate behavioral responses to changes in fuel prices and other relevant factors. The report contends that fuel tax forecasts are rarely accurate beyond a three to five year timeframe.

The report noted that the level of expected revenue is directly tied to the form of a state's fuel tax. Thus, fuel sales taxes are volatile, waxing and waning with fuel prices. Fixed per-gallon tax rates are less volatile but are unresponsive to inflation. The paper also reports that there are three approaches to consider when estimating fuel tax revenue: a) the simple model that is based on historical data, b) a model based on an econometric time-series approach such as the ARIMA model, or c) a causal forecasting model using relevant economic and demographic variables.

There are several states that forecast revenue based on historical data. The report points out that the use of a simple model implicitly assumes that demand for travel and fuel is not linked to economic and demographic variables.

Report: Gittings, G. and Narayan, B. 1996. Federal Highway Revenue Estimation: Cost Allocation Perspective." *Transportation Research Record 1558*. Washington, D.C.

This report presents a revenue estimation methodology used to attribute federal highway revenue to individual passenger and heavy vehicle classes. It presents and analyzes variables that influence future growth in federal transportation revenue. The paper also presents both short and long-term recommendations for improving Federal revenue estimating procedures.

An aggregate demand model was used to forecast transportation revenue based on three components: demand for a fleet of vehicles, demand for new vehicles and demand for VMT. New personal vehicle-sales forecasts were constructed using the following variables: GDP, unemployment, annual fixed capital costs of owning and purchasing a car, annual operation costs, and a variable on the relative burden of housing expenditures. In addition, a dummy variable was used to deal with market interruptions caused by labor stoppage in the motor vehicle industry.

Truck commercial-vehicle sales were forecast as a function of: intercity truck-freight ton-miles, unemployment, annual ownership costs, real price of diesel fuel and two dummy variables used to account for legislative changes affecting the motor carrier industry and the deregulation of the trucking industry.

Fleet size was forecast based on the fleet size of the previous year plus new vehicle sales minus scrappage rates. VMT was forecast as a function of fleet size, annual vehicle operating costs and a dummy variable used to account for fuel shortages.

Report: Hallquist, Theresa E. December 1999. "A Comparison of Selected EIA-782 Data with Other Data Sources." *Petroleum Marketing Monthly.* Energy Information Administration, Washington, D.C.

This report presents an overview of fuel price and volume data collected by the Petroleum Division (PD) of the EIA using the EIA-782 survey from. The report compares EIA-782 price data with price data published by the BLS, and it compares EIA-782 fuel volumes data with data published in EIA's Petroleum Supply Annual (PSA) and FHWA's Annual Highway Statistics.

The report notes that there is significant historical divergence between EIA and BLS gasoline price estimates because: the EIA survey does not include taxes but BLS price estimates do, EIA surveys target producers and distributors of gasoline while the BLS targets retail outlets, EIA prices are volume-weighted while BLS prices represent a simple average of monthly prices of varying grades of gasoline, and BLS prices represent a point-in-time estimate while EIA prices are weighted based on total monthly sales.

The report also notes that there are large and irreconcilable historical differences between gasoline consumption estimates produced by EIA and data published by FHWA, such that FHWA estimates of taxed gallonage actually exceed the EIA estimates of gasoline supplied to the transportation sector, as shown in the PSA. Further, EIA estimates of sales volumes, derived from form EIA-782, significantly exceed the amount of fuel supplied to the system prior to 1994. These obvious discrepancies are the direct result of the divergence between data collection techniques, where the data are collected, errors corrected over time (e.g., double-counting and missing some reporters) and treatment of blending fuels. Note that as data collection techniques have been improved and procedural errors have been detected and eradicated, the discrepancy between EIA and FHWA estimates has declined in recent years.

Report: Hagquist, Ron and Dawn Doyle 1999. Fuel Tax Hijacking: How State Governments Are Responding. *Government Finance Review*.

This report discusses fuel tax evasion, providing the history of how the issue became acknowledged, real evasion case descriptions, state actions and the results of those actions and likely future actions.

Report : Harper, R. December 2000. Comparisons of Independent Petroleum Supply Statistics. *Petroleum Supply Monthly*, Energy Information Administration. Washington, D.C.

This report compares data relating to crude oil production, crude oil imports, motor gasoline supplied and distillate fuel supplied for numerous sources. The article identifies major discrepancies between data sets and analyzes causes of data variations.

The report also provides an overview of the data compiled by the PD of the EIA. The PD compiles and published data regarding the supply and distribution of petroleum in the United States. The data collected by the PD in aggregate comprise the Petroleum Supply Reporting System (PSRS). The PSRS is based on a series of surveys collected from the petroleum industry, state agencies and the Minerals Management Services (MMS) of the U.S. Department of the Interior. PSRS data are published in the Petroleum Supply Annual (PSA), Petroleum Supply Monthly and the Weekly Petroleum Status Report. EIA also uses market surveys to publish data on motor gasoline and distillate fuel supplied in the Petroleum Marketing Annual. Respondent data are collected from refiners, gas plant operators, importers and resellers or retailers.

The American Petroleum Institute (API) publishes data relating to crude oil production, imports, motor gasoline supplied and distillate fuel oil supplied in the United States. Crude oil production data are based on information provided by state government agencies. Import data do not include crude oil imported by the Strategic Petroleum Reserve. Total gasoline supplied is based on an assessment of production plus imports (adjusted based on net stock change) minus exports. Import and export data are based on historical industry information provided by importers and operators of pipelines, bulk terminals and refineries. Estimates of distillate fuel supplied are based on distillate fuel oil delivered from primary storage facilities. Distillate fuel estimates do not include kerosene.

Additional sources of data included in the analysis are: crude oil production estimates published in the Oil and Gas Journal, data on United States oil and gas reserves published by EIA's Reserves and Production Division, crude oil import data compiled by the United States Census Bureau and the Fuel Oil and Kerosene Sales Report published by the EIA.

The report notes that there are large and irreconcilable historical differences between gasoline consumption estimates produced by EIA and data published by FHWA, such that FHWA estimates of taxed gallonage actually exceed the EIA estimates of gasoline supplied to the transportation sector shown in the PSA. Further, EIA estimates of sales volumes, derived from form EIA-782, significantly exceed the amount of fuel supplied to the system prior to 1994. These obvious discrepancies are the direct result of the divergence between data collection techniques, where the data are collected, errors corrected over time (e.g., double-counting and missing some reporters) and treatment of blending fuels. Note that as data collection techniques have been improved and procedural errors have been detected and eradicated, the discrepancy between EIA and FHWA estimates has declined in recent years

Report: Henry, Eric 2002. "Excise Taxes and the Airport and Airway Trust Fund, 1970-2002." *SOI Bulletin*, Winter 2003-2004. Internal Revenue Service. Washington, D.C.

This report provides a history of aviation fuel excise taxes and the evolution of the aviation trust fund concept. The excise tax on aviation gasoline began with a 1 cent per gallon tax enacted by the Revenue Act of 1932. Today, the aviation tax rate is 21.9 cents per gallon. In 1970, the Airport and Airway Development Act created the Aviation Trust Fund, which was terminated in 1980 to be replaced with the Airport Improvement Fund of 1982. These fund pots have traditionally been used to fund airport improvements such as airport operations, safety measures and noise abatement projects. Today, the aviation improvement program is funded through the Airport and Airway Trust Fund.

Report: Hu, Patricia, D. Trumble, and Lu, A. 1994. *Fuel Used for Off-Highway Recreation*, ORNL-6794. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

This Oak Ridge National Laboratory (ORNL) study estimates the amount of motor fuel used for off-highway recreation at the state level by vehicle types. In this study, recreational fuel was defined as federally taxed gasoline, gasohol, diesel fuel or special fuel used in recreational motorized vehicles on recreational trails of backcountry terrain. The project assisted FHWA in the determination of how the amounts transferred to the Trails Trust Fund could be apportioned equitably to individual states.

Report: Hwang, Ho-Ling, Lorena F. Truett and Stacy C. Davis. 2003a. *The Federal Highway Administration Gasohol Consumption Estimation Model*. Oak Ridge National Laboratory ORNL/TM-2003/210.

This report discusses ORNL's review of the FHWA gasohol consumption model and the development of a new gasohol consumption model. The regression-based gasohol estimation model reviewed had been in use for several years prior to 1994, but based on an analytical assessment of that model and an extensive review of potential data sets, ORNL developed a rule-

based model. The new model uses data from the Internal Revenue Service, Energy Information Administration, Environmental Protection Agency, Department of Energy, ORNL, and FHWA. The model basically consists of three parts: (1) development of a controlled total of national gasohol usage, (2) determination of reliable state gasohol consumption data, and (3) estimation of gasohol usage for all other states.

Report: Hwang, Ho-Ling, Truett, Lorena F., and Davis, Stacy C.. 2003b. *A Study of the Discrepancy Between Federal and State Measurements of On-Highway Motor Fuel Consumption*. Oak Ridge National Laboratory ORNL/TM-2003/171.

This report assesses the discrepancy between state and federal estimates of motor fuel consumption. The Treasury Department collects highway taxes and puts them into the HTF. However, there is no direct connection between taxes collected and gallons of highway fuel used, which leads to a discrepancy between these totals. This study was conducted to determine the magnitude of the discrepancy between the Treasury Department's estimated total fuel usage based on highway revenue funds and the total fuel usage used in apportioning HTF funds to states.

Using data from Highway Statistics for 1991 through 2001, the analysis found that the overall discrepancy between these totals is relatively small, within 5 percent. Further, the discrepancy varies from year to year and varies among gasoline, gasohol and special fuels. Potential explanations for these discrepancies include issues on data, gallon measurement, tax measurement, HTF receipts and timing. For instance, evasion can result in a divergence between fuel use and taxes collected. Further, data anomalies such as deferment of tax payments from one fiscal year to the next can skew fuel tax data. Differences between state data reporting and collection processes will also impact fuel use data. Tax receipt data as conveyed through HTF can be impacted by refunds, credits and transfers. Lastly, a discrepancy can also be caused by timing issues such as calendar year vs. fiscal year.

Report: Hwang, Ho-Ling. November 2000. *Draft Technical Memorandum on Literature Review of Existing Methods and Models on Revenue Estimation*. Working Paper. Oak Ridge National Laboratory.

This report provides an overview of revenue estimation methods and models. It provides a summary of the general approach to revenue estimation and detailed descriptions of several different federal level forecasting models. Some forecasting models included in this report are the FHWA Highway Revenue Forecasting Model, Department of Energy's National Energy Modeling System and IRS's Excise Files Information Retrieval System (ExFIRS). Revenue estimation processes and methods discussed in this report include the Joint Committee on Taxation, Congressional Budget Office and the Office of Tax Analysis.

Report: IRS, Internal Revenue Service. 2001. *Criminal Investigation (CI) Annual Report*. http://www.irs.gov/irs/article/0,,id=107541,00.html

This report summarizes federal efforts to curb motor fuel tax evasion, gives examples of recent and specific evasion cases and statistics on initiated investigations and convictions by the IRS.

Report: Internal Revenue Service. 1993-2002. *Statistics of Income Bulletin*. Washington, D.C.

The Statistics of Income (SOI) Bulletins document historical IRS excise tax collections. The SOI Bulletin presents fuel excise tax data stratified according to 25 fuel types – gasoline, gasoline floor stock, gasohol 5.7 percent, gasohol 7.7 percent, gasohol 10.0 percent, gasohol floor stock, gasoline for gasohol 5.7 percent, gasoline for gasohol 7.7 percent, gasoline for gasohol 10.0 percent, gasoline for gasohol floor stock, dyed diesel fuel used in trains, dyed diesel fuel used in trains floor stock, dyed diesel fuel for intercity or local buses, special motor fuels, special motor fuels floor stock, compressed natural gas, alcohol fuels, fuels used commercially on inland waterways, aviation gasoline, diesel fuel, diesel floor stocks, aviation fuel for non-commercial use, aviation fuel floor stock, aviation fuel for commercial use and kerosene. Since 1993, the IRS has published an SOI Bulletin in the spring and fall of each year. Prior to 1993, IRS tax collections were published in the Internal Revenue Report of Excise Taxes.

Report: IRS, Internal Revenue Service. 1981-1993. **Internal Revenue Report of Excise Taxes**. Washington, D.C.

Prior to 1993, the IRS prepared quarterly reports of excise tax revenue in these Internal Revenue Reports on Excise Taxes. Motor fuel excise taxes are reported by type of fuel. Excise taxes have subsequently been reported in the Statistics of Income Bulletins.

User Guide: IRS, Internal Revenue Service. 1981-1993. *Motor Fuel Excise Tax, EDI Guide.* Washington, D.C. http://www.irs.gov/pub/irs-pdf/p3536.pdf

This document provides general requirements, specifications and procedures for filing electronic forms for fuel terminal operators, carriers and transmitters. It also contains required electronic data interchange (EDI) record and file formats.

Report: Jack Faucett Associates. February 1995. *Fuel Efficiency, Alternative Fuels, and Highway Trust Fund Revenues*. Bethesda, Maryland.

This report assesses the future impact of alternative fuels on federal HTF revenue under several scenarios. The scenarios developed for this study are based on input from the ORNL Alternative Motor Fuel Use (AMFU) Model. The report quantifies the diminishing effects of increased fuel efficiency and market penetration of alternative fuels on federal HTF receipts. The report describes in detail the AMFU model and documents estimates of the long-term impact of alternative fuels on federal HTF receipts.

Report: Joint Committee of Taxation (JCT). March 1998. *Chairman's Amendment Relating to Extension of Highway Trust Fund Excise Taxes and Related Trust Fund Provisions* (Revenue Title to H.R. 2400). Washington, D.C.

This report presents a detailed overview of roadway taxation in the United States. Specifically, it focuses on the implementation of highway excise taxes, motor fuel excise tax rates and motor fuel tax exemptions.

Report: Joint Committee of Taxation. January 1995. *Written Testimony of The Staff of The Joint Committee on Taxation Regarding The Revenue Estimating Process*, JCX-1-95. Washington, D.C.

The Joint Committee of Taxation (JCT), established under the Revenue Act of 1926, is the official congressional scorekeeper in determining the revenue effects (i.e., budgetary implications) of any proposed tax changes. This report provides a good description of JCT's revenue estimating methodology. At the JCT, a variety of econometric models are utilized to estimate the revenue impact of changes in tax laws relating to many issues. In some cases, such as the motor fuel excise tax, the information needed to calculate the revenue effects of a proposal may not be available from tax return data or may be available only for a limited number of potentially affected taxpayers. In these instances, the JCT staff must look beyond the Statistics of Income (SOI) data and construct a model that relies on alternative sources of data from other federal agencies.

Report: Jorgenson, D. 1998. *Growth, Vol. 1. Econometric General Equilibrium Modeling,* MIT Press. Cambridge, Massachusetts.

This book is the first of two volumes dedicated to the modeling of economic growth. The book presents the concept of an intertemporal price system, where demands and supplies for products and factors of production are balanced at various points in time. In this approach, a forward-looking feature (e.g., linking prices of assets to the present value of future capital services) is combined with a backward linkage between capital services, investment and capital stock. In doing so, the combined forward and backward-looking model captures the long-run dynamics of economic growth. The book includes chapters on aggregate consumer expenditures on energy, two-stage consumer demand for energy, linear growth models, the neo-classical model of development of a dual economy and econometric studies of energy policy and economic growth.

Report: KPMG Consulting, Inc. December 2001. *Motor Fuel Excise Tax Revenue Leakage Analysis*. Prepared for Center for Balanced Public Policy. Washington, D.C.

This report compares EIA estimates of domestic jet fuel supply with domestic fuel consumption, as reported by air carriers to the Federal Aviation Administration (FAA). Evasion estimates in this study are based on the assumption that the disparity between EIA supply data and FAA domestic consumption data are due to evasion. The study also considers the possibility that the jet fuel overage represents the use of jet fuel used as an additive or replacement to diesel fuel for taxable highway operations. Based on this set of assumptions, the study estimates a range of evasion resulting from the illegal use of jet fuel of $1.7 billion to $9.2 billion during the 2002 – 2011 timeframe. The range is due to the varying tax rates for fuel potentially displaced by non-taxable jet fuel (e.g., jet fuel for commercial use or diesel fuel for highway consumption).

Report: Lazzari, Salvatore. 1997. *The Tax Treatment of Alternative Transportation Fuels*. CRS Report for Congress. National Council for Science and the Environment. Washington, D.C.

This report reviews federal tax treatment of alternative motor fuels in comparison with traditional petroleum highway motor fuels such as gasoline and diesel. The report discusses certain purposes of motor fuel excise taxes: revenue generation for highways, budget deficit reduction and energy policy concerns. Tax rates for several types of fuel are discussed including naphtha, benzene, benzol, casinghead gasoline, natural gasoline, liquefied petroleum gas (propane), liquefied natural gas, gasohol, ethanol blends, dieselhol, compressed natural gas and other blended fuels. It was noted that electricity is not considered to be a highway fuel in current tax code and therefore does not carry a highway tax.

Report: Mingo, R., Chastain, R., Mingo, J., and Cummings, S. March 1996. *Diesel Fuel Fee Non-Compliance Study*. Report for the Oregon Department of Transportation. Salem, Oregon.

This report documents the findings of a study conducted for the Oregon Department of Transportation. The study used an econometric model to estimate diesel fuel fee non-compliance rates for all 50 states. The model was specifically designed to estimate evasion rates at varying diesel tax rates in Oregon. Oregon is currently the only state in the nation that does not impose a tax on diesel fuel consumption by trucks weighing in excess of 26,000 pounds. The report also describes several methods for evading the federal and state fuel taxes and documents efforts to combat evasion.

The report contends that federal and state diesel taxes experience high evasion rates. Evasion methods are continually evolving in response to changes in the point of collection and methods for tax enforcement. This study estimates the national average state diesel fuel tax non-compliance rate at 21 percent. The 21 percent evasion rate was calculated by comparing FHWA estimates of fee-based gallons to an amount calculated based on VMT and average fuel efficiency data contained in the 1992 Truck Inventory and Use Survey (TIUS).

The findings of this study suggest that the level of evasion of state diesel taxes is most dependent upon: (1) the location of the state and its geographic proximity to coast lines and borders, (2) diesel fuel tax rates in neighboring states, (3) level of truck ownership and usage in states and (4) other truck tax rates within each state.

Testimony: Mitstifer, G. May 1992. *Shortfalls in Highway Trust Fund Collections: Hearing Before the Subcommittee on Investigations and Oversight*. p. 238. Washington, D.C.

In this testimony, diesel tax evasion estimates constructed by the National Association of Truck Stop Operators (NATSO) were presented to the United States Congress. The NATSO evasion finding was generated by comparing estimates of diesel fuel sold by truck stop operators across the nation to gallons taxed by the IRS. The comparison yielded a $3 billion estimate of federal and state diesel tax evasion.

Report: New Jersey Commission of Investigation. 1990. *Motor Fuel Tax Evasion: Hearing Before the State of New Jersey Commission of Investigation*. Trenton, New Jersey.

This report provides an overview of testimony provided by industry leaders and federal, state and local enforcement agency representatives. Testimony summarized in this report notes the

problem and financial implications of diesel fuel tax evasion in New Jersey, the methods used to evade taxes, weaknesses in statutes for combating evasion, possible solutions to address the problem of diesel tax evasion and recommendations for statutory change to combat evasion and reduce tax losses.

Testimony provided by a representative of the New Jersey Division of Taxation indicates that the daisy chain method and the mislabeling of home heating oil are the most common forms of diesel tax evasion. The Division representative also noted that total fuel tax evasion in New Jersey represents an estimated $40 million annual loss in revenue to the state.

Report: Oum, T., Waters, W., and Young, J. January 1990. *A Survey of Recent Estimates of Price Elasticities of Demand for Transport.* Policy, Planning and Research Working Paper, Infrastructure and Urban Development Department, The World Bank. Washington, D.C.

This paper presents an in-depth literature review inclusive of 70 recent journal articles focusing on price elasticities of demand for transport. Data are presented for both passenger and freight transport, and are used to construct estimates of both own-price and mode choice elasticities. The economic principles underlying elasticity estimates are reviewed in detail, including the analysis of compensated, uncompensated, price, cross-price and mode choice elasticities. The paper addresses the relationship between each concept of elasticity.

Data obtained from the literature review are used to present an estimated range for the elasticity of demand for transport, and are used to present a most likely estimate. The paper explores and attempts to qualitatively account for the variability of elasticity estimates between studies. The findings of the literature review suggest that transportation represents a derived form of demand. Further, the elasticity of demand for transport is inelastic (as prices rise demand is reduced by less than a proportional amount in percentage terms). Exceptions are evident for discretionary travel and certain forms of freight shipments due to intermodal competition.

Testimony: Peters, Mary E. July 12, 2002. *Statement of Mary E. Peters, Administrator Federal Highway Administration.* Before the Committee on Finance United States Senate, Hearing on Schemes, Scams and Cons: Fuel Tax Fraud. Washington, D.C.

This testimony contains a summary of the fuel tax evasion problem including descriptions of specific evasion schemes. It also describes the nature and impact of major federal legislation and efforts to curtail evasion.

Report: Pickrell, D. and Schimek, P. May 1999. "Trends in Motor Vehicle Ownership and Use: Evidence from the Nationwide Personal Transportation Survey." *Journal of Transportation and Statistics*. Washington, D.C.

The Nationwide Personal Transportation Survey (NPTS) consists of a periodic survey of household-level data on demographics, motor vehicle ownership and vehicle travel. The NPTS was conducted in 1969, 1977, 1983, 1990 and 1995. The survey is produced by the US DOT's Volpe Center in Cambridge, Massachusetts. Surveys were conducted using random digit dialing.

The 1995 NPTS was based on three types of survey methods: vehicle-based estimates, driver-based estimates and trip-based estimates.

For each respondent, VMT and trip information is matched with demographic and ownership data to analyze trends in vehicle ownership and usage for respondent groups segregated by age, gender and socioeconomic factors. NPTS respondent data suggest the following: single occupant vehicle (SOV) trips grew from 60 percent of total trips in 1977 to 68 percent in 1995; the household vehicle fleet has continued to age, and that ownership of sport utility vehicle vehicles and vans grew dramatically between 1990 and 1995; and the aging of the fleet may have been caused by the recession of the early 1990's.

User Guide: RAILINC. August 2003. *User Guide for the 2002 Surface Transportation Board Carload Waybill Sample*. Cary, NC.

This is a user guide for working with and interpreting carload Waybill data. The Surface Transportation Board conducts annual surveys of rail shipments for the U.S. This guide includes a summary of Waybill processing and record layouts. The data itself contains information such as date, individual waybill number, commodity code, billed weight, transit charges, origin and destination and reporting railroad.

Report: Raven, Ronald. 1999. *Deliver Us From Evil: Governmental Responses to Reports of Fuel Tax Evasion*. Washington, D.C.

This report reviews fuel tax evasion literature, including analysis of public testimony and government-sponsored studies. The paper presents alternative administrative models for fuel tax systems and documents how model adjustments (e.g., moving the point of collection up the distribution chain) have historically affected tax collections. The report documents relevant court cases, legislation and administrative program adjustments for the period 1981 to 1999.

Report: Reno, A. and Stowers, J. March 1995. *Alternatives to the Motor Fuel Tax for Financing Surface Transportation Improvements.* NCHRP Report 377, TRB. National Cooperative Highway Research Program. Washington, D.C.

This report contains recommendations for evaluating alternatives to the motor fuel tax. It provides an overview of numerous fuel tax forecasts and includes an analysis of the variables that affect tax collections (e.g., VMT and fuel economy).

The report also notes that fuel efficiency changes can alter the per-mile revenue generated by fixed per-gallon motor fuel taxes. The report presents forecasts relating to on-road fuel economy, vehicle utilization (VMT/vehicle), and VMT and fuel consumption. Forecasts cited within this study include those performed by the Argonne National Laboratory, Data Resources, Inc., Gas Research Institute, Energy and Environmental Analysis, ORNL and the EIA.

Report: Reno, Arlee T. October 1990. *Measures to Curtail State Fuel Tax Evasion*. Prepared for NCHRP, National Cooperative Highway Research Program. Washington, D.C.

This report synthesizes fuel tax evasion issues, discussing tax dodging methods and various fuel tax compliance methods and efforts. Fuel tax evasion schemes are discussed in four major categories: failures to file, the filing of incorrect information, filing false exemptions and failures to pay assessed taxes. Methods and practices of curtailing evasion are changes in point of taxation, screening, licensing, permitting, bonding, better information and reporting, uniform motor carrier fuel tax reporting, fuel purchase invoice requirements, audit efforts, cooperation among state agencies, criminal investigations and diesel fuel dying. These methods are both explained in detail and are described in terms of state experience in implementing them.

Report: Revenue Canada. September 1996. *1996 Report of the Auditor General of Canada: Chapter 18, Excise Duties and Taxes on Selected Commodities*. Ottawa, Canada.

This report documents the findings of the Canadian Auditor General's audit of Canada's excise tax programs. The stated objective of the audit was to determine whether appropriate and sufficient controls, systems and practices had been used to maximize excise tax collections. This report analyzes three areas of risk to revenue collections: evasion realized through smuggling, illegal fuel production and failure by licensed producers to fully pay excise tax liability. The audit assessed the adequacy of Canada's approach to finding and eradicating tax evasion. The report also highlights the revenue impact of auditing efforts.

The report noted that the Canadian Department of Finance has compared estimates derived from Statistics Canada on motor fuel sales volumes with gallons taxed by Revenue Canada. Based on this analysis, revenue loss is estimated at $55 million, or 1.5 percent of the $3.8 billion in motor fuel taxes collected in Canada in 1994-95. The audit assigned relatively low confidence to the Department of Finance estimate because the data used by Statistics Canada were obtained directly from fuel producers. Because the data provided by fuel producers are likely the basis for assessing tax liability, the comparison of Statistics Canada and Revenue Canada data is thought to be more a reflection of the quality of record keeping on the part of Revenue Canada rather than an indication of the amount of evasion.

Report: Runde, Al. 2003. *Motor Vehicle Fuel and Alternative Fuel Tax.* Prepared for Wisconsin Legislative Fiscal Bureau. Informational Paper 40. Madison, Wisconsin.

This report outlines the history and current characteristics of the motor fuel tax in Wisconsin. This history includes a discussion of legislatively increased tax rates on various fuels and how tax rates have been indexed to account for inflation. Other characteristics of Wisconsin's motor fuel tax administration system described are fuel tax exemptions, Wisconsin's participation in IFTA, fuel tax refunds and a floor tax imposed on holders of fuel when fuel tax rates are altered.

Report: Sinha, K. and Varma, A. 1997. "Long-Term Highway Revenue Forecasting for Indiana." *Transportation Research Record 1576*. Washington, D.C.

This report documents a revenue-forecasting model developed for estimating transportation tax revenue in Indiana. The report documents the methodology underlying the model and notes that the model was designed with an emphasis on the accuracy and availability of data needed to input into the model, simplicity of model inputs and ease of use and responsiveness to changing

energy, environmental, financial, legislative, socioeconomic and technology factors. The paper presents a summary of the highway revenue analysis, which includes a long-range forecast of all transportation revenue sources in Indiana.

Report: U.S. Army Corps of Engineers. June 2002. *Waterborne Commerce of the United States, Calendar Year 2002, Part. 5, National Summaries*. New Orleans, LA.

Waterborne Commerce of the United States is published annually providing statistics on both foreign and domestic waterborne commerce traversing U.S. waterways. It provides data relating to the transport of commodities at the ports and harbors located along the waterways and canals of the U.S. and its territories. Waterborne transport of petroleum products – e.g., crude petroleum, gasoline, kersosene, distillate fuel oil, residual fuel oil and liquid natural gas are examined in terms of foreign/domestic short tons transported, foreign/domestic short tons-miles and domestic barge transport in short tons.

Report: U.S. Census Bureau. October 1999. *US Vehicle Inventory and Use Survey - VIUS – 1997*. Washington D.C. Other 1992, 1987, 1982, are found under Truck Inventory and Use Survey.

The Vehicle Inventory and Use Survey (VIUS) compiles data from a sample survey of 150,000 commercial and private trucks registered in the United States. VIUS was known as the Truck Inventory and Use Survey (TIUS) prior to 1997. VIUS data were first collected in 1963. Since 1967, VIUS data have been collected once every five years, with the most recent survey being conducted in 1997. VIUS data do include state-level VMT and fuel efficiency data for trucks. The VIUS survey does not include passenger vehicles.

Report: U.S. Congressional Research Service. March 29, 2000. *The Federal Excise Tax on Gasoline and The Highway Trust Fund: A Short Histor*y, CRS Issue Brief for Congress, http://www.cnie.org/nle/trans-24.htm (CRS 2000).

This report gives a history of federal gasoline excise tax revenues for fiscal years 1933 through 1993. It also provides a brief description of where these revenues have traditionally gone.

Testimony: U.S. Congress. January 9, 1995a. W*ritten Testimony of The Staff of The Joint Committee on Taxation Regarding The Revenue Estimating Process*, JCX-1-95.

This testimony provides a description of the Joint Committee on Taxation (JCT) methodology for estimating revenue effects from changes in tax legislation. Discussions of past revenue estimates, issues of importance when modifying revenue estimation methodology and approaches for improving the revenue estimation process.

Report: USDOE, U.S. Department of Energy. February 2001.*The Transportation Sector Model of The National Energy Modeling System,* Model Documentation Report, DOE/EIA-M070 (2000), Energy Information Administration. Washington, D.C.

This report describes the National Energy Modeling System (NEMS) Transportation Model (TRAN), specifically focusing on its development, objectives and approach. The report also discusses model assumptions and other factors related to the structure of the model.

TRAN consists of several partially independent models that pertain to various features of the transportation sector. The transportation model provides mid-term forecasts of transportation fuel demand by type, including gasoline, distillate, jet fuel and alternative fuels. The model also provides forecasts of passenger travel demand by automobile, air, or mass transit; estimates of the efficiency with which that demand is met; projections of vehicle stocks and the penetration of new technologies; and estimates of the demand for freight transport which are linked to forecasts of industrial output. Currently, NEMS forecasts extend to the year 2020 and use a base year of 1990.

Energy consumption within several types (i.e. aircraft, marine, rail, light duty vehicles and truck freight) of transport are considered separately in NEMS forecasts. This approach is used to assess the impact of public policy and technological advances on particular transportation modes.

Report: USDOE, U.S. Department of Energy. 1997. *1994 Residential Transportation Energy Consumption Survey.* Energy Information Administration, DOE/EIA-0464(94), Washington, D.C. Other years are also available.

The RTECS is based on a national multistage probability sample survey conducted on personal household vehicles. The first RTECS was conducted in 1983. Subsequent surveys were conducted in 1985, 1988, 1991 and 1994. No surveys have been conducted since 1994, and the US DOE Energy Information Administration (EIA) is presently investigating new methods to construct data formerly generated through the RTECS. Data on household, vehicle stock and fuel consumption is obtained through an initial personal interview. A subsequent telephone interview is conducted the following years, and is used to collect data on vehicle stock, turnover, new purchases and VMT. A third interview is conducted the following year. The RTECS is designed to construct VMT estimates for personal vehicles based on odometer readings. Vehicle characteristic information is obtained directly from the respondent. Prior to 1994, the RTECS based fuel consumption estimates on fuel consumption logs provided by the respondents. Due to budgetary constraints, however, RTECS fuel consumption estimates in 1994 were based on vehicle fuel efficiency data collected from the United State Environmental Protection Agency, adjusted for on-road degradation.

Report: United States Department of Transportation. 1995. *Revenue Impact of Diesel Fuel Dyeing*. Washington, D.C.

This report documents the estimated fiscal impact of dyeing diesel fuel and moving the point of diesel fuel tax collection to the highest point in the distribution chain. The Omnibus Budget Reconciliation Act (OBRA) of 1993 moved the point of collection from the distributor to the terminal level (effective January 1, 1994) and required the dyeing of all tax-exempt diesel prior to removal from the terminal. Treasury estimated that tax receipts available to the federal HTF grew by more than $1.2 billion in fiscal year (FY) 1994 after adjusting for the tax increase enacted on October 1, 1993. After adjusting for increased refunds stemming from moving the

point of collection to a point higher in the fuel distribution chain and growth resulting from increased travel and motor fuel consumption, the Treasury Department further estimated that $600-$700 million of the total growth in diesel fuel tax collections experienced in FY 1994 could be attributed to reduced tax evasion resulting directly from the enforcement provisions of OBRA 1993.

This report also documents a spill-over compliance benefit realized by states as a result of federal diesel dyeing requirements and enforcement activities. In 1994, states reported an average increase in diesel tax collections of 6.9 percent, an amount equal to almost twice the expected growth in diesel fuel use. The report concludes that if half the growth experienced by states were attributable to increased compliance; state transportation programs would yield an additional $150 million due to reduced evasion. The report also notes that each dollar spent on auditing and enforcement activity yields an average of $10 to $20 in additional highway user revenue.

Report: Varma, Amy and Kumares, Sinha. 1997. Long-Term Highway Revenue Forecasting for Indiana. *Financial, Economic, and Social Topics in Transportation*, TRR No. 1576, TRB.

This paper presents a summary of the highway revenue analysis and highway revenue forecasting methodology developed for the state of Indiana. Indiana's long-term highway forecasting model was developed with an emphasis on ease of data input and responsiveness to changes in various variables, including socioeconomic and technological factors. Concentration was placed on forecasting vehicle travel and vehicle registration. This paper includes an extensive list of references regarding federal and state forecasting models.

Report: Virginia Department of Motor Vehicles. November 2000. *Commonwealth Transportation Fund: Preliminary Revenue Estimates*. Richmond, Virginia.

This report presents revenue estimates for transportation revenues during the 2001 to 2006 timeframe, and documents the econometric model designed by the Wharton Economic Associates (WEFA) for the Forecasting and Analysis Office (FAO) of the Virginia Department of Motor Vehicles (DMV). The econometric model is maintained by the FAO. The report notes that gasoline and diesel revenues are modeled differently to reflect the markets in which these fuels are sold. Specifically, diesel consumption is more closely tied to economic growth, while gasoline consumption is more tied to personal income and fuel prices. In the Virginia Revenue Forecasting Model, gasoline is estimated as a function of real personal income in Virginia, a three-period moving average of personal expenditures on gasoline, expenditures on oil products relative to total consumer expenditures and three quarterly dummy variables. Taxable diesel gallons are estimated as a function of chain-weighted gross domestic product (GDP) and a three-period moving average of the refined petroleum producer price index.

Report: Washington Interagency Revenue Task Force. February 2000. *Transportation Economic and Revenue Forecasts*. Olympia, Washington.

This report provides an overview of a six-year forecast of transportation revenues in Washington State. Further, the report documents the regression equations used to forecast motor fuel excise

tax revenues in Washington State. Taxable fuel gallonage is estimated with an econometric model comprised of two equations. There are separate equations for forecasting gasoline and diesel taxes. Gasoline tax revenue is estimated as a function of Washington state real personal income, population, inflation, gasoline prices and average passenger car fuel efficiency. Diesel tax revenue is estimated as a function of Washington State real personal income and production activity in the lumber and wood products industry. The report notes that during the last 20 years, gasoline tax forecasts have been quite accurate, generally within 2 percent of actual collections. Diesel tax revenue forecasts have not been as accurate with the divergence between actual collections and forecast amounts reaching as high as 8 percent. Because diesel tax revenue represents only 15 percent of total fuel tax revenue in Washington State, the overall forecast has historically been within 3 percent of actual collections on an annual basis.

Report: Washington Legislative Transportation Committee. 1996. *Fuel Tax Evasion in Washington State*. Olympia, Washington.

This report documents the findings of a legislative task force established in 1995 to study the issue of fuel tax evasion in Washington State. The task force included representatives from the Washington State Patrol, the Department of Licensing, the Department of Revenue, the Washington State Department of Transportation, the Internal Revenue Service and representatives from private businesses. The objective of the task force was to estimate the magnitude of evasion and the methods used to evade fuel taxes. Further, the task force identified measures to counteract the methods of evasion and reduce tax losses to the State of Washington.

The task force identified nine fuel tax evasion methods: cross-border smuggling, daisy chains, cocktailing/blending, fraudulent use of exempt licenses, fraudulent tax returns, fraudulent refund claims, failure to file, using dyed diesel in highway vehicles, and fraudulent licenses.

The task force used three methods to identify and quantify evasion: literature review, a three-day border interdiction effort and random audits. Based on their findings, the task force estimated that Washington could recover between $15 and $30 million annually through enhanced enforcement of motor fuel taxes.

Methods identified to reduce tax evasion included: change the point of taxation from the distributor to the rack, implement a dyed diesel fuel program, implement and encourage information sharing between enforcement agencies, develop a national evader database, require total fee accountability from origin to end user, encourage electronic reporting, foster working relationships with British Columbia and neighbor states, create an evasion investigation unit, institute a distributor bonding requirement, and educate public and prosecutors.

Report: Weimar, M. R. et al. August 2002. *Economic Indicators of Federal Motor Fuel Excise Tax Collections*. Prepared by Pacific Northwest National Laboratory and Oak Ridge National Laboratory for the U.S. Internal Revenue Service.

This report documents the development of a structural and statistical model that predicts gasoline excise taxes, discerns trends in tax collection and detects possible historical under-collection of motor fuel taxes based on macroeconomic variables. This model represents the first installment

of a larger model that would predict excise tax revenues for all motor fuels. Three stage least squares is incorporated to estimate fuel consumption for various vehicle classes. Further, supply and demand equations for VMT for various vehicle classes are estimated using economic variables, including non-farm employment and the price of gasoline. Fuel efficiency is also integrated into this model based on Corporate Average Fuel Economy (CAFE) and lagged endogenous variables.

Quarterly data from 1981 forward obtained from federal, state and private sources were used to estimate this model. The structural approach of this model differs from other revenue estimation models in that most other models estimate revenue directly from VMT and this model first estimates consumption and then estimates revenue through tax rates and accounting procedures. Further, this model is designed to detect changes in levels of evasion as well as project fuel tax revenue. While it does not directly detect evasion, it can detect unexpected movements in collections which can be inferred as unexpected changes in the level of evasion.

The model predicted higher collections than what was actually collected by the IRS prior to 1988. After the point in taxation was moved to the rack in 1993, the model results are on par with IRS collections. This is evidence that there was a systematic problem of under-collections prior to the change in the point of taxation.

Report: Weinblatt, Herbert et al. 1998. *Alternative Approaches to the Taxation of Heavy Vehicles*. Prepared for NCHRP, National Cooperative Highway Research Program. Washington D.C. Transportation Research Board.

This study reviews alternative state tax systems, specifically for heavy vehicles, and develops six criteria by which to compare taxation alternatives used to finance surface transportation. To assess existing state highway tax systems, previous studies on the equity of state and federal systems were reviewed and a survey was conducted of state agencies responsible for tax administration. Equity ratios that show the extent to which each vehicle class pays their share of the cost responsibility are presented. Further, tax systems in ten foreign countries were reviewed and major characteristics of those systems were presented to identify taxes and administration procedures that might be of interest for the US. Technologies that have potential for decreasing administrative and compliance costs were also reviewed.

The criteria developed by this study to evaluate alternative tax systems are adequacy, administrative efficiency, equity, economic efficiency, evasion and avoidance and feasibility. Given these criteria, the authors found that there was no unambiguously superior taxation system. Rather, the choice between systems involves tradeoffs between the criteria. For instance, one important trade-off mentioned was between administrative efficiency and evasion. Enforcement can decrease evasion but at a cost to both the public and private sectors.

Report: Wisconsin Department of Transportation. July 2001. *Wisconsin Department of Transportation Revenue Forecasting Model Documentation.* Madison, Wisconsin.

This report documents the revenue forecasting model used by the Wisconsin Department of Transportation (WDOT) to estimate future vehicle registration and motor fuel tax revenues. The

revenue forecasting model is based on regression analysis, which relies on past behavior to predict future behavior. The gasoline consumption model is based on the assumption that fleet composition, real income and real fuel prices affect the demand for travel and fuel consumption, where: auto registrants = autos registered - autos scrapped + new auto registrations; and VMT = f (real disposable income, real gas price adjusted for fuel efficiency, dummy variables for abnormal years such as oil embargo years).

APPENDIX E

Acronyms

AADT	Average annual daily traffic
AASHTO	American Association of State Highway and Transportation Officials
ACS	Affiliated Computer Services, Inc.
AID	Acoustic Inspection Device
AMFU	Alternative Motor Fuel Use Model, ORNL
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
ATA	American Trucking Associations
BC	British Columbia
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
BOL	Bill of Lading
BTRIS	Below the Rack Information System
CAFE	Corporate Average Fuel Economy
CBPP	Center for Balanced Public Policy
CDF	Cumulative distribution function
CGPA	Council of Governor's Policy Advisors
CSG	Council of State Governments
DMV	Department of Motor Vehicles
DOL	Department of Licensing
DOR	Department of Revenue
DOT	Department of Transportation
EDI	Electronic Data Interchange

ExFIRS	Excise Files Information Retrieval System
ExFON	Excise Fuel Online Network
ExSTARS	Excise Summary Terminal Activity Reporting System
ExTOLE	Excise Tax Online Exchange
ExTRAS	Excise Tax Registration Authorization System
FAA	Federal Aviation Administration
FAO	Forecasting and Accounting Office of the State of Virginia
FBI	Federal Bureau of Investigation
FEIN	Federal Employer Identification Number
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FTA	Federation of Tax Administrators
GAO	General Accounting Office
GDP	Gross Domestic Product
GPS	Geographic Positioning System
GSP	Gross State Product
HA	Highway Account
HCAS	Highway Cost Allocation Study
HERS	Highway Economic Requirements System
HPMS	Highway Performance and Monitoring System
HRFM	Highway Revenue Forecasting Model
HTF	Highway Trust Fund
IFTA	International Fuel Tax Agreement
IRC	Internal Revenue Code
IRP	International Registration Plan
IRS	Internal Revenue Service
ISTEA	Intermodal Surface Transportation Efficiency Act
IT	Information Technology
ITS	Intelligent Transportation Systems
JCT	Joint Committee of Taxation
JFSMFTCP	Joint Federal/State Motor Fuel Tax Compliance Project
MPG	Miles Per Gallon

MMS	Mineral Management Service of the US Department of the Interior
MTBE	Methyl Tertiary Butyl Ether
NAICS	North American Industry Classification System
NASI	North American Standard Inspection
NATSO	National Association of Truck Stop Operators
NBER	National Bureau of Economic Research
NCHRP	National Cooperative Highway Research Program
NEMS	National Energy Modeling System
NERA	National Economic Research Association
NHS	National Highway System
NIST	National Institute for Standards and Technology
NPTS	National Personal Travel Survey
OBRA	Omnibus Budget Reconciliation Act
OLS	Ordinary Least Squares
OMB	Office of Management and Budget
OIG	Office of the Inspector General
ORNL	Oak Ridge National Laboratory
OTA	US Treasury Office of Tax Analysis
PD	Petroleum Division of the EIA
PMA	Petroleum Marketing Annual
PNNL	Pacific Northwest National Laboratory
PSA	Petroleum Supply Annual, EIA
PSRS	Petroleum Supply Reporting System
PTB	Pounds per thousand barrels
RABA	Revenue Aligned Budget Authority
RFG	Reformulated Gasoline
RRA	Revenue Reconciliation Act
SAFER	Safety and Fitness Electronic Records
SEA	Simultaneous Equations Approach
SOI	Statistics of Income
STAA	Surface Transportation Assistance Act of 1982
STP	Surface Transportation Program

SUV	Sport utility vehicle
TAME	Tertiary anyl methyl ether
TBA	Tertiary butyl alcohol
TEA-21	Transportation Equity Act for the 21st Century
TIUS	Truck Inventory and Use Survey
TRA	Tax Reform Act
TRAN	Transportation Demand Module
TRB	Transportation Research Board
USDOE	United States Department of Energy
USDOT	United States Department of Transportation
VIUS	Vehicle Inventory and Use Survey
VMT	Vehicles Miles Traveled
WEFA	Wharton Economic Forecasting Associates
WIM	Weigh in Motion
WSLTC	Washington State Legislative Transportation Committee
WSP	Washington State Patrol

Abbreviations and acronyms used without definitions in TRB publications:

AAAE	American Association of Airport Executives
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway and Transportation Officials
ACI–NA	Airports Council International–North America
ACRP	Airport Cooperative Research Program
ADA	Americans with Disabilities Act
APTA	American Public Transportation Association
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATA	Air Transport Association
ATA	American Trucking Associations
CTAA	Community Transportation Association of America
CTBSSP	Commercial Truck and Bus Safety Synthesis Program
DHS	Department of Homeland Security
DOE	Department of Energy
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
IEEE	Institute of Electrical and Electronics Engineers
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991
ITE	Institute of Transportation Engineers
NASA	National Aeronautics and Space Administration
NASAO	National Association of State Aviation Officials
NCFRP	National Cooperative Freight Research Program
NCHRP	National Cooperative Highway Research Program
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
SAE	Society of Automotive Engineers
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
TCRP	Transit Cooperative Research Program
TEA-21	Transportation Equity Act for the 21st Century (1998)
TRB	Transportation Research Board
TSA	Transportation Security Administration
U.S.DOT	United States Department of Transportation