Implications of an Inflation-Adjusted Fuel Tax on Government Revenue and Consumer Welfare

International Association for Energy Economics
June 16, 2014

John Marron, AICP
Policy Analyst
University Public Policy Institute

Jerome Dumortier, Ph.D.
Assistant Professor
Indiana University-Purdue University
Indianapolis
School of Public and Environmental Affairs

Fengxiu Zhang
Research Assistant
Indiana University-Purdue University
Indianapolis
School of Public and Environmental Affairs
Fuel taxes are the largest source of state revenue for transportation finance

- Each state, the District of Columbia and the federal government tax gasoline and diesel sales to fund the construction and maintenance of the surface transportation system

Based on the “benefits principle”
Transportation Finance: Fuel Taxes

First instituted in the US in 1932 as an excise tax to help fund a government shortfall due to the Great Depression, at one-cent per gallon.

Used to fund defense activities through World War II and the Korean War

Was an unpopular tax and many interests fought to have it rescinded through the mid-’50s
Transportation Finance: Fuel Taxes

As a compromise in the debate around the interstate highway system, the federal fuel tax was raised to three cents and dedicated to the construction and maintenance of the interstate highway system. Resources from federal fuel taxes would be put into a “Highway Trust Fund” for that purpose.
Transportation Finance: Fuel Taxes

Source: Federal Highway Administration
Transportation Finance: Fuel Taxes

Creation of the Highway Trust Fund

Fuel tax increased to current $0.184/gallon

Source: Federal Highway Administration
Transportation Finance: Infrastructure Needs

Bridges

– The average age of the nation’s bridges is 42 years
– One in nine bridges in the US is structurally deficient
– More than 200,000,000 vehicles cross structurally deficient bridges in the US, every day
– To address the shortfall of bridge maintenance by 2028, an additional $8 billion per year is needed

Source: American Society of Civil Engineers

Image credit: New York T
Transportation Finance: Infrastructure Needs

Roads

- 42 percent of major US urban highways are congested
- $101 billion is wasted in lost time and wasted fuel on these congested highways, annually
- The ASCE 2013 Report Card for America’s Infrastructure improved its grade for the nation’s roads... To a D
- The Federal Highway Administration estimates that an additional $170 billion is needed on an annual basis to significantly improve road conditions and performance

Source: American Society of Civil Engineers
Transportation Finance: Infrastructure Needs

**Transit:** Deficient and deteriorating transit systems cost the US economy $90 billion/year.

Rail, ports, airports, inland waterways, multi-modal paths, levees and many other forms of infrastructure are deteriorating and in need of additional funding.

The US is ranked 25th among nations for the quality of its infrastructure

Source: American Society of Civil Engineers
Transportation Finance

Given declining resources and increasing need, perhaps it’s surprising that...
Transportation Finance

FY 2014 Projected Estimates for End-of-Month Cash Balances (as of 4/25/2014) \(^1\)/\(^2\)/\(^3\)/

Highway Account of the Highway Trust Fund (Includes FHWA, FMCSA & NHTSA)

1/ Graph reflects actual data through 4/25/14 and end-of-month projections for the remainder of the fiscal year.
2/ Total receipt and outlay projections are based on FY 2015 President’s Budget Baseline assumptions. Projected monthly receipt and outlay rates are based on historic averages.
3/ Range of anticipated shortfall: Green brackets denote the estimated window of when the anticipated shortfall will occur.

Source: FHWA
The status quo is no longer sufficient to fund the United States’ transportation needs. Federal taxes are inadequate to address the needs of the surface transportation system, and unsustainable over the long-term because of the way they are structured.
Inadequacy of Fuel Taxes

**International Unleaded Gasoline Prices and Taxes**

<table>
<thead>
<tr>
<th>Country</th>
<th>Price/gallon</th>
<th>Excise Tax/gallon</th>
<th>Sales Tax or VAT/gallon*</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>1.55</td>
<td>0.31</td>
<td>0.09</td>
</tr>
<tr>
<td>Mexico</td>
<td>1.79</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>1.63</td>
<td>0.78</td>
<td>0.17</td>
</tr>
<tr>
<td>Australia</td>
<td>1.57</td>
<td>1.12</td>
<td>0.27</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1.71</td>
<td>1.14</td>
<td>0.36</td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>1.48</td>
<td>1.96</td>
<td>0.65</td>
</tr>
<tr>
<td>Japan</td>
<td>2.07</td>
<td>2.36</td>
<td>0.20</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.76</td>
<td>3.36</td>
<td>0.31</td>
</tr>
<tr>
<td>Hungary</td>
<td>1.65</td>
<td>1.93</td>
<td>0.89</td>
</tr>
<tr>
<td>Spain</td>
<td>1.94</td>
<td>1.92</td>
<td>0.62</td>
</tr>
<tr>
<td>Poland</td>
<td>1.67</td>
<td>2.02</td>
<td>0.81</td>
</tr>
<tr>
<td>Ireland</td>
<td>1.66</td>
<td>2.20</td>
<td>0.81</td>
</tr>
<tr>
<td>Austria</td>
<td>2.03</td>
<td>2.06</td>
<td>0.82</td>
</tr>
<tr>
<td>Korea</td>
<td>1.82</td>
<td>2.75</td>
<td>0.46</td>
</tr>
<tr>
<td>France</td>
<td>1.76</td>
<td>2.86</td>
<td>0.91</td>
</tr>
<tr>
<td>Sweden</td>
<td>1.73</td>
<td>2.71</td>
<td>1.11</td>
</tr>
<tr>
<td>Germany</td>
<td>1.53</td>
<td>3.25</td>
<td>0.76</td>
</tr>
<tr>
<td>UK</td>
<td>1.51</td>
<td>3.37</td>
<td>0.85</td>
</tr>
<tr>
<td>Belgium</td>
<td>1.94</td>
<td>2.80</td>
<td>1.00</td>
</tr>
<tr>
<td>Italy</td>
<td>2.18</td>
<td>2.73</td>
<td>0.98</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1.89</td>
<td>3.36</td>
<td>1.00</td>
</tr>
<tr>
<td>Norway</td>
<td>2.23</td>
<td>2.87</td>
<td>1.27</td>
</tr>
<tr>
<td>Turkey</td>
<td>1.84</td>
<td>3.90</td>
<td>1.03</td>
</tr>
</tbody>
</table>


Inadequacy of Fuel Taxes

Underfunded maintenance

Resources often diverted for new construction (more politically expedient)

Increasingly requires stop-gap measures to meet needs

- Diverting general revenue funds
- Raising taxes is politically difficult at the federal and state level
- Any manner of increasing user fees is unpopular
Inadequacy of Fuel Taxes

Figure 3: Attitudes of local government officials towards alternative fuel tax policies

Source: Indiana Advisory Commission on Intergovernmental Relations
Inadequacy of Fuel Taxes

Figure 2: Years Since Last Gasoline Tax Increase

Source: Institute on Taxation and Economic Policy
Inadequacy of Fuel Taxes

Addressing the adequacy issue requires political will.

If the unsustainability issue isn’t addressed, it also requires political will to be exercised repeatedly.

Image credit: Jeff Koterba, Omaha World-Herald
Unsustainability of Fuel Taxes

Most taxes are based on a rate (e.g., income tax)
- Automatically adjust to inflation
- Require no political will to maintain purchasing power

Fuel taxes are often a fixed amount per gallon
- Do not adjust to inflation
- If fuel consumption remains constant, fuel tax revenue buys less construction and maintenance each year
- Requires political will to maintain or increase purchasing power
Unsustainability of Fuel Taxes

Fuel consumption remains constant, fuel tax revenue buys less construction and maintenance each year...

Vehicle Miles Traveled (VMT)
Aggregate VMT peaked in 2007 after 100 years of increases
Per capita VMT has fallen for nine years – lowest level since 1996
Trends seen as not related to prices and the broader economy – downward trend has been persistent through prosperity, recession and recovery

Figure 1: Vehicle Miles Traveled (VMT) per licensed driver and nation

Sources: Federal Highway Administration
State Smart Transportation Initiative
Unsustainability of Fuel Taxes

If fuel consumption remains constant, fuel tax revenue buys less construction and maintenance each year...

Fuel Economy

CAFE standards projected to nearly double by 2025

Hybrid vehicles are forecast to increase their market share 4x between 2013 and 2040

Market share of gasoline powered vehicles expected to drop 14%
Unsustainability of Fuel Taxes

Source: ITEP analysis of data from the Federal Highway Administration (FHWA)
Unsustainability of Fuel Taxes

The Institute on Taxation and Economic Policy suggests addressing the eroding purchasing power of fuel taxes as the most important component in addressing the unsustainability of fuel taxes.

Options:
- Fixed rate tax on the price of fuel (sales tax)
- Rate indexed to a measure of cost of construction
- Rate indexed to the Consumer Price Index (CPI)

Sources: Environmental Protection Agency
Association for Convenience and Fuel Retailing
Unsustainability of Fuel Taxes

Figure 5: States Levying a Variable-Rate Gas Tax

Source: Institute on Taxation and Economic Policy
Indexing Fuel Taxes to Inflation

Option:
Fixed rate tax on the price of fuel (sales tax)

Challenge:
Volatility

Source: Institute on Taxation and Economic Policy
Indexing Fuel Taxes to Inflation

Option:
Indexing fuel taxes to the cost of construction

Challenges:
Obscurity of measure
Some volatility

Benefit:
Linking index to construction costs (rather than general inflation)
Indexing Fuel Taxes to Inflation

**Explanation:**
Indexing fuel taxes to the CPI

**Challenges:**
May not consistently track with cost of construction

**Benefit:**
Widely used and understood metric
Relatively predictable growth

Our Analysis

Objective:
- Measure the impact of indexing fuel taxes to inflation for 12 Midwestern states and the federal government
- Identify the increased revenue that would result in linking fuel taxes to inflation in 2014 through 2025
- Identify the impact of a one-cent reduction in gasoline and fuel taxes
- Identify the amount of foregone revenue from states having not indexed fuel taxes to inflation the last time they increased taxes
Our Analysis
Our Analysis: Methodology

\[ \ln(c_{i,t}) = \beta_0 + \beta_1 \ln(c_{i,t-1}) + \beta_2 \ln(p_{i,t}) + \beta_3 \ln(inc_t) + \beta_4 \ln(pop_t) + \beta_5 \ln(mpg_t) + \beta_6 \ln(vmt_t) \]

\(c_{i,t}\) represents consumption
\(p_{i,t}\) represents price of gasoline and diesel (Energy Information Administration)
\(inc_t\) represents state per-capita income (US Bureau of Economic Analysis)
\(pop_t\) represents state population (US Census Bureau)
\(mpg_t\) represents fuel economy (Environmental Protection Agency)
\(vmt_t\) represents vehicle miles traveled (US Census Bureau)

Lagged consumption (one-year) as a predictor of current year consumption is included. Future CPI estimates based on an analysis by the International Monetary Fund approach modified from Washington State Department of Transportation in its *Statewide Fuel Consumption Forecast Model* (2010)
Results

Identify increased revenue that would result from indexing fuel taxes to the CPI (without one-cent reduction):

**States**
- Average state would have **$156.4 million** in additional annual revenue in 2025
- Cumulative additional state revenue across the 12 states by 2025 would be slightly more than **$11.3 billion**

**Federal**
- In 2025, the federal government would realize **$8.3 billion** in additional fuel tax revenue
- Cumulative additional revenue at the federal level by 2025 would be **$49.5 billion**
Results

Additional Annual Fuel Tax Revenue in 2025

- Illinois: $262.61
- Indiana: $177.78
- Iowa: $115.73
- Kansas: $64.08
- Kentucky: $130.51
- Michigan: $226.88
- Minnesota: $149.88
- Nebraska: $45.79
- North Dakota: $39.95
- Ohio: $415.13
- South Dakota: $39.55
- Tennessee: $180.90

INDIANA UNIVERSITY PUBLIC POLICY INSTITUTE

SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS
INDIANA UNIVERSITY
IPEI
Results

Cumulative Additional Fuel Tax Revenue (2014-2025)

- Illinois: $1,587.4
- Indiana: $1,086.6
- Iowa: $596.3
- Kansas: $575.5
- Kentucky: $742.0
- Michigan: $1,274.1
- Minnesota: $981.3
- Nebraska: $279.5
- North Dakota: $243.7
- Ohio: $2,504.2
- South Dakota: $204.9
- Tennessee: $1,096.0

INDIANA UNIVERSITY PUBLIC POLICY INSTITUTE

SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS INDIANA UNIVERSITY
Results

Annual Additional Fuel Tax Revenue
Results

Additional Federal Revenue from Indexing Fuel Taxes

- 2014: $0.0
- 2015: $1.1
- 2016: $2.8
- 2017: $5.1
- 2018: $8.1
- 2019: $11.8
- 2020: $16.1
- 2021: $21.3
- 2022: $27.1
- 2023: $33.8
- 2024: $41.2

Annual Revenue vs. Cumulative Revenue
Results

Identify the impact of an immediate one-cent reduction in gasoline and fuel taxes

States
- Average state would lose $32.5 million in the first year of a one-cent reduction (prior to indexing)
- Across the 12 states the loss would total $389.6 million

Federal
- Reducing the fuel tax by one-cent (prior to indexing to inflation) would cost the federal government $1.7 billion in foregone tax revenue in the first year.
- Would recover annual losses after indexing by 2017
- Would recover cumulative losses after indexing by 2019
Results

First Year Cost of One-Cent Reduction in Fuel Taxes

Illinois: -$58.2
Indiana: -$41.7
Iowa: -$29.4
Kansas: -$17.0
Kentucky: -$21.9
Michigan: -$53.1
Minnesota: -$34.2
Nebraska: -$15.6
North Dakota: -$7.6
Ohio: -$6.7
South Dakota: -$63.6
Tennessee: -$40.5
Results

Identify the amount of foregone revenue from states having not indexed fuel taxes to inflation the last time they increased taxes.

**States**
- In total, the twelve states have foregone $29.5 billion by not indexing fuel taxes the last time they were adjusted.
- Illinois, Indiana, Michigan, Ohio, and Tennessee have each foregone more than $1 billion alone.

**Federal**
- The federal government has foregone $133.3 billion by not indexing fuel taxes when they were last adjusted.
Results

Foregone Revenue from Having Not Indexed to CPI at Last Adjustment

- Illinois [1990] $12.84
- Indiana (2003/1997) $1.66
- Iowa (2008/1989) $0.15
- Kansas (2003) $0.62
- Kentucky (adj annually) $0.09
- Minnesota (adj annually) $0.01
- Nebraska (adj annually) $0.01
- North Dakota (2005) $0.15
- Ohio (2005) $1.67
- South Dakota (1999) $0.44
- Tennessee (1989/1989) $25.18
Illinois

Cost of a one-cent reduction: $58.2 million

Additional annual revenue in 2025: $195.1 million

Cumulative additional revenue by 2025: $847 million

Additional cost to average driver in 2025: $1.73/month
Results

Indiana

Cost of a one-cent reduction: $41.7 million

Additional annual revenue in 2025: $125.9 million

Cumulative additional revenue by 2025: $505 million

Additional cost to average driver in 2025: $1.64/month

Projected and forgone fuel tax revenue

Million 2013 U.S. Dollars


Base
Scenario
Forecast
Results

Iowa

Cost of a one-cent reduction:
$21.9 million

Additional annual revenue in 2025:
$90.9 million

Cumulative additional revenue by 2025:
$405 million

Additional cost to average driver in 2025:
$3.05/month
Results

Kansas

Cost of a one-cent reduction: $17.0 million

Additional annual revenue in 2025: $75.3 million

Cumulative additional revenue by 2025: $361 million

Additional cost to average driver in 2025: $2.64/month
Results

Kentucky

Cost of a one-cent reduction: $29.4 million

Annual additional revenue in 2025: $95.1 million

Cumulative additional revenue by 2025: $357 million

Additional cost to average driver in 2025: $2.34/month
Results

Michigan

Cost of a one-cent reduction: $53.1 million
Annual additional revenue in 2025: $164.0 million
Cumulative additional revenue by 2025: $687 million
Annual cost to average driver in 2025: $1.72/month
Results

Minnesota
- Cost of a one-cent reduction: $34.2 million
- Additional annual revenue in 2025: $116.2 million
- Cumulative additional revenue by 2025: $577 million
- Additional cost to average driver in 2025: $2.19/month
Results

Nebraska

Cost of a one-cent reduction: $15.6 million

Additional annual revenue in 2025: $28.0 million

Cumulative additional revenue by 2025: $76 million

Additional cost to average driver in 2025: $1.48/month
North Dakota

Cost of a one-cent reduction: $7.8 million

Additional annual revenue in 2025: $31.2 million

Cumulative additional revenue by 2025: $147 million

Additional cost to average driver in 2025: $4.45/month
Results

- Cost of a one-cent reduction: $63.6 million
- Annual revenue in 2025: $340.5 million
- Cumulative additional revenue by 2025: $1.67 billion
- Additional cost to average driver in 2025: $3.15/month
Results

South Dakota

Cost of a one-cent reduction:
- $6.7 million

Additional annual revenue in 2025:
- $25.9 million

Cumulative additional revenue by 2025:
- $119 million

Additional cost to average driver in 2025:
- $3.08/month
Results

Tennessee

Cost of a one-cent reduction: $40.3 million

Additional annual revenue in 2025: $133.6 million

Cumulative additional revenue by 2025: $578 million

Additional cost to average driver in 2025: $2.14/month
Results

Federal Government

- Cost of a one-cent reduction: $1.74 billion
- Additional annual revenue in 2025: $6.18 billion
- Cumulative additional revenue by 2025: $26.8 billion
- Additional cost to average driver in 2025: $2.11/month
Results: Impact on the Housing Trust Fund

Indexing fuel taxes to the CPI does not address the inadequacy of current fuel taxes

Indexing fuel taxes to the CPI does begin to arrest the issue of unsustainability
Results: Impact on Consumer Welfare

Increased Monthly Driver Fuel Costs in 2025 (2013 Dollars)

- Tennessee: $4.25
- Dakota: $5.19
- Ohio: $5.26
- Dakota: $6.56
- Nebraska: $3.59
- Texas: $4.30
- Illinois: $3.83
- Michigan: $4.45
- Kentucky: $4.75
- Kansas: $5.16
- Iowa: $3.75
- Indiana: $3.84
- Illinois: $6.00

Federal and Federal + State Costs

School of Public and Environmental Affairs
Indiana University
Results: Note on Consumer Welfare

Fuel taxes are regressive taxes, indexing them to inflation does nothing to address their regressivity.
Discussion

Indexing fuel taxes to the CPI would yield substantial additional public resources to address surface transportation needs.

Indexing fuel taxes to the CPI by itself will not address the inadequacy of our current transportation finance mechanism but will make fuel taxes as a funding stream more sustainable.

The impact of indexing fuel taxes to the CPI will have a modest direct impact on consumers; however, such a measure will not address the regressivity of fuel taxes.
Questions?