

Policy Report



State Highway Funding in New England: The Road to Greater Fiscal Sustainability

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Introduction

There is general agreement that many of the nation’s—and region’s—roads and bridges are in need of significant repair and improvement. According to the American Society of Civil Engineers, over half of public road miles in the New England states are in poor or mediocre condition and driving on roads in need of repair collectively costs the region’s motorists over \$3 billion per year in extra vehicle repair and operating costs. Furthermore, 12 percent of the region’s bridges are structurally deficient, while an additional 29 percent are functionally obsolete.¹

While there may be debate over how much state governments should spend on highway infrastructure and how that spending should be funded, there is also general agreement that revenue sources currently used to fund highways are inadequate. Analyses conducted in all six New England states in recent years have identified sizable gaps between projected expenditures necessary to achieve or maintain a state of good repair among existing highway and other transportation assets and projected revenues from the sources currently dedicated to their upkeep, namely fuel taxes, tolls, and fees associated with motor vehicle ownership or operation.² (See the reference list under “New England Funding Studies” for the individual state sources.) The annual shortfalls estimated in these reports have ranged in the hundreds of millions of dollars per state, reflecting, in aggregate, nearly a quarter of the region’s total annual transportation expenditures.³

The fact that these shortfalls exist is, at least in some sense, a policy choice. Policymakers have always had the option to raise more revenues or to shift spending away from other areas, including the general fund, in order to fund highways at the level necessary to maintain a state of good repair. That they have not always done so may be because policymakers have viewed existing spending levels as adequate or because they have been willing to accept spending levels they believed to be inadequate in the face of competing priorities.

If policymakers wish to return existing highway assets to a state of good repair, they will likely need to pursue a combination of cost saving measures and additional revenues. To help ensure that new shortfalls do not emerge going forward, policymakers must also consider whether revenue sources used to fund highways are, in aggregate, fiscally sustainable. In other words, will they produce revenue streams that, over time, keep pace with the services they intend to fund?

The motor fuel excise tax or “gas tax” has long been a key source of highway revenues for the federal government and most states. The tax is typically levied as a flat tax per gallon sold, a structure that is not fiscally sustainable for two major reasons. First, the tax is not automatically linked to inflation. Second, the revenue-raising potential of the tax is adversely affected by increases in fuel efficiency and the use of alternative-fuel vehicles. In many states, and at the federal level,

1 American Society of Civil Engineers. “2013 Report Card for America’s Infrastructure.” Generally speaking, a highway bridge is classified as structurally deficient if it has one or more structural defects that require attention. A functionally obsolete bridge is one that is not structurally deficient but that features a design no longer functionally adequate for its task (for example, not enough lanes to accommodate traffic flow or high enough clearance to allow an oversize vehicle). See Appendix Tables 1 and 2 available at www.bostonfed.org/neppc for information on highway conditions and transportation funding gaps for individual New England states.

2 As measured, these funding gaps do not consider general revenues that are not earmarked for transportation, but do take into account revenues earmarked for transportation outside of these named sources.

3 Author’s calculations comparing the sum across the region of each state’s most recent annual estimated gaps with total transportation spending (including highways, transit, airports, parking facilities, and sea and inland port facilities) for FY 2012, as reported by the U.S. Census Bureau.

policymakers have not raised gas tax rates sufficiently to keep pace with increases in road construction costs or improving fuel efficiency, a factor that has likely contributed to existing funding shortfalls.

In this report, we compare existing gas taxes in the New England states and examine several alternative gas tax structures that have been proposed to address concerns about the traditional levy. Specifically, we consider gasoline excise taxes that are periodically adjusted to reflect inflation or changes in average fuel efficiency or both (all these options are referred to here as “indexed gas taxes”) as well as levies linked to the price of gasoline (referred to here as “price-based gas taxes”). Our primary objective in this report is not to determine whether any of these alternatives, or even fuel taxes in general, represent the best way to pay for highways among all available funding options, but rather to assess how well these alternatives could improve upon the fiscal sustainability of existing gas tax structures. In doing so, our analysis provides information for policymakers to consider as they make decisions about highway funding going forward.

To illustrate differences in fiscal sustainability, we simulate tax revenues under multiple alternative gas tax structures and compare them with estimates of revenues generated by actual gas taxes in the New England states between 1993 and 2012. We also perform forward-looking simulations in which we project revenues through 2033 for a selected subset of gas tax structures. These simulations help to sharpen our understanding of the consequences of various alternatives with respect to fiscal sustainability and also with respect to revenue stability, another important consideration, given the long-term nature of transportation planning.

Findings of the simulations include the following:

- Actual gas tax structures vary across the New England states. Gas tax revenues in the region’s states that employed a tax structure that varied with inflation for all or part of the 1993–2012 period fared better with respect to fiscal sustainability than those that did not.
- A hypothetical gas tax that accounted only for rising fuel efficiency but not for inflation was the least sustainable of the examined alternatives over the 1993–2012 period, but performed slightly better than actual, flat, per-gallon taxes.
- Among hypothetical indexed taxes, those tied to the consumer price index (CPI) showed slightly lower, but substantially more stable, revenue growth over the historical period than those linked to a highway construction cost index (CCI).
- A hypothetical price-based tax, which is similar to a sales tax, produced the highest revenues by the end of the historical period, but was also the most volatile. A dual tax combining a price-based and a per-gallon component yielded lower, but more stable, revenues. However, neither option directly accounts for rising fuel efficiency.
- Forward-looking simulations suggest that an inflation- and fuel-efficiency-indexed gasoline excise tax would produce more fiscally sustainable revenues than a flat, per-gallon gasoline excise tax or a gasoline tax indexed to inflation alone, with similar stability.

If states wish to promote more sustainable revenue streams for highways while continuing to rely on gasoline taxes as a major component of highway funding, it is important for policymakers to consider the dual revenue impacts of rising costs and improving gas mileage when evaluating policies to modify to existing structures. Our analysis suggests that a gasoline excise tax linked to both inflation and average fuel efficiency might be one way to meet this objective. Policymakers may also wish to consider how other revenue-raising mechanisms, such as tolling, fees, or general taxes, could be used to improve the overall fiscal sustainability of highway funding. In selecting the road forward, policymakers must also be mindful of other important criteria, such as equity, implications for the environment and traffic congestion, and administrative costs. Finally, it bears

repeating that simply adopting a more fiscally sustainable revenue structure without also addressing revenue levels or identifying ways to reduce costs will not necessarily erase existing highway funding gaps, but can help to ensure that existing shortfalls do not grow larger and that new gaps do not emerge.

Gas Taxes and Fiscal Sustainability

A tax may be described as fiscally sustainable if it yields a revenue stream that grows at the same pace as the services it is intended to fund. In contrast, a fiscally unsustainable tax will generate an increasingly inadequate amount of revenue over time. In most states, gas tax revenues flow into a fund dedicated to supporting highways and other transportation services and, by tradition, most spending on highways comes from these funds as opposed to state general funds.⁴ Two of the most frequently cited criticisms of the tax in its common form relate directly to fiscal sustainability and support the view that this form of tax contributes to the transportation funding issues experienced by many states and the federal government.

First, revenues from a conventional flat-rate excise tax do not automatically grow with inflation, whereas the costs associated with maintaining, constructing, and reconstructing roads tend to increase as prices and wage rates rise. This form of tax differs from other major taxes, such as general sales or income taxes, whose revenues tend to grow automatically with inflation due to the nature of their bases.⁵ To prevent the real value of traditional gas taxes from declining, legislatures must actively and periodically vote to adjust the rates, something that does not occur widely in practice. A 2011 report by the Institute on Taxation and Economic Policy (ITEP) noted that 14 states had gone at least 20 years without increasing their gas tax rate, and 26 states had gone at least 10 years. The federal gas tax, which is the largest source of funding for federal aid for highways, has not been raised since 1993, and many observers believe that it will not be raised in the near future, despite solvency issues facing the Federal Highway Trust Fund.⁶

Second, as vehicle fuel efficiency increases, flat-rate gas taxes will generate less revenue for a given amount of road use than in the past. Thus, even if the need for highway maintenance and reconstruction services remains the same, revenues derived from traditional gas taxes will decline. Since 1993, the average fuel economy of all light-duty vehicles in the United States—which include a mix of both newer and older-model-year vehicles—has grown from 19.3 miles per gallon to 21.6 miles per gallon in 2012 (a 12-percent increase).⁷

Over the past 20 years, inflation has played a more important role with respect to gas tax erosion than rising fuel efficiency and will likely continue to do so in the next few decades (see Figure 1).⁸ That being said, increasing federal fuel economy standards through 2025 and the

4 In addition to supporting operations, maintenance, capital expenditures, and debt service associated with highways, such funds—which typically rely on other sources of funding beyond gas taxes—may also support local road programs, other modes of transportation, such as transit, rail, or aviation, or highway-related services, such as state police highway patrols.

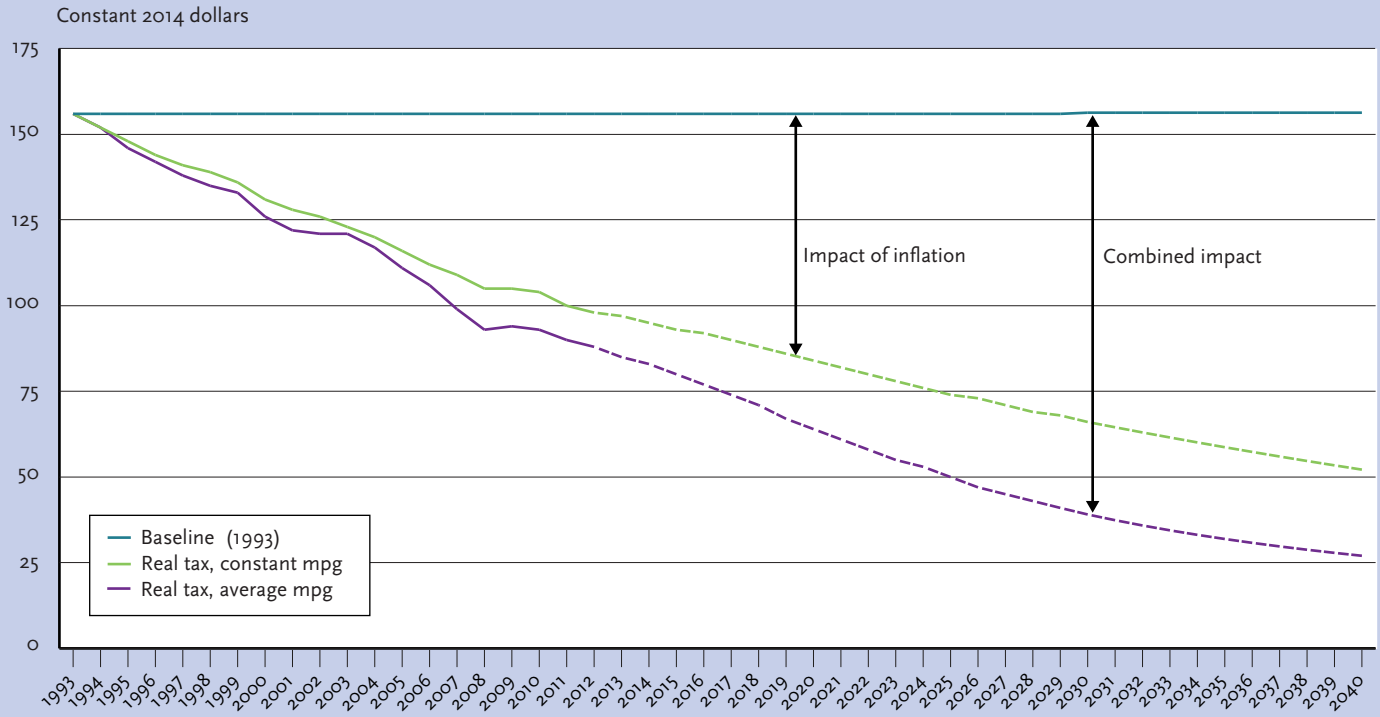
5 The dollar value of retail sales tends to increase as prices rise, increasing general sales tax revenues even if the sales tax rate remains unchanged. Likewise income tax revenues tend to increase as wage rates rise.

6 The Federal Highway Trust Fund is the source of federal funding for highway and transit programs. Trust fund revenues dedicated to highways, which comprise federal motor fuel excise taxes and various trucking-related taxes and fees, have fallen short of authorized federal highway spending for over a decade. The federal government has made up the gap by drawing down the fund's reserves and, between 2008 and 2014, through multiple general fund transfers. Facing a cash shortfall again in the summer of 2014, Congress passed a measure aimed at keeping the trust fund solvent through May 2015 by relying on funding from changes to rules surrounding employer contributions to private-sector pensions, the extension of certain customs user fees, and transfers of funds from a trust fund established to pay for the cleanup of leaking underground storage tanks. See "How is Congress paying for the short-term Highway Trust Fund fix?" CBS News. August 2, 2014.

7 U.S. Department of Transportation. FHWA. Highway Statistics, Table VM-1. Various Years. These estimates represent the ratio of actual vehicle miles traveled by light-duty vehicles (including hybrid, electric, and other alternative-fuel vehicles) divided by actual gallons of gasoline consumed. Increases in average fuel efficiency have not always been even, as they also depend on the mix of vehicle types. In some years during this period, average fuel efficiency decreased, reflecting a shift from more-fuel-efficient passenger cars to less-fuel-efficient light-duty vehicles, such as SUVs, mini-vans, and pick-up trucks.

8 This figure assumes travel at the national average level of fuel efficiency. Further details on how the impacts of inflation and fuel efficiency are calculated are provided in the methodological appendix available at www.bostonfed.org/neppc.

Figure 1. Annual revenue from federal gas tax on vehicle traveling 10,000 miles per year



Source: Author's calculations using data from FHWA, BLS, CBO, and EIA. See the methodological appendix at www.bostonfed.org/neppc for details.
 Note: Combined impact includes increased fuel efficiency of conventionally powered vehicles and increased presence of hybrid, electric, and other alternative fuel vehicles.

growing availability of hybrid and electric vehicles suggest that rising fuel efficiency will represent a greater threat to gas tax revenue streams in the years ahead than it has in the recent period. Average on-road fuel efficiency among all light-duty vehicles is expected to reach 28.7 miles per gallon by 2025, and 37.2 miles per gallon by 2040 (gains of 33 percent and 73 percent over 2012, respectively).⁹

Highway Funding and Gas Taxes in New England

Motor fuel taxes—including taxes on gasoline and diesel fuel—are a large source of state highway revenues in the New England region and elsewhere in the United States. In fiscal year (FY) 2013, these levies represented nearly one-third to over one-half of own-source revenues for highways in the six New England states, with the majority of motor fuel tax collections associated with sales of gasoline.¹⁰ Other important state highway funding sources represented in the region include motor vehicle fees, such as license and registration fees, tolls collected on specific highway facilities, and earmarked sales taxes (see sidebar “Other Current Funding Options”).

⁹ Estimates represent miles-per-gallon equivalents, which capture both conventionally powered and hybrid, electric, and other alternative-fuel vehicles. Sales of hybrid and electric vehicles in New England are expected to grow from 3.4 percent of total light-duty vehicle sales in 2012, to 4.7 percent in 2025, and 6.8 percent by 2040. See U.S. Energy Information Association. 2014 Annual Energy Outlook, Tables 48 and 59.

¹⁰ Author's calculation based on various state documents. State reports frequently do not break out gasoline versus diesel tax revenues. However, from Federal Highway Administration (FHWA) data we observe that gasoline represented 80 to 90 percent of motor fuel volume taxed in the New England states in 2012. Because tax rates on gasoline (including price-based components) and diesel motor fuels are similar, this implies that gasoline receipts also represent the lion's share of motor fuel tax revenue. While we have chosen to focus on the gasoline tax in this report, the diesel fuel tax faces similar issues with regard to fiscal sustainability.

Table 1. Summary of Gasoline Taxes in New England States as of July 2014

State	Excise Rate (cents per gallon)	Price-based Tax Description	Price-based Tax Rate (cents per gallon equivalent)	Indexing
Connecticut	25.0	Petroleum gross earnings tax: Statutory 8.1 percent tax on gross earnings (capped at \$3 per gallon for gasoline) derived from the first sale of selected petroleum products in the state (usually wholesale level).	26.0	None
Maine	30.0	None	N/A	In effect between 2003 and 2011 (CPI)
Massachusetts	24.0	None	N/A	Indexing scheduled to take effect in 2015 was repealed by voter initiative in November 2014
New Hampshire	22.2	None	N/A	None
Rhode Island	32.5	None	N/A	Scheduled to take effect in 2015 (CPI)
Vermont	12.1	Motor Fuel Transportation Infrastructure Assessment (MFTIA): 2 percent of the average tax-adjusted retail price of regular gasoline; computed quarterly. Motor Fuel Tax Assessment (MFTA): 4 percent of the tax-adjusted retail price of regular gasoline, subject to a floor of 13.4 cents per gallon and ceiling of 18.0 cents per gallon; computed quarterly.	MFTIA: 6.45 MFTA: 13.4	None

Source: Compiled by author from FHWA data, state sources, and the *Boston Globe*.

All six New England states levy an excise tax per gallon of gasoline sold. As of July 1, 2014, excise tax rates in the region ranged from 12.1 cents per gallon in Vermont to 32.5 cents in Rhode Island.¹¹ The U.S. average (as of January 1, 2014) was 20.9 cents per gallon. Vermont's per-gallon excise rate is low in part because the state also levies two additional assessments tied to the retail price of gasoline to support highway and other transportation infrastructure. Their combined effective rate as of July 2014 was 19.85 cents per gallon. Within the region, Connecticut is the only state to levy a tax on the wholesale price of gasoline; known as the petroleum products gross earnings tax, this tax was roughly equivalent to 26 cents per gallon in July 2014. These taxes are summarized in Table 1.

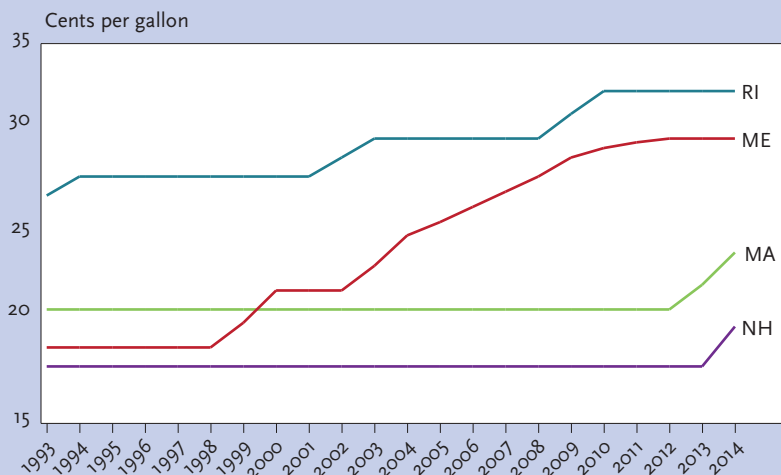
New England states have varied not only in the levels of their gas tax rates, but also in their willingness to increase these rates over the years. At one extreme, nominal excise tax rates in Massachusetts and New Hampshire remained unchanged from the early 1990s until increases were adopted in 2013 (Massachusetts) and 2014 (New Hampshire) (see Figure 2). Rhode Island's excise tax rate increased several times during this period, and it is scheduled to rise again in 2015.¹² At the other end of the spectrum, Maine automatically adjusted its excise tax to the

11 Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont also levy assessments on gasoline sales to fund clean-up of leaking underground gasoline storage tanks and other environmental programs. In 2014, these fees ranged between 0.5 and 2.6 cents per gallon. In Connecticut, a portion of revenue from the state's petroleum products gross earnings tax has historically been dedicated to similar purposes.

12 In the early 1980s, Massachusetts and Rhode Island were among several states that replaced their flat gasoline excise taxes with a tax based on a percentage of the pre-tax wholesale price of gasoline, but including statutory per-gallon floors. Although price-based tax laws were on the books for the two states in the 1990s, both states effectively had flat rate taxes during this period because of the statutory floors. See Bowman and Mikesell (1983) and Ang-Olson, Wachs, and Taylor (1999).

Figure 2. Nominal excise tax rates: 1993–2014

Maine, Massachusetts, New Hampshire, and Rhode Island



Source: Compiled by author from FHWA data and state sources.

Note: Represents simple average of rates in effect each month. Excludes underground storage tank fund and other environmental fees.

changes in the CPI between 2003 and 2011, leading to small but steady rate increases during that period.

The share of overall gas taxes represented by variable-rate components in Connecticut and Vermont has grown in recent years (see Figure 3). After a temporary bump-up through the mid-1990s, Connecticut's excise tax rate has remained flat at 25 cents per gallon since 2000.¹³ In the ensuing years, the effective cents-per-gallon rate of the state's petroleum products gross earnings tax has increased from five cents to over 25 cents as a result of statutory increases in the percentage tax rate and growth in the wholesale price of gasoline. After a four-cent increase in 1997, Vermont's excise tax rate remained at 19 cents per gallon until 2013, when the state adopted the second of its two variable rate assessments, the Motor Fuel Tax

Assessment (MFTA). Originally lowered to 18.2 cents per gallon, Vermont's excise tax rate was further reduced to 12.1 cents per gallon in 2014, while the MFTA rate was doubled from 2 to 4 percent.¹⁴

Alternatives to Traditional Gas Taxes

Several alternatives have been proposed, and in some states adopted, to improve upon the fiscal sustainability of traditional fixed-rate gasoline excise taxes by addressing one or both of the major revenue threats discussed above. This report focuses on two categories of alternatives: indexed gas taxes and price-based gas taxes. These are discussed in turn.

Indexed Gas Taxes

An indexed tax refers to one whose per-unit rate is adjusted periodically to reflect changes in the general price level or some other measure. Typically, indexing refers to adjustments that are set to occur automatically, although a similar result can also be achieved through periodic votes of a state legislature.¹⁵

An example of an indexed tax is a per-gallon excise tax that is adjusted on an annual basis to reflect changes in the CPI, a commonly cited measure of general inflation. Massachusetts and Rhode Island recently (in 2013 and 2014, respectively) passed legislation to automatically index their excise taxes to the CPI in future years, joining Florida and Maryland, but Massachusetts

13 In 1983, a bridge section of I-95 in Greenwich, Connecticut, collapsed into the Mianus River, killing three motorists and injuring several others. In the wake of the tragedy there was a major push for highway infrastructure investment in Connecticut, which was funded by a series of scheduled increases in the gasoline excise tax. This was followed by a series of scheduled decreases between 1997 and 2000.

14 The cents-per-gallon floor and ceiling associated with the MFTA rate were also doubled from their original levels. See 2013 Vermont Statutes, Title 23, Chapter 28, Section 3106.

15 In general, when we use the term indexing in this report without the modifier "automatic," we refer to a tax that is periodically adjusted, regardless of the mechanism by which such adjustment occurs. Critics of automatic gas tax indexing have argued that lawmakers should be required to vote on any tax increase, whereas proponents contend that the automatic feature is necessary to maintain the value of the tax, given the political difficulty of raising the tax rate through the legislative process. Maine's experience with automatic indexing presents an example of potential middle ground. While indexing was in effect in Maine, the tax rate was automatically adjusted on an annual basis, but the legislature was required by law to vote every two years on whether to repeal the indexing measure (which they ultimately did). See Paul Carrier, "Boost in gas tax gets green light." *The Portland Press Herald*. April 10, 2002.

voters repealed the indexing provision in a November 2014 referendum.¹⁶

Some researchers have advocated tying gasoline excise rates to changes in road construction costs instead of to the more familiar CPI.¹⁷ The justification for a construction cost index, such as the National Highway Construction Cost Index (CCI), is that it represents better than the CPI the costs of services that gasoline tax revenues are meant to support.¹⁸ Two states—Michigan and Ohio—tied their gasoline taxes to measures of road construction costs in the past but, to our knowledge, none do so today.¹⁹

To address the second threat to fiscal sustainability inherent in the traditional gas tax structure, analysts have also proposed indexing gasoline excise rates to changes in average vehicle fuel economy.²⁰ The idea behind this concept is that tax rates are periodically adjusted upward as vehicles become more fuel efficient, allowing states to retain some of the revenue they would otherwise lose due to decreased gasoline consumption. To our knowledge, no state currently employs this approach.²¹

Price-based Gas Taxes

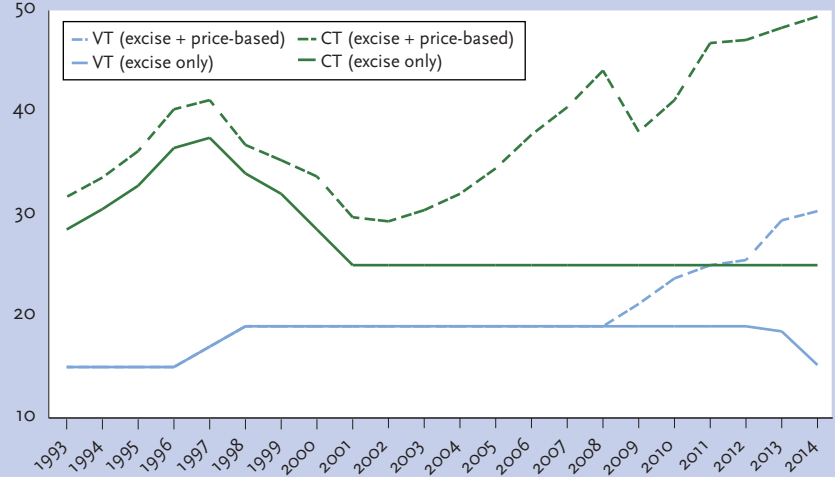
A tax that is linked to the price of gasoline represents a more commonly used alternative to the traditional gas tax. Here, the tax levy is calculated as a percentage of the wholesale or retail price of gasoline. While the statutory (percentage) rate of a price-based tax is usually fixed, the effective tax paid per gallon of gasoline purchased varies with the price.²² Because gas prices tend to rise over time, a price-based gas tax is likely to yield a more sustainable revenue stream than a traditional flat excise tax, without requiring changes to the tax rate. Two potential drawbacks are that gasoline prices tend to be volatile—as evidenced by the sharp decline in gasoline prices in the latter part of 2014 and early 2015—and their long-term trends may not match up with trends in highway maintenance or construction costs.

There are a number of different ways to structure a price-based tax. The percentage tax rate may be applied to the price at the time of purchase (like a sales tax or other *ad valorem* tax), but, in practice, the rate is more commonly applied to the statewide average price over a specified prior

Figure 3. Nominal excise and excise + price-based tax rates: 1993–2014

Connecticut and Vermont

Cents per gallon



Source: Source: Compiled by author from FHWA data and state sources.

Note: Represents simple average of rates in effect each month. Excludes Vermont's underground storage tank fee but does not exclude portion of CT petroleum gross earnings tax dedicated to underground storage tank fund.

16 Andy Rosen. "Mass voters eliminate gas tax indexing." *The Boston Globe*. November 4, 2014.

17 See O'Connell and Yusef (2013), ITEP (2011), and ITEP (2013).

18 Another alternative to the CPI is a price index for state and local government consumption expenditures published by the Bureau of Economic Analyses (BEA). Unlike the CPI, which is based on a market basket of consumer goods, the BEA price indexes, which are available for overall state and local governments as well as by government function, capture goods and services purchased by governments, including employee wages and benefits, fuel, utilities, office supplies, and construction costs and equipment. See Bruce E. Baker. "Price Indexes for State and Local Governments." Presentation for Rockefeller Institute of Government Forum. November 13, 2008.

19 At least one state commission on highway funding has recommended this approach in recent years. See Arkansas Blue Ribbon Committee on Highway Finance. Final Report. December 2010.

20 See O'Connell and Yusef (2013), and ITEP (2013).

21 Another alternative, also previously used by Ohio and Michigan, would be to inversely link gas tax rates to actual gasoline consumption. See Bowman and Mikesell (1983).

22 For this reason, price-based taxes, like indexed taxes, are sometimes referred to as variable-rate taxes.

period.²³ This latter approach results in a single statewide effective per-gallon rate (preferred by some for equity reasons), more easily allows the imposition of constraints (floors and/or ceilings) on effective rates, and has been described by some as easier to administer.²⁴

A number of states have turned to price-based alternatives to traditional gas taxes over the years. Several states adopted variable-rate price-based gasoline taxes in the late 1970s and early 1980s in response to the Arab oil embargo and general high inflation of the period. When gasoline prices began to fall in subsequent years, some states repealed their variable-rate taxes in favor of a traditional per-gallon tax, while others—including Massachusetts and Rhode Island—adopted floors that served as effective fixed-rate taxes.

Price-based taxes appear to be increasing in popularity again as the long-term fiscal unsustainability of the traditional gas-tax structure becomes more apparent. Today three states (Kentucky, Pennsylvania, and Virginia) levy a price-based gasoline tax in place of a fixed-rate excise tax, whereas a number of others (including California, Connecticut, Georgia, Maryland, Nebraska, New York, North Carolina, Vermont, and West Virginia) levy a price-based tax on top of a fixed-rate excise.

Historical Simulations

To illustrate how fiscal sustainability can vary under different alternative gas tax structures, we conducted a series of simulations, following an approach similar to those laid out by the ITEP (2013) and O’Connell and Yusef (2013). This approach essentially asks: How much revenue could have been raised over the past 20 years under each alternative tax compared with the revenue that was actually raised under existing tax rates and structures?

Methodology

For each gasoline-tax alternative, we developed hypothetical tax rates for each of the New England states for the period 1993–2012. By design, most of the examined alternatives generate incremental increases in the actual or effective per-gallon tax rate, which can impact behavior by inducing people to drive less and switch to more fuel-efficient vehicles. To obtain simulated revenues, we multiplied the hypothetical rates by the number of actual gallons of gasoline taxed, adjusted to account for these expected behavioral changes.²⁵ Because gasoline demand and vehicle miles traveled tend to be fairly unresponsive to price changes, and because the hypothetical tax changes are quite small relative to the overall tax-inclusive price of gasoline, these adjustments are relatively small.²⁶

Our final step was to compare simulated revenues under different alternatives with each other and with estimates of actual revenues (obtained by multiplying actual tax rates by actual gallons taxed).²⁷ To gauge the fiscal sustainability of each structure we compared real revenues (expressed in constant 2014 dollars) per 10,000 vehicle miles traveled in the baseline year (1993) and in

23 In Georgia, a percentage-based tax is currently applied to a forecasted retail price as opposed to an actual price over a prior period. See Clarke, Brown, and Hauer (2010).

24 See Bowman and Mikesell (1983) and Ang-Olson, Wachs, and Taylor (1999). Constraining the effective per-gallon rate can help to stabilize revenues and also lessen consumers’ pain associated with sharp, price-based tax increases.

25 These adjustments were based on estimates of the long-run price elasticity of gasoline (-0.4) reported by the Congressional Budget Office (CBO). See: CBO (2008).

26 For simplicity, we assume that tax-rate changes in a given New England state do not affect cross-border gasoline purchasing patterns. In reality, there is evidence that cross-border gasoline purchasing does occur in New England (particularly when the effective per-gallon tax-rate differential between states is large, as in Connecticut versus Massachusetts or Rhode Island). However, given the magnitude of the hypothetical year-over-year tax-rate increases examined in this report, we expect any new cross-border effects would also be relatively small.

27 For Connecticut and Vermont, actual tax rates are the sum of flat excise-tax rates and effective cents-per-gallon rates of price-based taxes. Estimated actual revenues may not exactly match revenue collections reported by state revenue departments.

Table 2. Summary Description of Simulated Funding Alternatives

Alternative	Description	Price-based Tax Description	Accounts for Inflation	Accounts for Rising Fuel Economy
1	Consumer price index (CPI)-indexed gasoline excise tax	Consumer price index (CPI) for all urban consumers (U.S. city average)	Yes	No
2	Construction cost index (CCI)-indexed gasoline excise tax	National bid-price index (1993–2006) National highway construction cost index (2006–2012)	Yes	No
3	Fuel economy (FE)-indexed excise	National average miles per gallon, light-duty vehicles	No	Yes
4	CPI- and FE-indexed gasoline excise tax	Consumer price index (CPI) for all urban consumers (U.S. city average) National average miles per gallon, light-duty vehicles National bid-price index (1993–2006)	Yes	Yes
5	CCI- and FE-indexed gasoline excise tax	National highway construction cost index (2006–2012) National average miles per gallon, light-duty vehicles	Yes	Yes
6	Price-based gasoline tax	State average retail price for regular gasoline excluding taxes	Yes	No
7	Dual gasoline tax (5 percent price-based gasoline tax + flat gasoline excise tax)	State average retail price for regular gasoline excluding taxes	Yes	No

Note: The rate for the indexed gasoline excise tax alternatives is set to equal a state's total actual per-gallon gasoline tax rate (including any price-based components) in the base year (1993). The rates for the price-based tax and the flat excise portion of the dual tax are set to generate the same amount of revenue in the base year (1993) as a state's total actual per-gallon gasoline tax (including any price-based components). See the methodological appendix at www.bostonfed.org/neppc for details.

2012.²⁸ For a fiscally sustainable structure, this metric should be level over time. This approach implicitly assumes that highway service needs are determined by current levels of road use; in reality, there may be other factors that also affect service demand and, ultimately, the fiscal sustainability of any revenue source.²⁹

Table 2 summarizes seven alternative gasoline tax structures that we examined.³⁰ In all cases, base year (1993) hypothetical rates were selected to be revenue neutral—that is, to produce the same amount of revenue as existing fuel taxes in that year.

Results

By performing historical simulations we can gauge the fiscal sustainability of existing gas taxes in New England over this period. Figure 4 presents a cross-state comparison of real gasoline tax

28 In calculating this metric for simulated revenues, we also adjusted vehicle miles traveled in the denominator to reflect behavioral responses. For these adjustments, we used an estimate of the long-run elasticity of vehicle miles traveled (-0.2) reported by the CBO. See CBO (2003).

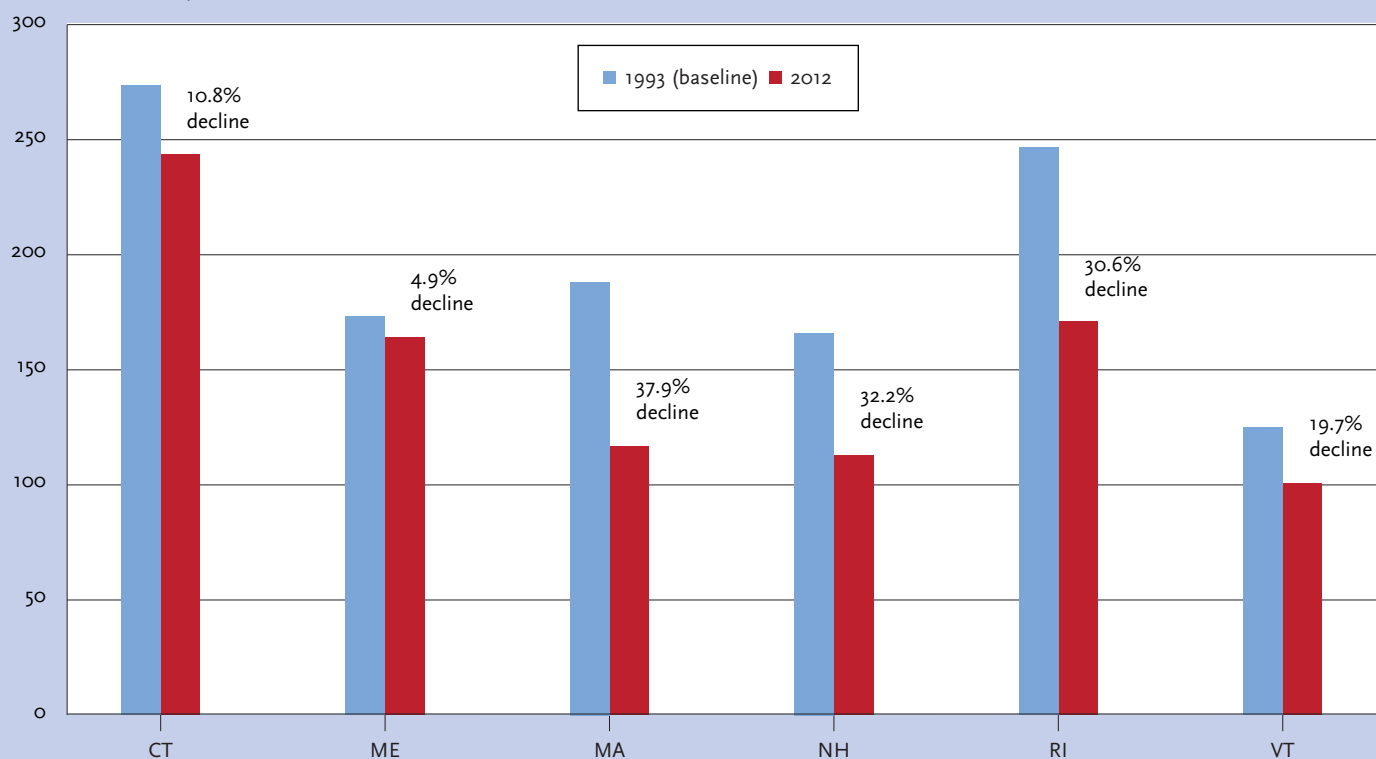
29 To the extent that highways were inadequately funded in 1993 (which is suggested by data on road and bridge conditions from the early 1990s) and that weather fluctuations have become more extreme in recent years, vehicle miles traveled likely understates actual service needs over this period and overstates the absolute fiscal sustainability of the examined alternatives. Service needs will also be affected by excess damage imposed on roadways by heavy trucks; however, we are assuming that these costs should not be attributed to light-duty vehicles nor borne by their users.

30 In addition to these seven, we examined alternatives that used the CPI for Boston-Brockton-Nashua instead of the national CPI and wholesale price-based taxes instead of retail. State-by-state results for the full set of alternatives are available in the online data appendix available at www.bostonfed.org/neppc.

Figure 4. Actual gas taxes in New England

Real revenue per 10,000 vehicle miles traveled

Constant 2014 dollars



Source: Author's calculations using data from FHWA, BLS, and state sources. See the methodological appendix available at www.bostonfed.org/neppc for details.

revenue per 10,000 vehicle miles traveled in each state in 1993 versus 2012. These metrics also provide ballpark estimates of the annual taxes per year associated with a typical light-duty vehicle in each state.³¹ Gas taxes in Maine, which employed automatic indexing for close to a decade, and Connecticut, which had a dual structure throughout the period, show the smallest reductions (4.9 and 10.8 percent declines, respectively) in real revenue per 10,000 vehicle miles traveled between the two years.³² Massachusetts and New Hampshire, the two states that did not adjust their tax rates over this period, saw the largest declines (37.9 and 32.2 percent, respectively).³³

Using Massachusetts as an example, Figure 5 displays the fiscal sustainability of all seven of the examined revenue alternatives, by again comparing real revenue per 10,000 vehicle miles traveled at the beginning and end of the period. The figure illustrates several important points.

First, the hypothetical alternative that accounts only for rising fuel efficiency (the fuel-efficiency-indexed gas tax) was the least fiscally sustainable alternative over this period, although it lost slightly less ground than flat, per-gallon taxes. This is an expected result, given that the erosion of flat, per-gallon gas taxes in these years was driven predominantly by rising prices. Indexed alternatives that account for price or cost growth (either with or without indexing for fuel efficiency) would have generated real revenues per 10,000 vehicle miles traveled in 2012 comparable

31 Per FHWA data, the average light-duty vehicle traveled around 11,400 miles in 2012.

32 Revenues from Connecticut's variable petroleum products gross earnings tax flow into the state's general fund, with a statutorily specified amount to be transferred to the state's special transportation fund each year. Thus, revenues generated by the tax may not equal the funding from the tax that is made available for highway or other transportation purposes.

33 Because fuel efficiency growth in these states did not match the national average over this period, these states experienced less revenue erosion than suggested by Figure 1.

Figure 5. Fiscal sustainability of highway funding alternatives in Massachusetts

Real revenue per 10,000 vehicle miles traveled

Constant 2014 dollars



Source: Author's calculations using data from FHWA, BLS, EIA, and state sources. See the methodological appendix available at www.bostonfed.org/neppc for details.

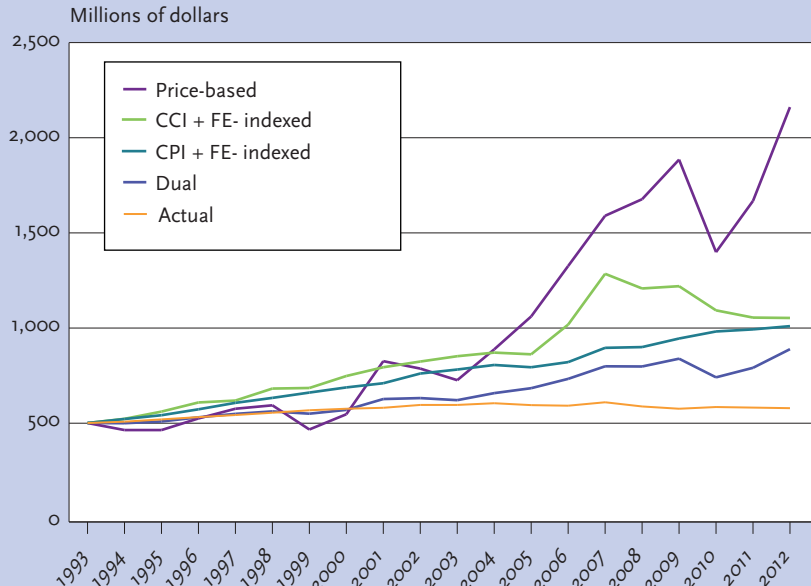
to, or slightly higher than the baseline value.³⁴ The dual tax structure, which here combines a 5-percent tax on the average Massachusetts retail price of gasoline with a fixed excise of 17.1 cents per gallon, was also relatively fiscally sustainable over the 20-year period, showing a 4-percent reduction in real revenue per 10,000 vehicle miles traveled. The fiscal sustainability of this structure, however, will depend on the relative importance of the variable- and fixed-rate components of the tax.³⁵ The pure, price-based gas tax, by contrast, is the only alternative that generated substantially more revenue (in real terms) per 10,000 miles traveled at the end of the period than

34 Conceptually, one would expect the CPI- and fuel efficiency-indexed gasoline tax to produce simulated revenues equal to baseline revenues when presented on a real, per-10,000-vehicle-miles-traveled basis (ignoring elasticity adjustments). However, because we index by lagged changes in national—rather than state-level—average fuel efficiency and lagged changes in the CPI, our simulated values deviate slightly from those of the baseline. Because average fuel efficiency in Massachusetts exhibited flatter growth between 1993 and 2012 than in the nation as a whole, this method of indexing overcompensates slightly for revenue losses in the Commonwealth during this period. Conversely, it would undercompensate for revenue losses in states that had higher than average growth in fuel efficiency.

35 Specifically, increasing the fixed-rate portion of the tax in this simulation yields revenues that are less fiscally sustainable over time, whereas increasing the variable-rate portion of the tax yields more fiscally sustainable, but also more volatile, revenues. In general, the extent of the tradeoffs associated with a dual structure depends on the growth and volatility of the gasoline price underlying the variable-rate component.

Figure 6. Simulated nominal aggregate revenue in Massachusetts

Selected alternative gas tax structures



Source: Author's calculations using data from FHWA, BLS, EIA, and state sources. See the methodological appendix for details.

streams, which can complicate planning efforts for state officials and lead to funding shortfalls in times of price declines.³⁶ This revenue volatility reflects instability in underlying gas prices, particularly in the second half of the period. Between 2002 and 2008, Massachusetts retail gas prices increased nearly 20 percent per year on average before plunging 30 percent in 2009 and then rising again. The dual tax, which combines a price-based and a fixed component, would have yielded more stable revenues than a price-based tax alone, while being more fiscally sustainable than Massachusetts' actual fixed-rate tax. However, neither price-based option accounts for rising fuel efficiency, which is expected to be a more significant factor in the years ahead than it has been in the past.

Figure 6 also highlights differences that are not fully apparent when comparing only the beginning and end of the period, between taxes indexed to general inflation (as measured by the CPI) versus highway construction costs. The CCI had somewhat higher overall growth over the full 20 years captured in the analysis, but was also more volatile, reflecting the bubble in the overall construction industry that took place in the mid-2000s. Simulated revenues under the hypothetical CCI-indexed gas tax grew sharply between 2005 and 2007, with a decline in

at the beginning.³⁶ This reflects the fact that actual gasoline prices in Massachusetts rose roughly 360 percent between 1993 and 2012, while overall consumer prices rose only 59 percent. Results for the other New England states, available in the online appendix, show a similar pattern.

While our primary goal is to examine fiscal sustainability, our simulation results also allow us to inspect another important concern for policymakers and transportation officials: the relative revenue stability associated with alternative funding sources. To illustrate how stability can vary across options, Figure 6 presents simulated nominal aggregate revenues for four alternative gas tax structures: the CPI- and FE-indexed gas tax, the CCI- and FE-indexed gas tax, the dual gas tax, and the price-based gas tax.³⁷

As indicated in Figure 5, an unconstrained price-based tax would have produced the highest revenues by the end of the period; however, as shown in Figure 6, it would also have produced the most volatile revenue

36 No tax structure will exactly match service demands year over year. Given this reality, policymakers will always need to look at other relevant information, such as engineering reports and cost-benefit analyses to determine how much should be spent on infrastructure and to adjust revenues to match spending needs as necessary. For example, if policymakers viewed the revenues associated with a price-based tax as excessive relative to service demands, they could constrain the tax by imposing a ceiling or lowering the statutory rate.

37 Traditional gasoline taxes have historically been quite stable, as they combine a fixed tax rate with a base that has been fairly unresponsive to changes in price or the business cycle. See Alan Cole. "A Straightforward Gas Tax Proposal from Murphy and Corker." The Tax Policy Blog. The Tax Foundation. June 19, 2014, and Sobel and Holcombe (1996). The United States did see a slight reduction in gasoline consumption during the Great Recession, corresponding to a decrease in vehicle miles traveled, which fell by about 5 percent between 2006 and 2008. Prior to that, total national vehicle miles traveled had increased steadily for decades, presumably reflecting population growth, an increasing number of cars per household, and changing commuting and other travel patterns.

38 Volatility may also be undesirable from the point of view of the motorist, who faces added pain from higher taxes when gasoline prices spike and greater unpredictability in budgeting in general.

subsequent years as the industry softened. Simulated revenues for the CPI-indexed tax show slow but steady increases over this period.³⁹

Forward-looking Simulations

To further examine the differences between alternative funding options, we also performed selected forward-looking simulations, again using Massachusetts as an example. Employing a similar methodology as in our historical simulations, we projected forward revenues for three gasoline tax alternatives: a flat, per-gallon excise tax, a CPI-indexed, per-gallon excise tax, and a per-gallon excise tax indexed to both the CPI and average fuel efficiency.⁴⁰ Figure 7 presents a comparison of real revenues per 10,000 vehicle miles traveled in 2014 and 2033, for each of the three options.

These simulations reveal that while a CPI-indexed gasoline tax would be more fiscally sustainable than a flat tax, it would still suffer from considerable erosion over this future period, when average light-duty vehicle fuel efficiency is expected to increase at a faster rate than in the past two decades. In contrast, the double-indexed gas tax is projected to be fiscally sustainable by our chosen metric, showing only a small deviation from the baseline by the end of the 20-year period.⁴¹

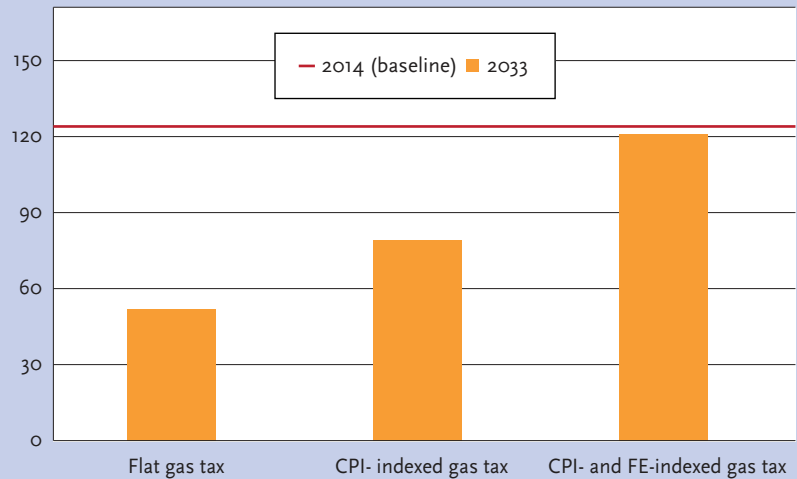
Beyond Fiscal Sustainability and Revenue Stability: Other Evaluation Criteria

While fiscal sustainability represents the primary focus of this report, there are numerous other criteria by which gas taxes and other highway funding sources can, and should, be evaluated. We have examined one of these—revenue stability—in the context of our simulation results. Additional important criteria include: equity, implications for negative externalities, and administrative costs. This section briefly describes these criteria and discusses how well they are met by the traditional gas tax and the alternative structures examined. See Box 1 “Other Current Funding Options” on page 16 for a discussion of how other currently available revenue mechanisms such as fees, tolls, and general taxes measure up against these principles and how they might be used to complement a gas tax. Box 2 “VMT Taxes: The Future of Highway Funding?” on page 18 provides a brief analysis of this widely cited potential future revenue source.

Figure 7. Projected fiscal sustainability of selected alternatives in Massachusetts (2033)

Real revenue per 10,000 vehicle miles traveled

Constant 2014 dollars



Source: Author's calculations using data from FHWA, BLS, CBO, EIA, and state sources. See the methodological appendix available at www.bostonfed.org/neppc for details.

39 One could make arguments in either direction as to which index is “better.” Although volatility could make a CCI-index tax less stable and predictable, it would likely more accurately reflect cost pressures faced by states in building and maintaining highways. Yet, some would argue that it is preferable for states to take on more projects when construction costs are low—a common refrain heard during the Great Recession—and that a tax designed to increase revenues during high-cost periods would discourage this.

40 In the forward-looking simulations, we assume that growth rates for price levels, fuel efficiency, vehicle miles traveled, and fuel consumption in Massachusetts will equal projected national growth rates. General inflation projections are based on Congressional Budget Office August 2014 projections of the CPI-U. Other projections are based on the U.S. Energy Information Association’s April 2014 Annual Energy Outlook. See the online methodological appendix at www.bostonfed.org/neppc for further information.

41 The deviation from the baseline reflects the use of lagged indexing factors and elasticity adjustments to gasoline consumption and vehicle miles traveled.

Equity

Traditionally, one of the most compelling arguments for a gas tax has been its alignment with the so-called benefit principle of equity, which holds that a consumer of government services (in this case, highway travel) should pay in proportion to the benefit he or she obtains from those services.⁴² Gasoline use has historically served as a good proxy for road use: those who drive more tend to pay more.⁴³ As new conventional vehicles have become more fuel efficient and more hybrid and alternative fuel vehicles have entered the fleet, the relationship between gasoline consumption and road use has weakened. In addition to affecting fiscal sustainability, this has reduced the ability of the gas tax to equitably apportion highway-related costs among light-duty vehicles.⁴⁴ A gas tax indexed to average fuel efficiency would help to limit this source of revenue erosion, but none of the examined alternatives would address this equity concern.

Negative Externalities

According to economic theory, motorists should not only pay for the direct costs of wear and tear associated with each added mile they drive, but should also bear the additional costs their driving imposes on society overall—so-called negative externalities. Another common argument in favor of gas taxes is their potential to price-in the negative externalities associated with pollution. By raising the price of a gallon of gasoline, gas taxes (in either fixed- or variable-rate form) impose a higher cost per mile on vehicles that use more gasoline and encourage individuals to limit their driving and, over the longer term, switch to more-fuel-efficient alternatives.⁴⁵ While the resulting reduction in gasoline use is a threat to the fiscal sustainability of the tax, it can improve environmental sustainability by lowering emissions of greenhouse gases and can provide a public health benefit by reducing emissions of other pollutants.⁴⁶

Traffic congestion is another negative externality associated with driving and an important concern in Greater Boston and other major metro areas in the region.⁴⁷ Although gasoline taxes can affect overall levels of vehicle travel, they are unlikely to influence when and where people drive. None of the alternative gas tax structures we examined are likely to ameliorate this problem.

42 Like many types of consumption taxes, the gas tax has been criticized under the ability-to-pay principle of fairness, which maintains that those who have more resources should pay more than those with fewer resources (also known as vertical equity) and those with similar resources should pay similar amounts (horizontal equity). The alternatives examined for funding highway maintenance and repair would likely face similar criticisms. Understanding how gasoline taxes and other revenue sources affect consumers at different income levels or living in different locations is important, but a detailed examination along these lines is beyond the scope of this study.

43 Additionally, under a gasoline tax, those who drive larger vehicles (such as SUVs) tend to pay more per mile than drivers of smaller vehicles. Drivers of larger vehicles may obtain greater benefit per mile because they can accommodate more passengers or cargo. Larger vehicles may also impose more damage on roadways, which has led some to argue that their drivers should pay higher taxes; however, research has indicated that the bulk of road damage is caused by heavy trucks and that differences in damage imposed by large light-duty vehicles (for example, SUVs, vans, and pickups) and smaller light-duty vehicles are relatively small.

44 Another important issue is the division of highway costs between heavy- and light-duty vehicles. This is especially relevant, as research has indicated that heavy trucks are responsible for the bulk of road damage. Although beyond the scope of this study, it is important for policymakers to consider the appropriateness of the current allocation of costs across these vehicle classes and to be mindful of how this allocation would be affected by alternative funding structures.

45 Various researchers have attempted to quantify the external costs associated with vehicle use. A 2008 study by Lemp and Kockelman, for example, estimated that the external costs of carbon dioxide emissions per vehicle mile traveled ranged from \$0.0134 for a 48.5 miles per gallon Honda Insight (a small hybrid car) to \$0.0610 for a 10.7 miles per gallon Ford F-350 or similar truck. According to the American Petroleum Institute, the average combined state and local gasoline tax (including environmental fees and price-based components) as of October 2008 amounted to 48.4 cents per gallon, representing a tax cost per mile of around \$0.0100 for the 48.5 miles per gallon vehicle and \$0.0452 for the 10.7 miles per gallon vehicles.

46 Most economists agree that in an ideal world, governments would tax harmful emissions directly; however, this poses feasibility issues.

47 According to the Texas A&M Transportation Institute's most recent Annual Urban Mobility Report, the average auto commuter in the Boston MA-NH-RI urban area experienced 53 hours of delay due to traffic congestion in 2011, ranked 5th among 101 areas studied in the report, and had an annual congestion cost per auto commuter of \$1,147 (ranked 6th). Bridgeport-Stamford CT-NY was the second most congested urban area in the region, based on these metrics, with the average auto commuter there experiencing 42 hours of delay (ranked 21st) and incurring \$902 in costs (ranked 24th).

Administrative Costs

A third argument in favor of the gas tax is that the costs of administering it are fairly low. Most states impose the tax at the distributor level, which limits the number of entities from which the state must collect payment. An indexed or price-based gasoline tax that is also imposed at the distributor level would be unlikely to add much complexity or expense to the administration of the tax, as it could simply piggy-back on the existing system.

Concluding Thoughts

This report focuses on analyzing more fiscally sustainable alternatives to traditional gasoline taxes. There are many other issues germane to highway funding, and transportation funding considerations more broadly, that are beyond the scope of this report. It makes no specific comment on the appropriate level or mix of highway funding to be generated by gasoline taxes or other alternative sources, and we do not discuss other factors that may have contributed to funding gaps. More broadly, the report does not address how transportation revenues, however raised, should be allocated between highways and other modes, nor does it address the optimal level of transportation infrastructure investment. To close existing shortfalls in funding necessary to achieve or maintain a state of good repair among current assets, policymakers will likely need to increase revenue levels available for highways, either by increasing revenues raised through existing highway funding sources or by using revenues from sources not traditionally dedicated to transportation purposes, as part of the solution. Adopting revenue-raising structures that are more fiscally sustainable over time can help states to avoid new or growing gaps in the future.

Between the early 1990s and today, inflation has played the dominant role in eroding the real value of traditional gasoline tax revenues in the region and elsewhere in the nation. Some states have attempted to address this issue by indexing tax rates to general inflation or adopting a price-based tax. While such approaches represent an improvement with respect to the fiscal sustainability of highway funding, they do not directly address potential revenue loss due to rising fuel efficiency, a concern that is expected to become more acute in the decades ahead than in the recent period.

If states wish to promote more sustainable revenue streams available for highways while continuing to rely heavily on gasoline taxes for funding, it is important for policymakers to consider the impacts of both rising costs and improving fuel efficiency when assessing alternative structures. Simulations in this report suggest that a gasoline excise tax whose rate is regularly adjusted to reflect changes in both price levels and average gas mileage would produce more fiscally sustainable revenues than either a flat excise tax or one tied to inflation alone, and would be one option for furthering this goal. Policymakers may also consider how other revenue-raising mechanisms, such as tolls, fees, or general taxes, could be used to complement or replace gasoline taxes as a means of improving the fiscal sustainability of overall highway funding, as well as to address other revenue policy goals.

Box 1: Other Current Funding Options

This report focuses on examining variable-rate gasoline taxes as alternatives to traditional, flat, per-gallon gasoline excise taxes as a means of improving the fiscal sustainability of highway funding. Here, we describe some of the other revenue sources that are currently used by states to fund highway spending or could be used to do so in the future, and we provide a brief analysis of the fiscal sustainability of these sources and of other salient evaluation factors (see the section, “Beyond Fiscal Sustainability and Revenue Stability: Other Evaluation Criteria”).^a

Motor Vehicle Fees

Motor vehicle fees, which include fees for registrations, driver’s licenses, titles, and inspections, are another important source of highway funding in New England and other states. In terms of fiscal sustainability, such fees are not subject to erosion due to increased fuel efficiency in the way that flat, per-gallon gasoline taxes are. However, as fixed-dollar amounts, their real value will also generally decline if not adjusted periodically for inflation. Such fees are loosely aligned with the benefit principle in that they are imposed on vehicle owners or operators; however, the amount of the fee typically does not vary directly with road use.^b In terms of revenue-raising potential, a Vermont analysis has suggested that the state would need to raise registration fees by \$4.60 across the board to generate the same amount of revenue as a one-cent-per-gallon increase in the gasoline tax.^c

Some states charge, or have considered charging, additional fees on alternative-fuel vehicles as a means of recouping some of the costs those vehicles impose on the highway system that are not offset by fuel taxes.^d Critics have argued that such fees provide a disincentive for drivers to switch to more environmentally friendly options. As of 2014, at least five states (Colorado, Nebraska, North Carolina, Virginia, and Washington) charge electric vehicle owners an annual fee. Virginia also adopted a fee on hybrid vehicles as part of a major transportation funding overhaul passed in 2013, but repealed the measure the following year in response to an outcry from owners of the affected vehicles and from environmental groups.

Tolls

Tolls represent another important source of highway revenues in the New England region and are currently relied on by four of the six states.^e As a pure user charge, toll revenues are not adversely affected by increases in fuel efficiency, but, as with motor vehicle fees or the traditional gas tax, rates must be adjusted regularly to remain sustainable in the face of inflation.

More widespread using of tolling has historically encountered two barriers. The first relates to technology. Tolls have traditionally been collected via staffed tollbooths, leading to higher labor costs than other revenue alternatives, as well as time costs to motorists who must slow down to pay. Traditional toll plazas have also posed environmental concerns (pollution from idling vehicles) and safety concerns. The development and adoption of electronic tolling mechanisms, such as the EZPass system, have helped to ameliorate some of these problems. “Open road tolling,” a form of electronic tolling that allows drivers to pass through toll plazas at highway speeds, is gaining popularity. Electronic toll collection is also more conducive to implementing congestion pricing—varying tolls charged based on time of day or level of traffic—and could be used to complement gasoline taxes in this manner.

^a There is evidence that both New Hampshire and Massachusetts have turned to some of these other sources of funding in the face of eroded gas tax revenues; for example, in 2009 New Hampshire instituted a two-year \$30 surcharge on motor vehicle registrations. In the same year, as part of a large-scale reform of its transportation agencies, Massachusetts began dedicating 0.385 percent of all state sales tax revenues to its transportation fund. In 2013, the statute was revised to dedicate sales tax revenues associated with motor vehicle sales to transportation in lieu of 0.385 percent of total sales tax revenues.

^b Registration fees tend to vary by vehicle weight, with heavier trucks typically paying higher fees, reflecting the greater damage they impose on roadways. In many states, vehicle owners also pay property or excise taxes that are based on the value of the vehicle. In New England, such taxes represent a local revenue source and are not necessarily earmarked for transportation.

^c Vermont Transportation Funding Options Section 40 Act 153 (2012). Final Report. January 2013. For context, a one-cent-per-gallon gas tax increase would cost \$5 per year for someone driving 10,000 miles per year with a vehicle achieving 20 mpg.

^d This type of fee could help to address benefit principle concerns about the gasoline tax. The opposite—a fee that increases with a vehicle’s CO₂ emissions—has been used in Canada and has been considered in some U.S. states.

^e Connecticut and Vermont are the two New England states that do not currently employ tolling; Connecticut eliminated tolls in the 1980s after a tragic accident at a toll plaza in Stratford killed seven people.

Federal restrictions on the implementation of new tolls on existing interstate highway capacity are a second barrier to widespread toll use. The Obama administration has proposed loosening such restrictions, which has prompted states to consider expanding the use of tolls to fill revenue gaps.^f

While technological advances have reduced or eliminated many of the drawbacks to toll collection, some issues remain. Although tolls can help to manage congestion on the tolled roadways, they can also lead to higher traffic on untolled alternative routes. Also, tolling may not be financially feasible on highways that do not meet a certain traffic threshold.

Sales Taxes and Other General Revenues

Another funding option that has generated discussion recently involves dedicating a portion of a state's sales tax receipts or other general revenues to transportation.^g With a broad base, sales taxes have high revenue-generating potential, which is attractive in the face of existing funding gaps.^h In New England, Connecticut, Massachusetts, and Vermont all currently dedicate to transportation funding a portion of sales tax revenues associated with motor vehicle sales.ⁱ

With respect to fiscal sustainability, sales tax revenues are designed to increase with inflation and, except for any portion falling on gasoline, are not adversely impacted by increasing vehicle fuel efficiency, thus avoiding the two major drawbacks of traditional gasoline taxes.^j However, sales taxes (or other general taxes) are not directly tied to road use, and thus cannot be justified as readily by the benefit principle, although there is an argument that some portion of highway funding should be borne by general taxpayers, since benefits of a well-functioning highway system extend beyond drivers alone. With respect to economic efficiency, sales and other general taxes are unlikely to directly influence driver decisions. In addition, they may be more subject to cyclical decline and may face more competition from needs other than highways.

^f In many cases, revenues collected through existing tolls are used exclusively to support the tolled facility. This can limit the ability of tolls to address more widespread highway funding gaps in a state. In New Hampshire, for example, the state's toll-funded Turnpike System has operated with a surplus, but without changes to state law these funds cannot be used to address shortages in the state's highway fund, which is supported primarily by fuel taxes and motor vehicle fees.

^g Most policy discussions around this option center on using a specified portion of a state's sales tax revenues to supplement fuel taxes and other traditional highway funding sources. In contrast, Virginia's governor proposed abolishing the state's gas tax in favor of a 0.8 percentage point increase in the state's sales tax to be dedicated to transportation. See Olympia Meola. "Governor: Fund roads with higher sales tax." *Richmond Times-Dispatch*. January 9, 2013. A more far-reaching option would be to fund highways out of a state's general fund using general revenues, ending the long-held tradition of using dedicated revenues.

^h A Massachusetts analysis has estimated that raising the state sales tax rate from 6.25 percent to 7.75 percent would raise an additional \$1 billion in annual revenue. The report estimated that an equivalent revenue gain could be achieved by a 30-cent-per-gallon increase in the state's gasoline excise tax, a 2.4-cent-per-mile VMT tax, or an increase in the state income tax rate from 5.25 percent to 5.66 percent. Massachusetts Department of Transportation. "The Way Forward." January 2013.

ⁱ In Vermont, the *ad valorem* tax applied to motor vehicle sales is the purchase and use tax. It carries the same rate as the state's general sales tax.

^j Gasoline sales are not currently subject to general sales taxes in any of the New England states. Several states, including Hawaii, Illinois, Indiana, and Michigan do levy their general sales tax on gasoline sales, but these revenues are not specifically dedicated to highways.

Box 2: Vehicle Miles Traveled Taxes: The Future of Highway Funding?

A widely cited potential future alternative (or complement) to gasoline taxes is a tax on vehicle miles traveled (VMT tax). As the name implies, this is a tax levied on each mile driven. Various states and the federal government have studied the potential of a VMT tax, although it has not yet been used in practice for light-duty vehicles.^a Among these entities, Oregon has been a leader in developing a VMT tax as an alternative to traditional gasoline taxes. After conducting two pilot studies, the state passed legislation in 2013 instructing the state DOT to develop a voluntary VMT program for 5,000 drivers, the first in the nation, to be operational by 2015.^b

The key advantage of a VMT tax over a traditional gasoline tax with respect to fiscal sustainability is that its revenues are tied to actual road use rather than to gasoline consumption. As a result, VMT tax revenues would not be expected to decline as vehicle fuel efficiency rises. However, sometimes lost in the public discourse is the fact that, like a traditional gasoline excise tax, a VMT tax would also face erosion due to inflation, if not adjusted periodically.

An inflation-adjusted VMT tax would be conceptually identical to an inflation-and fuel-efficiency-indexed gasoline tax and would be expected to yield similarly fiscally sustainable revenues. Such a levy could provide a mechanism for charging vehicles that do not rely on gasoline (and thus pay no gasoline tax) in proportion to their road use and could also be used to address traffic externalities by charging higher rates for travel on the busiest roads or during peak travel times. Unlike a double-indexed gasoline tax, a VMT tax would not provide an incentive for drivers to switch to more-fuel-efficient vehicles unless differential rates were charged, based on fuel efficiency or emissions ratings of the vehicle.^c

Significant challenges would need to be overcome before the widespread adoption of a VMT tax would be feasible.^d For one, the tax would require developing a new system of administration and would likely be costlier to administer than a gasoline tax, as it would require collection from a substantially larger number of taxpayers (there are many more drivers than fuel distributors). Moreover, public acceptance would be a considerable hurdle, given widespread concerns about the implications of the tax for privacy and mobility.^e Finally, policymakers would also need to seriously consider the impact of a VMT tax on the distribution of tax burdens relative to the impact of alternative highway funding options.

^a For example, the University of Iowa conducted a 10-year study funded by the federal government and a consortium of state Departments of Transportation to assess the technological feasibility and user acceptance of a mileage-based fee. Other individual states that have studied the concept include Georgia, Minnesota, Nevada, New York, Texas, and Washington.

^b For more information on Oregon's efforts, see Oregon DOT (2007, 2013a, 2013b, and 2014). It is also worth noting that Oregon and several other states have imposed distance-based taxes on heavy trucks for years. Kentucky charges a flat rate per mile driven in-state for all trucks exceeding a specified weight threshold, whereas New Mexico, New York, and Oregon charge variable rates per mile that increase with the weight of the truck, reflecting the greater wear and tear on roadways imposed by heavier vehicles. In Oregon, in-state and out-of-state trucking companies are required to report their Oregon road miles and to remit the calculated tax on those miles on either a monthly or quarterly basis. Such a system, as currently implemented, requires significant recordkeeping by truckers and auditing capacity from the state to ensure that in-state mileage is accurately reported. Although this particular model would not be feasible for passenger cars, the fact that it exists demonstrates that the concept of distance-based taxes has been used in practice.

^c Evidence from mileage-based fees levied on trucks in Germany suggests that adopting variable rates according to emissions can have a considerable impact on the adoption of more-fuel-efficient vehicles. See Sorenson, Ecola, and Wachs (2012). However, the VMT tax legislation adopted in Oregon does not call for differential rates.

^d See Sorenson, Ecola, and Wachs (2012) for a full discussion of the potential benefits and challenges of a VMT tax.

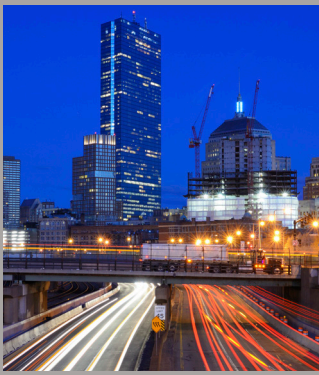
^e A recent paper found that the number of opponents of a VMT tax exceeded the number of supporters by almost four to one, but that the degree of public support was related significantly to the costs of the new system for vehicle owners and the system's potential for invasion of privacy. See Duncan et al. (2014).

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At the time this report was written, Jennifer Weiner was a Senior Policy Analyst with the New England Public Policy Center. Her work focused on state and local public finance and has included research on state business tax credits, unemployment insurance financing, state debt affordability, transportation funding, and the fiscal systems of the New England states. Weiner has testified before legislative committees in Massachusetts and presented her research at public forums throughout New England and at academic meetings. She holds a Master of Public Affairs from Princeton University and a B.A. in economics from Bates College.



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