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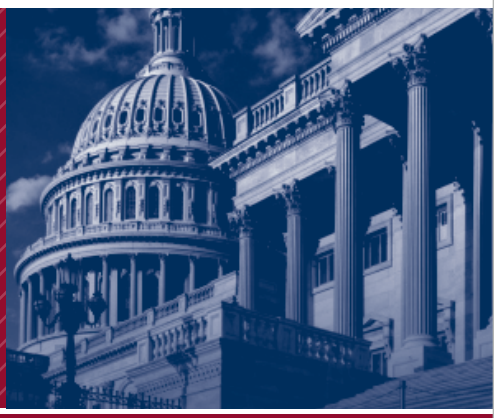

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SHOULD WE BROADEN THE FUEL TAX BASE?

JUSTIN MARION

As the United States continues to emerge from a deep recession, Americans once again are turning attention to environmental issues that faded from view in the wake of the housing crisis.

Gallup's 2013 environment poll reveals that the percentage of Americans at least somewhat concerned about global warming rose to 58 percent after bottoming out at 51 percent in 2011. With record-setting temperatures and an improved economy, combating climate change has risen in perceived importance.

At the same time as attention has shifted toward climate change, contentious debates have persisted regarding how to close the nation's persistent fiscal deficits. The budget deficit stood at 7.0 percent of output in 2012. Though this gap has closed somewhat since its peak of 10.1 percent during the Great Recession, it is still high by historical standards.

Several observers have noted that implementing either carbon taxes, or higher fuel taxes, would simultaneously address both climate change and deficit reduction.[1] New sources of revenue are needed to close the deficit, and taxation of carbon based fuels often is favored by economists to reduce carbon emissions. Raising the tax on gasoline and diesel consumption, or alternatively implementing a broad carbon tax, would have the double dividend of raising government revenues while at the same time acting to curb U.S. carbon emissions.

Compared to other developed countries, the United States is an outlier in terms of its rate of taxation on motor fuel. Among OECD countries, only Mexico's tax rates on gasoline and diesel used in vehicles are lower than those in the U.S. The OECD reports that the average member country taxes gasoline at a rate of 16 euro per gigajoule, which converts to approximately $2.75 per gallon. This is around fifteen times the U.S. federal tax rate of 18.4 cents per gallon. However, it is questionable whether the current political environment will allow for closing this gap in the near future.

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Instead of raising the tax rate on gasoline and other fuels or imposing a new carbon tax, an alternative is to broaden the tax base by eliminating current disparities in the way fuels are taxed, so as to make these taxes more comprehensive and uniform. This idea is in line with a number of other recent proposals for reforming the income tax system and simplifying the tax code. A prominent example is the proposal by the bipartisan Simpson-Bowles commission, which garnered attention in 2011 for suggesting, among other things, eliminating a variety of tax exemptions and raising the cap on earnings to which Social Security applies, both of which would have the effect of subjecting a greater share of income to taxation. Doing so can increase revenue while at the same time allowing tax rates to be maintained or even lowered. A tax that applies more uniformly across different activities also is more efficient, since it does not distort economic decisions toward more lightly taxed activities. Furthermore, it is plausible that simplification of the tax code will meet with less political resistance than raising rates, though of course many of the tax breaks that are targeted by base broadening proposals are some of the most popular.

In this brief, I describe how the concept of base broadening can be extended to fuel taxation, with beneficial economic and environmental results. Currently, gasoline, diesel, and other petroleum products are taxed at different rates depending on how the fuel will be used. This system of taxes is potentially unfair and inefficient. It invites evasion, which imposes a resource cost on the economy and is inequitable since it favors individuals and firms more able to engage in evasion. It also creates price differences across different uses of fuel, which is distortionary. Furthermore, the current pattern of taxation fails to address the harm to the environment incurred when fuel is consumed. Applying broader and more uniform taxes across fuels therefore can help achieve the environmental goal of reducing carbon emissions at a comparatively low cost to the economy. I conclude by quantifying the potential impact on government revenue, which could be as high as $28 billion per year at current levels of fuel consumption.

CORRECTIVE TAXES AND THE ENVIRONMENT

The use of taxation as an instrument for environmental policy enjoys broad support among economists. A recent survey conducted by the University of Michigan found that 85 percent of tax economists favor a tax on carbon emissions.[2] Since taxation generally is understood to be harmful to the economy, it is worth discussing the case for its use as a policy tool for addressing the emissions from fuel consumption.

> **"The gain in tax revenues achieved by uniformly applying the diesel tax to all petroleum output . . . is of the same order of magnitude as the controversial 2013 American Taxpayer Relief Act."**

Basic economics tells us that consumption is efficient when the benefits outweigh the costs. If the price that consumers are charged for fuel reflects the cost of using fuel, then the individual's decision regarding consumption will be an efficient one. However, when all of the costs of using fuel are not indicated in the price, consumers are less incentivized to care about waste or overuse. And in fact, not all costs associated with fuel use are incorporated into the price. In a competitive market, the cost of refining and delivery is reflected in the price paid by consumers. However, the adverse effect that consuming a gallon of fuel has on the environment and on other vehicle drivers is not. Emissions of pollutants such as nitrogen, sulfur, ozone, and particulate matter impose a cost on the economy by harming health and property. Furthermore, more driving increases congestion and adds wear and tear to the roadways.

An appropriately chosen corrective tax causes the price paid by consumers to reflect both types of costs associated with fuel use—the refining and delivery, as well as the negative effects on health, the environment, and infrastructure. This is efficient, since consumers can freely choose the desired level of consumption while at the same time taking into account the full set of costs and benefits of this choice. This ultimately will reduce carbon emissions and have the added benefit of raising some tax revenues along the way.[3]

The current rates of taxation, however, fall short of capturing the external costs of fuel consumption. Taxes on gasoline and diesel only apply to on-highway uses, and revenues are used solely to fund road construction and repair. States also implement gasoline and diesel taxes on top of that imposed by the federal government, and generally use that tax revenue to fund road construction and repair.[4] This implies that fuel taxes at best only address the wear and tear on roadways associated with driving. Actually, the current rate of taxation fails to achieve even this objective. The Congressional Budget Office (CBO) reports that since 2008, the federal government has transferred $41 billion from the general fund to the Highway Trust Fund to cover its obligations.[5] Current fuel taxes therefore are falling short of capturing the direct costs of fuel use on the roadways.

Other externalities of fuel consumption beyond those associated with road depreciation are not currently addressed by taxes. The contribution of the consumption of carbon-based fuels to global warming is one such externality, as is the emission of local pollutants such as particulate matter. Costs associated with oil dependency, including

1 This double dividend of environmental taxation is detailed by A. Lans Bovenberg and Ruud A. de Mooij. (1994) Amercan Economic Review Papers and Proceedings 84:4, p. 1085-1089.

2 http://ns.umich.edu/new/releases/21386-what-do-tax-policy-experts-think-about-u-s-tax-policy

3 Such a policy can be designed in a revenue neutral way, where the revenues generated from the tax are simply returned to citizens. So long as the refund to an individual is unrelated to his or her fuel use, such a tax can still achieve the environmental objectives.

4 In addition to the 18.4 cents per gallon federal gasoline tax and 24.4 cents per gallon diesel tax, states gasoline tax rates range from 7.5 to 37.5 cents per gallon for gasoline and from 7.5 to 39.6 cents per gallon for diesel. Nationwide, 90 percent of state revenues generated from user fees – including gas and diesel excise taxes and tolls – are distributed for highway and mass transit purposes, or to fund collection of these taxes and tolls. See Federal Highway Administration Highway Statistics, 2011.

5 Congressional Budget Office. "Statement for the Record on the Status of the Highway Trust Fund," April 24, 2013.

6 See Delucchi, Mark A., and James Murphy (2004), "U.S. Military Expenditures to Protect the Use of Persian Gulf Oil for Motor Vehicles." Energy Policy, 36:6, p. 2253-2264.

7 Ian W. H. Parry, Margaret Walls, and Winston Harrington (2007), "Automobile Externalities and Policies," Journal of

the vulnerability of the U.S. economy to oil price volatility and the military and geopolitical costs of maintaining stable sources of oil supply, also have been pointed to as additional external costs of fuel consumption.[6] A recent study by Ian W. H. Parry, Margaret Walls, and Winston Harrington, economists at Resources for the Future, suggest that the externality associated with driving could be as high as 228 cents per gallon.[7] Much of this is owed to externalities specific to driving, and unrelated specifically to the consumption of fuel. However, they estimate that the externalities that apply to fuel consumption itself—greenhouse gas emissions, particulate pollution, and costs related to oil dependency—account for 60 cents per gallon.

Moreover, since gasoline and diesel taxes are not adjusted for inflation, the gap between fuel taxes and the external cost of fuel consumption is growing over time. Figures 1A and 1B show how the federal gasoline and diesel taxes have evolved over time. The nominal tax is adjusted upward periodically, though for both gasoline and diesel has been left virtually unchanged since 1993. In the years prior to this most recent tax change, the periodic increases kept up with inflation, as the nominal and real rates both rose by a similar amount during the eighties and early nineties. Taxes also largely kept up with increases in fuel prices during this time. However, since 1993, gasoline and diesel taxes have eroded significantly in real terms, falling by an inflation-adjusted 37 percent. As a percentage of the retail price of gasoline, between 1993 and 2012 the federal gasoline tax fell from 20 percent to 6.2 percent.

The decline in the real fuel tax presents a problem for road maintenance since road repair costs rise over time due to inflation. According to the Federal Highway Administration's National Highway Construction Cost Index, between March 2003 and December 2012, road construction costs rose 11.3 percent, during which time the real gasoline tax rate fell 19.8 percent.

FIGURE 1A: FEDERAL GASOLINE TAX

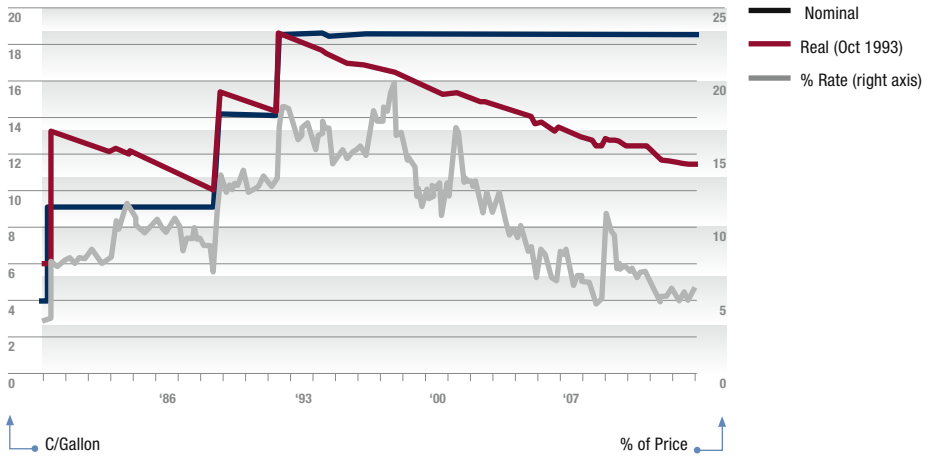
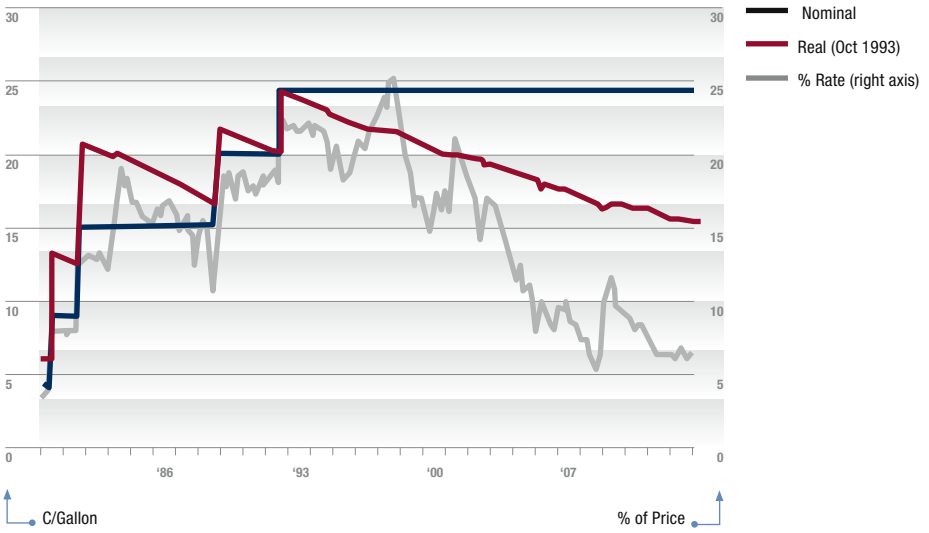


FIGURE 1B: FEDERAL DIESEL TAX



Other external costs of fuel consumption rise over time as well, at a rate that may even exceed inflation. As an example, emissions related to burning fossil fuels can lead to several documented adverse health effects, such as respiratory problems resulting from exposure to nitrogen oxide and sulfur dioxide. Since the cost of health care has substantially outpaced consumer prices in recent years, and the cost of early mortality rises over time, the decline in real taxes may fail to capture how far behind they have fallen in addressing the externalities associated with fuel consumption.[8]

In summary, gasoline, diesel, and other fuels comprise an important portion of the economy, yet the consumption of these fuels comes with significant costs that are not fully reflected in the price or properly addressed through taxation. In addition, the country is in a situation where tax revenues

Economic Literature XLV, p. 373-399.

8 On the other hand, as pointed out by Parry, Walls, and Harrington, content regulations are growing more stringent over time, which will reduce the local pollution resulting from fuel consumption.

9 The National Committee on Fiscal Responsibility and Reform, "The Moment of Truth," December 2010.

10 The tax rate on diesel and gasoline on road includes 0.1 cents per gallon tax to fund cleanups of underground storage tank spills. This trivial tax is also assessed on off-road diesel and kerosene.

11 Baluch, Stephen J. (1996), "Revenue Enhancement Through Increased Motor Fuel Tax Enforcement," Transportation Research Record: Journal of the Transportation Research Board 1558, p. 67-73.

12 Improvements in monitoring and enforcement were put in place in the subsequent years that improved compliance at least temporarily. These efforts include adding dye to untaxed fuel and moving the point of collection to the bulk terminal level. This improved tax collections substantially, though evaders may have subsequently innovated new techniques. See Marion, Justin and Erich Muehlegger (2008), "Measuring Illegal Activity and Regulatory Innovation: Tax Evasion and the Dyeing of Untaxed Diesel," Journal of Political Economy 116:4, p.633-666.

13 Federal regulations dictate that such diesel is dyed red so that it can be distinguished by simple visual inspection. See Robert S. Done. "Dyed Diesel Education and En-

currently fall well short of meeting government expenditures. As will be discussed below, a policy for broadening the base for fuel taxes would help mitigate both of these problems.

TAX BASE BROADENING AND FUEL TAXATION

TAX DIFFERENCES AND ECONOMIC EFFICIENCY

Recent proposals for federal income tax reform have centered on ways to simplify the tax code and broaden the base of income subject to taxation. In 2010, the bipartisan Simpson-Bowles commission recommended eliminating or substantially reducing a number of exemptions in the tax code, raising the cap on income subject to social security taxes, and taxing capital gains and dividends at the same rate as personal income.[9] Despite lowering marginal tax rates, their proposal would have increased government revenues and narrowed the budget deficit.

Base broadening is appealing from the standpoint of economic efficiency. Low tax rates are less costly to the economy than high tax rates, and increasing the income subject to taxation leads to more government revenue without requiring an increase in the tax rate. Furthermore, eliminating exemptions reduces distortions that are created when different activities are taxed at different rates. Therefore, if revenue generation is the goal, extending the reach of the tax while keeping the tax rate low is desirable.

There are reasons to believe that these beneficial aspects of base broadening could apply to fuel taxation as well. The tax rate applied to carbon-based fuels varies widely depending on the type of fuel, purpose of consumption, and identity of the user. While diesel fuel used on-road is taxed at a rate of 24.4 cents per gallon, any other use of diesel – for agriculture, home heating, industrial burners, in trains and buses – is virtually untaxed.[10] The tax treatment of other fuels produced from petroleum varies by a similar amount. Kerosene is taxed at 24.4 cents per gallon. Aviation-grade kerosene is taxed at 21.9 cents per gallon, though this only applies to non-commercial flights. Commercial airlines pay 4.4 cents per gallon. This pattern of taxation is likely to be inefficient, which implies that reforming fuel taxation presents an opportunity to raise government revenue at comparatively low cost to the economy.

From the perspective of implementing a corrective tax on fuels contributing to global warming, it makes little sense to tax fuels at different rates depending on use. In terms of the contribution to atmospheric concentrations of carbon, whether a gallon of fuel is burned in an engine powering an on-road vehicle versus being burned in an engine powering a conveyor belt is irrelevant. Table 1 shows the carbon content of several different outputs from oil refining. The carbon content is fairly similar across different fuels. In fact, the most carbon-intensive fuels – residual fuel oil and petroleum coke—are not taxed. Gasoline, most consumption of which is subject to taxation, is among the fuels with the lowest carbon content.

TABLE 1: CARBON DIOXIDE EMISSIONS BY FUEL

	POUNDS PER GALLON
Gasoline	19.6
Diesel	22.4
Kerosene	21.5
Residual Fuel Oil	26.0
Kerosene Jet Fuel	21.1
Aviation Gasoline	18.4
Petroleum Coke	32.4

In addition to the environmental benefits, broadening the fuel tax base could lead to a more efficient tax system. Tax compliance is one important reason. When tax rates differ across fuels, or across different uses of a given fuel, it invites tax evasion. Buyers can misstate the intended use of a gallon of fuel. Also, more lightly taxed fuels can be illegally blended with more heavily taxed fuels, a practice known as cocktailing. Fuel not ordinarily used for on-road use, such as #4 or #6 fuel oil, is sometimes introduced into diesel to increase the volume sold without increasing the tax liability. In 1992, the Federal Highway Administration estimated that 15-25 percent of diesel taxes, and 3-7 percent of gasoline taxes, went unpaid.[11] While more recent estimates of evasion are not available at the federal level, [12] anecdotal evidence from enforcement efforts, along with several recent studies of the evasion of state motor fuel taxes, suggest that tax evasion remains an issue. In Arizona, random roadside stops found that 1.3 percent of diesel-powered vehicles were inappropriately using diesel that had been sold for untaxed uses.[13] A recent study commissioned by the Montana Department of Transportation found that 16.3 percent of its state diesel taxes go unpaid.[14] And in a celebrity case, it was determined that then-California governor Arnold Schwarznegger owed federal gasoline taxes on cooking oil he had used to power his Hummer. Furthermore, the gap between commercial aviation fuel supplied and that actually used by airlines suggests that substantial quantities of this low-taxed fuel are being diverted to high-tax uses, which could be costing as much as $1 billion in tax revenues per year.[15] Based on these studies, it seems that a substantial amount of tax revenue is being lost to evasive practices that follow from the inconsistencies in the way fuels are taxed.

Evasion not only leads to lower government revenues but is potentially inequitable and wasteful. Inequities arise if the ability to evade is held by only some consumers and firms. For instance, consumers with legitimate untaxed uses for diesel may find it easy to use untaxed gallons for taxed purposes.

forcement," Arizona Department of Transportation Final Report 578.

14 Battelle Memorial Institute (2006), "Determining the current rates of motor fuel tax evasion for the state of Montana."

15 Weimar, Mark, Patrick Balducci, Eihab Fathelrahman, Susan Whitmore, and Anthony Rufolo (2008), "Identifying and Quantifying Rates of State Motor Fuel Tax Evasion," National Cooperative Highway Research Program Report 623.

16 Output of the various refined fuels from crude oil is for the most part in fixed proportions. Refiners do have some scope to adjust the composition of output, though typically the objective of the refiner is to simply maximize gasoline output. Therefore, it is worth noting that this aspect of production is likely unaffected by tax differences across fuels.

17 Distillate fuel oil includes No. 1, 2, and 4 fuel oil, and kerosene. No. 2 distillate, aka diesel, represents 98.5 percent of distillate fuel supply.

18 According to the FHWA, around 4 billion gallons of motor gasoline is exempt from taxation.

19 Table 3 also lumps revenues from other taxes into the category "Other." This includes other taxed fuels such as aviation grade kerosene for non-commercial use, and the very small 0.1 cent/gallon tax on dyed diesel and kerosene. The figure can be negative since net-of-refund revenues are reported.

And dishonest taxpayers will benefit relative to law-abiding consumers.

Furthermore, tax evasion could have real resource consequences. Time and resources are expended by tax authorities to monitor taxpayers, and taxpayers expend time and resources evading the tax. If the likelihood of the authorities detecting evasion depends on the amount of sales a retailer makes, the retailer may elect to operate at an inefficient size in order to reduce the likelihood of detection. And cocktailing may adversely affect engine performance and lead to harmful emissions.

The efficiency benefits of base broadening extend beyond addressing externalities and reducing evasion. Tax rate differences also lead to artificial differences in prices. This tends to distort economic decisions, such as whether individuals on vacation travel by car or by air, or whether goods are transported via trains or trucks.[16]

Maintaining disparities in fuel tax rates constitutes bad policy in terms of addressing environmental impacts, generating needed revenues, and promoting general economic efficiency.

REVENUE EFFECTS

To get an idea of the revenue effects of fuel tax base broadening, consider the U.S. supply of fuel, and the extent to which that fuel is taxed. Table 2 shows the supply of finished petroleum product in the U.S. in total and across different types of fuels. In 2010, 259.1 billion gallons of fuel were supplied to the U.S. market. The two primary outputs of refining are gasoline and diesel, which combined for 75 percent of supply. Motor gasoline supply was 137.9 billion gallons, while distillate fuel oil, which is mostly comprised of diesel, accounted for 58.3 billion gallons.[17] Kerosene-type jet fuel represented 8.5 percent of supplied petroleum products. Still gas, residual fuel oil, petrochemical feedstocks, petroleum coke, and asphalt and road oil were the other significant components of supply.

Almost all gasoline, and approximately two-thirds of distillates, is subject to taxation, and these are far and away the most important sources of fuel tax revenues. Table 2 displays the 2010 federal revenues and implied taxed gallons across the significant types of taxed fuel. The federal government reported collecting $25.1 billion in gasoline taxes, which at a tax rate of 18.4 cents per gallon implies that taxes were paid on 136.2 billion gallons.[18] The revenues from diesel were $8.6 billion in 2010, implying that 35.4 billion gallons were subject to taxation, and therefore 34 billion gallons of distillate are either exempt from taxation or are evaded.

Other tax revenues were negligible. Aviation grade kerosene for commercial use, though a significant source of consumption, yielded just $389 million in revenues due to being taxed at 4.4 cents per gallon. Conversely, kerosene is taxed at a similar rate as diesel, yet the consumption is small, yielding low tax revenues.[19]

If all 259.1 billion gallons of petroleum supply had been taxed at 24.4 cents per gallon, excise tax revenues from petroleum would have been $63.2 billion, or $28.3 billion more than what actually was collected. This gain in tax revenues achieved by uniformly applying the diesel tax to all petroleum output does not seem large in comparison to the federal budget deficit, which in 2012 was $1.1 trillion. However, when projecting the revenues forward over a ten-year period, it is of the same order of magnitude as the controversial 2013 American Taxpayer Relief Act (the Fiscal Cliff deal), which according to the Congressional Budget Office would raise $618 billion over a ten year period.

Two aspects of this calculation are worth noting. First, not all output from oil refining is used as a fuel. Asphalt and road oil represent 5.6 percent of petroleum supply, yet do not contribute to atmospheric concentrations of carbon since they are used in materials for road construction and repair. Similarly, petrochemical feedstocks are not used for energy purposes. Even if the goal is to use taxation to address emissions contributing to climate change, it may make sense to subject them to taxation as well,

TABLE 2: PETROLEUM PRODUCT SUPPLIED, 2010 (BILLIONS)

Finished Motor Gasoline	137.9
Distillate Fuel Oil	58.3
Kerosene - Type Jet Fuel	21.9
Still Gas	10.3
Residual Fuel Oil	8.2
Petrochemical Feedstocks	7.2
Petroleum Coke	5.8
Asphalt and Road Oil	5.6
Other	4.0
Total Finished Petroleum Products	259.1

TABLE 3: FEDERAL FUEL TAXES AND REVENUES, 2010 (BILLIONS)

	GALLONS	RATE/GALL	REVENUES
Motor Gasoline	136.2	$0.184	$25.1
Diesel	35.4	$0.244	$8.6
Aviation-Grade Kerosene for Commercial Use	8.8	$0.044	$0.4
Kerosene	3.3	$0.244	$0.8
Other Net	Various		-$0.005
Total			$34.9

20 Bureau of Transportation Statistics.

21 Metcalf, Gilbert E. (1999), "A Distributional Analysis of Green Tax Reforms," National Tax Journal 52:4, p. 655-682.

since a broadly applied tax is less costly to administer. This is a relatively minor issue, since exempting these products would only reduce the revenue gain from $28.3 billion to $25.2 billion.

A second aspect of this calculation is that it ignores how fuel consumption and tax reporting will respond. Some of the $28.3 billion gain in revenues would be lost due to reduced consumption by users of fuel. However, the tax rate would represent a fairly small portion of the purchase price of fuel, and furthermore, consumers become less tax responsive as the tax base broadens and avenues for evasion are closed off. Therefore, the behavioral response of taxpayers is likely to be fairly small.

Despite the efficiency gains and improvement in government revenues, broadening the reach of the fuel tax would have an adverse impact on currently untaxed or lightly taxed fuel consumers. Expenditures on fuel are an important part of cost for airlines – in 2012 it represented 28% of the operating cost of U.S. airlines.[20] Jet fuel for commercial use is lightly taxed and raising it from its current rate of 4.4 cents per gallon to 24.4 cents per gallon would increase the price of fuel by 6.4 percent based on the March 2013 price of kerosene-type jet fuel. This would increase operating costs of the U.S. airlines by 1.9 percent. Though this is likely to translate into a relatively modest increase in fares, such a tax is unlikely to be popular with airlines and their passengers. The prices of goods that are intensively transported by rail or ship are also likely to be affected, though there is evidence suggesting the consumer price effect will be small. Economist Gilbert Metcalf estimates the consumer price impact of implementing a hypothetical carbon tax levied on top of the existing fuel tax system, finding modest effects across most goods.[21]

In some regions of the country, particularly states in the Northeast and Mid-Atlantic, it is common for households to use untaxed fuel oil for home heating. According to the 2000 census, nationwide only 9 percent of households use fuel oil, however in states such as Maine (80 percent of households), New Hampshire (58 percent), Vermont (59 percent), and Connecticut (52 percent), heating oil was the predominant fuel used for home heating. Residents of these states are likely to see heating costs increase. Extending diesel taxes to cover untaxed fuel oil would likely only raise prices by 6 percent based on the most recent prices for heating oil from the Energy Information Administration.

Agriculture is a significant user of untaxed diesel. Fuel use associated with transporting agricultural products to market is already covered by existing fuel taxes that apply to on-road use of diesel. However, that fuel used off-road, for instance to power tractors, is untaxed. Opposition from agriculture interests therefore could present an obstacle.

CONCLUSION

The use of taxation as a policy tool to address both climate change and persistent budget deficits has achieved recent attention. In this issue brief, I describe how the current system of taxing only certain uses of fuel, and at varying rates, is likely to be inefficient. Broadening the reach of fuel taxes, even without raising the tax rate, can increase government revenues at a low cost to the economy. An even broader tax would cover all carbon fuels, including natural gas and coal. This brief shows that even the more modest policy change of widening the tax base to include all petroleum based products could have a significant impact—not just on the environment, but on the critical issue of deficit reduction.

BRIEF IN BRIEF

- Currently, the rules of fuel taxation in the U.S., like the U.S. tax code more generally, is complex and riddled with inconsistencies. The tax rate applied to carbon-based fuels varies widely depending on the type of fuel, purpose of consumption, and identity of the user.
- These inconsistencies only invite tax evasion and result in fuel tax revenues that fall short of even covering the costs associated with fuel consumption.
- Not simply for the sake of environmental policy, but as a matter of deficit reduction, the tax reform concept of base broadening can and should be applied to fuel taxation. Taxing carbon-based fuels more consistently will lead to increased revenues without raising the tax rate.
- The resultant gain in tax revenue could be as high as $28 billion per year at current levels of fuel consumption.

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