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Routing

Don't Increase Federal Gasoline Taxes— Abolish Them

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Executive Summary

Many experts believe that gasoline taxes should be increased for a variety of reasons. Their arguments are unpersuasive. Oil is not disappearing, and when it becomes more expensive, market agents will substitute away from gasoline to save money. The link between oil price shocks and recessions, although real in the 1970s, has been much more benign since 1985 because of the termination of price controls. Market actors properly account for energy costs in their purchasing decisions absent government intervention. Pollution taxes, congestion fees, and automobile insurance premiums more closely related to vehicle miles traveled are better remedies for the externalities associated with automobile travel than a simple fuel tax. Gasoline consumption does not necessarily distort American foreign policy, impose military commitments, or empower Islamic terrorist organizations.

State and federal gasoline taxes should be abolished. Local governments should tax gasoline only to the extent necessary to pay for roads when user charges are not feasible. If government feels compelled to more aggressively regulate vehicle tailpipe emissions or access to public roadways, pollution taxes and road user fees are better means of doing so than fuel taxes. Regardless, perfectly internalizing motor vehicle externalities would likely make the economy less efficient—not more—by inducing motorists into even more (economically) inefficient mass transit use.

The arguments advanced against increasing gasoline taxes are applicable to the broader discussion about America's reliance on oil generally. The case for policies designed to discourage oil consumption is nearly as threadbare as the case for increasing the gasoline tax—and for largely the same reasons.

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Introduction

Economists almost uniformly believe that markets should be left alone by government unless market failures exist. They go on to caution that government intervention will improve efficiency if—and only if—the prospective intervention remedies one or more of those market failures. And even if market failures exist, actual government policies may not improve market operations, because politicians rather than economists design the policies.¹

The economic case for a gasoline tax is relatively straightforward. Gasoline consumption imposes costs on third parties. If gasoline consumers had to compensate third parties for those costs, the total cost of gasoline would rise, demand would fall, injured parties would be made whole, and gasoline consumption would be optimal. But because those who suffer damages find that the transaction costs associated with securing compensation are high, gasoline consumers do not pay for the burden they impose on others.

Many economists believe that gasoline taxes are too low relative to the external costs fuel consumption imposes on others and that the economy would be more efficient with a substantial increase in the federal fuels tax. That argument is embraced by conservatives as well as liberals. For example, Harvard professor Greg Mankiw, a prominent free-market economist and former chairman of President George W. Bush's Council of Economic Advisers, has recently formed "The Pigou Club," which is made up of prominent economists and public intellectuals who support an increase in the federal gasoline tax.²

We examine those arguments and find them unpersuasive. Some arguments for fuel taxes—such as the need for society to facilitate the inevitable transition away from an oil-based economy, encourage energy conservation, or reduce foreign oil imports—fail to convince because they are unlikely to improve upon resource allocations that would occur absent government intervention. Other argu-

ments for fuel taxes are unpersuasive because they are second-, third-, or fourth-best remedies to problems—such as automobile tailpipe emissions and roadway congestion—that are best remedied by direct charges on offending externalities.

In fact, we find no compelling reason for a federal gasoline tax at all and call for its repeal. Nor do we find any compelling case for state gasoline taxes. The only circumstance in which gasoline taxes might make sense are those in which the transaction costs associated with road use charges are so high that gasoline taxes are the only reasonable way to pay for road construction and maintenance. This implies that fuel taxes are at best matters of local governmental concern and that they should only be a fraction of current charges on motorists.

This paper is primarily concerned with gasoline taxes, but the arguments we make against the gasoline tax are applicable to the broader policy discussion about oil's place in American society. Although liberals and conservatives, Democrats and Republicans, appear to agree that government should "do something" to move the country away from oil consumption, the case for governmental intervention is little different from—and no better than—the case for raising gasoline taxes.

Energy Depletion and Future Generations

Because fossil fuels are exhaustible, some gasoline tax advocates argue that we need to ration production in order to save resources for future generations.³ Future generations have no say in energy markets, but their preferences regarding resource availability in the future should be considered. Markets will not provide that consideration, so government must do so.

Another version of this argument does not emphasize the rights of future generations. Instead, it paints a picture of inevitable future shortages as production declines occur. Fuel shortages will be accompanied by

price hikes, recessions, and political struggle. Those unpleasant effects can be avoided only if government starts planning now. As a recent report for the U.S. Department of Energy put it, “Intervention by governments will be required, because the economic and social implications of oil peaking would be otherwise chaotic.”⁴

Oil depletion concerns, however, rest on shaky ground. First, they are primarily about the future availability of conventional crude oil. Unconventional crude oil deposits—such as those found in heavy bitumen, tar sands, and shale rock—are extremely plentiful and only lightly tapped at the moment because of high extraction costs.⁵ Moreover, the technology exists to convert coal and natural gas to synthetic petroleum liquids, which means that other, more plentiful, fossil fuels could be harnessed to produce vast amounts of petroleum if the economics are favorable. Second, concerns that conventional crude oil is becoming scarce in any meaningful sense have not withstood close scrutiny.⁶

If petroleum depletion were to become a genuine problem, would intergenerational equity demand conservation? We think not. The strongest normative argument against conservation is that it transfers resources from the relatively poor to the relatively rich.⁷ That’s because today’s generation is almost certainly much poorer than future generations will be. For instance, if per capita income grows at 2 percent a year, people 100 years from now will be approximately 7 times wealthier than we are today. Those concerned about intergenerational equity should worry more about standards of living today than about standards of living tomorrow.

The strongest positive argument against government intervention is that markets are more capable than government of reacting quickly and efficiently to declines in petroleum production. True declines, rather than temporary shocks, will permanently increase oil prices, which will induce investments in alternative energy sources and conservation.

But what about temporary (albeit multi-year) price shocks? If low prices most of the

time and high prices some of the time are a problem, is there a market solution? Indeed there is. Long-term oil futures contracts are available to those who are worried about future price increases.

The fact that marketers have not tried to offer long-term stable prices to consumers by arbitraging between the futures and retail markets suggests that most consumers believe that they benefit by accepting low spot prices most of the time in return for unpleasantly high spot prices some of the time. Said differently, we are “dependent” on oil exported from unstable countries rather than domestic oil or alternative sources of energy, and we don’t attempt to contract our way out of that instability, because it is cheaper in present value terms to remain “dependent.”

The “solution” to oil price instability is to accept higher prices most of the time in return for lower prices some of the time. There is nothing wrong with such a trade-off as long as it is achieved through contract. Thirty-year fixed rate mortgages, for example, allow consumers to shift to others the risk of varying daily spot rates for borrowing (whose mean is lower but accompanied by higher variance) in return for higher mean and no variance (fixed) prices.

We don’t, however, see those sorts of contracts in energy markets. Instead, what we see are proposals for European-style taxes on gasoline consumption, mandated or subsidized alternative energy production, and regulations that require energy producers to retain excess production capacity.

Unlike contractual solutions, governmental solutions have the dubious distinction of being more expensive not just most of the time, but all of the time. That is, the “alternatives” to fossil fuels are more expensive than conventional fossil fuels, even when the latter prices are at peak, which is, of course, why such “alternatives” are not embraced without government subsidy or coercion. For example, we have recently calculated that the federally owned Strategic Petroleum Reserve has cost the taxpayer between \$65 and \$80 per

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barrel (2004 dollars) to fill, which rivals the highest spot market prices ever recorded.⁸

We believe that market actors are also more likely to work in the interests of future generations than are governmental actors. That's because democratically elected governments, and the regulatory agencies established by them, have a tendency to reflect the interests of swing voters in swing voting districts. Accordingly, it's unreasonable to expect governments to be more interested in the well-being of future generations than swing voters in swing districts who have short time horizons and political preferences. A single glance at America's lavish commitments to retirees in the form of Medicare, Medicaid, and Social Security should disabuse everyone of the notion that current voters make major sacrifices for future generations—even when the case for sacrifice is mathematically indisputable.

The opposite, in fact, is the case; voters are happy to rob future generations. Economist Jagadeesh Gokhale, for instance, calculates that the current Social Security benefit structure taxes future generations for the benefit of those currently alive. Taxes for future generations are more than \$1 trillion greater than the benefits they are scheduled to receive.⁹

Markets, on the other hand, can reflect longer time horizons. In fact, because the market value of assets is determined by expectations about what others might pay for them in the future, speculators represent future generations' interests in today's markets more effectively than politicians who follow swing voters—whose time horizon rarely exceeds the next election.

To summarize, there is no market failure associated with oil depletion. If oil becomes more scarce over time, prices will rise to reflect that scarcity and resources will be allocated efficiently. Nor is there a market failure associated with the interests of future generations. Market agents have more incentive to consider the interests of the future than government actors because asset values are affected by estimates of future profitability. We recognize that markets do not take the

distant future into account because of discounting, but the government's treatment of current versus future Social Security costs and benefits does not support the view that governments are good stewards of the future.

Oil Shocks Cause Recessions and Inflation

Energy supply and demand are relatively inflexible in the short run. As a consequence, small changes in either have very large effects on prices.¹⁰ This is the underlying reality that explains why oil and gasoline prices are so volatile.¹¹ Over a longer time period, however, both supply and demand are more responsive to prices.¹²

The short-run inflexibility of producers or consumers, and the oil price shocks that result from such inflexibility, are allegedly responsible for inflation and recessions. The macroeconomic damage inflicted by oil price volatility is an external cost imposed on society by gasoline consumers. Analysts at the Oak Ridge National Laboratory peg the marginal external costs associated with oil price shocks at somewhere between 0 and \$8.30 per barrel of oil, or up to about 20 cents per gallon of gasoline.¹³

Economists disagree about the macroeconomic impact of oil shocks. Federal Reserve Board chairman Ben Bernanke and his colleagues, for example, have argued that different ("better") monetary policy would reduce the recessionary effect of oil shocks, while economists James Hamilton and Anna Herrera are skeptical of that proposition.¹⁴ The current oil price explosion that began in 2003 has caused far less economic harm than conventional wisdom predicted, which adds credence to those economists who have argued that the recessions that followed previous oil shocks were not caused by energy price increases.¹⁵

Recent work in the field tends to confirm the suspicion that past analyses overstated the macroeconomic damage caused by oil price shocks. A rigorous econometric analysis by economists at the Federal Reserve Bank of

Atlanta, for instance, suggests that oil shocks had significant effects on the macroeconomy before 1985 but not after. They argue that the federal price control regime of the 1970s is the explanation.¹⁶ Similarly, David Walton, an economist at the Bank of England, argues that wage rigidities in the 1970s were the culprit.¹⁷ Economists at the Federal Reserve Bank of Cleveland, on the other hand, argue that oil price increases might be painful for many, but they never have and never will cause inflation. They calculate that a doubling of oil prices would lead to a one-time increase in commodity prices of about 3 percent.¹⁸ A common theme of these recent papers is that policy-imposed rigidities in the economy were responsible for the bad economic outcomes associated with past oil price shocks, and the more flexible economy we now have allows us to cope more easily.

Even though severely negative macroeconomic consequences may not follow oil shocks, the lack of supply and demand response in the short run leads to large transfers of wealth from consumers to firms in times of high prices (1979–85, 2004–07) and firms to consumers in times of low prices (1991–99). While energy policy discussions often invoke macroeconomic or market failure rationales for government action, the most likely source of constituent demands for intervention in energy markets is the distributional concerns of firms and consumers. Both consumers and firms attempt to enlist the assistance of government to prevent those wealth transfers.

Energy market interventions, however, have failed to help consumers and done much to damage efficiency.¹⁹ The oil price-control system in the 1970s induced shortages and increased reliance on imports at a time when America's stated policy was to reduce import dependency. Consumers were made worse off as a consequence.²⁰

In summary, price volatility is not a market failure. Recent evidence suggests that major macroeconomic damage is not caused by oil price shocks per se but instead by policy-induced rigidities including price controls

and wage rigidities that impede market adjustment.

Consumer Failure to Conserve

Claims that consumers fail to invest as much as they should in energy efficiency are an often-invoked rationale for energy taxes in general and gasoline taxes in particular. Explanations vary as to why consumers act irrationally, but common complaints include lack of information regarding prospective savings, cultural hostility to energy conservation, excessively optimistic expectations about future energy prices, imperfect access to capital, and the demand for irrationally high rates of return.²¹ Appropriate energy taxes would encourage optimal conservation expenditures.

How irrational are consumers when they make energy decisions? Empirical investigations find that consumers act far more rationally than many analysts believe. Clemson economist Molly Espey, for example, closely examined sales data from 2001 model automobiles and found that consumers actually *over-valued* the gains possible from buying fuel-efficient vehicles.²² An earlier examination by Mark Dreyfus and W. Kip Viscusi found that consumers discounted the savings from fuel efficiency by 11–17 percent when buying automobiles, rates equivalent to returns demanded by investors from other investments at the time.²³

Thus economists undermine the argument that consumers are unwilling to pay more for a car to reduce gasoline use during the operating life of the vehicle. The government has no basis for regulating the use of gasoline by vehicles either through a tax or through Corporate Average Fuel Economy Standards (CAFE) standards.²⁴

Environmental Externalities

Gasoline tax advocates frequently argue that energy use causes environmental and

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human health damages and that those costs are not reflected in energy prices. Economists describe such costs as “externalities” because they impose costs on others that are external to the prices that govern the transaction between buyer and seller. Economists’ remedy for externalities is a tax that would quantify the cost of the externalities associated with each energy source in dollar terms. The tax would force consumers to pay the external cost of their energy use (which would “internalize the externality”).²⁵

The underlying objective of energy taxes in this regard is to approximate the market that would arise if polluters had to compensate those harmed by pollution.²⁶ An energy tax that considers environmental impacts from energy consumption is thus an attempt to mimic the market that would arise if third parties could hold polluters liable for the damages caused by their pollution.

The first problem with a gasoline tax as a means of internalizing environmental externalities, however, is that it taxes the wrong thing. If we want to tax pollution, we should tax the emission of pollutants, not the raw consumption of gasoline.²⁷ The two are not identical given the differences in automobile age and maintenance. For example, 5 percent of the vehicles on the road today generate 53 percent of volatile organic compound (VOC) emissions, while 10 percent of the vehicles on the road today generate 76 percent of the same.²⁸ Given that VOC emissions are a major contributor to urban smog—and that vehicles that emit unusually high loads of VOCs are likewise more likely to emit unusually high loads of other pollutants—this illustrates the difficulty of regulating fuel consumption rather than emissions. A uniform gasoline tax will overtax some drivers and undertax others.

The second problem is that an increase in gasoline taxes would have very little effect on aggregate tailpipe emissions. That’s because consumers will primarily respond to a fuel tax over the long run by purchasing more fuel efficient vehicles, not by driving less.²⁹ And for every incremental increase of automotive fuel efficiency, a 20 percent increase in vehicle miles traveled follows,³⁰

and this increase in driving will greatly reduce the emissions reductions that we might otherwise see in response to the tax.³¹ Economist J. Daniel Khazoom, for instance, calculates that doubling the gasoline tax under the current regulatory regime would only reduce tailpipe emissions by 6 percent over the long run.³²

The third problem with a federal gasoline tax designed to internalize environmental externalities is that the environmental and health-related damages imposed by air emissions vary by location. Air sheds have variable carrying capacities and the harms caused by emissions are largely determined by background ambient concentration and the marginal impact of additional loads. Accordingly, a given amount of hydrocarbon tailpipe emissions will have a greater negative impact in Los Angeles, California, than in Sioux City, Iowa. Uniform national environmental externality taxes will be inefficient and wrong all the time—too low in some areas and too high in others.

The fourth problem with environmental externality taxes is the difficulty associated with monetarizing the aggregated national health and environmental externalities associated with energy consumption in the United States.³³ Parry and his colleagues report that the plausible estimates for conventional pollutants range from \$.36 to \$4.20 per gallon.³⁴ Of course, auto emissions continue to decline from the 2000-era estimates used in those calculations,³⁵ and studies that rely on toxicological risk assessments and epidemiological studies to ascertain damages may overstate human health impacts.³⁶ Estimates regarding the climate-related costs associated with consuming a ton of carbon likewise vary greatly; according to one survey of the literature, from \$9 to \$200 per ton of carbon in 2000 dollars.³⁷

Experts also disagree about the dollar values one should attach to human morbidity, mortality, and environmental harms. For example, the peer-reviewed literature suggests that employers have to pay employees anywhere between \$0.7 million and \$16.3 million to compensate for a statistical risk of death.³⁸

What number should analysts use when monetizing mortality in externality internalization exercises? One might try to dodge that problem by estimating the number of quality adjusted life years (QALYs) lost through pollution and then calculate what it would cost government to provide for an equivalent number of QALYs through improved health services.³⁹ But that would require politicians to dedicate pollution taxes to health services programs. Hence, pollution taxes might prove quite inefficient, reflecting not the cost of pollution per se but the cost of socialized health care.

A more recent estimate is offered by economists Ian Parry and Kenneth Small. Their review of the “best guesses” in the literature suggests that a national gasoline tax would internalize environmental externalities by imposing a tax of 16 cents per gallon to pay for cost of conventional pollution and 5 cents per gallon to pay for the costs of greenhouse gas emissions.⁴⁰

To summarize, the environmental damages imposed on third parties by driving motor vehicles are indeed a market failure; the costs associated with those damages are not reflected in driving costs. Gasoline taxes, however, will have little effect on aggregate tailpipe emissions. The correct remedy to the problem—assuming we wish to address it—is an emissions charge that varies with emissions as well as the capacity of the air shed to handle extra emissions rather than a tax on gasoline. A national emissions tax would be inefficient because it would ignore the large geographic variation in damages associated with pollution. And even though the literature provides estimates of damages that could be used to set local emission charges, the range is so large that it provides very little guidance to decisionmakers.

Accident and Congestion Externalities

Gasoline tax advocates also see the tax as a means to discourage highway congestion and reduce accidents on the roadway. Drivers do not pay the marginal costs they impose on others when they crowd the roads—including the

increased probability of accidents. Those costs are not trivial. Parry and Small, for example, calculate congestion externalities at 29 cents per gallon (8 cents more than the environmental externalities associated with motor vehicle use)⁴¹ and accident externalities at 24 cents per gallon (3 cents more than the environmental externalities associated with motor vehicle use). A recent paper by economists Aaron Edlin and Pinar Karaca-Mandic estimates that accident externalities in California alone exceed \$66 billion, more than current individual and corporate income taxes collected in the state.⁴²

But internalizing those externalities via a gasoline tax is a very poor way of addressing those problems. Better approaches include tolls that vary with congestion⁴³ and the promotion of “Pay-As-You-Drive” insurance under which premiums would vary in direct proportion to vehicle miles traveled and the insured’s risk factor as determined by insurance companies.⁴⁴ Gasoline taxes are an imperfect means to address congestion or accident costs because such taxes don’t vary with the density of the setting in which driving occurs or the extent to which a driver might be accident-prone.⁴⁵

The futility of taxing gasoline as a second-best policy to tackle congestion is well illustrated by policy in London. Gasoline taxes in the United Kingdom are \$2.80 per gallon,⁴⁶ more than seven times higher than they are in the United States (where they average 38 cents per gallon).⁴⁷ Yet, high U.K. taxes have not alleviated congestion in urban areas like London. When the municipal government in London imposed congestion-based tolls, however, to charge drivers for using inner-city streets, congestion was greatly diminished.⁴⁸ When congestion charges were imposed in Stockholm in 2006, traffic likewise decreased 22 percent and exhaust emissions decreased by 14 percent.⁴⁹

National Security Externalities

The most common rationale heard today for higher gasoline taxes is the complaint that

Gasoline taxes are an imperfect means to address congestion or accident costs.

From an economic perspective, the key question is whether an elimination of U.S. military and foreign aid expenditures dedicated to “the oil mission” would result in an increase in the price of oil.

oil consumption harms national security. There are four distinct arguments. First, oil imports require the United States military to secure foreign production facilities and shipping lanes. Second, good relations with oil producers are necessary to ensure that oil flows into U.S. ports, but good relations with producers can impose unacceptably large short- and long-term costs on the Treasury and contribute to anti-American sentiment, which itself imposes costs. Third, oil profits fund Islamic extremists. Fourth, oil revenues are often captured by international bad actors, and the harm done by those regimes both within and without their borders is to some extent “paid for” by U.S. motorists. None of those costs, however, are paid by those who consume gasoline. Hence, higher gasoline taxes would internalize the externalities.

In this section we examine each argument.⁵⁰

Taxing for the “Oil Mission”

Motorists do not pay for the costs associated with the safe and reliable delivery of foreign oil. Protecting oil tankers from harm, after all, is an explicit mission of the United States military. Protecting friendly oil-producing states from attack is also thought by many to be an implicit U.S. military mission.⁵¹

Quantifying the national security costs associated with ensuring the safe and reliable delivery of foreign oil is difficult. The Congressional Research Service estimated in 1997 that those costs may be anywhere between \$0.5 billion and \$65 billion, or 1.5 cents to 30 cents per gallon for motor fuel from the Persian Gulf.⁵² Deeper analysis by Mark Delucchi of the Institute of Transportation Studies at the University of California, Davis, and James Murphy at the University of Massachusetts suggests that, if the United States did not import Persian Gulf crude oil, military costs would be \$11 billion—\$42 billion less than they are today. If we did not use oil at all in the motor transport sector, expenditures would be \$3 billion—\$31 billion a year less than they are today.⁵³

Agreement about the extent of the military’s “oil mission” is difficult to achieve because military and foreign policy expendi-

tures are generally tasked with multiple missions and objectives, and oil security is simply one mission among many. Analysts disagree about how to divide those missions into budgetary terms. Agreement about total expenditures is difficult because it’s very difficult to know what Congress would appropriate in various counterfactual scenarios.

Debate about the size of the U.S. military’s oil mission and related foreign policy expenses is not particularly relevant to gasoline taxes. From an economic perspective, the key question is whether an elimination of U.S. military and foreign aid expenditures dedicated to “the oil mission” would result in an increase in the price of oil, and, if so, how much? That is the true measure of the national security externality if it exists. Measuring the externality by the amount of money government spends on the oil mission is at best a measure of how much politicians *believe* the externality might be. Political assessments may or may not be accurate.

To be sure, if the termination of the American “oil mission” implied the termination of all military, police, and court services in the region, petroleum extraction investments would become more risky, oil production would decrease, and prices would increase. But remember that oil companies in the region are creatures of government. So the question is really whether Middle East governments would produce less oil because the United States ended its oil-related military mission and foreign aid. Or would oil producing states provide—or pay others to provide—military services to replace those previously provided by the United States?

We believe that a cessation of U.S. security assistance would be replaced by security expenditures from other parties. First, oil producers will provide for their own security needs as long as the cost of doing so results in greater profits than equivalent investments could yield. Because Middle Eastern governments typically have nothing of value to trade except oil, they must secure and sell oil to remain viable. Second, given that their economies are so heavily dependent on oil revenues, Middle

Eastern governments have even more incentive than we do to worry about the security of production facilities, ports, and sea lanes.⁵⁴ Third, even if producing countries were to provide inadequate security in the eyes of consuming countries, consuming countries could pay producers to augment it.

In short, whatever security our presence provides (and many analysts think that our presence actually *reduces* security)⁵⁵ could be provided by other parties were the United States to withdraw. The fact that the Saudi Arabia and Kuwait paid for 55 percent of the cost of Operation Desert Storm suggests that keeping the Straits of Hormuz free of trouble is certainly within their means.⁵⁶ The same argument applies to al Qaeda threats to oil production facilities.

If oil regimes paid for their own military protection and the protection of their own shipping lanes, would U.S. Middle-East military expenditures really go down? The answer might well be “no” for two very different reasons. First, the U.S.–Middle East military presence stems from our implicit commitment to defend Israel as well as the region from Islamic fundamentalism, and those missions would not likely end simply because Arab oil regimes paid for their own economic security needs. Second, bureaucratic and congressional inertia might leave military expenditures constant regardless of Israeli or petroleum defense needs.⁵⁷

Thus, U.S. Persian Gulf expenditures should *not* be viewed as a subsidy that lowers oil prices below what they otherwise would be. Instead, the expenditures are a taxpayer-financed gift to oil regimes and the Israeli government that has little, if any, effect on oil prices. One may support or oppose such a gift but not on “market failure” grounds.

Foreign Policy Externalities

Many foreign policy analysts think that U.S. oil imports are dependent on friendly relationships with oil-producing states. The fear is that unfriendly regimes might not sell us oil. Maintaining good relations with oil producers, however, interferes with other foreign policy objectives and increases anti-American senti-

ment in producer states with unpopular regimes. While the costs associated with this distortion of foreign policy are difficult if not impossible to quantify, that doesn’t make them any less real. Because a higher gasoline tax would reduce consumption, many believe that high fuel taxes would give us more freedom to shun odious oil-producing regimes.⁵⁸

The problem with this argument, however, is that its fundamental premise is incorrect. Friendly relations with producer states neither enhance access to imported oil nor lower its price.

Selective embargoes by producer nations on some consuming nations are unenforceable unless (1) all other nations on Earth refuse to ship oil to the embargoed state, or (2) a naval blockade were to prevent oil shipments into the ports of the embargoed state. Once oil leaves the territory of a producer, market agents dictate where the oil goes, not agents of the producer, and anyone willing to pay the prevailing world crude oil price can have all he wants.⁵⁹

The 1973 Arab oil embargo is a perfect case in point. U.S. crude oil imports actually increased from 1.7 million barrels per day (mbd) in 1971 to 2.2 mbd in 1972, 3.2 mbd in 1973, and 3.5 mbd in 1974.⁶⁰ As MIT’s Thomas Lee, Ben Ball Jr., and Richard Tabors observe: “It was no more possible for OPEC to keep its oil out of U.S. supply lines than it was for the United States to keep its embargoed grain out of Soviet silos several years later. Simple rerouting through the international system circumvented the embargo. The significance of the embargo lay in its symbolism.”⁶¹ Granted, “there were short term supply disruptions,” but “the only tangible effect of the embargo was to increase some transportation costs slightly, because of the diversions, reroutings, and transshipments necessitated.”⁶² MIT economist M. A. Adelman agrees:

The “embargo” of 1973–4 was a sham. Diversion was not even necessary, it was simply a swap of customers and suppliers between Arab and non-Arab sources. . . . The good news is that the United States cannot be embargoed, leaving other countries undisturbed.⁶³

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In short, it does not matter to consumers to whom the oil is initially sold. All that matters to consumers is how much oil is produced for world markets.

Do oil-producing nations allow their feelings toward oil-consuming nations to affect their production decisions? Historically, the answer has been “no.” The record strongly indicates that oil-producing states, regardless of their feelings toward the industrialized West, are rational economic actors. After a detailed survey of the world oil market since the rise of OPEC, M. A. Adelman concluded, “We look in vain for an example of a government that deliberately avoids a higher income. The self-serving declaration of an interested party is not evidence.”⁶⁴ Prof. Philip Auerwald of George Mason University agrees, “For the past quarter century, the oil output decisions of Islamic Iran have been no more menacing or unpredictable than Canada’s or Norway’s.”⁶⁵

Although this is indeed the orthodox view among oil economists, there are examples of countries selling oil and natural gas to others at below-market rates: Russia sold oil to Cuba at below-market prices during the Cold War; Russia continues to sell natural gas to Ukraine at below-market prices but has ended its subsidy to Georgia as relations have soured; and China sells oil to North Korea at low rates and used this as leverage to induce North Korea to bargain over its nuclear weapons program.⁶⁶

What should we learn from those cases? First, sellers have leverage in natural gas markets that is not possible in oil markets because oil can be transported easily while natural gas is shipped through pipelines. Buyers have few near-term alternatives if natural gas sellers reduce shipments. As liquefied natural gas gains market share, however, natural gas markets will look increasingly like world crude oil markets and the ability of Russia or other states to extract concessions from consumers will dissipate. Second, the Russia-Cuba and China-North Korea cases involve poor countries receiving foreign aid in the form of low-priced oil. We are unaware of any wealthy western countries receiving such in-kind aid from oil-producing countries.

Thus far, our analysis has examined the behaviors and incentive structure of incumbent regimes. But if a radical new actor were to emerge on the global stage, how would it behave? For example, if the House of Saud were to fall and the new government consisted of Islamic extremists friendly to Osama bin Laden, the new regime might reduce production and increase prices.⁶⁷ But that scenario is by no means certain, given that Iran—despite all its anti-western rhetoric—has not reduced oil output, because the Iranian economy and regime are dependent on oil revenue and the Saudis are even more dependent.⁶⁸

Regardless, the departure of Saudi Arabia from world crude oil markets would probably have about the same effect on domestic oil prices as the departure of Iran from world crude oil markets in 1978. Iran accounted for just shy of 10 percent of global oil production before the Iranian Revolution virtually shut down oil production, whereas Saudi Arabia accounts for about 13 percent of global oil production today.⁶⁹ Oil prices increased dramatically after the 1978 revolution, but those higher prices set in motion market supply-and-demand responses that undermined the supply reduction and collapsed world prices eight years later. The short-term macroeconomic impacts of such a supply disruption would actually be less today than they were then, given the absence of price controls on the U.S. economy and our reduced reliance on oil as an input for each unit of GDP.⁷⁰

So while it is possible that a radical oil-producing regime might play a game of chicken with consuming countries, producing countries are very dependent on oil revenue and have fewer degrees of freedom to maneuver than consuming countries. Catastrophic supply disruptions would harm producers more than consumers, which is why they are extremely unlikely.

Oil Profits for Terrorists

Money spent on gasoline flows to oil producers, and many of those producer states use those revenues to directly or indirectly fund Islamic extremists. Private individuals who

profit from the oil trade likewise contribute to Islamic extremists. Those extremists pose foreign policy and national security problems. This suggests that reduction in oil revenues would reduce Islamic extremist activities.

Before we go on, it's worth noting that only 15.5 percent of the oil in the world market is produced from nation-states accused of funding terrorism.⁷¹ Hence, the vast majority of the dollars we spend on gasoline do not end up on this purported economic conveyor belt to terrorist bank accounts.

Regardless, terrorism is a relatively low-cost endeavor, and oil revenues are unnecessary for terrorist activity. The fact that a few hundred thousand dollars paid for the 9/11 attacks suggests that the limiting factor for terrorism is expertise and manpower, not money.

What is the relationship between oil prices and Islamic terrorist incidents? We estimated two regressions using annual data from 1983 to 2005: the first between fatalities resulting from Islamic terrorist attacks and Saudi oil prices and the second between the number of Islamic terrorist incidents and Saudi oil prices. In neither regression was the estimated coefficient on oil prices at all close to being significantly different from zero.⁷²

That probably explains why there is no correlation between Persian Gulf oil revenues and terrorist activity. Inflation-adjusted oil prices and profits during the 1990s were low. But the 1990s also witnessed the worldwide spread of Wahhabi fundamentalism, the build-up of Hezbollah, and al Qaeda's coming of age. Note too that al Qaeda terrorists in the 1990s relied on help from state sponsors such as Sudan, Afghanistan, and Pakistan—nations that aren't exactly known for their oil wealth or robust economies.

What terrorists need most is a recruiting pool from which to draw. If the United States were to tax gasoline to such an extent that global oil demand, prices, and profits for oil producers declined, the oil states would have smaller economies and less to distribute to their underemployed youth. To the extent that deteriorating economic conditions breed social discontent and political resent-

ment, taxing gasoline to reduce revenues flowing to Islamic terrorists might well increase the recruitment pool for Islamic terrorists and make matters worse.

Reducing oil revenue to noxious regimes might be a risk worth taking if billions were finding their way from such regimes into al Qaeda coffers, but that seems unlikely. Everything we know suggests that al Qaeda terrorist cells are "pay as you go" operations that primarily engage in garden-variety crime to fund their activities, and Islamic charities are the primary sources for organizational revenue.⁷³ Given that the governments of Saudi Arabia, Kuwait, and others in the region are slated for extinction should bin Laden have his way, those governments have no interest in facilitating the transfer of oil revenues to some post office box in Pakistan.

Producer states do indeed use oil revenues to fund ideological extremism, and Saudi financing of *madrassas* and Iranian financing of Hezbollah are good examples. But given the importance of those undertakings to the Saudi and Iranian governments, it's unlikely that they would cease and desist simply because profits were down. They certainly weren't deterred by meager oil profits in the 1990s.⁷⁴

The futility of reducing oil consumption as a means of reducing terrorism is illustrated by an examination of revenues earned from oil sales. A recent paper from the publishers of the *Lundberg Letter* notes that oil exports from states accused of funding terrorism earned those governments \$290 billion in 2006. Even if that sum were cut by 90 percent, it would still leave \$29 billion at their disposal—more than enough to fund terrorism given the minimal financial needs of terrorists. "Even a price of \$10 per barrel crude (an unlikely scenario even under massive subsidy programs for plug-in hybrid vehicles and biofuels market share mandates) would likely not cut off the purported cash flow to terror groups."⁷⁵

Rents to Bad Actors

When oil prices are high, so too are oil profits for infra-marginal (low-cost) producers. Even if those profits do not find their way to

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international terrorists, they serve to prop up many regimes we find distasteful. Oil producers in the Second and Third worlds, after all, often use their robust flow of petrodollars to squelch human rights at home and to menace neighbors abroad.⁷⁶ Many analysts blame U.S. motorists for indirectly funding these international bad actors and argue that the actions of these bad actors impose costs on third parties that are not reflected in gasoline prices. Taxes to reduce demand would internalize this particular externality, reduce the flow of money to bad actors and, presumably, weaken their grip on political power. At the very least, it might well reduce the threat they pose to others.

To our knowledge, no one has attempted to quantify this alleged externality, and it is unlikely that anyone ever will. After all, putting a price tag on lost civil and economic liberties, not to mention regional instability and military tension, would be extremely difficult. Moreover, one would need to estimate the baseline degree of “bad acting” associated with a particular regime or nation-state before one could estimate to what extent oil profits are responsible for observed instances of “bad acting.” Accordingly, policymakers have little concrete information at their disposal to inform tax policy.

Regardless, it is unclear to what extent oil profits are associated with human rights abuses or militaristic activity. There are plenty of examples, after all, of relatively long-lived regimes with terrible human rights records (such as North Korea) that have no oil revenues to speak of, and this is the case even within the same socioeconomic regions. Denuding Iran and Libya of oil revenues might produce a government that looks a lot like Syria; denuding Venezuela of oil revenues might produce a government that looks a lot like Cuba; and denuding Russia of oil revenues might produce a government that looks a lot like Russia used to be. After all, all of these “bad-acting” petro-states yielded unsavory regimes even when oil revenues were a third of what they are today.

The claim that oil revenues increase the threat those regimes pose to their neighbors seems reasonable enough, but here again, it is unclear to what extent this is true. Pakistan is a

relatively poor country with no oil revenues to speak of, but it has still managed to build a nuclear arsenal and is constantly on the precipice of war with India. Impoverished, oil-poor Egypt and Syria have at various times been the most aggressive anti-Israeli states in the Middle East. Russia launched its war with Chechnya before oil revenues engorged its treasury. While we have no doubt that (all other things being equal) a rich bad actor is more dangerous than a poor bad actor, the marginal impact that oil revenues have on “bad acting” might well be rather small.

Regardless, the fact that unsavory petro-states have been fully capable of holding on to power, oppressing their people, and menacing their neighbors during a decade associated with the lowest inflation-adjusted oil prices in history (the 1990s) suggests that nothing short of rendering oil nearly valueless will have any real effect on regime behavior. A one dollar hike in the federal gasoline tax, for example, would reduce world crude oil prices by only 1–5 percent, or by \$0.65–\$3.25 given \$65 crude—not enough to have any appreciable effect on bad acting or terrorist funding. Getting prices back down to 1998 levels (the lowest inflation-adjusted price in history) would require a gasoline tax of more than \$20.00 per gallon.⁷⁷

For the sake of argument, however, let’s assume that there is some incremental benefit associated with reducing oil revenues to bad-acting oil producers—an assumption that seems entirely reasonable. Unfortunately, we have only very blunt and imperfect instruments at hand to achieve that end. A gasoline tax, for instance, would reduce oil demand—and, thus, reduce revenues—for *all* oil producers, whether they are bad actors or not. Producers in the North Sea, Canada, Mexico, and the United States (which collectively supplied 20.1 million barrels of oil per day in 2006, or 24 percent of the world’s crude oil needs that year) would be harmed just the same as producers in Venezuela, Iran, Russia, and Libya (which collectively supplied 20.3 million barrels per day in 2006).⁷⁸

Imposing oil taxes to reduce profits for

unsavory petro-states is thus akin to taking out a shotgun to kill a mosquito at 50 yards. You may or may not kill the mosquito, but you're sure to hit a lot of unintended targets when you pull the trigger.

Given there was plenty of "bad acting" in 1998, it's unlikely that even astronomical gasoline taxes would have much effect on bad acting. Accordingly, we doubt that the foreign policy benefits that might accrue from gasoline tax increases would outweigh the very real costs that such a tax would impose on both consumers and innocent producers. We suspect that there are better remedies available to the United States to curtail bad behavior abroad.

To summarize, we find little reason to believe that America's national security is jeopardized to any great extent by oil consumption or that gasoline taxes could reduce whatever problems may exist. U.S. taxpayers do pay for U.S. military activities in the Middle East, which are justified in part by the desire to secure oil production and export facilities. But those expenditures are properly thought of as wealth transfers rather than externality-creating payments because their termination would not alter oil prices. Good relations with oil producers have no effect on the price or the availability of oil in the world market. Oil revenues are not necessary for terrorist activity, and the variation in terrorist activity over time does not seem to be related to oil revenue. And while bad international actors do indeed get rich off oil revenues, gasoline taxes are unlikely to substantially reduce the degree or the extent of bad acting.

Gasoline Taxes: Better than the Alternative?

Many if not most of the economists who embrace federal and state gasoline taxes concede the arguments above when pressed. They continue to support fuel taxes, however, for two reasons. First, they believe that fuel taxes are more efficient means of raising revenue than other forms of taxation. Second,

they fear that first-best means of addressing externalities (direct taxes on pollution, road use, etc.) are not politically feasible and that gasoline taxes are a second-best remedy that is preferable to the alternative, which is to leave externalities unaddressed.

We examine each of those arguments in turn.

Fuel Taxes and the "Double Dividend"

Gasoline taxes change fuel consumption habits less than other taxes affect the consumption of other goods or services. They simply extract revenue. From an economist's point of view, that's good. When taxes decrease consumption of that which is taxed, individual welfare is reduced over and above the amount of the taxes actually paid. Those welfare losses are thought to be quite substantial. Michigan State economist Charles Ballard, for instance, has calculated that each additional dollar of tax revenue imposes 20–30 cents of welfare loss above and beyond the losses associated directly with the tax payment.⁷⁹

Hence, some observers have argued that if gasoline taxes were increased and other taxes decreased so that overall revenue remained constant, a gasoline tax hike would provide a "double dividend." That is, it would reduce the negative externalities associated with gasoline consumption while also reducing the welfare losses associated with taxation. Even if a gasoline tax created no net benefits, as long as the welfare losses associated with a gasoline tax were smaller than the welfare gains associated with cuts in other more distortionary taxes, a gasoline tax hike would make economic sense.⁸⁰

But if gasoline taxes produce such benefits, a tax on vehicle miles traveled would be even better because the demand for vehicle miles traveled is even more inelastic than demand for fuel.⁸¹ Given that monitoring vehicle miles traveled is quite simple and not particularly costly, analysts who embrace the "double dividend" argument have no good reason to prefer fuel taxes over taxes on vehicle miles traveled.

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who support increasing the gasoline tax—have several reservations about the double-dividend claim.⁸² First, while it's true that a gasoline tax will not change behavior very much in gasoline markets, they impose significant distortions in other markets. For instance, a gasoline tax will reduce after-tax wages in precisely the same way as a direct tax on wages. Hence, a gasoline tax will introduce distortions in the labor market. It will also create distortions in other commodity markets by reducing demand for some goods while increasing the demand for others. Those distortions are at least as large as the distortions introduced by other forms of labor taxation, and they tend to “exacerbate, rather than alleviate, preexisting tax distortions—even if revenues are employed to cut preexisting distortionary taxes.”⁸³

But for reasons that are partially illustrated above, a gasoline tax (and a tax on virtually any other commodity, for that matter) is implicitly a tax on labor,⁸⁴ and taxing labor creates less welfare loss than taxing capital.⁸⁵ So even if a gasoline tax hike leads to welfare losses in labor and other commodity markets, if the revenues associated with the tax were used to cut taxes on capital, it is possible that the welfare gains associated with the capital tax reductions would exceed the welfare losses associated with increasing the gasoline tax.

Despite this theoretical escape hatch, the gasoline market offers too narrow a tax base to substitute in any substantial way for taxes on capital. To be revenue neutral, the gasoline tax would have to be too high. And once the tax becomes high enough, behavior will change (motorists will switch from gasoline to some other fuel—like ethanol), and behavior change implies welfare losses. Accordingly, the efficiency gains that might result from a tax swap will not offset the efficiency losses caused by the gasoline tax increase.⁸⁶

There are two other practical complications. First, replacing income with gasoline taxes decreases the efficiency of revenue collection because it is cheaper to collect a given amount of revenue from a broad tax base relative to a narrower tax base.⁸⁷ Second, the “double dividend” can only occur if the revenues

from the gasoline tax are used to offset cuts in capital taxes. If the revenues are rebated to lower-income Americans to offset the regressivity of the tax swap—which would almost certainly happen to some extent in the current political climate—that would reduce the revenues available to “buy” cuts in capital taxes and, thus, further reduce or eliminate the efficiency gains that result from the tax swap.⁸⁸

So while replacing capital taxes with labor (consumption) taxes is welfare-improving, the gains associated with that switch cannot be secured absent generalized tax reform across all sectors of the economy.⁸⁹ As economist Stephen Smith observed after surveying the literature:

Ecotaxes are likely to involve distortionary costs at least as high as those involved in raising equivalent revenues through existing taxes. If the question is posed whether we would choose to use energy taxes, in preference for existing taxes on labour and other bases, in the absence of any environmental benefits, then the answer is almost certainly that we would not. Energy taxes would be likely to involve just as much distortion of the labour market as income taxes, and at the same time distort the commodity market. Only if there are expected to be environmental gains can the use of environmental taxes be justified, and the case for ecotax reform must be made primarily on the basis of the environmental gains that would result.⁹⁰

First- vs. Second- vs. Third-Best Policy

Are gasoline taxes worth embracing as a “second-best” policy, given the widespread belief that “first-best” remedies, such as direct taxation of the externalities in question, are off the table?⁹¹ We don't think so.

First, as a factual matter, it's unclear whether alleged first-best remedies such as tailpipe emission taxes and road use charges are truly more difficult to pass in a legislature than fuel tax increases. Energy taxes, after all,

are among the most politically unpopular taxes in America, as President Bill Clinton discovered when he attempted to impose a Btu tax during the first year of his presidency. Pollution taxes, on the other hand, are somewhat more “virtuous” in the public’s mind, and highway tolls are increasingly common. If one posits that gasoline taxes are unpopular because they are visible, unavoidable, and imposed on a commodity for which demand is relatively unaffected by price, then pollution taxes and road-use charges would likely prove no more unpopular than gasoline taxes.

Second, economists who argue for increased gasoline taxes rarely concede (to non-economists, anyway) that those taxes are deeply problematic and only worth embracing because better policies are presumably off the table. Instead, the case for higher gasoline taxes is usually offered to the public with a great deal of intellectual bravado that almost always overstates the ability of gasoline taxes to solve identified problems.⁹² We believe that economists should argue for first-best policies and let the political chips fall where they may. After all, if academics (who don’t have to worry about winning popularity contests at the ballot box) don’t make the case for politically unpopular first-best economic policies, who will? Abandoning the case for ideal policy in the public realm because it may prove unpopular implicitly assumes that good arguments do not persuade. It also requires economists to make judgments about what is politically feasible and what is not, and economists have no particular expertise in that matter.

Third, it’s unclear whether gasoline taxes even qualify as a “second-best” means of addressing air pollution or road congestion. That’s because the difference between the upper- and lower-bound externality cost estimates are larger than the marginal gains promised by intervention. Hence, raising the gasoline tax too high could well make prices even less, not more, reflective of total costs.

The only way to hedge against that risk is to support gasoline tax increases that fall within the lower bound of the aggregated

externality estimates, but that would produce correspondingly little efficiency gain even in theory. As economist Stephen Smith points out:

It is perhaps an over-generalization to suggest that environmental taxes should be large, or not imposed at all. However, the costs of complexity and the risk that minor environmental taxes will simply be ignored should both caution against too much environmental fine-tuning of the fiscal system.⁹³

That’s particularly the case given that small, incremental tax increases do not guarantee only small, incremental welfare losses when the preexisting tax system is inefficient. Relatively small carbon taxes, for example, yield disproportionately large gross costs in theoretical simulations replicating the existing tax system.⁹⁴

Fourth, and most important, even if a gasoline tax increase were able to perfectly price gasoline’s externalities, that would not necessarily lead to greater efficiency. In fact, the economy might become *less* efficient if gasoline prices are corrected in isolation of other prices.⁹⁵ Transportation economists, including Mark Delucchi, a research scientist at the Institute of Transportation Studies at the University of California, and Clifford Winston at the Brookings Institution, have demonstrated that if all inefficiencies in transportation markets were corrected, there would be more, not less, automobile use than at present because mass transit “prices” (user charges) are even more distorted than the price of automobile travel.⁹⁶ Hence, a perfect correction of gasoline externalities would likely make the economy less, not more, efficient to the extent that even more inefficient transit use increased.

Conclusion

Many economists argue that gasoline taxes should be increased to internalize externalities

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It is striking that the two frequently cited researchers in the literature pertaining to motor vehicle externalities agree that internalizing those externalities via a gasoline tax should be resisted.

associated with oil use. Some of the concerns on which those arguments are based have no (or a very weak) foundation, including concerns about future generations, the macroeconomic consequences of oil shocks, the “failure” of consumers to conserve, and the four national security arguments. The concerns about the environment, accidents, and congestion have much more validity.

Regardless, it is striking that the two frequently cited researchers in the literature pertaining to motor vehicle externalities—Ian Parry of Resources for the Future and Mark Delucchi of the Institute of Transportation Studies at the University of California, Davis—agree that internalizing those externalities via a gasoline tax should be resisted.⁹⁷ The greater familiarity one has with the literature, the less inclined one is to embrace gasoline taxes as a remedy for the externalities associated with motor vehicle transport.

Gasoline taxes represent a “second-best” means of internalizing the externalities associated with motor vehicle travel. Unfortunately, federal gasoline taxes, no matter how carefully constructed, always send the wrong signals to motorists. When addressing road construction and maintenance costs, for example, they overcharge motorists in low-maintenance, low-construction locations and undercharge those in high-maintenance, high-growth areas. When addressing pollution costs, they overcharge rural motorists and undercharge many urban motorists. When addressing congestion, they overcharge non-peak road users and undercharge peak road use.

In an ideal world, there would be direct externality charges rather than gasoline taxes. But first-best charges levied directly on pollution (via computerized internal monitoring equipment), congestion (via tolls), and road use (via user charges) in lieu of gasoline taxes would almost certainly be counterproductive for two reasons.

First, the error bars associated with the externality estimates are very large. Any attempt to internalize those externalities with government-imposed charges risks reducing economic efficiency. That’s particularly the case given the poor track record that

legislative bodies have when it comes to “problem-solving” exercises like this.⁹⁸

Second, correcting motor vehicle externalities would likely result in some incremental increase in mass transit use, and that would make the economy *less* efficient because the economic distortions induced by mass transit use under the current subsidy regime are greater than the economic distortions induced by uninternalized motor vehicle externalities.

Notes

1. For a review of the literature, see *The Theory of Market Failure: A Critical Examination*, ed. Tyler Cowen (Fairfax, VA: George Mason University Press, 1988). See also Charles Wolf, *Markets or Government: Choosing Between Imperfect Alternatives* (Cambridge, MA: MIT Press, 1991).

2. A manifesto of sorts for the Pigou Club is N. Gregory Mankiw, “Raise the Gas Tax,” *Wall Street Journal*, October 20, 2006, p. A12. A roster of inductees into the Pigou Club is maintained on Mankiw’s website, <http://gregmankiw.blogspot.com/2006/09/rogoff-joins-pigou-club.html>. Journalist Terence Corcoran has countered by forming the “The NoPigou Club,” <http://www.canada.com/nationalpost/features/nopigouclub/index.html>.

3. For representative arguments, see Edith Weiss, *In Fairness to Future Generations* (Dobbs Ferry, NY: Transnational Publishers, 1989); and Paul Barresi, “Beyond Fairness to Future Generations: An Intergenerational Alternative to Intergenerational Equity in the International Environmental Arena,” *Tulane Environmental Law Journal* 11, no. 1 (1997): 59–88.

4. Robert Hirsch, Roger Bezdek, and Robert Wendling, “Peaking of World Oil Production: Impacts, Mitigation, and Risk Management,” Report Commissioned by the U.S. Department of Energy, February 2005, p. 5; <http://www.hilltoplancers.org/stories/hirsch0502.pdf>.

5. Recoverable oil deposits within heavy bitumen in the Venezuelan Orinoco Belt may be nearly equal to Saudi proved reserves. Juan Forero, “For Venezuela, A Treasure in Oil Sludge,” *New York Times*, June 1, 2006, p. C1. Shale rock in the United States is estimated to contain three times the amount of petroleum found in proved Saudi reserves. James Bartis et al., “Oil Shale Development in the United States: Prospects and Policy Issues” prepared by the Rand Corporation for the National Energy Technology Laboratory of the U.S. Department of Energy, 2005. For an overview of unconventional petroleum

resources, see Robert L. Bradley and Richard Fulmer, *Energy: The Master Resource* (Dubuque, IA: Kendall/Hunt, 2004).

6. For a review of the literature, see Robert Arnott, "Supply Side Aspects of Depletion," *Journal of Energy Literature* 8, no.1 (June 2002): 3–21. For a general critique regarding past and present worries about a near-term peak in global oil production, see Vaclav Smil, *Energy at the Crossroads* (Cambridge, MA: MIT Press, 2003), pp. 181–213. For a withering critique of current "peak oil" hypotheses, see Michael Lynch, "Crop Circles in the Dessert: The Strange Controversy over Saudi Oil Production," International Research Center for Energy and Economic Development, Occasional Paper 40, Boulder, Colorado, 2006; and "Crying Wolf: Peak Oil Alarmism: Fact or Fiction?" Blue Book, CLSA Asia-Pacific Markets, March 2007.

7. Steven Landsburg, "Tax the Knickers off Your Grandchildren," *Slate*, March 7, 1997, <http://www.slate.com/d/2036/>.

8. Jerry Taylor and Peter Van Doren, "The Case against the Strategic Petroleum Reserve," Cato Institute Policy Analysis no. 555, November 21, 2005.

9. Jagadeesh Gokhale, "Is the Fed Facilitating an Unpleasant Fiscal Arithmetic?" *Cato Journal* 27, no. 2 (forthcoming): Table 2.

10. From 2000–2006, the short run-price elasticity for gasoline ranged from -0.034 to -0.077, that is, a 10 percent increase in gasoline prices would reduce consumption by only about three-tenths of 1 percent to about eight-tenths of 1 percent. This suggests that consumers have become less responsive to gasoline price increases over time, because data from 1975–80 reveal that short-run price elasticity over that time ranged from -0.21 to -0.34. Jonathan Hughes, Christopher Knittel, and Daniel Sperling, "Evidence of a Shift in the Short-Run Price Elasticity of Gasoline Demand," CSEM WP-159, Center for the Study of Energy Markets, University of California Energy Institute, September 2006.

11. Between March 1982 and January 2002, the standard deviation in monthly oil prices was 29.5 percent of its mean. By means of comparison, the standard deviation in monthly steel prices was 9.2 percent. Oil prices fluctuate more than, or at least as much as, the most volatile commodity prices in other sectors. Hillard Huntington, "Energy Disruptions, Interfirm Price Effects, and the Aggregate Economy," OP 51, September 2002, p. 4, <http://www.stanford.edu/group/EMF/publications/doc/op51.pdf>.

12. Estimates in the literature vary from -.3 to -.9. See Robert M. Ames, Anthony Corridore, and Paul W. MacAvoy, "National Defense, Oil Imports, and Bio-

Energy Technology," *Journal of Applied Corporate Finance* 16, no. 1 (Winter 2004): 48; Ian W. H. Parry and Kenneth A. Small, "Does Britain or the United States Have the Right Gasoline Tax?" Resources for the Future Discussion Paper 02-12, revised September 2004, p. 22; and Gilbert E. Metcalf, "Federal Tax Policy Towards Energy," NBER Working Paper 12568, October 2006, p. 30.

13. Paul Leiby, et al., "Oil Imports: An Assessment of Benefits and Costs," ORNL-6851, Oak Ridge National Laboratory, 1997.

14. Ben Bernanke, Mark Gertler, and Mark Watson, "Systematic Monetary Policy and U.S. Aggregate Economic Activity," *Brookings Papers on Economic Activity* no.1 (1997): 91–142; and James Hamilton and Anna Maria Herrera, "Oil Shocks and Aggregate Macroeconomic Behavior," *Journal of Money, Credit, and Banking* 36 (April 2004): 265–86.

15. Donald Jones, Paul Leiby, and Inja Paik, "Oil Shocks and the Macroeconomy: What Has Been Learned Since 1996," *Energy Journal* 25, no. 2 (2004): 1–32; and Robert Barsky and Lutz Kilian, "Oil and the Macroeconomy since the 1970s," National Bureau of Economic Research, Working Paper 10855, October 2004.

16. Rajeev Dhawan and Karsten Jeske, "How Resilient Is the Modern Economy to Energy Price Shocks?" *Federal Reserve Bank of Atlanta Economic Review* 91, no.3 (Third Quarter, 2006): 21–32. A new paper by U. Michigan economist Lutz Kilian attempts to separate oil shocks into three categories: changes in oil supply, changes in oil demand resulting from changes in overall economic activity, and changes in oil demand resulting from precautionary inventory buildup (fears of future disruption). He argues that since 1975 all oil price increases have been result of increases in overall economic activity or precautionary inventory buildup. Actual reductions in crude oil supply have played a small role. The price increase since 2003 is the result of general economic growth rather than precautionary inventory demand. Lutz Kilian, "Not All Oil Price Shocks Are Alike: Disentangling Demand and Supply Shocks in the Crude Oil Market," Social Science Research Network, February 2007, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=975262.

17. David Walton, "Has Oil Lost the Capacity to Shock?" *Bank of England Quarterly Bulletin* 46, no. 1 (Spring 2006): 105–114, <http://www.bankofengland.co.uk/publications/quarterlybulletin/qb060109.pdf>.

18. Eric Fisher and Kathryn Marshall, "The Anatomy of an Oil Price Shock," *Economic Commentary*, Federal Reserve Bank of Cleveland, November 2006.

19. See Joseph Kalt, *The Economics and Politics of Oil Price Regulation* (Cambridge: MIT Press 1981); Peter Van Doren, *Politics, Markets, and Policy Choices* (Ann Arbor: University of Michigan Press, 1991); and Jerry Taylor and Peter Van Doren, "Economic Amnesia: The Case against Oil Price Controls and Windfall Profit Taxes," *Cato Institute Policy Analysis* 561, January 12, 2006.
20. Taylor and Van Doren, "Economic Amnesia."
21. For representative arguments, see David Greene, "Why CAFE Worked," *Energy Policy* 26, no.8 (1998), pp. 595-614.
22. Molly Espey, "Do Consumers Value Fuel Economy?" *Regulation* 28, no. 4 (Winter 2005-06), pp. 8-10.
23. Mark Dreyfus and W. Kip Viscusi, "Rates of Time Preference and Consumer Valuations of Automobile Safety and Fuel Efficiency," *Journal of Law & Economics* 38, no. 1 (April 1995): 79-105.
24. For critiques of CAFE standards see Andrew N. Kleit, "CAFE Changes, By the Numbers," *Regulation* 25, no. 3 (Fall 2002): 32-35; and Paul Portney et al., "The Economics of Fuel Economy Standards," *Journal of Economic Perspectives* 17, no. 4 (Fall 2003): 214-15.
25. This argument was first made by Arthur C. Pigou, *The Economics of Welfare* (London: Macmillan, 1920).
26. Some economists have argued that if government were to acknowledge and enforce private property rights over environmental resources, most environmental regulations would be unnecessary and that the resulting legal regime would be more efficient than the current regulatory regime. Murray Rothbard, "Law, Property Rights, and Air Pollution," *Cato Journal* 2, no 1 (Spring 1982): 55-100. But most believe that the costs associated with policing private environmental rights for mobile sources ("transaction costs" in economic parlance) would be (prohibitively?) large.
27. Passenger vehicles are so heavily computerized today that the technology necessary to collect emissions data for tax purposes is already onboard a large percentage of the U.S. auto fleet. If the transaction costs associated with monitoring, collecting, and billing motorists for tailpipe emissions prove too large, then a fuel tax might well be a superior means of internalizing the environmental externalities associated with automobile travel. While that may have been true in the past, it is unlikely to be true today.
28. Joel Schwartz, *No Way Back: Why Air Pollution Will Continue to Decline* (Washington: American Enterprise Institute, 2003), p. 23.
29. Ian Parry, "The Uneasy Case for Higher Gasoline Taxes," *Milken Institute Review* 4 (2005): 43, contends that 60 percent of the reduction in gasoline demand from any increase in gasoline taxes will come from vehicle mileage improvements.
30. Fuel efficiency reduces the marginal costs associated with driving, and reducing marginal costs will induce some demand response. David Greene, James Kahn, and Robert Gibson, "Fuel Economy Rebound Effect for U.S. Household Vehicles," *Energy Journal* 20, no. 3 (1999): 6-10.
31. Carolyn Fischer, Winston Harrington, and Ian Parry, "Economic Impacts of Tightening the Corporate Average Fuel Efficiency Standards," report prepared for the U.S. Environmental Protection Agency and the National Highway Safety Administration, 2005; J. Daniel Khazoom, "Gasoline Conservation Versus Pollution Control: Unintended Consequences, Continued," *Journal of Policy Analysis and Management* 7, no. 4 (1988): 710-14, and "The Impact of a Gasoline Tax on Auto Exhaust Emissions," *Journal of Policy Analysis and Management* 10, no.3 (1991): 434-54.
32. If EPA regulated tailpipe emissions based on emissions per gallon rather than on emissions per mile traveled, a 9 percent increase in the gasoline tax would reduce emissions to the same extent that a doubling of the gasoline tax would have under the current regulatory regime. Khazoom, p. 438.
33. For a review of the literature, see Ian Perry and Kenneth Small, "Does Britain or the United States Have the Right Gasoline Tax?" *American Economic Review* 95 (September 2005): 1276-89.
34. Ian Parry, Margaret Walls, and Winston Harrington, "Automobile Externalities and Policies," Resources for the Future Discussion Paper 06-26, June 2006, p. 4, gives a range for local pollution of 1.6-18.6 cents per mile based upon an analysis from the U.S. Federal Highway Administration. Assuming 22.6 miles per gallon (Parry and Small 2005, Table 1), that translates into environmental costs of \$.36 to \$4.20 per gallon. The "best estimate" from the U.S. Federal Highway Administration, however, is that local environmental costs total 2.2 cents per mile, a figure quite close to the 2.3 cents per mile embraced by Kenneth Small and Camilla Kazimi, "On the Costs of Air Pollution from Motor Vehicles," *Journal of Transport Economics and Policy* 29, (1995): 7-32. That suggests a plausible mean estimate of about 50 cents per gallon.
35. Schwartz, *No Way Back*. Tailpipe emissions will decline rapidly with the new Tier-2 emissions standards. That, combined with the improved durability of pollution control equipment, sug-

gests that this externality will decrease in importance over time.

36. For an overview of the debate and the uncertainties therein, see Donald McCubbin and Mark Delucci, "The Social Cost of the Health Effects of Motor-Vehicle Air Pollution," Report 11 in the series "The Annualized Social Cost of Motor Vehicle Use in the United States, based on 1990–91 Data," UCD-ITS-RR-96-3(11), Institute of Transportation Studies, University of California, Davis, August 1996, pp. 22–80, particularly pp. 22–26, [http://www.its.ucdavis.edu/publications/1996/UCD-ITS-RR-96-03\(11\).pdf](http://www.its.ucdavis.edu/publications/1996/UCD-ITS-RR-96-03(11).pdf). For a review of the epidemiological problems associated with mortality estimates from particulate matter—the most important of the environmental externalities associated with vehicle emissions—see Robert Crandall, Frederick Reuter, and Wilbur Steger, "Clearing the Air: EPA's Self Assessment of Clean Air Policy," *Regulation* 19, no.4 (Fall 1996): 35–46; and Randall Lutter and Richard Belzer, "EPA Pats Itself on the Back," *Regulation* 23, no. 3 (Fall 2000): 23–28; and Joel Schwartz, "Comments on EPA's Proposed Rule, National Ambient Air Quality Standards for Particulate Matter," Docket ID EPA-HQ-OAR-2001-0017, April 17, 2006, http://www.aei.org/publications/filter.all.pubID.24240/pub_detail.asp. For a summary of other health-related air pollution controversies, see Joel Schwartz, "Air Pollution and Health: Do Popular Portrayals Reflect the Scientific Evidence?" *Environmental Policy Outlook* 2 (2006).

37. R. Clarkson and K. Deyes, "Estimating the Social Cost of Carbon Emissions," Environmental Protection Economics Division, Department of Environment, Food and Rural Affairs, London, August 2001, cited in David Newberry, "Why Tax Energy? Towards a More Rationale Policy," *The Energy Journal* 26, no. 3 (2005): 21.

38. Cass Sunstein, *Risk and Reason: Safety, Law, and the Environment* (New York: Cambridge University Press, 2002), Table 7.5, p. 174.

39. David Newberry, "Fair Payment from Road Users: A Review of the Evidence on Social and Environmental Costs," Automobile Association, February 1998, cited in Newberry, "Why Tax Energy? Towards a More Rationale Policy," *The Energy Journal* 26, no. 3 (2005): 24.

40. Parry and Small 2005, p. 1283, Table 1. A recent study by economist Nicholas Stern suggests that an optimal climate change externalities tax would be \$85 per metric ton of carbon equivalent, which works out to about a 16 cent per gallon tax on gasoline. Nicholas Stern, *The Economics of Climate Change* (London: Cambridge University Press, January 2007, forthcoming), http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm. Parry and Small's

review of the literature, however, reveals that Stern's estimate is at the high end of the literature. See, for instance, William Nordhaus and Joseph Boyer, *Warming the World: Economic Models of Global Warming* (Cambridge, MA: MIT Press, 2000), which estimates that marginal damages associated with global warming work out to about \$15 per metric ton of carbon, or 4 cents per gallon of gasoline.

41. Parry and Small 2005, p. 1283, Table 1.

42. Aaron S. Edlin and Pinar Karaca-Mandic, "The Accident Externality from Driving," *Journal of Political Economy* 114, no.5 (October 2006): 951.

43. Variable toll congestion pricing now exists in state route 91 in Orange County California, I-15 in San Diego, I-394 in Minneapolis, and I-25 in Denver. See Timothy Egan, "Paying on the Highway to Get Out of First Gear," *New York Times*, April 28, 2005, p. A1. For a discussion of optimal congestion pricing see Kenneth Small, Clifford Winston, and Carol Evans, *Road Work* (Washington: Brookings, 1989); and Kenneth Small, Clifford Winston, and Jia Yan, "Differentiated Road Pricing, Express Lanes, and Carpools: Exploiting Heterogenous Preferences in Policy Design," AEI-Brookings Joint Center Working Paper 06-06-02, March 2006.

44. Ian Parry, in fact, believes that such innovations may emerge in the market with limited government help. Parry, Walls, and Harrington, pp. 29–30.

45. Although some economists have argued that a tax on vehicle miles traveled (VMT) alone would internalize the accident externality (see, for instance, Todd Litman, "Distance-Based Vehicle Insurance as a TDM Strategy," *Transportation Quarterly* 51 [Summer 1997]: 119–37; and Edlin and Karaca-Mandic, pp. 952–53), statistical analysis finds little correlation between VMT and automobile accidents. Oddly enough, a VMT tax might have the perverse effect of actually *increasing* the percentage of bad drivers on the road because it would disproportionately affect good drivers. If accidents are more closely correlated with bad driving than with VMT, a tax on the latter would likely increase automobile accidents. Clifford Winston and Vikram Maheshri, "Towards an Efficient Policy for Reducing Automobile Accidents," Working Paper, April, 2007 (available from authors).

46. Parry and Small 2005, p. 1276.

47. The figure is a weighted average of existing state taxes plus the federal fuels tax (U.S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, 2005).

48. As a consequence of road use charges, 60, 000 (16 percent) fewer vehicles a day entered central

- London, resulting in 30 percent less congestion. National Commission on Energy Policy, "Congestion Charging: Solutions for the Escalating Problem of Vehicle Miles Traveled," NCEP *Background Paper*, <http://www.energycommission.org/files/finalReport/III.5.a%20-%20Congestion%20Charging-VMT.pdf>, pp. 1–2.
49. Leila Abboud and Jenny Clevstrom, "Stockholm's Syndrome," *Wall Street Journal*, August 29, 2006, p. B1.
50. Many economists doubt that there are significant national security externalities associated with gasoline consumption. See Douglas Bohi and Michael Toman, *The Economics of Energy Security* (Norwell, MA: Kluwer Academic Publishers, 1996).
51. Andrew Bacevich, "The Real World War IV," *Wilson Quarterly* 29, no. 1 (Winter 2005).
52. Congressional Research Service, "Oil Imports: An Overview and Update of Economic and Security Effects," *CRS Report for Congress*, 98-1, December 12, 1997, Table A-1.
53. Mark Delucchi and James Murphy, "U.S. Military Expenditures to Protect the Use of Persian-Gulf Oil for Motor Vehicles," Report 15 in the series *The Annualized Social Cost of Motor-Vehicle Use in the United States*, based on 1990–1991 Data, UCD-ITS-RR-96-3(15) rev. 2, April 1996, rev. October 2006.
54. J. Robinson West, "Saudi Arabia, Iraq, and the Gulf," in *Energy Security*, ed. Jan Kalicki and David Goldwyn (Washington: Woodrow Wilson Center Press, 2005), pp. 197–218.
55. Robert Jervis, "Why the Bush Doctrine Cannot Be Sustained," *Political Science Quarterly* 120, no.3 (Fall 2005): 35177.
56. Saudi Arabia and Kuwait paid approximately \$33 billion (55 percent) toward the total cost of Desert Storm and Desert Shield, which was \$60 billion. The U.S. share was only \$6 billion (10 percent). U.S. Department of Defense, news release 125-M, May 5, 1992.
57. The claim that military costs are fixed rather than oil related is discussed in Portney et al.
58. Jonathan Rauch, "A Higher Gas Tax Is the Answer. Who'll Ask the Question?" *National Journal*, February 9, 2002.
59. This is such an obvious point that energy economists rarely bother to explore the issue in detail. To understand how the world crude oil market works is to understand that embargoes are unenforceable. See Philip Verleger, *Adjusting to Volatile Energy Prices* (Washington: Institute for International Economics, 1993) and M. A. Adelman, *The Genie out of the Bottle: World Oil Since 1970* (Cambridge, MA: MIT Press, 1995).
60. Energy Information Administration, *Annual Energy Review 2004*, Table 5.3.
61. Thomas Lee, Ben Ball Jr., and Richard Tabors, *Energy Aftermath* (Boston: Harvard Business School, 1990), p. 17.
62. *Ibid.*, p. 30. See also Edward Fried, "Oil Security: An Economic Phenomenon," in *Oil and America's Security*, ed. Edward Fried and Nanette Blandin (Washington: Brookings Institution, 1988), pp. 56–59.
63. Cited in Robert L. Bradley Jr., *The Mirage of Oil Protection* (Lanham, MD: University Press of America, 1989), p. 140. For similar arguments, see Francisco Parra, *Oil Politics: A Modern History of Petroleum* (New York: I. B. Tauris, 2004), pp. 184–85.
64. Adelman, p. 31. Former OPEC Secretary-General Francisco Parra makes the same point in Parra.
65. Philip Auerswald, "The Irrelevance of the Middle East," *American Interest*, May/June 2007, p. 22.
66. See Steven Lee Meyers, "Russian Gas Company Plans Steep Price Increase for Georgia," *New York Times*, November 3, 2006, p. A12; and Joseph Kahn, "China May Be Using Oil to Press North Korea," *New York Times*, October 31, 2006, p. A12.
67. Bin Laden has said on many occasions that he thinks the Saudi monarchy keeps oil prices below true market value in order to maintain friendly relations with the West.
68. Oil revenues are 40–50 percent of Iranian government revenues and 70–80 percent of Saudi government revenues. See Energy Information Administration, "Country Analysis Briefs," <http://www.eia.doe.gov/emeu/cabs/contents.html>. Iran's oil output increased steadily from 3.7 mbd in 2003 to 4.1 mbd in 2005. Energy Information Administration, *International Petroleum Monthly*, Table 4.1a
69. Data on Iranian production in 1978 and Saudi production in 2006 from the Energy Information Administration; http://tonto.eia.doe.gov/merquery/mer_data.asp?table=T11.01a and http://tonto.eia.doe.gov/merquery/mer_data.asp?table=T11.01b.
70. In 1978 the U.S. used 15,950 BTUs per (\$2000) dollar of GDP but only 8,970 BTUs per (\$2000) dollar of GDP in 2005, a reduction of 43.8 percent. And the BTUs used in 2005 came less from petroleum than in 1978 (47.5 percent of 1978 energy consumption was petroleum versus only 40.5 percent in 2005). Energy Information Administration, *Annual Energy*

Review 2005, Tables 1.3 and 1.5, pp. 9 and 13.

71. Calculation from Lundberg Survey, "Fatally Flawed Premise: Why Anti-Oil Weapon in War on Terror Won't Work," *Energy Détente* 27, no. 11 (November 30, 2006).

72. Data on international Islamic terrorism incidents and fatalities were taken from the Memorial Institute for the Prevention of Terrorism, Terrorism Knowledge Base, an interactive website maintained by the MIPT, <http://www.tkb.org/>. Data on that website comes from the RAND Terrorism Chronology and RAND-MIPT Terrorism Incident databases; the Terrorism Indictment database; and DFI International's research on terrorist organizations. Nominal Saudi oil prices were obtained from Energy Information Administration, *Annual Energy Review 2005*, p. 169, Table 5.19, "Landed Costs of Crude Imports From Selected Countries," and deflated with the GDP deflator. Unit root tests suggested that fatalities and Saudi oil prices had unit roots but terrorist incidents did not, so the former were first differenced before the regressions. Even after first differencing, auto correlation existed so autoregressive terms were added to each regression, which further weakened the insignificant relationships.

73. Mark Basile, "Going to the Source: Why Al Qaeda's Financial Network Is Likely to Withstand the Current War on Terrorist Financing," *Studies in Conflict and Terrorism* 27 (2004): 169-85.

74. Although little is known about funding trends associated with Iranian support for Hezbollah, the Iranian government probably spends no more than \$25-50 million on Hezbollah a year. Anthony Cordesman, "Iran's Support for Hezbollah in Lebanon," Center for Strategic and International Studies, July 15, 2006, p. 3. Even less is known about Saudi contributions to Islamic extremism. See Alfred Prados and Christopher Blanchard, "Saudi Arabia: Terrorist Financing Issues," RL32499, CRS Report for Congress, Congressional Research Service, updated December 8, 2004.

75. Lundberg Survey, p. 8.

76. For a brief review of the academic literature on this subject, which is somewhat mixed, see Paul Stevens, "Resource Impact: Curse or Blessing? A Literature Survey," *The Journal of Energy Literature* 9, no. 1 (June 2003): 22-24.

77. This is a crude calculation based on Ian Parry's estimate that a \$20 per barrel oil tax would reduce long-term world crude oil prices by 1-5 percent. See Ian Parry, "The Case for a Pay-by-the-Barrel Oil Tax," *Resources* (Fall 2006 27). A \$1 hike in the gas tax is the equivalent of imposing a tax on crude of \$42 per barrel if all the oil were used for gasoline,

but because only 44 percent of the oil consumed in the United States becomes gasoline (<http://www.eia.doe.gov/neic/infosheets/petroleumproducts.html>), the tax is equivalent to \$18.50, or close to Parry's original estimates of \$20, so we used the 1 to 5 percent estimate and \$65 a barrel crude. In 1998, the price of oil was \$13 per barrel in constant (2000) dollars. Average refiner acquisition costs in 2006 were about \$60 per barrel, or \$52 in constant (2000) dollars. To reduce prices from \$52 to \$13 is a reduction of 75 percent, which would require a 30-fold increase relative to Parry's calculation if the tax were on crude oil (30 * 2.5 percent, the middle of the 1-5 range, is 75 percent), or 60-fold on gasoline or about \$28 per gallon.

78. Energy Information Administration, *International Petroleum Monthly*, May 8, 2007, <http://www.eia.doe.gov/emeu/ipsr/t22.xls>.

79. Charles Ballard, J. Shoven, and J. Whalley, "General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States," *American Economic Review* 75 (1985): 128-38.

80. This is known as the "strong" double-dividend claim. Weaker versions of the double-dividend claim exist, but they are not relevant to the case for a major swap of more distortionary taxes in favor of less distortionary energy taxes. For a discussion of weaker double-dividend claims, see Lawrence Goulder, "Environmental Taxation and the 'Double Dividend': A Reader's Guide," National Bureau of Economic Research Working Paper 4896, October 1994, pp. 4-8.

81. Parry and Small 2005, p. 1286.

82. Stanford economist Lawrence Goulder, for instance, has written one of the seminal papers criticizing the strong double-dividend claim despite the fact that he supports raising the gasoline tax and is a member of Greg Mankiw's "Pigou Club." Weaker versions of the double-dividend claim, however, are on much firmer ground. See Goulder.

83. A. Lans Bovenberg and Ruud de Mooij, "Environmental Levies and Distortionary Taxation," *American Economic Review*, September, 1994, pp. 1085-1089. Bovenberg and de Mooij conclude that the double dividend argument holds only if the uncompensated wage elasticity of labor supply is negative, but empirical investigations of the labor market find that this is not the case.

84. Alan Auerbach and Laurence Kotlikoff, *Dynamic Fiscal Policy* (Cambridge, England: Cambridge University Press, 1987).

85. The fact that taxing capital creates more welfare loss than taxing labor explains why many

- economists support a switch from income taxes to consumption taxes. Dale Jorgenson and Kun-Young Yun, *Tax Policy and the Cost of Capital* (Oxford: Oxford University Press, 1990).
86. Goulder, pp. 15-16; Bovenberg and de Mooij; and A. Lans Bovenberg and Laurence Goulder, "Optimal Environmental Taxation in the Presence of Other Taxes: An Applied Equilibrium Analysis," Stanford University Working Paper, May, 1994.
87. Wallace Oates and Ian Parry, "Policy Analysis in the Presence of Distorting Taxes," *Journal of Policy Analysis and Management* 19 (Fall 2000) 603-14.
88. Stephen Smith, "Environmental and Public Finance Aspects of the Taxation of Energy," *Oxford Review of Economic Policy* 14, no. 4 (1998): 80-81.
89. See for instance Laurence Kotlikoff, "The Economic Impact of Replacing Federal Income Taxes with a Sales Tax," Cato Institute Policy Analysis 193, April 15, 1993.
90. Smith, p. 82.
91. For explicit concessions regarding the second-best nature of gasoline taxes, see Parry, "The Uneasy Case for Higher Gasoline Taxes," pp. 36-45; Newberry, "Why Tax Energy?" pp. 23-26, 29-31, and 35; and Metcalf.
92. See, for instance, Mankiw, p. A12.
93. Smith, p. 69.
94. Bovenberg and Goulder, and Ian Parry, "Pollution Taxes and Revenue Recycling," Working Paper, Economic Research Service, U.S. Department of Agriculture, April 1994, cited in Goulder, p. 30.
95. This is a well established and uncontroversial concept known in economics as "the general theory of the second best." See R. G. Lipsey and Kelvin Lancaster, "The General Theory of the Second Best," *Review of Economic Studies* 24, no. 1 (1956): 11-33; and O. Davis and A. Whinston, "Welfare Economics and the Theory of the Second Best," *Review of Economic Studies* 32 (1965): 1-14. For a contemporary summary of the theory, see Jean-Jacques Laffont, *Fundamentals of Public Economics* (Cambridge, MA: MIT Press, 1990), p. 167.
96. Mark Delucchi, "Should We Try to Get the Prices Right?" *Access Magazine* 16 (Spring 2000): 17. Clifford Winston and Chad Shirley, *Alternate Route* (Washington: Brookings Institution, 1998), p. 58.
97. Parry, Walls, and Harrington; and Delucchi, pp. 14-21.
98. David Mayhew, "Congress as Problem Solver," in *Promoting the General Welfare: New Perspectives on Government Performance*, ed. Alan Gerber and Eric Patashnik (Washington: Brookings Institution, 2006), pp. 219-36. Clifford Winston, *Government Failure versus Market Failure* (Washington: Brookings Institution, 2006).

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