

# How to Save Gas

*Pricing mechanisms, not fuel-economy standards, offer the best hope for reducing motor fuel consumption*

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As automotive fuel prices soared last summer, the need to conserve motor fuel was a popular talking point in the presidential campaign. Both President-elect Barack Obama and his rival U.S. Sen. John McCain emphasized the need to reduce consumption of motor fuel to reduce oil imports, cut exhaust emissions linked to global warming and lower prices at the pump.

But how? Except for a hiccup during the oil crisis of the late 1970s, gasoline consumption climbed inexorably between World War II and 2007 (see charts on page 33). Motor fuel, including diesel fuel used primarily by heavy trucks, currently accounts for about 60 percent of U.S. petroleum consumption. Declines in national fuel consumption this year showed the power of \$4-per-gallon gas to curb demand, but the goal stated on the campaign trail of substantially reducing fuel use seems a long way down the road.

In a market economy, the law of supply and demand ensures the efficient allocation of resources, promoting public welfare. But many economists view the market for motor fuel as flawed, because the market price doesn't reflect the costs of consumption—environmental damage and national security concerns, for example—that are borne by society. “The price we're paying for gasoline doesn't include the full social costs,” said Sarah West, an economist at Macalester College in St. Paul, Minn., who has studied fuel efficiency and conservation issues.

Because of this, the market price of fuel is inefficiently low, encouraging motorists to consume too much of it. Standard economic theory calls for govern-


ment to intervene in markets to address social costs or “negative externalities”—thereby restoring economic efficiency. For over 30 years, policymakers have tried to accomplish this by promoting greater automotive fuel efficiency, through either regulation or tax incentives.

Federal Corporate Average Fuel Economy standards are intended to save fuel by setting minimum average fuel economy targets for new passenger vehicles. During the presidential campaign, both candidates advocated tightening CAFE standards to help wean the country off foreign oil and cut greenhouse-gas emissions.

Government also promotes automotive fuel efficiency through incentives such as “clean vehicle” tax credits on some hybrid-electric and diesel vehicles and a new federal tax credit of at least \$2,500 for buyers of plug-in electric autos, part of economic stabilization legislation passed by Congress in October.

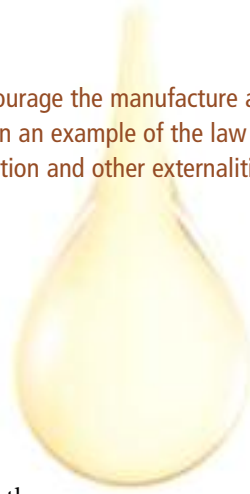
But these policies are at best a roundabout means of reducing fuel consumption and concomitant social costs. CAFE standards and tax breaks encourage the manufacture and purchase of fuel-efficient vehicles, but they don't cut fuel use directly and—in an example of the law of unintended consequences—may actually exacerbate traffic congestion and other externalities associated with driving.

Policymakers have shown a reluctance to take the more direct approach to curbing fuel consumption: relying on the power of prices. West and many other economists favor price-based policies that would



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reduce carbon emissions and enhance national security while addressing related problems such as traffic congestion and car crashes. They include:

- Increasing existing taxes on fuel so that the price includes the “external,” societal costs of consumption.
- Levying a new tax on emissions of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases.
- Charging fees for rush hour driving on congested highways.

But just as vehicle owners argue about the virtues of one make or model versus another, economists in this field are engaged in a lively debate about the merits of these various policies.

### The real cost of gas

If the price paid at the pump accounted for the full cost of burning motor fuel, it would be unnecessary for government to try to exert control over consumption. Prices would be high enough to ensure that consumers moderated their driving to conserve fuel. In

this utopian autoworld, an invisible hand on the pump would allocate fuel efficiently, with the least possible damage to the environment, the economy and public welfare.

But the actual market for automotive fuels is imperfect. As West noted, the price paid for fuel doesn't capture the full costs of consumption to society at large. Some of these externalities are a direct result of burning large amounts of refined petroleum. For example, passenger vehicles account for a fifth of nationwide emissions of CO<sub>2</sub>, the leading greenhouse gas. Every gallon of fuel consumed adds to the stock of atmospheric gases believed to be warming the planet, with potentially dire consequences for agriculture, human health and the economy decades from now.

In addition, U.S. dependence on foreign sources of oil to make motor fuel (60 percent of crude oil consumed in the United States is imported) exposes the economy to price manipulation by international cartels such as OPEC and provides revenue to unfriendly governments deemed to pose a threat to national security. However, economists disagree over the extent to which these factors constitute market failure.

Consuming fuel also runs up indirect external costs; millions of vehicles propelled by internal combustion contribute to traffic congestion in cities and other social ills. Between 1983 and 2007, miles driven on U.S. roads almost doubled, according to the Federal Highway Administration (FHA). A 2007 report by the Texas Transportation Institute estimates that travel delays and wasted fuel due to traffic congestion drain \$78 billion annually from the economy. More driving also increases the frequency of auto accidents—the costs of which society partially absorbs in the form of pedestrian injuries, traffic stoppages and property damage.

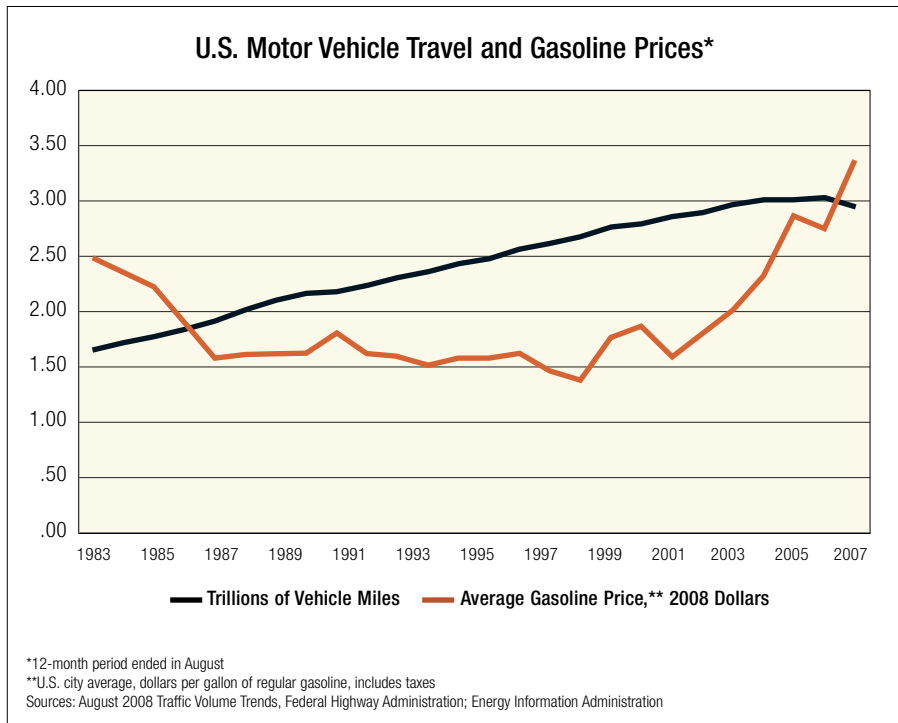
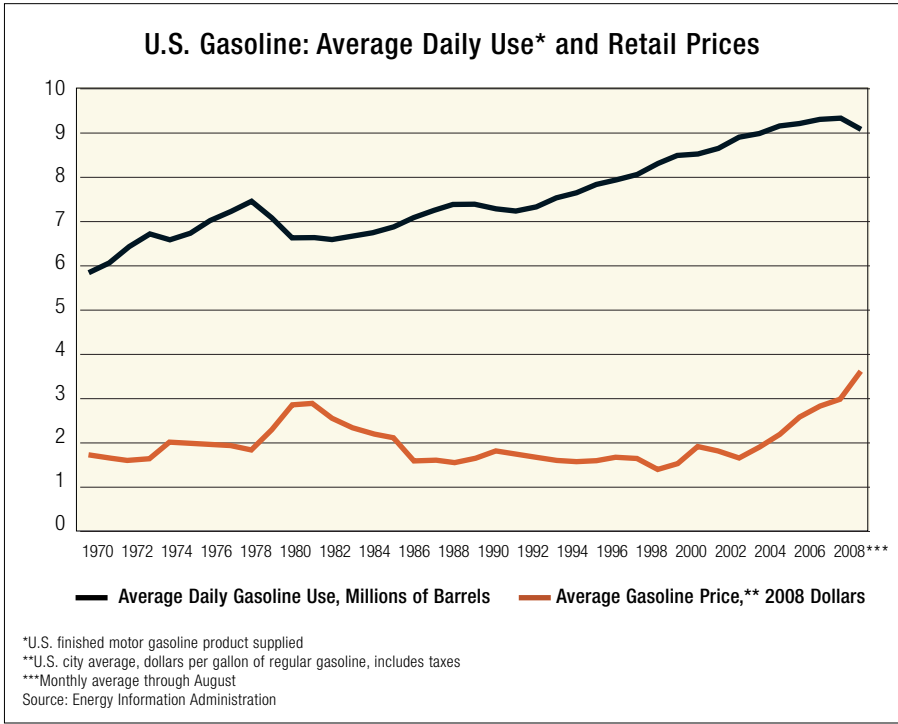
Other externalities related to driving include local pollution from tailpipe emissions and their impact on health (although progressively tougher emissions standards have reduced urban smog), highway noise and the downsides of urban sprawl.

When these external costs go unaccounted for, a market can be said to have failed—a good or service is underpriced, causing overconsumption and a loss of

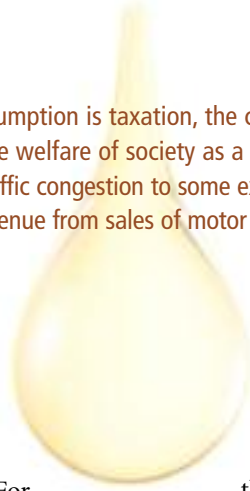
### In Brief

#### Capping fuel use

- Many economists view the market for motor fuel as flawed, because the market price doesn't account for social costs of consumption, such as environmental damage and traffic congestion. As a result, motorists consume fuel to excess.
- For over 30 years, government has tried to correct this market failure by promoting greater automotive fuel economy. But this is an inefficient way to reduce fuel use and the social costs associated with driving.
- Government policies favored by economists that rely on the power of prices to reduce both fuel consumption and driving include higher fuel taxes, taxes on greenhouse-gas emissions and congestion pricing on busy roads.



A different approach to curbing fuel consumption is taxation, the classic method of discouraging transactions that benefit some people while reducing the welfare of society as a whole. ... Such a corrective tax would have an immediate impact on fuel use, relieve traffic congestion to some extent and generate additional government revenue from sales of motor fuel.



public welfare. Traditionally, government intervenes in a failed market by either regulating it—enforcing performance standards, for example—or levying a tax or fee to discourage activities deemed harmful. For example, Congress has chosen to tax alcoholic beverages and cigarettes to curb their consumption (and generate revenue).

Motor fuel is also taxed to raise funds for highway construction and maintenance, and for public transit. But government's main tool for reducing consumption of fuel has been regulation, in the form of fuel-economy mandates.

### Drive more and save

Congress established CAFE standards for passenger vehicles in the wake of the 1973 Arab oil embargo, when fuel prices skyrocketed and gasoline was rationed across the country. Fleetwide averages for automobiles (cars must attain at least 27.5 miles per gallon, and the average for light trucks will rise to 23.1 mpg next year) foster greater fuel efficiency by penalizing automakers that fail to meet the standards.

Major revisions of the standards due to take effect in the 2011 model year, combined with new rules for nonpassenger vehicles, require annual increases in fuel efficiency, reaching 35 mpg in 2020 for the total fleet of autos and work vehicles. As a U.S. senator, Obama called for even stricter CAFE standards—a 4 percent annual increase in fuel efficiency to 40 mpg by 2020.

Despite the fact that overall U.S. fuel economy has declined since 1987 (due to the popularity of large SUVs and pickups, which until recently were exempt from the standards), the CAFE program has been credited with saving billions of barrels of fuel since its inception. That has curbed tailpipe emissions of CO<sub>2</sub> and presumably slowed the growth of oil imports from volatile regions of the world such as the Middle East—at least relative to what they would have been had CAFE not been enacted.

But CAFE standards inflict costs upon auto manufacturers and their customers. To avoid penalties, automakers must in many cases modify engines or reduce vehicle weight—and either absorb those

redesign costs or raise sticker prices. In addition, not all consumers value fuel economy, so forcing them to pay more for a CAFE-compliant model—an SUV that sacrifices acceleration for greater fuel efficiency, for example—reduces their welfare.

Moreover, a phenomenon called the “rebound effect” undercuts reductions in fuel consumption achieved by tightening CAFE standards. By lowering the operating costs of new vehicles—more fuel-efficient models burn less gas per mile—fuel-economy mandates encourage people to drive more, negating some of the fuel savings. Estimates of the size of the rebound effect vary widely, ranging from 5 percent to 20 percent of fuel savings erased in the first year after an increase in fuel-economy standards and 20 percent to 30 percent over the long term. In a 2007 paper, economists Kenneth Small and Kurt Van Dender of the University of California, Irvine, pegged the long-run rebound effect at 21 percent from 1966 to 2004, although it declined markedly in recent years.\*

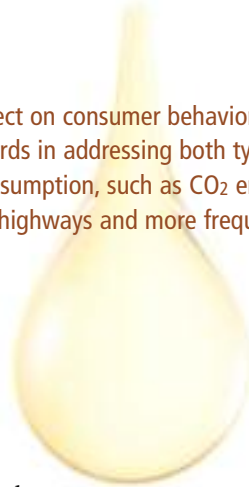
Because the rebound effect increases miles driven, raising CAFE standards may worsen traffic congestion and make auto accidents more likely. Several studies have found that these outcomes of increased driving exact a much greater toll on society than fuel-related externalities such as climate change.

High fuel prices like those that slammed pocket-books last summer increase demand for fuel economy, allowing automakers subject to CAFE standards to recoup some of their redesign costs by charging more for fuel-efficient vehicles. But high pump prices also boost the rebound effect because they increase the money saved by driving a fuel-efficient vehicle. Contacted via e-mail, Small estimated that a fuel price hike from \$2.50 to \$4 per gallon would double the rebound effect, income growth and other factors being equal.

Another, more obvious drawback of tougher CAFE standards is that they do nothing to improve the fuel

\*Income rose significantly between 2000 and 2004. As incomes rise, motorists become less sensitive to changes in fuel cost per mile, and time spent behind the wheel becomes more expensive. Both effects reduce miles driven when fuel economy increases.

So a fuel tax—which has the identical effect on consumer behavior as market-driven increases in fuel prices—would work better than CAFE standards in addressing both types of externalities caused by driving: those stemming directly from fuel consumption, such as CO<sub>2</sub> emissions, and those related to mileage, such as clogged highways and more frequent auto crashes.



economy of older, fuel-inefficient vehicles already on the road. A 2003 study by the Congressional Budget Office noted that an increase in CAFE standards wouldn't become fully effective until all vehicles currently in service were consigned to the junkyard—after about 14 years by CBO's reckoning.

These limitations—the rebound effect and a long time horizon for achieving significant reductions in fuel consumption—also apply to other policies intended to increase fuel economy, such as tax breaks on purchases of hybrid-electric cars and proposed “feebates” (fee + rebate)—government programs that penalize buyers of gas guzzlers and reward those who opt for smaller, fuel-efficient gas “sippers.” Last winter, the California Legislature considered a feebate program to reduce auto greenhouse-gas emissions, but the measure failed.

### A little extra for Uncle Sam

A different approach to curbing fuel consumption is taxation, the classic method of discouraging transactions that benefit some people while reducing the welfare of society as a whole. A number of economists, among them Gary Becker of the University of Chicago and N. Gregory Mankiw of Harvard University, have advocated raising the federal tax on motor fuel to reduce fuel consumption. Such a corrective (or Pigovian) tax would have an immediate impact on fuel use, relieve traffic congestion to some extent and generate additional government revenue from sales of motor fuel.

Unlike stricter CAFE standards, a higher fuel tax would reduce fuel use by older, generally less-efficient autos. Demand for motor fuel is fairly inelastic; it takes a big price jump to cause a small drop in consumption. Nevertheless, all drivers would respond in the short term to a tax-induced rise in pump prices by striving to save gas—driving slower on the freeway, biking or taking the bus to work, combining errands, vacationing closer to home. Over a period of a few years, some workers would also move to homes closer to their jobs in order to shorten their commutes. In its 2003 analysis, CBO calculated that a tax designed to

cut fuel consumption by 10 percent would save 42 percent more fuel over the initial 14 years than an equivalent increase in CAFE standards.

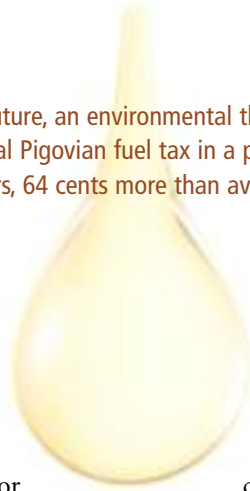
Another advantage of a fuel tax is the lack of a rebound effect that would offset reductions in fuel use. By raising operating costs per mile, the tax encourages people to drive less, not more, although after several years the tax would also lead to increases in fuel economy. The power of higher pump prices to depress driving was evident this year; for the first time since 1979, miles driven on U.S. highways and streets declined. In August, Americans drove 15 billion fewer vehicle miles—a drop of 5.6 percent—compared with the same month in 2007, according to FHA.

“It's clear that people are driving less as a result of higher gasoline prices,” said West of Macalester. “We're also seeing slowing, and sometimes decreases, in gasoline consumption overall.” So a fuel tax—which has the identical effect on consumer behavior as market-driven increases in fuel prices—would work better than CAFE standards in addressing both types of externalities caused by driving: those stemming directly from fuel consumption, such as CO<sub>2</sub> emissions, and those related to mileage, such as clogged highways and more frequent auto crashes.

How big a fuel tax would be required to account for the total external costs of driving? Miscalculating the magnitude of externalities—resulting in too large or too small a tax—would reduce public welfare. Gauging social costs is particularly difficult for fuel-related externalities such as climate change. For instance, estimates of the value of carbon abatement range from less than zero to well over \$100 per metric ton of CO<sub>2</sub>.

To justify raising the federal fuel tax, the sum of all negative externalities must exceed existing federal and state excise taxes on motor fuel (a combined average of 47 cents per gallon for gasoline), which already discourage fuel consumption and driving. Researchers at Resources for the Future, an environmental think tank based in Washington, D.C., took a stab at estimating the optimal Pigovian fuel tax in a paper published last year. Their figure: \$1.11 per gallon in 2007 dollars, 64 cents more than average current taxes on gasoline.

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There's also a public finance argument for using a fuel tax instead of fuel-economy mandates to cut fuel consumption. By increasing the price of a vital commodity, a fuel-tax hike would lower returns to labor and capital, dampening the overall level of economic activity. But a higher tax on fuel would also generate revenue—in contrast to the CAFE program, which will cost about \$5.2 million to administer in fiscal year 2009. If policymakers used the extra revenue to lower taxes on capital or labor, a higher fuel tax could result in a net increase in welfare. Cutting income taxes, for example, would encourage people to work and employers to hire, boosting economic output.

However, raising the federal fuel tax or introducing a carbon tax is likely to face staunch political opposition. One argument against motor fuel taxes is that they are regressive, unfairly burdening low-income households. Also, motorists have a loud voice in Congress; Americans of all income levels depend on auto travel to a much greater extent than Europeans and Japanese, who have readier access to mass transit. This is one reason why U.S. fuel taxes are the lowest among industrialized nations (roughly one-fifth the rate paid by western Europeans), and the federal tax has remained unchanged since 1993.

### Bumper-to-bumper externalities

For all its economic (if not political) advantages, a fuel tax doesn't address all the social costs of driving. A rise in pump prices due to the tax induces people to drive less, but roughly 50 percent to 60 percent of the drop in fuel use caused by higher prices comes from long-run increases in fuel economy, as people switch to vehicles that go farther on a tank of gas. Thus a fuel tax isn't the most efficient corrective for mileage-related externalities such as highway congestion and local pollution "because it is too indirect, causing greater shifts in fuel economy than in amount of travel," note Small and Ian Parry of Resources for the Future in a 2005 paper. This shortcoming is significant because mileage-related externalities account for the bulk of social costs associated with driving.

The same caveat applies to a tax or an equivalent

permit trading system to rein in greenhouse-gas emissions (see *The Region*, December 2007, online at [minneapolisfed.org](http://minneapolisfed.org)), which have also been proposed to curb fuel consumption. A carbon tax or emissions cap applied to fossil fuels would nudge up pump prices and therefore cut fuel use. But putting a price on automotive carbon, like taxing fuel, would go only part of the way toward alleviating miserable commutes and other outcomes of heavy auto use.

The optimum government policy, according to many economists, would combine a fuel or carbon tax with price-based programs that discourage driving, independent of the fuel consumed. One such program is congestion pricing, sometimes called road pricing: Drivers pay a surcharge for the privilege of using busy highways during periods of peak demand. To avoid the surcharge, some drivers opt to carpool or take public transport to and from work, effectively reducing traffic congestion—and fuel consumption. "If you could implement comprehensive congestion pricing to deal with the congestion externality, that would be great," Parry said.

Like raising fuel taxes, instituting congestion pricing may be a tough sell. So far, road pricing in the United States has been limited to the creation of free-way toll lanes in some cities; drivers in a hurry pay for access to lanes otherwise reserved for carpoolers and buses. Lawmakers have rejected broader initiatives—rolled out in Europe and East Asia—that apply congestion pricing to metro ring roads or entire downtowns. In 2007, New York City Mayor Michael Bloomberg proposed that drivers pay an \$8 congestion fee to venture into parts of Manhattan at peak hours on weekdays. City politicians and the public decried the plan as elitist, and it went nowhere.

Another antidote to mileage-related externalities—one that is being adopted by the private sector without government involvement—is pay-as-you-drive auto insurance. Standard auto insurance policies take no notice of how much the policyholder drives—increasing the risk of accident with each mile. Under PAYD plans offered by a few insurers, premiums are based on how many miles motorists drive annually, also taking into account individual driving habits. An

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onboard telemetering device keeps track of mileage, speed and acceleration. A study by the Brookings Institution published this year estimates that if all motorists paid for auto insurance per mile driven rather than in a lump sum, driving would decline by 8 percent nationwide and oil consumption would fall by about 4 percent.

### Prices: A driving force

The puzzle of how best to cut motor fuel consumption while also reducing collateral damage caused by driving has engaged transportation policy economists for more than 30 years. Not all researchers see eye to eye. For example, while most economists consider the rebound effect a persuasive argument against raising CAFE standards, Small and Van Dender disagree; because they expect the rebound effect to continue to shrink as incomes rise, they conclude that tightening CAFE standards can be as effective as increasing fuel taxes. Other economists favor taxation, but disagree about whether to tax motor fuel or economywide greenhouse-gas emissions (Parry prefers the latter). Both he and West endorse congestion pricing, but West sees it as a “second-best” solution in the event a fuel or carbon tax proves politically untenable.

Despite these differing viewpoints, one thing seems certain: The price paid at the pump doesn’t reflect the full cost driving imposes on the environment and society. The role of government is to correct that market failure, to enhance public welfare by making sure that motor fuel is not consumed to excess. The weight of the evidence suggests that pricing mechanisms curb consumption, and reduce driving, more efficiently than regulations or tax breaks designed to boost automotive fuel efficiency. That evidence includes the reaction of consumers to escalating fuel prices last summer. Price signals—whether sent by a fuel tax, road toll or insurance premium—possess a singular power to alter human behavior.

Congestion pricing and other policies that charge drivers by the mile instead of the gallon are likely to gain traction as highly fuel-efficient hybrid and electric vehicles become more prevalent on American

roads. Demand for these vehicles—driven primarily by consumer preferences, not CAFE standards or tax credits—is undermining the funding base for highway construction and maintenance.

“[T]he highways of tomorrow cannot be supported solely by the federal gas tax,” U.S. Secretary of Transportation Mary Peters said last summer, noting the diminished flow of revenue into the Highway Trust Fund.

Implicit in all the discussion of fuel efficiency by the presidential candidates last summer was the assumption that conserving fuel would lower pump prices, helping cash-strapped households to make ends meet. Prices dropped this fall, partly because of slackening demand and a weakened economy. However, any attempt to significantly reduce fuel prices over the long term by tightening CAFE standards, levying a fuel tax or any other government intervention would likely fail.

Crude oil prices largely determine the price of motor fuel, and oil prices are set in international markets. Most analysts expect demand from developing nations such as China and India—which in this decade grew at a faster pace than U.S. consumption—to maintain upward pressure on oil and fuel prices. “Even if there was now a possibility of the U.S. affecting the price of fuel through reducing gasoline consumption, the potential for that occurring in the future will be less,” West said.

The world’s oil consumption has plummeted along with its economic fortunes in recent months, but West and other economists expect a resurgence of demand—and rising pump prices in the United States—when global markets get back on the road to recovery. **R**