The Ethanol Boondoggle

By Jerry Taylor and Peter Van Doren

The closest thing to a state religion in America today isn't Christianity – it's corn. Whether liberal or conservative, Democrat or Republican, urban or rural, virtually everyone in the business of offering opinions is in firm and total agreement that America's ills, from Islamic terrorism to global warming to economic stagnation in the heartland, could be solved by a hefty dose of 200-proof grain alcohol.

Virtually everyone, however, does not include economists worthy of their No Free Lunch buttons. To them, the dizzying array of federal, state and local subsidies, preferences and mandates for ethanol fuel are a sad reflection of how a mix of cynical politics and we-can-do-anything American naiveté can cloud minds and distort markets. If ethanol had economic merit, no government assistance would be needed. Investors would pour money into the ethanol business and profits would be made, even as alcohol displaced oil in the markets for liquid fuels.

If ethanol lacks economic merit, however, no amount of subsidy is likely to provide it. And make no mistake – welfare

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directed now (and for many decades) at the ethanol industry is staggering. A comprehensive study recently published by the nonpartisan International Institute for Sustainable Development estimates that federal and state subsidies for ethanol in 2006 were somewhere between $5.1 billion and $6.8 billion, and that they will soon increase, to as much as $8.7 billion annually, assuming no further change in policy.

Those estimates, moreover, are conservative, because they do not include the benefits bestowed by federal and state ethanol-consumption mandates, loan guarantees, subsidized loans, implicit subsidies provided by tax-exempt bond financing for the construction of ethanol processing plants, subsidized water for corn production, and state vehicle-purchase incentives. Don't forget the regulatory loophole given to manufacturers of flex-fueled vehicles – cars that can run on gasoline or blends of gasoline and ethanol – under federal automobile fuel-efficiency mandates.

Without those subsidies, there would be no corn-based ethanol production at all. According to the U.S. Department of Agriculture, corn ethanol's variable production costs are 96 cents a gallon, while capital costs average $1.57. The upshot is that ethanol costs an average of $2.53 a gallon to produce in the United States, far more than the cost of conventional gasoline. The stuff only makes it to the pump because the feds and the states give it a big financial boost. In 2006, the subsidies translated into $1.05 to $1.38 per gallon of ethanol, or 42 percent to 55 percent of its wholesale market price.

Proponents justify this marketing intervention with a number of arguments. Ethanol subsidies, we are told:

- Level the playing field, which is distorted by subsidies to the oil industry.
- Move us closer to energy independence, which reduces the economic, political and national-security costs associated with oil consumption.
- Reduce the flow of oil revenues to the Middle East and, as a consequence, starve the military capabilities of Islamic terrorists.
- Promote cleaner-burning fuel, which, in turn, improves air quality and reduces greenhouse gas emissions.
- Provide an economic stimulus to rural America by creating jobs and income that would otherwise not exist.

Close examination reveals that these are flimsy rationales for the real purpose of the program – to convince urban voters and their representatives to willingly hand over their money to corn farmers and the rapidly growing ranks of investors in ethanol plants.

ETHANOL AND THE UNLEVEL PLAYING FIELD

Contrary to popular belief, federal oil subsidies are quite modest. When the Department of Energy examined those subsidies in 1999 (the most recent year in which a comprehensive analysis was performed), researchers found that they totaled a mere $567 million per year. That figure did not change significantly until passage of the 2005 Energy Policy Act, which added an estimated $1.4 billion of subsidies for the oil industry, spread out over a decade. So, while no comprehensive up-to-date assessment of federal oil subsidies is currently available, the 2006 total is certainly less than $1 billion – which translates to 0.3 cents per gallon of gasoline.

More important for our purposes, however, is the fact that federal oil subsidies do not

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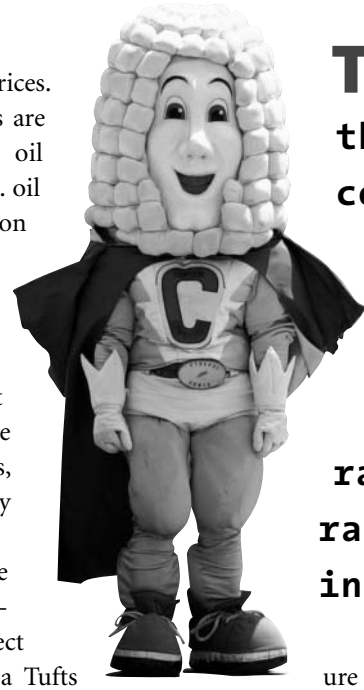
significantly affect gasoline prices. That's because U.S. oil prices are established in global crude oil markets, and subsidies to U.S. oil producers have little effect on global supply and demand. Oil subsidies may generate modest windfalls for corporations in the oil business and their employees, but they do not have a noticeable effect on oil prices and, thus, on the efficiency of energy markets.



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Oil subsidies might reduce prices if they increased global oil supply by enough to affect global crude oil prices. But a Tufts University economist, Gilbert Metcalf, calculates that federal oil subsidies increase United States production by no more than 0.3 percent and that global prices are no more than 0.7 percent lower as a consequence.

In any case, the proper remedy for an objectionable subsidy is its elimination, not the imposition of a countervailing subsidy. The riposte that oil subsidies are impossible to eradicate, thus necessitating a "second-best" response of counter-subsidy – is hardly persuasive. Oil subsidies have been eliminated in the past – most recently, during the Reagan administration.

ETHANOL AND ENERGY INDEPENDENCE

Many people believe that the less oil we import from the Middle East, the less vulnerable we are to supply disruptions and, as a consequence, the less we need to spend to keep the sea lanes clear, the production facilities safe and the region at peace and friendly to the United States. But many analysts who have tried to calculate the national security costs associated with oil consumption put the figure at close to zero, because the great bulk of these military outlays would be made even if there were little risk of oil disruptions in the Middle East. We think that assessment is correct, and that there is no national security externality specifically associated with gasoline consumption. Consequently, there is no need for federal intervention in fuel markets to address it.

Moreover, energy independence, on its face, would do nothing to protect the American economy from supply disruptions abroad. Since oil prices are established in world markets and oil is a fungible commodity moving anonymously around the globe, a supply disruption in the Middle East means that the price of crude oil everywhere goes up by roughly the same amount, and it does so instantaneously. Thus, the only way a country that produces as much oil as it consumes could actually protect domestic consumers from changes in global oil prices linked to supply disruptions elsewhere would be to embargo oil exports – behavior that our allies in Europe and Asia would not take lightly.

Nor would energy independence protect

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the economy from embargoes by foreign producers. Once oil enters the world market, buyers – not sellers – dictate its ultimate destination. Only if every single nation on Earth refused to sell to the embargoed nation would an oil embargo keep foreign petroleum out of that nation's ports. An attempt to deny oil to a specific country thus becomes a supply restriction with a lesser impact on the entire world market.

During the 1973 oil embargo, when the major Arab producers cut sales to supporters of Israel in the Yom Kippur war, transportation costs increased slightly because of the diversions, reroutings and transshipments that followed, but the flow of oil from abroad was otherwise unaffected. The long lines and shortages that coincided with the embargo were a result of domestic price controls, production cutbacks and consumers' efforts to hoard existing supplies – not of the embargo directly.

Energy independence might reduce the interest that politicians have in the geopolitical situation in the Middle East, but then again, it might not. As a major energy producer itself, the United Kingdom does not import substantial amounts of oil from the Middle East. But it remains heavily engaged in the region nonetheless. By the same token, there are many reasons why the United States is politically and militarily involved in the Middle East, including the defense of Israel, the hunt for Al Qaeda terrorists and the worry that producers might use oil revenues to build nuclear weapons. Those reasons won't vanish if oil imports decline, particularly given that supply disruptions there affect our economy whether we're importing oil from the region or not.

It is still fair to say that the less oil we consume, the less damage that supply disruptions will cause to our pocketbooks and to the economy as a whole. But consumers have plenty of ways to hedge against future supply disruptions if they are so inclined. They can buy fuel-efficient cars, choose to live near mass transit hubs, buy stock in oil companies or invest in oil futures. There is now even an exchange-traded mutual fund (the United States Oil Fund) that permits anyone to bet on the price of oil at minimal cost. Government should not force consumers to hedge against their will, or to dictate the manner in which hedging will occur (in this case, via ethanol consumption).

Economists disagree about whether oil-supply disruptions lead to recessions and/or inflation – externalities that could, in theory, justify measures to diversify fuel sources. Hillard Huntington of Stanford University estimates that the external macroeconomic costs associated with oil supply disruptions may approach $5 a barrel (12 cents per gallon of gasoline). But Rajeev Dhawan and Kartsen Jeske, economists at the Federal Reserve Bank of Atlanta, argue that as long as the economy is free of wage and price controls, the effect of disruptions on GDP is likely to be minor.

In any event, shifting to ethanol would not necessarily provide consumers with a more reliable source of energy. First, corn yields vary with the weather, and corn prices are relatively volatile as a consequence. A major push to displace oil with corn-based ethanol might simply result in the substitution of one price-volatile commodity for another. Second, relying exclusively on one set of producers (in this case, farmers in the American Midwest) is arguably riskier than relying on a multiple producers via international trade. Putting all of our eggs into one basket is as risky in fuel markets as putting all our 401(k) money into one company's stock.

Regardless, the goal of price stability is in

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itself is a poor argument for investing in corn rather than oil for transportation needs. Oil markets deliver low-cost energy most of the time and high-cost energy some of the time. Ethanol markets deliver high-cost energy all of the time and may – or may not – prove less volatile than oil markets. The fact that no one has found it profitable to offer price-smoothing services (such as long-term supply contracts) to motorists suggests that consumers are disinclined to pay more for protection against volatile fuel prices.

ETHANOL AND THE WAR ON TERROR

Some foreign-policy analysts and political pundits are touting ethanol subsidies as a vital component of America's defense against terrorism. The less we spend on oil, the argument goes, the less we need to spend fighting Islamic terrorists, who finance their activities to a large extent with American petrodollars. In this view, reducing the flow of dollars to the Middle East would reduce the capabilities of a whole host of problematic state and non-state actors.

Well, hardly. A robust ethanol market would reduce oil revenues for producer states, but not by much. That's because ethanol cannot be produced in sufficient volume to significantly affect global demand for other liquid fuels. If all the corn produced in America in 2005 were dedicated to ethanol production (only 14 percent of it is so dedicated today), it would have reduced U.S. demand for gasoline by, at most, 12 percent. By Department of Energy estimates, in order for corn ethanol to displace gasoline completely in the United States, we would need to appropriate all crop land in the country, turn it over to corn-ethanol production and then find 20 percent more land on top of that.

Economic reality, of course, precludes any such thing. The Department of Energy argues that 700,000 barrels per day by 2030 is

the "practical limit" for U.S. corn ethanol production, which would amount to about 6 percent of the U.S. transportation fuels market by that time.

If the government is correct, ethanol will have, at best, a modest impact on global oil demand – and thus, on global oil prices and profits. Because ethanol has only three-quarters of the energy content of petroleum, 700,000 barrels of ethanol would displace about 525,000 barrels of oil. Accordingly, if America could fully reach its realistic potential for ethanol production as soon as next year, it would reduce global oil demand by only about six-tenths of 1 percent. Over the long haul, that would reduce oil prices by all of three-tenths of 1 percent – about 20 cents per barrel at current world prices. It's unlikely that such a modest drop in oil profits would have any measurable effect on the dollars flowing to Islamic terrorists.

But even if ethanol subsidies were to reduce the price of crude oil by a substantial amount, it's not clear that would hurt Islamic terrorists. Terrorism is a relatively low-cost endeavor and oil revenues appear to be unnecessary to pay for it. The fact that just a few hundred thousand dollars paid for the 9/11 attacks suggests that the limiting factor for terrorism is expertise, fanaticism and manpower – not petrodollars.

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 rather low. But the 1990s also witnessed the worldwide spread of Wahhabi fundamentalism, the buildup of Hezbollah and the coming of age of Al Qaeda. Note, too, that Al Qaeda terrorists in the 1990s relied on help from state sponsors, including 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 oil prices fall, that would mean smaller producer-state subsidies to young, underemployed Muslims and less-prosperous Middle Eastern economies. Thus, to the extent that deteriorating economic conditions breed social discontent and political resentment, promoting ethanol to reduce revenues flowing to Islamic terrorists might perversely increase the recruitment pool for Islamic terrorists and make matters worse.

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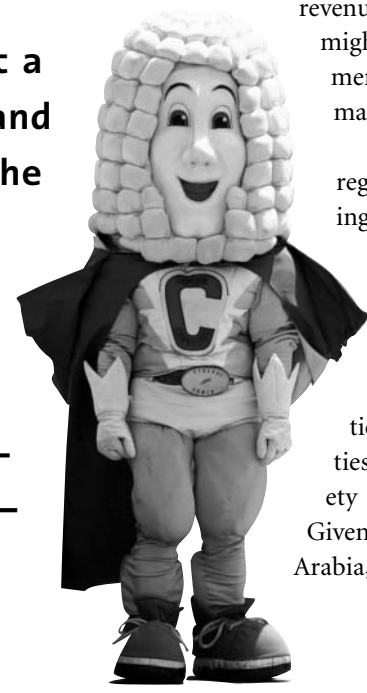

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Reducing oil revenue to noxious regimes might be a risk worth taking if billions were finding their way from such regimes into Al Qaeda's coffers. But that seems unlikely. Everything we know suggests that Al Qaeda cells are pay-as-you-go operations that rely on Islamic charities, smuggling, and garden-variety crime to finance their activities. Given that the governments of Saudi Arabia, Kuwait and other petro-states in

the region are slated for extinction should bin Laden have his way, those governments have no interest in facilitating the transfer of oil revenue to post office boxes in Pakistan.

Producer states do, indeed, use oil revenues to finance ideological extremism; 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 they would cease and desist simply because oil profits were down. They certainly weren't deterred by meager revenues in the 1990s.

ETHANOL AND THE ENVIRONMENT

One of the most commonly heard claims about ethanol is that it reduces automobile pollution. Archer Daniels Midland, the gigantic commodities processor, has paid for an avalanche of advertising for some years now suggesting that ethanol is the thin yellow kernel standing between us and environmental Armageddon.

Calling these claims the equivalent of the Big Lie is probably harsh, but it's also accurate. The only thorough appraisal of the peer-reviewed and technical literature of which we are aware of was published last year by Prof. Robert Niven of the Australian Defense Force Academy at the University of New South Wales. He found that when evaporative emissions are taken into account, E10 (fuel that's nine parts conventional gasoline to one part ethanol, the standard mix in service stations in the United States) actually increases emissions of total hydrocarbons, non-methane organic compounds and volatile toxins. Photochemical smog is worsened by ethanol consumption, while ambient concentrations of toxic chemicals are higher as well. By no coincidence, air pollution is even worse from E85, the 85 percent ethanol fuel now being heavily promoted by General Motors.

The picture is a bit better for greenhouse gas emissions, but not by much. Niven's review found that E10 offers only a 1 percent to 5 percent reduction of greenhouse emissions over conventional gasoline. The use of pure ethanol as a transportation fuel, however, as is used in Brazil, might reduce this category of emissions by up to 12 percent.

Note, though, that even this latter number is hard to pin down because of the larger disagreements about the energy needed to produce ethanol. Those who believe that ethanol production requires more fossil fuels – something has to power the tractors that till the fields, provide feed stocks for the chemical fertilizers and fire the boilers that distill the alcohol – than it actually generates, assert that ethanol has little impact on overall greenhouse gas emissions. Those who believe that ethanol has a positive net energy balance produce higher estimates for greenhouse gas savings. The debate surrounding ethanol's net energy balance is highly uncertain and data to settle the matter is not available.

In any event, this debate about life-cycle emissions from ethanol misses the point that reducing greenhouse gas emissions via ethanol would be an incredibly costly proposition – $250 per ton according to a recent report by the International Energy Agency. Moreover, that's a conservative estimate, because the agency considered only greenhouse gas emissions from automobile tailpipes. Given that most of the emissions associated with ethanol come from upstream in the production process, a full accounting would inflate its estimate dramatically.

Spending $250 (at the very least) to remove a ton of carbon from the atmosphere is an incredibly expensive way to get the job done – and one that surely costs more than it benefits the environment. William Nordhaus of Yale, for example, calculates that an

optimal policy of greenhouse gas controls would embrace abatement costs of between $15 and $22 per ton of carbon in the United States. Accordingly, employing ethanol to reduce greenhouse gas emissions is fantastically wasteful.

Wait, it gets worse. Although the environmental debate regarding ethanol is almost exclusively concerned with air-quality issues, a forgotten dimension concerns the effect of ethanol consumption on land use. Profitable corn production requires tremendous amounts of fertilizer, pesticide and water. Increasing the demand for ethanol would increase the amount of land dedicated to corn production. And that would mean more water pollution, less water for other uses, and more ecosystem destruction.

In short, then, ethanol promises to reduce greenhouse gas emissions, but not by very much and at an unacceptable cost since there are any number of less expensive means to the same end. To add to the insult, ethanol worsens air and water quality and contributes to habitat destruction.

ETHANOL AND RURAL ECONOMIC REVITALIZATION

While all of these arguments are made to justify ethanol subsidies, it's clear that the main reason the program has support in Washington is because ethanol subsidies increase corn prices and thus, farm and corn-processor income. The program concentrates great benefits on a few but diffuses costs to the many – the classic recipe for interest-group-driven government initiatives.

The rationales offered for the subsidies are useful narratives designed to convince non-farmers to embrace a program that will make them poorer so that some farmers can be richer. The highest-minded hope is that the subsidies will do something to reverse the long-term economic decline that has plagued rural towns and farms since the mechanization of agriculture in the late 19th century.

But as a morally uplifting project, ethanol gets poor grades. For starters, the belief that the transfer of wealth from non-farmers to farmers is progressive is not supported by the data. U.S. farm households earn about 11 percent more on average than non-farm households, and there is no particular reason to believe that the primary beneficiaries of more farm largesse would go to the poorest of those who still work the land.

And even if redistribution from the relatively poor to the relatively rich is something that political majorities wish to engage in, direct transfer payments would be preferable to the indirect transfer payments that follow from the ethanol program. That's because ethanol subsidies generate collateral damage. For instance, while rising corn prices (which are expected to go up 50 percent in 2007, due largely to the federal ethanol mandate) certainly help corn farmers, they hurt poultry, hog and cattle farmers, who rely on corn feed for their livestock. Increases in market demand for ethanol likewise help those who own ethanol-processing facilities, but harm soybean farmers, because many of the derivative products associated with ethanol production (like high-protein animal feed) compete in markets once dominated by soybean producers. In short, ethanol subsides help some agribusinesses but hurt others.

Subsidy proponents also frequently overlook the fact the benefits bestowed by rising corn prices are capitalized into land values, and thus the wealth transfers associated with ethanol subsidies are almost completely captured by incumbent landowners. Accordingly, those who wish to enter into or expand in the farming business by buying or renting

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land will find that the subsidies provide little benefit to them. Note, too, that the more land one owns, the larger one's share of the federal subsidy will be – which highlights the truly regressive nature of the ethanol subsidy program.

Whether rural America witnesses a net increase in jobs as a consequence of the subsidies is almost immaterial from an economic perspective. After all, if the metric by which we were to judge public policy was the impact that a specific program might have on jobs in one narrow but favored slice of the economy, then banning all mechanized farm equipment and prohibiting farm imports would create far more jobs in rural America than is created by ethanol subsidies. No sane person would advocate turning back the clock in this way – unless, of course, rural job creation were to trump all other considerations.

SUBSIDIES AND MARKET TRANSFORMATION

Would long-term, government subsidies trigger technological and organizational gains that transform the ethanol industry into a more productive enterprise, capable of delivering fuel at competitive prices? Subsidy proponents point to the Brazilian experience, where ethanol fuels have a big chunk of the market, as evidence of the miracle to be had.

A close examination of Brazil's ethanol market, however, reveals that major subsidies still persist and that ethanol there (made from

sugar cane rather than corn) almost certainly couldn't compete in the market without government support.

Brazil's ethanol program was launched in 1975, when its dictator, Gen. Ernesto Geisel, ordered the country's gasoline to be mixed with 10 percent ethanol. That requirement was increased to 25 percent over the next five years and, under democratically elected governments, it has since varied between 20 and 26 percent. Generous subsidies were initially provided to sugar cane growers and ethanol processors, as well as to car manufacturers who built vehicles that could run on significant concentrations of ethanol fuels. But the oil price collapse of 1986 led the government to cut back on some of the most financially burdensome of those subsidies.

At present, Brazil provides a liberal tax subsidy to hydrous-ethanol producers (fuel that is about 95 percent ethanol and 5 percent water) and manufacturers who produce vehicles that can run on high-ethanol fuel blends. The government also imposes a national ban on competing diesel-powered cars (whose fuel costs are substantially below the cost of 25 percent sugar-cane fuel), maintains a federal alcohol-storage program to subsidize inventory holdings, and enforces a 21.5 percent import duty on foreign ethanol.

As a consequence, ethanol's share of the Brazilian motor vehicle fuels market has ranged between 40 and 55 percent since the mid-1980s. It's impossible to say, however, what the market share for ethanol might be without government-mandated use and other forms of assistance. The fact that Brazil was importing ethanol even with a steep import duty in place as late as January 2001 – and from the United States no less! – suggests that the marginal production cost of sugar ethanol may be substantially higher than that of American corn ethanol.

In short, Brazil's subsidy program worked if we define "worked" as creating a significant market. It probably has not worked, however, if we define it as creating an industry that could compete without government help.

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The American experience has been no better. Two economists, Richard Duke (McKinsey) and Daniel Kammen (University of California at Berkeley) constructed a model in 1999 to compare the benefits and costs of various federal market-transformation programs. While they found some evidence for the proposition that subsidies might help uneconomic industries become economically competitive in some cases, they found that federal ethanol subsidies have provided no net economic benefit despite more than 20 years of handholding.

"The ethanol market would collapse without the federal subsidy," they found, and additional subsidies were unlikely to improve matters because there are virtually no economies of scale associated with ethanol processing, production costs have declined only glacially over time, and ethanol production is a very mature technology. "It is therefore difficult to imagine a scenario," they conclude, "under which continuing the ethanol program can yield" a net gain to the economy.

THE BIG PICTURE

Thus far, we have confined our discussion to corn and sugar cane ethanol. But what about cellulosic ethanol? The former uses the fruit of the plants in question, where a greater portion of the energy content is concentrated. The latter uses all of the plant's biomass – stalks, leaves, everything – to produce ethanol, and is the great long-term hope of ethanol proponents. Congress mandated that hope into law: the 2005 Energy Policy Act requires refiners to use 250 million gallons of cellulosic ethanol a year, starting in 2012.

The prospects aren't attractive, however, because the production costs of cellulosic ethanol are even higher than the costs of making alcohol from the fruit of the plant, and are likely to remain higher. With only a handful of cellulosic ethanol production facilities in the world, the Department of Energy's best guess is that cellulosic ethanol probably costs about $3.35 a gallon to produce at present. If all goes well, that might drop to $2.43 per gallon by 2020.

Cellulosic ethanol is, in theory, more attractive than corn ethanol because many of the plants we might harvest for processing require less fertilizer, pesticide and irrigated water to produce than corn does. Unfortunately, though, the energy yields are also significantly lower. Accordingly, even if production costs come down, cellulosic ethanol is unlikely to ever contribute more than a trivial amount to the transportation fuels market.

Of course, what the future holds for technology is unknowable. Perhaps scientists will engineer energy-intensive crops that can be harvested and processed at minimal cost. If that were to happen, we would have no complaint. But subsidies for existing technologies are unlikely to hasten that sort of market transformation and have been economically and environmentally counterproductive.

One might be tempted to cite the invasion of Wall Street into the ethanol industry as evidence that smart people with a lot of money are willing to bet to the contrary. But there is a better explanation: many ethanol investments make perfect sense in light of existing mandates to use the stuff and the lavish subsidies available to distill it. Without government favoritism, it's unlikely that investment would be more than a tiny fraction of its present level. In short, people are investing based on the politics of ethanol subsidies, not the economics of ethanol production.

Corn ethanol, as we noted at the outset, is more a religion than a reasoned proposition. People are entitled to their religious beliefs. But there ought to be a steep wall between church and state. M