Clearing the Air

A Policy Analysis of the Ethanol Excise Tax Credit

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Established in 1978, the ethanol excise tax credit has been a resounding success in helping establish a vibrant corn ethanol market, with almost 11 billion gallons produced in 2009. However, the original goals of the credit—energy security and oil independence—have not been significantly aided and, by at least some measures, have actually been hindered by the subsidy. Secondary environmental goals, such as avoidance of carbon emissions from motor fuels, show limited success. Ex post cost-benefit analyses of the subsidy have shown that it has negative to zero cost-benefit ratios and that socially optimal levels are well below current tax credit rates. The credit had a high dollar cost of $4.8 billion in 2009, and has also increased corn prices. Finally, development of a host of alternatives, such as cellulosic ethanol, have been retarded by the creation of hegemonic constituencies dependent on the credit.

Introduction

Oil dependence has been a hot-button, political issue since the 1970s energy crisis thrust it into focus. While the United States is still very reliant on foreign oil, especially in the area of transportation, one proposed potential remedy to reliance was domestic production of alternative fuels, mainly ethanol. To this aim, the federal government first established a tax credit for ethanol fuels as part of the *Energy Tax Act of 1978* with a 40 cents-per-gallon of ethanol blended exemption from gasoline excise taxes.

Table 1:

Federal Legislation Affecting Ethanol Production

Law Title	Excise Tax Exemption Amount	Notes
Energy Tax Act of 1978	40 cents-per-gallon	Initiating tax expenditure legislation.
Ethanol Import Tariff of 1980	40 cents-per-gallon	Established a corresponding tariff on imported ethanol to support domestic production.
Omnibus Budget Reconciliation Act of 1990	54 cents-per-gallon	Increased excise tax credit by 35%.
Clean Air Act Amendments of 1990	54 cents-per-gallon	Established a requirement for an oxygenate to be added to gasoline sold in "severely" polluted areas – which led to adoption of methyl tert-butyl ether (MTBE) as an additive.
Energy Policy Act of 1992	54 cents-per-gallon	Established required minimum for blending ethanol in gasoline; 10% of all fuels sold in 2000 must be blended.
1998 Transportation Equity Act for the 21st Century	54 cents-per-gallon	Extended exemption credit through September 30, 2007.
American Jobs Creation Act of 2004	51 cents-per-gallon	Modified the credit into the Volumetric Ethanol Excise Tax Credit (VEETC) so that the credit would not reduce dedicated Highway Trust Funds. Extended expiration to Dec. 31, 2010.
Energy Policy Act of 2005	51 cents-per-gallon	Removed oxygenate requirements from the Clean Air Act, but retained EPA authority to require gasoline blending in polluted areas (MTBE phased out in preference for ethanol). Also mandates levels of ethanol blending via a Renewable Fuel Standard (RFS), built off of the Energy Policy Act of 1992.
Energy Independence and Security Act of 2007	51 cents-per-gallon	Increased amounts of ethanol to be blended required under RFS.
2008 Farm Bill	45 cents-per-gallon	Decreased ethanol tax exemption amount but added increased exemption for cellulosic ethanol.

Source: GAO 2000, Department of Energy 2009, Texas State Energy Conservation Office 2009.

The original policy theory proposed that subsidizing corn ethanol production would benefit farmers while also combating the oil security issue, with potentially minor increases in food prices (GAO 2000).

From its humble beginnings in 1978 to the present, the federal ethanol excise tax exemption has been increased and decreased and generally modified, as summarized in Table 1. The tax credit remained largely unchanged until 1990 when it was increased by 35 percent to 54 cents-per-gallon. In the same year, the Clean Air Act was amended to include a requirement to add oxygenates to motor fuel in areas with severe air pollution. This lead to the adoption of methyl tert-butyl ether (MTBE) as an oxygenate, which was a cheaper oxygenate alternative than ethanol. Despite MTBE having been found to have unanticipated drinking water impacts and the oxygenate requirements being abolished in 2005, the Environmental Protection Agency (EPA) still retained authority to set broader blending requirements. Blending requirements in general were established by the *Energy Policy Act of 1992*, and were later expanded in 2005 into the Renewable Fuel Standard (RFS), which was increased in 2007. While blending requirements have increased, the actual exemption amount has decreased—down to 51 cents-per-gallon in 2004 and to 45 cents-per-gallon in 2008. However, in the *2008 Farm Bill*, the excise tax exemption was divided into two different rates for corn ethanol and cellulosic ethanol, with cellulosic ethanol receiving a higher exemption. Additionally, several states have ethanol production incentives of various kinds, and there exist smaller federal programs that incentivize ethanol gas stations, research and development, and production (GAO 2007a).

In order to analyze the United States' ethanol policy, the first step will be to construct a policy framework as to why the ethanol subsidy exists. This policy framework will focus on the main issues of oil security and environmental benefits. From that, an examination of the effectiveness of the subsidy will be conducted, looking at its cost-effectiveness, economic efficiency, and program evaluation. And finally, a sample of possible policy alternatives to address identified weaknesses will be proposed.

Policy Goals for Ethanol Subsidization

Oil Security as a Policy Driver

In general, the goal of increasing oil security was the primary driver of the ethanol subsidization policy through the 1990s. In a 1996 report, the Government Accountability Office (GAO) found that transportation sector oil usage surpassed domestic production by 38 percent. "Therefore, the development of alternative fuels and vehicles that can cost-effectively decrease the transportation sector's use of oil could substantially reduce the economy's dependence on oil" (GAO 1996, 64). This line of reasoning was the basis for establishing complementary governmental programs to assist domestic ethanol production. However, in the 1990s, the ethanol subsidization proved to be less successful than was hoped, or at least not as successful as the initiatives of the nation leading ethanol production, Brazil. Starting in 1976, Brazil had similar governmental initiatives that encouraged domestic ethanol production for gasoline displacement. By the late 1990s, those Brazilian production incentives were maturing, producing an annual 4 billion gallons of ethanol—a level that the United States only reached in 2006 (Rico 2007).

There is one central difference in the comparison of Brazilian ethanol production and domestic U.S. production. Brazil produces ethanol from sugar cane that is highly energy efficient, outputting approximately nine units of energy for every one used to grow the sugar cane. The best feedstock the United States has is corn, which has been estimated to output 1.3 units of energy for every unit used to grow the corn (Goettemoeller 2007). Put simply, corn ethanol needs almost as much energy to produce it as is released from its consumption. More so, because of these inefficiencies, corn requires more crop production—and hence more dedicated land area, agricultural inputs, and infrastructure—than its sugar cane counterpart. Because of this fundamental difference, any U.S. ethanol production would need to be highly subsidized and would likely fail to allow the United States to achieve oil independence.

To this end, in a 1997 report, the GAO was critical of the goals of ethanol subsidization. It reported that ethanol accounted for less than 1 percent of total United States fuel consumption, and projections for 2015 showed relative levels remaining the same, meaning that ethanol showed little potential to significantly mitigate oil demand. Its final conclusion was that the subsidy did not increase the United States' energy security (GAO 1997, 20). Despite this potentially undermining analysis, the federal government proceeded to extend the excise credit until 2007 with the 1998 *Transportation Equity Act for the 21st Century*. Since then, further economic studies have demonstrated, ex post, that the ethanol subsidy has actually decreased oil security by artificially lowering the price of fuel, thereby increasing the total amount of gasoline consumed (Vedenov 2008).

Behind this seeming bull-headedness is both a sizeable constituency of exemption beneficiaries who are not keen on eliminating the tax credit as well as an insistence that American technological prowess can increase the efficiency of domestic ethanol production. For the first point, the main proponent of the credit is the farm lobby, including Archer Daniels Midland (ADM), the main domestic ethanol producer and supplier of genetically modified corn seed (GAO 2002, 2008). With the establishment of a multi-billion dollar industry and subsidy program, there is a large incentive to form a cohesive lobbying force to advocate for its continued existence, which has been relatively effective in forestalling reductions in the subsidy. This lobbying force is also able to rally the substantial political capital of farmers, who benefit indirectly from the subsidy and constitute a potent American symbol. Further, it should be noted that this excise tax exemption is only one small part of a multitude of subsidies which exist for corn production, without which it is unlikely that corn ethanol would be possible even with the excise tax exemption (de Gorter 2008).

As for the promise of technological advances, the 1997 GAO report also included one of the first mentions of the promises of cellulosic ethanol, a type of ethanol production that uses more dense plant stock to produce ethanol at a much higher energy efficiency than corn ethanol (GAO 1997, 17). The main difference between cellulosic ethanol and corn and sugar ethanol is that the latter rely on simple sugars that are easily transformed into ethanol while the former converts the thicker, denser cellulose into ethanol. The cost effectiveness has yet to be determined, but some initial energy efficiency estimates project a return of 5.4 units of energy for each unit of energy expended when using switchgrass, a hardy variety of tall grass, as a feedstock (Schmer 2008). And while the technology to produce cellulosic ethanol is still in development, its potential has sustained the oil security policy ideal of domestic ethanol production for the past decade.

Environmental Policy Drivers

In the 1990s, when oil security was no longer viewed as a wholly legitimate rationale for ethanol subsidies, other possible alternatives to maintain the policy basket were proposed. The primary alternative reasoning was that ethanol production could reduce greenhouse gas emissions because any carbon dioxide emitted from the burning of the ethanol would effectively be cancelled out by the absorption of carbon dioxide in the plant's photosynthesis. However, even in the 1997 GAO report, there was enough evidence to conclude that ethanol likely had no significant net influence on greenhouse gas emissions or on global environmental quality. Further, "the greenhouse gases emitted during the ethanol fuel cycle have so much greater global-warming potential than those emitted during the conventional gasoline fuel cycle that the global-warming picture may be worsened by using ethanol" (GAO 1997). This skepticism was reinforced by a recent scientific study on the effectiveness of ethanol production as a greenhouse gas reducer, which found that conservation programs are currently cheaper and more efficient greenhouse gas policy alternatives than is corn-ethanol production (Pineiro 2009). The climate change benefit argument would appear to be demonstrated as ineffective, but it too has remained for the past decade despite little evidence that ethanol production would have a positive impact. A possible explanation of this is that scientific evidence is often purposefully confused in the political arena and that Brazil's successful ethanol polices represent a possibility for eventual improvement.

A second potential environmental benefit argument is associated with the issue of smog formation in highly-polluted urban areas. With the *Clean Air Act Amendments of 1990*, gasoline additives called oxygenates were required to reduce the amount of ground-level ozone and other smog forming compounds. Initially, this requirement led to the blending of MTBE, a fossilfuel derived compound that filled the necessary environmental role and was also cheaper than subsidized ethanol. Eventually the U.S. Geological Survey found that MTBE was accumulating in aquifers, imparting an unpleasant taste and odor to drinking water at extremely low concentrations (Squillace 1995). While the associated health risks are still uncertain, MTBE's persistence was problematic for drinking water processing (Prah 2004). As a result, the federal government modified legislation with the *Energy Policy Act of 2005*, clearing the way for national replacement of MTBE with ethanol and denying legal protection to MTBE producers, hastening the transition.

Currently, ethanol is the preferred oxygenate additive, demonstrating a clear need for ethanol production and blending in environmental management. However, as argued by the GAO's 1997 report: "Because tax incentives are only likely to cause substitution among equally clean fuels in areas where the use of gasoline containing oxygenates is mandated, it is unlikely that eliminating the tax incentives would affect air quality in these locations" (GAO 1997, 14). Thus, while it is convenient that ethanol is being subsidized, the oxygenate requirement dictates its use regardless of incentives; that is, ethanol would be used as an oxygenate whether it is subsidized or not. The fact that ethanol is used as a oxygenate should not be used as an ideological support for the continuance of subsidies.

In general, environmental policy positions for ethanol subsidization are not well-founded. Furthermore, the continued subsidization of corn ethanol does not necessarily influence the development of cellulosic ethanol viability research. In fact, if corn ethanol is subsidized, the cost barrier that cellulosic ethanol must exceed is higher than it would be if there was no corn ethanol subsidization. It could then be argued that there are no environmental grounds for the subsidization of corn ethanol, and further, that there may be environmental grounds for the removal of corn ethanol subsidization to promote development of cellulosic ethanol.

Policy Position Summary

Over the 30-odd years that ethanol subsidies have been in place, the original policy purpose of enhancing oil security has remained despite evidence that corn ethanol would not be able to fulfill that role due to its inherent inefficiencies. This continuance has been rationalized with the promise of cellulosic ethanol which may yield enhanced efficiency at some unknowable point in the future. Likewise, environmental arguments for ethanol's benefits have been raised and found to be of little merit; indeed, many environmentalists now oppose corn ethanol subsidies. Yet environmental arguments in favor of ethanol persist with the promise of cellulosic ethanol. The reason why there is such adamancy is perhaps best summarized by one of the original benefits of ethanol subsidies—they benefit American farmers and farm interests. The straw-man rationales have remained largely to benefit this constituency despite great cost to the average American, the price of which will now be examined.

Effectiveness of the Ethanol Excise Tax Exemption

This paper uses three main approaches to evaluate the effectiveness of the ethanol excise tax exemption. The first is a simple cost accounting of the value of revenue foregone by the treasury to assess the 'cost' to the taxpayer; the second is an examination of the efficiency impact in terms of economic theory; and the last is using governmental program evaluation techniques to assess the outcomes of the subsidies.

Assessing Cost-Effectiveness

As the excise tax exemption is applied on a per-gallon basis, a rough estimate of its cost can be calculated simply by multiplying the exemption amount by the volume of ethanol produced in that period. For example, the most recent year on record, 2009, had a production of 10.8 billion gallons (see Table 2); with an excise exemption rate of 45 cents-per-gallon, the approximate cost of the subsidy in 2009 is $4.8 billion.

By way of comparison, $4.8 billion would be 14 percent of the 2009 Department of Energy (DOE) budget of $33.7 billion. In the same year DOE was appropriated $217 million for research into cellulosic ethanol, or 4.5 percent of the ethanol subsidy amount (DOE 2010). As stated previously, the main hope for domestic ethanol production is cellulosic techniques, as corn ethanol has proven inadequate. This fiscal disparity is inappropriate to the needs and realities of the future of ethanol development.

Sadly, this disparity is only forecast to grow. The Energy Information Administration predicts that ethanol production will reach 14.1 billion gallons by 2012 (a 31 percent increase), which would trigger $1.5 billion in tax credits under current law (EIA 2009) and require over a third of the U.S. corn crop (GAO 2007b). Realistically, "due to limitations on the production and use of corn…15 billion to 16 billion gallons is the generally agreed maximum amount of U.S. corn ethanol production" (GAO 2007b, 2). This level would bring the total tax expenditure to approximately $7 billion. It would appear that the United States can realistically hit the maximum amount of domestic corn ethanol production in approximately three years, yet has minimal research and development funds to transition to cellulosic feedstocks. This transition failure has been noted by the GAO in a 2007 report: "DOE has not yet developed a comprehensive approach to coordinate its strategy for expanding biofuels production" (GAO 2007b, 2).

The future of domestic ethanol production could be said to be the victim of its own successful policies. The subsidy has worked so well that it will likely cap out production in a few years' time. But this is more than just a problem of saturation of capacity: as the industry has grown by leaps and bounds (see Table 2) and consumed more of the U.S. corn crop, corn prices have risen as well. In 2004, ethanol consumed 12 percent of the U.S. corn crop and by 2006, the consumption had risen to 17 percent (USDA 2006). In 2006 corn prices were $2.00 per bushel; in 2008 they spiked to prices over $4.50 per bushel; and in the future the USDA predicts that 2009/2010 prices will again reach a sustained $4.50 per bushel (USDA 2009). While rising oil prices are also partially to blame as they raise the cost of agricultural inputs, the rapidly increasing corn demand from ethanol production is widely considered the main motivating factor for the increase in corn prices. If the past is any indicator of future values, it is quite possible that the ethanol subsidy will lead to even more excessive increases in corn prices.

The rising price of corn has repercussions throughout the United States and world food markets. Because of the rising price of U.S. corn, livestock production costs have also been increasing as corn is one of the primary feedstocks for U.S. livestock. This price increase ripples out to a large portion of the U.S. food supply as corn is used in a wide variety of products

Table 2:

Approximate rates of Ethanol Production and Corresponding Subsidy Amounts

Year	Gallons of Ethanol (in millions)	Subsidy Rate ($/gallon)	Subsidy Amount (in millions)
1980	175	0.4	$70.0
1981	215	0.4	$86.0
1982	350	0.4	$140.0
1983	375	0.4	$150.0
1984	430	0.4	$172.0
1985	610	0.4	$244.0
1986	710	0.4	$284.0
1987	830	0.4	$332.0
1988	845	0.4	$338.0
1989	870	0.4	$348.0
1990	900	0.54	$486.0
1991	950	0.54	$513.0
1992	1,100	0.54	$594.0
1993	1,200	0.54	$648.0
1994	1,350	0.54	$729.0
1995	1,400	0.54	$756.0
1996	1,100	0.54	$594.0
1997	1,300	0.54	$702.0
1998	1,400	0.54	$756.0
1999	1,470	0.54	$793.8
2000	1,630	0.54	$880.2
2001	1,770	0.54	$955.8
2002	2,130	0.54	$1,150.2
2003	2,800	0.54	$1,512.0
2004	3,400	0.51	$1,734.0
2005	3,904	0.51	$1,991.0
2006	4,855	0.51	$2,476.1
2007	6,500	0.51	$3,315.0
2008	9,000	0.45	$4,050.0
2009	10,750	0.45	$4,837.5

Note: Historical ethanol price levels are stored behind paywalls and thus are not included in this paper.

Source: Renewable Fuels Association 2010.

in some form, most commonly as feedstock or as high fructose corn syrup. In essence, what was originally seen as a potentially small impact in 1978 escalated to potentially severe price increases in current market conditions. It could be stated that the true cost of the ethanol excise exemption should not only include the dollar value of revenues foregone, but also the broader economic impact on the nation's food supply. While it is beyond the scope of this paper and of current research to calculate that impact, it is clearly a non-minor fiscal impact.

Assessing Economic Efficiency

Beyond a simple cost accounting of the ethanol subsidy are more economically-focused arguments of the effects on efficiency. In 2006, the Congressional Research Service issued a report indicating that "tax expenditures are generally an inefficient way to deal with environmental or energy security concerns and this was the case with biofuel tax expenditures" (GAO 2007b, 43) and that, "with the RFS in place, the Volumetric Ethanol Excise Tax Credit (VEETC) has caused substantial and unnecessary losses in federal tax revenue without providing a significant incentive for additional production" (GAO 2007b, 43). Indeed, because of the overlapping of the RFS and the tax credit, it can well be argued that the tax credit is now even more inefficient economically.

At least four cost-benefit analysis studies have been conducted on the ethanol subsidy. The simplest model of the four, which included no externalities, still found that the subsidy "has not yielded positive benefits to date, and it appears unlikely that it will do so in the future" as a result of the substantial size of the subsidies necessary relative to their relatively meager benefit (Duke 1999, 38). Another study, which factored in vehicle miles traveled and greenhouse gas emissions, found that "the socially optimal levels of gasoline and ethanol consumption are obtained by imposing a tax of $0.085 per mile, $0.08 per gallon of gasoline, and $0.04 per gallon of ethanol" (Khanna 2008, 417). In other words, the socially optimal response is to impose a tax, not a subsidy. This result was driven by increased costs associated with an increase in gasoline usage, which was fostered by subsidizing ethanol costs and thereby decreasing total fuel costs. Further, the study found that "social welfare is [in 2007] $18.5 billion lower than the optimal level" (Khanna 2008, 417).

A third analysis, which examined overall corn subsidies, looking at a loan rate as well as the ethanol tax credit, found that the tax credit reduces farm subsidy costs at first glance. However, that result belies the underlying deadweight costs and increased costs of the tax credit, as amplified by the loan rate. In fact, "the tax credit itself doubles the deadweight costs of the loan rate and the loan rate increases the deadweight costs of the tax credit by one-third. Ethanol policies can therefore not be justified on the grounds of mitigating the effects of farm subsidy programs" (de Gorter 2008, 408). Thus, in addition to having no net social benefit, the ethanol tax credit only increases economic inefficiencies of complementary subsidies.

The final cost-benefit has the most detailed accounting of externalities, including factors for greenhouse gases and oil security. Here they found an "optimal ethanol subsidy of $0.22 per gallon. [But] the optimal subsidy is positive only because the benefits of economic development and increased government spending offset the negative marginal external benefits" (Vedenov 2008, 22). In other words, the subsidy is economically inefficient in terms of any of the stated policy goals examined in this paper.

Another factor that impacts economic efficiency is the concept of incidence of a tax, or in this case, the incidence of a tax exemption. If the policy goal is to help American farmers, the de Gorter cost-benefit analysis found that "corn producers do not benefit at all from ethanol policies when [corn subsidies are] operational and benefit very little from the tax credit when the mandate is binding" (de Gorter 2008, 2). Further, because the excise tax exemption is given to those who blend the ethanol into the gasoline and not the producers of the ethanol, it may be the case that the incidence is not with the ethanol producer either. In fact, the 1997 GAO report concluded that "the groups that legally must pay the excise tax on gasoline do not receive the full benefit of the ethanol tax incentives" (GAO 1997, 9). In other words, neither farmers nor ethanol producers gain the full benefit of the subsidy. This means that the excise tax exemption is not economically efficient in regards to tax incidence as well.

Assessing Program Evaluation Analyses

The final measure of effectiveness is that of governmental program evaluations. However, because "neither DOE nor any other executive branch agency has conducted an analysis of the benefits of the VEETC, it is impossible to know whether the 51 cent tax expenditure for every gallon of ethanol blended with gasoline is too high, too low, or at the proper level" (GAO 2007b, 42). Of the four cost-benefit analyses referenced in this paper, two computed optimal levels for the subsidy and both found the subsidy level was set higher than the socially optimal level. For these reasons, it may well be that the credit, while effective in spurring ethanol production, was unnecessarily expensive and did not adequately prepare for the future of ethanol production needs. In this frame, the policy could potentially be a failure despite the tangible benefits produced.

Effectiveness Summary

The effectiveness of the ethanol excise tax exemption can be considered a complete success in simple terms of spurring a corn ethanol industry where none would likely occur naturally (GAO 1997). However, there are issues with the success. Namely:

- the tax exemption has a high dollar value cost;
- the corn ethanol industry is projected to run out of available corn and transitions to cellulosic ethanol are not being aggressively pursued;
- the cost of the subsidy has spilled over substantially into general food price inflation;
- the economic effectiveness of a tax expenditure is sub-optimal in general;
- the cost benefit ratio for the subsidy has been generally found by academics to be negative or zero;
- the incidence of the tax credit lies neither with producers of corn nor ethanol; and
- there has been no official federal evaluation of the exemption since it was instituted.

Policy Alternatives

This paper has demonstrated that while the ethanol subsidy has produced significant results, it is sub-optimal in other areas. Further, the case was made by the GAO that because the RFS is in place, the ethanol subsidy is unnecessary on the whole. The case could be made that legislation is moving to eliminate this subsidy as the *2008 Farm Bill* did decrease the excise exemption rate; however, the reduction was minimal and is no guarantee for future reductions or eliminations. It has been noted previously that there is now a substantial constituency that supports continued subsidy, so the most politically reasonable action may be one that gradually phases out the subsidy in some manner. This could be accomplished over the course of several years with progressive step reductions or by decreasing subsidy payments for each billion gallons of ethanol produced each year. Alternatively, the subsidy could be eliminated completely, and the consumer would likely bear the burden of higher expenses for ethanol requirements.

In all, there have been a large number of evidence-backed arguments in favor of eliminating or reducing the corn ethanol excise tax exemption. The excise tax exemption on the whole, however, is not just applied to corn ethanol production and carries many different levels of incentives for other methods of production such as cellulosic ethanol, which with the *2008 Farm Bill* was set at 2.5 times the rate of the corn ethanol subsidy (Energy Outlook 2009). Given the success of the corn ethanol credit, the cellulosic ethanol credit could well be a feasible means for spurring its development, ignoring the questions of efficiency.

Another method of addressing the inefficiencies of corn ethanol would be to eliminate the protectionistic tariff on ethanol imports. This would allow Brazil and other nations that produce ethanol more efficiently to more openly compete with U.S. ethanol production. This is also a politically difficult issue: in the original context of oil security, it would reduce our dependence on foreign oil at the cost of raising our dependence on foreign ethanol. However, it should also be noted that the United States has overtaken Brazil in terms of ethanol production—9 billion gallons versus 6.4 billion gallons in 2008—and that it is unlikely that foreign competitors would be able to completely dominate domestic production (RFA 2010).

Currently the United States imports a scant 5 percent of its domestic consumption (RFA 2010). It could be argued then that a reduction in the tariff is quite appropriate, especially as the United States begins to run out of usable feedstock for ethanol production.

Additionally, there are a variety of policy mechanisms that could be further employed to spur ethanol, especially cellulosic ethanol, development. The traditional grants, contracts, loans, and tax expenditures already employed could be expanded. Also, with the *Energy Policy Act of 2005*, the Department of Energy was granted the ability to engage in 'Other Transactions Authority,' similar to the special authority of the Departments of Defense and Homeland Security. DOE's authority is not subject to Federal Acquisition Regulation and bypasses portions of federal law. "Therefore, the other transactions authority could provide for more flexible terms and conditions, thereby enhancing the federal government's ability to acquire cutting-edge science and technology by attracting contractors that had not typically pursued government contracts" (GAO 2008, 1-4). In practice, DOE used this authority to establish a joint venture with Range Fuels to construct a pilot plant for cellulosic ethanol production.

In summary, there are a variety of options for pursuing enhancements to current U.S. ethanol subsidization policy. These range from legislative measures to agency initiatives of varying types, but all constitute a move away from the traditional excise tax exemption of corn ethanol. Additionally, in order to achieve the original goal of oil security, there are a host of other options that do not rely on ethanol at all, including raising Corporate Average Fuel Economy (CAFE) standards, pursuing new vehicle technology such as hybrids and plug-in hybrids, and investing in public transportation and high-density housing.

Conclusion

In the late 1970s, concern over oil security instigated the ethanol excise tax exemption. From a paltry 175 million gallons of ethanol in 1980 to a booming 9 billion gallons of ethanol in 2008, the subsidy was the main driver for the establishment of the ethanol industry in America and could be judged to be a rousing success. However, over the same course of time, American corn ethanol has been shown to be highly inefficient energetically, and relatedly, also inefficient economically. There is still hope for cellulosic ethanol production to reverse ethanol's fortunes, but since 1997, the GAO and others have been calling for the abolition of the corn ethanol excise tax exemption. RFSs and the *Clean Air Act* have laid the groundwork to ensure that ethanol production would not vanish in the absence of the exemption, and it appears that political will might well be marshalling to finally eliminate the subsidy. At stake is foregone revenue of $4 billion in 2008, which is projected to increase rapidly in the near future. The diverted funds could arguably be put to much better use developing other renewable fuels, or even funding other alternatives such as increases in CAFE standards, which have demonstrably produced more oil security than the ethanol excise tax exemption has, even at its best projection.

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