

Chapter 9

Ethanol Policy and Ethanol Politics

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The United States is currently passing through one of the most exciting and controversial periods of its energy history. With the US military caught up in armed conflict in the Middle East, and with global warming looming in the minds of many expert scientists as the world's greatest environmental challenge, a common belief is that it is more important than ever that the US develop sensible and far-sighted energy policy.

Politicians' claims aside, the politics of energy policy are rarely about what is best "for the country." When government sets energy policy, some people gain, and others may lose. The politics of energy policy, then, are not simply, or even generally, about how to make the nation as a whole better off. Rather, the politics of energy policy are very much about interested political groups struggling against one another. This type of "special interest" politics is nothing new, and not unique to energy policy. Nevertheless, it is widely held among average Americans that the political activities of special interest politics are often bad for the nation as a whole.

Because public information is a democracy's best weapon against harmful special-interest politics, in this chapter we hope to accomplish three goals: 1) to present an outline of the "nuts and bolts" of U.S. ethanol policy; 2) to use economic analysis to examine the effects of ethanol policy, presenting arguments to cut through much of the political rhetoric about which groups win and which lose from it; and 3) to discuss the politics that drive ethanol policy for clearer view of just why we see the policies implemented that we do.

The Issue at Hand: Who Really Benefits from and Who Really Pays for US Ethanol Policy?

Groups of citizens are interested in ethanol policy because their well-beings are affected by it, either positively or negatively. The special interest groups involved in the ethanol policy debate are several and varied, and they express several and varied political viewpoints. Claims made by different interest groups as to the benefits and costs of ethanol policy often are contradictory. To analyze these divergent claims, we first review what they are.

The Political Rhetoric of the Various Groups Interested in Ethanol Policy

Clearly, the companies that produce ethanol are affected by and work to affect ethanol policy. This group is not homogeneous. It is comprised both of agri-business giants, such as Archer-Daniels Midland, and of smaller, farmer-owned cooperatives whose members have pooled their resources to invest in an industry that they hope adds value to their crops. Even such cooperatives are not homogeneous. Some of the members of these farmer-cooperatives are people of moderate means who have spent their lives mostly working others' land. Others are multi-millionaires owning thousands of acres of prime farmland worth thousands of dollars per acre.

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An important organization through which ethanol producers represent themselves politically is the Renewable Fuels Association (RFA). The RFA's ethanol policy opinions and arguments are not difficult to find on the Internet:

***A Success Story:** The federal ethanol program has been a tremendous success, helping to build a strong domestic energy resource. ... Today, approximately 30% of the nation's gasoline is blended with ethanol - reducing the demand for imports, stimulating economic benefits across the country, and reducing air pollution. And the federal government realizes a net gain annually due to increased tax revenues and reduced farm program costs. (Renewable Fuels Association, 2005).*

In the US, corn is the chief input to ethanol production. When government policies encourage ethanol production, they raise demand for corn, which raises the price of corn. There is no doubt that ethanol policy was a key factor leading to the high corn prices of 2006 and 2007. Corn farmers, then, also take interest in ethanol policy, and their organizations participate actively in ethanol politics. As do many interest groups, sometimes corn farmer organizations like to argue that policies that favor them also favor the citizenry in general:

NCGA believes it is in the best interest of the US consumer to have a comprehensive National Energy Plan, which includes renewable fuels. Renewable fuels will provide an environmentally clean, domestically produced fuel, which will contribute to our independence from foreign oil. In addition, rural communities benefit from the additional jobs created through the development of this renewable fuel industry. (National Corn Growers Association, 2005).

But again, corn farmers are not a homogeneous group. Especially important to this study is that some corn farmers own much farmland while others own little.

In addition, many owners of farmland are not farmers at all. Often, they are the widows or descendants of one-time farmers, who live in cities and act as absentee landlords. Some farmland owners are wealthy individuals and corporations who simply own agricultural land as an investment in their large portfolios. Some are real estate developers waiting to turn farmland on the outskirts of cities into housing developments and shopping malls. We will argue that who owns the farmland is of ultimate importance in the analysis of the impacts of ethanol policy on income distribution. Ethanol policy allows landlords to raise the rental rates of their land, which must be paid by those who actually farm it. It is not at all clear, therefore, that when ethanol policy raises the price of corn, that it benefits all "family farmers." Surely it benefits those families that own a lot of farmland, some of whom actually farm that farmland. It may harm those farmers who rent their land from absentee landlords.

Ethanol competes with gasoline for American motorists' dollars. Therefore members of the petroleum industry also maintain interests in ethanol policy. The petroleum industry is not homogeneous, either. Rather it is comprised of many different firms at many different levels. Multinational conglomerates, such as Exxon/Mobil, dwarf even the agri-business giants. These companies explore and drill for crude oil, buy crude oil from foreign nations, transport crude oil around the world, refine it into motor fuel and other products, transport motor fuel around the US

by pipeline, distribute it to local service stations, and sell it to consumers. Other, smaller companies also compete in the petroleum industry: owners of small crude oil reserves in Texas and Oklahoma, independent refineries and distribution terminals, independent truckers, and of course owners of service station franchises. All such entities take an interest in ethanol policy, and many are active in ethanol politics. A main representative organization of the petroleum industry is the American Petroleum Institute (API). Because of the current political popularity of the ethanol industry, recently the API has been careful not to express overtly anti-ethanol political arguments, but rather has emphasized that market forces should determine economic outcomes²⁹:

API and its member companies believe that allowing market forces and consumer preferences to determine where and how ethanol is consumed is the most effective and least costly way to integrate ethanol into our nation's transportation fuels system. (American Petroleum Institute, 2007)

Not all those whom we generally consider to be farmers benefit from ethanol policy. In particular, farmers who produce livestock, and buy corn to feed their livestock, increasingly have felt harmed by the high corn prices brought about by ethanol policy. Recently livestock producers' organizations have been less reticent than has the API to state their true views of ethanol policy:

"This ethanol binge is insane. This talk about energy independence and wrapping yourself in the flag and singing God Bless America – all that's going to come at a severe cost to another part of the economy."
-- Paul Hitch, President of the National Cattlemen's Beef Assn. (Herbst, 2007)

US ethanol policy can affect commodity prices in the rest of the world. As a result, many citizens of other countries take interests in US ethanol policy, and participate in the US policy debate. Many times US citizens have sided with foreign interest groups, participating in a "food versus fuel" debate in their attempts to affect US ethanol policy. Tortilla prices in Mexico have skyrocketed over the past year. Recently Mexican consumers' protests over US ethanol policy have been in the spotlight:

In another place, a rise in the cost of a single food product might not set off a tidal wave of discontent. But Mexico is different.

"When you talk about Mexico, when you talk about culture and societal roots, when you talk about the economy, you talk about the tortilla," said Lorenzo Mejía, president of a tortilla makers trade group. "Everything revolves around the tortilla."

...There is almost universal consensus in Mexico that higher demand for ethanol is at the root of price increases for corn and tortillas. (Roig-Franzia, 2007)

²⁹ The API does not explicitly mention, but certainly knows that incentives underlying the current growth in the ethanol industry would be much smaller if government intervention were stopped and the ethanol industry were forced to compete with the petroleum industry in freer markets.

US corn growers' organizations have made counter-arguments:

Skeptics suggest the corn industry will face difficulty in meeting demand and growers will experience a dilemma of whether to supply customers in the feed, food and export markets or to supply the burgeoning ethanol industry. This contrived "food versus fuel" argument is fraught with misguided logic, deception, and scare tactics. ... Detractors argue that grain markets should adhere to a hierarchical approach that emphasizes grain's utility as food and feed. But what about the fundamental human needs of energy, security, and mobility? ... MYTH: Ethanol production diverts corn away from food and feed markets. FACT: There will be plenty of corn available. (National Corn Growers Association, 2006)

Environmental concerns have been a key focus of the ethanol policy debate. Not surprisingly, pro-ethanol interest groups have argued that ethanol is good for the environment:

Ethanol is one of the best tools we have to fight air pollution from vehicles. Ethanol contains 35% oxygen. Adding oxygen to fuel results in more complete fuel combustion, thus reducing harmful tailpipe emissions. Ethanol also displaces the use of toxic gasoline components such as benzene, a carcinogen. Ethanol is non-toxic, water soluble and quickly biodegradable. (Renewable Fuels Association, 2007b)

But some environmental groups have been skeptical of such claims. The following appeared in the Sierra Club's *Sierra Magazine*:

Supporters tout ethanol as "renewable," but it takes the equivalent of 70 percent of the energy in a gallon of ethanol to fertilize, harvest, transport, and distill it. (Efficiency like that could give renewability a bad name.) Senator Dianne Feinstein (D-Calif.) called the proposal a "wealth transfer" to corn-producing states from the rest of the country, but she and other dissenters were overwhelmed by farm-state senators of both parties, as well as the recipients of campaign largesse from Archer Daniels Midland... (Pope, 2003)

Additionally, various scientists have questioned the environmental and health benefits of current ethanol policy. Commenting on his recently published academic article (Jacobson 2007), Stanford University atmospheric scientist Mark Jacobson stated,

"Ethanol is being promoted as a clean and renewable fuel that will reduce global warming and air pollution, but our results show that a high blend of ethanol poses an equal or greater risk to public health than gasoline, which already causes significant health damage." (Davidson 2007)

Arguments about who pays taxes and who receives subsidies abound in the political rhetoric that surrounds ethanol policy. For example, the National Corn Growers Association has stated on its web site,

...fuel blended with 10 percent ethanol receives a tax credit of 5.1 cents per

gallon. E-85, which is 85 percent ethanol by volume, receives a 43-cent-per-gallon credit. Petroleum blenders – not corn farmers – receive this tax credit (National Corn Growers Association, 2007).

Similarly, the Renewable Fuels Association has stated,

The tax credit, which was formerly 54 cents, has been reduced to 51 cents per gallon. ... The tax credit is taken by gasoline producers and marketers. It is not taken by ethanol producers. (Renewable Fuels Association, 2007a)

In a similar vein, the RFA has stated,

Gasoline marketers (not ethanol producers) can claim the federal ethanol tax incentive... The ethanol tax incentive has been especially helpful to small, independent gasoline marketers by allowing them to price-compete with the major international petroleum companies. Such price competition has consistently restrained retail market prices and thereby generated substantial benefits for consumers of gasoline... (Renewable Fuels Association, 2005)

At the same time that pro-ethanol interest groups and politicians focus on claims that the ethanol subsidies benefit consumers and independent gasoline marketers, however, they also claim that current pro-ethanol policies are crucial to the family farm. Even the most conservative anti-tax/anti-government-spending politicians have seen fit to make these claims:

... just as I support the independence of the family farm, I support a policy of US energy independence that includes a strong stand for ethanol. This industry creates 40,000 jobs, adds \$12 billion in net farm income each year... (Buchanan, 1999).

But politicians from outside the Corn Belt often feel quite differently:

... it's hard to justify continued government subsidies for programs that haven't lived up to expectations after more than two decades of government assistance. ... It's even harder when those subsidies are given to an industry that makes over \$30 million a year producing ethanol. (McCain, 1998)

Ultimately, ethanol policy can affect the prices consumers pay for motor fuel, and much ethanol policy is paid for through taxes. To some degree, the “average American,” represented by organized consumer and taxpayer groups, has also participated in the politics of ethanol:

Instead of supporting the traditional American farmer and reducing our oil demands, ethanol subsidies are a corporate handout to big agribusiness disguised as fuel innovation. (Taxpayers for Common Sense, 2007).

Perhaps even more importantly, the average American has an interest in the degree to which the country is energy-independent. It is widely held that the nation’s dependence on

foreign oil has contributed to its involvement in the Middle East's political conflicts. It is obvious that this involvement has been costly, not only to the US Treasury, but also to the individuals and families, both American and foreign, hurt by military conflict and terrorism.

The quotations provided above make it clear that the ethanol policy debate is contentious and complicated, and often not completely honest. Different groups, from the Midwest to the Middle East, are working, sometimes for the common good and sometimes in their own special interests, to influence US ethanol policy. These groups have much to gain and much to lose from ethanol policy, as well as much to reveal and much to hide in ethanol politics. Indeed, the nation as a whole has much to gain from sound ethanol policy, and much to lose from poor ethanol policy. Therefore in the following, we hope to cut through some of the logical confusion and political obfuscation to present an objective analysis of US ethanol policy and politics.

Because Market Prices Are Linked, Who Wins and Who Loses from a Policy Is not Always Obvious: An Example from the Motor Fuels Tax

Only in an atmosphere of public confusion can different interest groups get away with making such divergent and contradictory claims. It is no surprise that the American public has many questions about the economic effects of ethanol policy--answering these questions is not always easy. Because markets in the motor fuels and corn industries have many links, their prices are linked, the analysis of ethanol policy can be complicated, and winners and losers from ethanol policy are sometimes difficult to spot and separate. We illustrate with a discussion of the most fundamental of U.S energy policies: the motor fuel tax.

We all know that there are taxes on the gasoline that we buy at service stations. But buying gasoline is a little different from buying most other goods in the US. If we drive into a service station that has "\$2.59⁹" on the sign out front, and want to buy ten gallons, we must pay $\$2.599 \times 10 = \25.99 before we leave the station. But if we buy ten loaves of bread in a supermarket, and each loaf carries a \$2.60 price tag, then we cannot leave with the bread for \$26.00. The reason for this anomaly is, of course, that the bread tax is a retail tax, paid (at least nominally paid) by the final consumer. With a six percent sales tax, we must pay $\$26.00 \times 1.06 = \27.56 to get out of the store with the bread. The supermarket receives \$27.56 from the consumer, but must remit \$1.56 of it to the government. So the supermarket only keeps \$26.00, which is the \$2.60 per loaf that the supermarket on each loaf. We all know this from experience. We also all know that taxes on gasoline in the US generally are not retail taxes, and are not (at least nominally) paid by the final consumer. The consumer leaves the station paying the price on the sign, and no more.

Living our whole lives in an economy in which the tax on bread is nominally paid by the consumer but the tax on gasoline is not, we have grown to take this for granted. But if one asked the average consumer whether she thinks that she is somehow paying a tax on gasoline, she would probably give an answer like, "Well, yeah, I think I'm paying it, or at least some of it. I mean, because of the tax, the station probably raises its price. So if there weren't a tax, I'd get a lower price, and therefore in reality I am paying some of the tax, even though it doesn't look like it on the surface." Similarly, if one asked the supermarket owner if he was in reality paying the tax on bread, he might answer something like, "Well, sure. If the government didn't put the tax

on the consumer, then I could probably charge a higher price than \$2.60 and not lose so many customers. So, even though I'm not paying the tax on the surface, I am paying at least some of it in reality." The question could be posed to, and similar answers might be given by other participants in the "bread" industry: wholesalers and distributors, bakeries, flour millers, and even wheat farmers.

So, who really does pay motor fuels taxes? Who really benefits from ethanol subsidies? The answers that interest groups give publicly to these questions are often self-serving and made for political purposes. In the following section we begin to address these questions, first examining in detail the characteristics of the different buyers and sellers involved in the auto fuels sector, and how these various sectors of the industry are linked.

Characteristics, Links, and Movements in the Automobile Fuels Sector

The automobile fuels sector is vertically integrated. Before they can be used by consumers as fuel, petroleum and corn products must be produced and then moved to various locations where they are transformed in several steps from raw products to fuel available to the final consumer. Often ownership of the products changes several times as they move through the sector towards the consumer. Figure 1 is an illustrative simplification of this vertically integrated automobile fuels sector. Figure 1 depicts fuel being provided to the consumer by way of the two branch lines, the corn-ethanol branch line and the petroleum branch line, which merge into the automobile fuels main line. Every arrow in the diagram represents a physical movement of a resource or product from one location or mode of transportation to another.

Three main resources of production begin the corn-ethanol branch line: farmland, farm labor, and farm management skills (which we will also call farm "know-how"). It may be that one individual (generally called a "farmer") owns and supplies farmland, farm labor, and farm management skills to produce corn in the field. Or, these supply factors may belong to someone other than the farmer—large percentages of cropland in the US are rented from absentee landowners, farm labor is often hired, and consultants are sometimes hired for management expertise. The flows of these factors into the production of corn in the field are represented by arrows C-1, C-2, and C-3 in Figure 1. As we will explain in detail, it turns out that who owns these factors of production plays a central role in how we think about who wins and who loses from various types of ethanol policy.

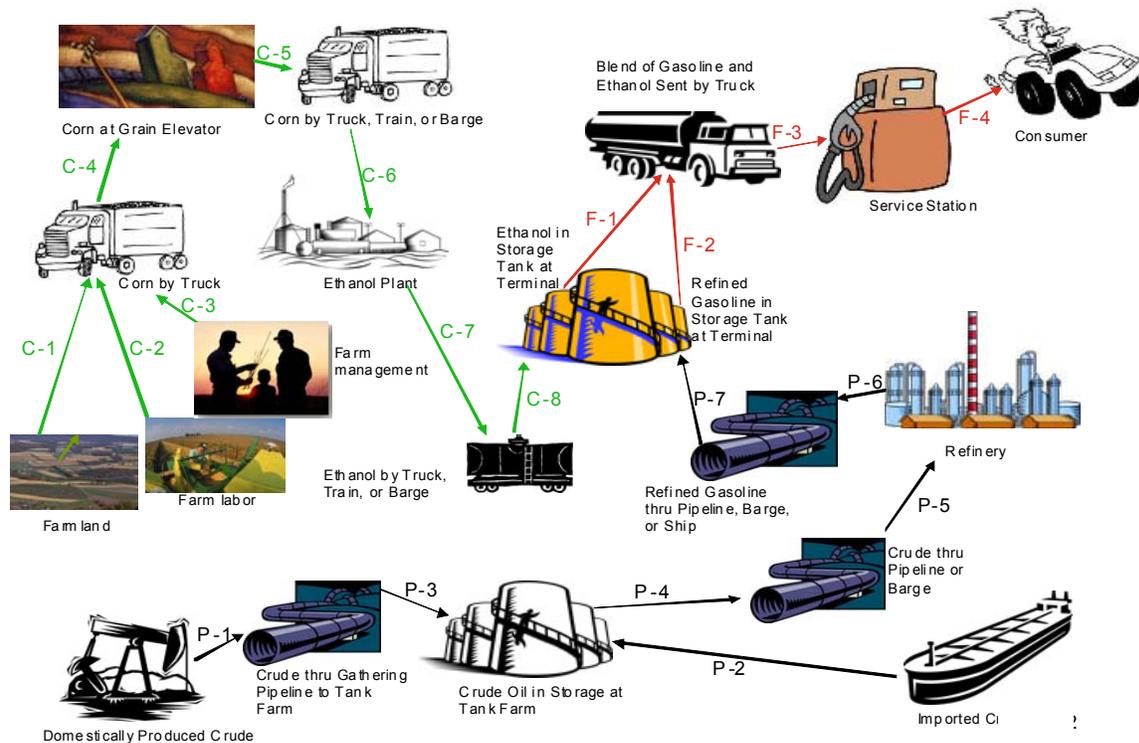


Figure 1. The automobile fuels sector.

Arrow C-4 shows that once farmland, labor, and know-how are used to grow and harvest the corn, it is usually transported by truck to a local grain elevator. Often the farmer owns the truck used for transport between the farm and the grain elevator, though sometimes that truck is hired. The corn usually switches legal ownership at the elevator, where owners of the elevator buy the corn from the farmer. Elevators store the corn, and eventually load it onto a truck, train, or barge to ship it to demanders, such as to livestock producers, or in the illustrated case to ethanol factories. Movement C-5 from elevator to truck may or may not involve a change in legal ownership of the corn. At C-6, the corn is moved out of the transport truck and into an ethanol factory. The ethanol factory employs a host of inputs (like labor, natural gas, management skills, buildings, and machines) that we will aggregate with the title “ethanol factory services.” These services transform the corn into ethanol and by-products. The ethanol is loaded onto a truck, train, or barge and shipped to a “terminal,” where at C-7 it is moved to a storage tank. Terminals sometimes are owned by large petroleum producers, and are also independently owned. Sometimes terminal owners take legal possession of the ethanol when it enters their tanks, and sometimes the terminal owners are simply paid a fee by the ethanol company to store the ethanol. At the terminal the corn-ethanol production process ends.

In the petroleum branch line of the model, crude oil is the basic resource for gasoline production. In the US, crude oil is both produced domestically and imported. Domestic producers may be independent, or they may be part of large petroleum conglomerates, like ExxonMobil and ConocoPhillips. Domestic crude oil generally is made to flow (P-1) into small-diameter pipeline, and at P-3 is moved from the pipeline into a tank at a tank farm, where it is

gathered. On the other hand, imported crude moves along flow (P-2) from a tanker ship to a tank farm. The crude may or may not change ownership along P-2. Sometimes a large petroleum conglomerate owns the crude when it is in the tanker ship, and continues to own it in its tank farm. Sometimes the owner of the crude in the tanker ship sells it to the owner of a tank farm.

From the tank farm, crude oil is transferred (P-4) into another pipeline, and eventually is supplied (P-5) to a refinery. The refinery provides “refinery services” such as labor, machinery, and management to produce gasoline and other petroleum products from the crude oil. Gasoline produced is often transferred (P-6) to yet another pipeline, and from there transferred (P-7) to a storage tank at a terminal, which is at the end of the petroleum branch line in our model. Again, petroleum products may or may not change ownership along P-7.

Ethanol and gasoline enter the main line of the motor fuels sector when they leave the terminal. At the terminal, the gasoline and ethanol are sometimes pumped directly from each of their tanks into a tank truck (F-1) and (F-2). This process of mixing ethanol and gasoline by pumping them from separate storage tanks into a common tank on a truck, is called “splash-blending.” Another common method of mixing ethanol and gasoline can occur when a terminal owns a “blending unit,” which is a tank into which the ethanol and gasoline are both pumped. The two products are mechanically stirred together in the blending unit, then transferred into a tank truck. The tank truck delivers (F-3) the gasoline and ethanol mixture to a service station, which stores the fuel, and eventually, using “service station services”: labor, its pumps, etc.--sells (F-4) it to a consumer.

Policies Implemented at One Level Often Affect Markets at Other Levels

A policy implemented in one level of a vertically linked sector can affect markets in other levels. For example, a change in ethanol policy may affect owners of farmland, owners of grain elevators, owners of freight trains, terminal owners, owners of tank trucks, owners of service stations, as well as consumers. These groups can be made up of very different people. How ethanol policy affects various entities involved in the automobile fuel sector can depend on who owns which factors of production and movement. It has been claimed many times that ethanol policy helps the “family farmer.” We will argue below that whether this claim is legitimate can depend very much on who we consider the “farmer” to be—the land owner, the farm laborer, or the farm manager (or some combination of all three). It is also claimed that ethanol tax policy does not provide a tax break to ethanol producers, but rather to petroleum companies. We will argue below that whether this claim is true depends on the details of how easily competition can be brought into or kicked out of various links in the automobile fuel sector.

Automobile Fuel Policies and the Links at which They Are Implemented

Automobile fuel markets are impacted by various policy instruments used by federal, state, and local governments. In the following, we review the various policy instruments, interpreting where in the vertically linked fuels sector the policy instruments are implemented, and discussing how such policies may affect prices and profits at other links.

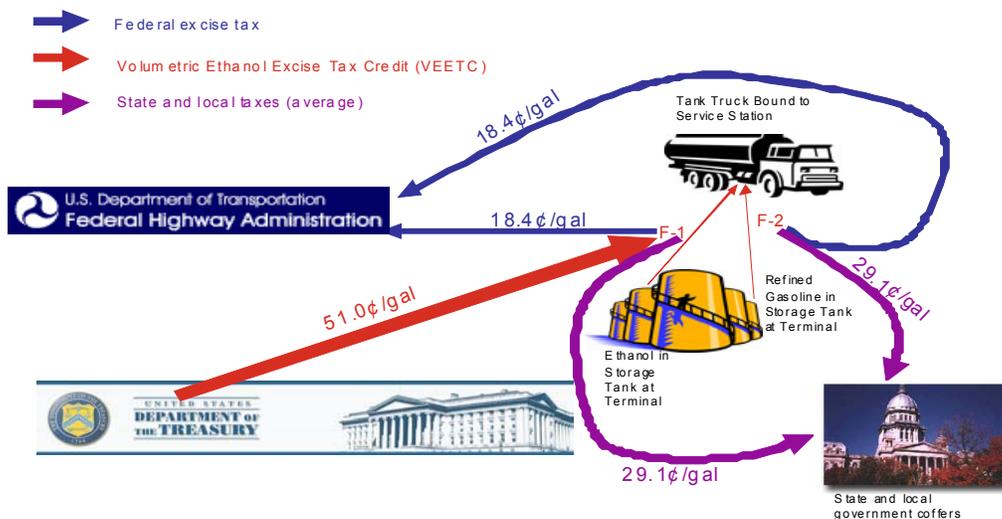
The Federal Motor Fuel Excise Tax (Nominally Paid by “Position Holders,” which Are Often

Terminals)

One of the main policies that affect fuel markets in the US is the federal excise tax on motor fuels. This policy is imposed on the entity that is the “position holder” of fuel as it is transferred from a terminal storage tank into a tank truck (“leaves the rack”). The position holder is that entity which legally owns the fuel immediately before it leaves the rack. When the company that owns the terminal also owns the fuel it stores and pours, then every month that company must “write a check” to the US government, paying 18.4 cents for every gallon of ethanol or gasoline that it has put into tank trucks for delivery to service stations. If the terminal company does not actually own the fuel it is storing and pouring, but rather is simply accepting a fee for its services, then it does not pay the excise tax, but rather the tax is paid by an entity operating at an earlier link in the sector, for example the refinery.

It is interesting that when the tax is paid for ethanol that is moved from a terminal to a tank truck, it is not generally a company normally identified with the corn-ethanol sector that pays the tax. For example, unless the ethanol plant retains ownership of the ethanol while it is at the terminal, then the terminal owner is the position holder and must “write the check” to the US government. Large petroleum companies own many terminals. Therefore, at least nominally, petroleum companies and not ethanol factories often pay the US excise tax on ethanol.

The logistics of the Motor Fuel Excise Tax are illustrated in Figure 2, where it is shown that the tax is imposed at link F-1, where ethanol leaves the terminal rack, and at link F-2, where gasoline leaves the terminal rack. The arrow that runs from F-1 to the box labeled “Federal Highway Administration” is labeled with “18.4¢/gal” because every time a gallon of ethanol leaves the terminal rack, an obligation to pay 18.4¢ to the US government is incurred, and that money is ear-marked for the US Highway Fund. The arrow that runs from F-2 to the “Federal Highway Administration” illustrates that the same tax is imposed as gasoline leaves the terminal rack.



The Principal Figure 2. Per-gallon taxes and tax credits for gasoline and ethanol Tax Credit

The principal policy instrument used by the US government to encourage the production and use of ethanol is the Volumetric Ethanol Excise Tax Credit (VEETC). The mechanics of the VEETC also are illustrated in Figure 2. In the figure we show that the VEETC is earned at linkage F-1, where ethanol leaves the terminal rack. For every gallon of ethanol that is blended with gasoline, the position holder receives 51¢ from the US Treasury's General Fund (United States Department of Energy 2007). Who the position holder is depends on various factors. If the terminal uses a "blending unit," it delivers all components simultaneously at the correct ratios into the load arm that is connected to the truck, then the terminal is generally the blender of record. Regarding splash blending, if the truck in which the ethanol and gasoline are splash blended is owned by the company that owns the service stations to which it is delivering, then that company is the blender of record. If the truck is a pure "common carrier" (i.e. truck for hire), then the company hiring the common carrier truck is the blender of record. Some station owners may contract their trucking services directly or they may ask a large oil company to contract out this service for them. In the former example the customer is the blender of record, and in the latter example, the oil company is the blender of record (Petrella, 2007). There are even examples of when a large petroleum company volunteers to be the blender of record (thus taking responsibility for the paperwork, but also making itself eligible to receive, at least nominally, the subsidy check from the government) (American Recycler, 2003).

Small Ethanol Producer Credit

Any ethanol plant that produces no more than sixty million gallons of ethanol per year receives from the federal government a tax credit of ten cents per gallon produced. Thus, the maximum small ethanol producer credit is \$6 million per year. This credit is depicted in Figure 3.

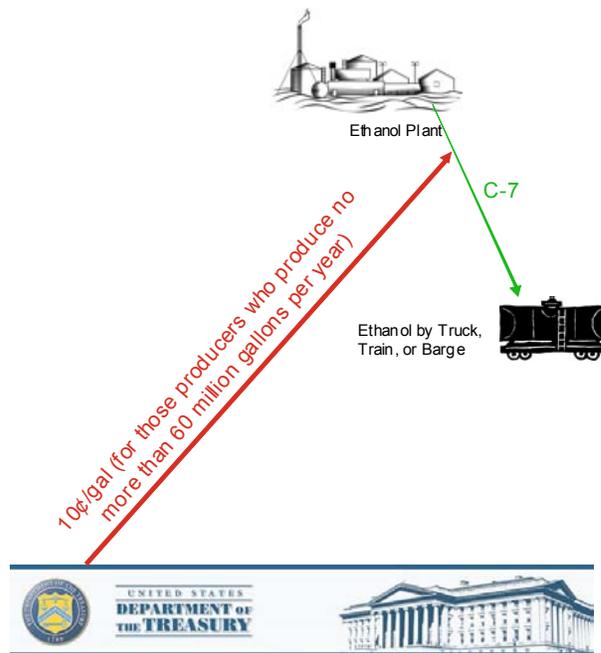


Figure 3. The Small Producer Tax Credit.

Tax Credit for E85 Infrastructure

The Energy Policy Act of 2005 provides a service station provider a tax credit for installing an E85 pump or other E85 infrastructure. (E85 is gasoline blended with ethanol. It is often 15% gasoline and 85% ethanol, thus the name.) The tax credit is equal to the minimum of 30% of the cost of the infrastructure and \$30,000 (US Department of Energy 2007). This tax credit is illustrated in Figure 4.

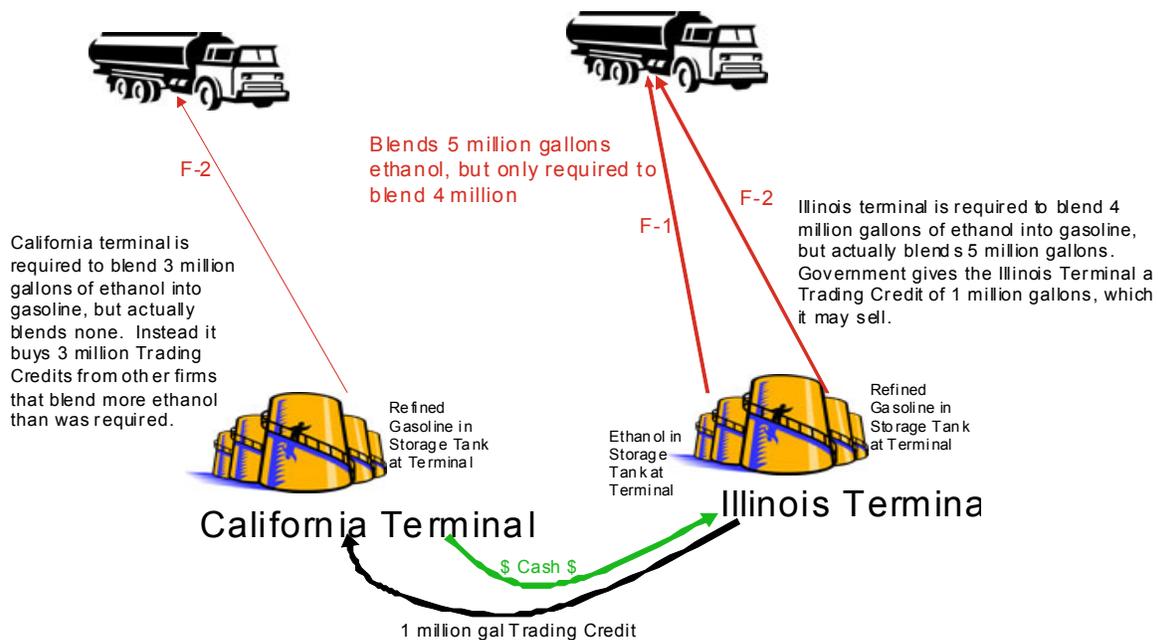


Figure 4. The Credit Trading Program, Proposed by the EPA to Implement the Renewable Fuels Standard (assuming the terminal is the “blender of record”).

The Renewable Fuels Standard and the Proposed Credit Trading Program

The Energy Policy Act of 2005 mandated the following amounts of biofuel (either ethanol or biodiesel) must be mixed with gasoline or diesel in the US in the following time schedule: 4.0 billion gallons in 2006, 4.7 billion in 2007, 5.4 billion in 2008, 6.1 billion in 2009, 6.8 in 2010, 7.4 billion in 2011, and 7.5 billion in 2012. Congress did not provide details in the Act about how the government should assure that the renewable fuels standard should be met every year. The Act does state that the regulations, “(I) shall contain compliance provisions applicable to refineries, blenders, distributors, and importers, as appropriate, to ensure that the requirements of this paragraph are met, but (II) shall not—(aa) restrict geographic areas in which renewable fuel may be used; or (bb) impose any per-gallon regulation on the use of renewable fuel” (Title XV, Subtitle A, Section 1501). In other words, Congress told the Environmental Protection Agency to coordinate with the US Departments of Energy and Agriculture, along with “stakeholders” to work out the details of a program that requires either refineries, blenders, distributors, and importers to sell certain amounts of renewable fuel mixed with the gasoline or diesel they sell.

In response to Congress’s mandates, in late 2006 the EPA proposed and invited comments

on a Credit Trading Program, (US Environmental Protection Agency, 2006), which is illustrated in Figure 5. Basically, the EPA proposes to set a percentage standard for renewable fuel that each refinery, blender, distributor, or importer must meet. For example, if the standard set were 4%, then any terminal selling fuel to service stations either would have to have 4% of its fuel sold be a renewable fuel mixed with a petroleum-based fuel, or else purchase credits from terminals that have blended more renewable fuel than was required. That is, any terminal that blends more than its mandated amount of renewable fuel would gain “credit” for each extra gallon, which it can sell to other terminals deciding not to blend as much ethanol as is mandated to them. Firms blending less than their required amounts would have to buy sufficient credit to make up for the blending shortfall. Under this program, those distributors located far from the Corn Belt could avoid shipping ethanol or corn long distances by purchasing credits from distributors closer to the Corn Belt. For example, instead of having its required four million gallons of ethanol shipped to its location, a California terminal could purchase on the open market trading credits for four million gallons. Corn Belt firms would have blended more than their required gallons in anticipation that the trading credits thus earned could be sold in the open market.

The effect of the Credit Trading Program is to potentially increase demand for ethanol and biodiesel, and thus raise their prices. Lately, however, market incentives and other policy incentives have been sufficient to bring about as much aggregate ethanol production as was mandated by Congress in the Energy Policy Act of 2005. The mandated amount for 2006 was 4.0 billion gallons, but actually nearly five billion gallons were produced in 2006, even though the Credit Trading Program was not yet implemented. The 2012 standard of 7.5 billion gallons will likely be met during 2007.

Winter Oxygenated Fuels Areas and State MTBE Bans

The Clean Air Act requires the EPA in coordination with states to administrate a Winter Oxygenated Fuels program. Oxygenated fuels contain fuel additives (which in the past have been either ethanol or a petroleum-based product Methyl Tertiary Butyl Ether (MTBE)) that boost octane in gasoline. Increasing the octane in gasoline reduces emissions of carbon monoxide. Currently only a few areas in the US are under the Winter Oxygenated Fuels program: El Paso, Texas; Las Vegas, Nevada; Los Angeles, Orange, Riverside, and San Bernadino Counties in California; Missoula, Montana; Reno, Nevada; and Salem, Oregon. (US Environmental Protection Agency, 2007c). Until recently, most areas required to oxygenate their fuels in the winter elected to use MTBE as the oxygenate. But concerns about groundwater contamination have led most of these areas, most notably California, to ban the use of MTBE. As a result, they have had to turn ethanol as the oxygenate, so the Winter Oxygenated Fuels Program and the state-imposed MTBE bans have worked together to boost demand for ethanol, and thus raise ethanol prices.

Trade Barriers: Tariffs and Import Quotas

The US and Brazil are the world's largest ethanol producers. It is often argued that, because of lower costs, Brazilian ethanol producers could make large profits if they were allowed to export ethanol from Brazil into the United States. An additional profit incentive is provided by the \$0.51/gallon federal tax credit which is given to whoever blends ethanol with gasoline in the US, regardless of the origin of the ethanol. To dissuade Brazilian ethanol producers from competing with US producers, the US government places two types of tariffs on ethanol. The first tariff is a per-gallon tax. For every gallon of ethanol imported into the US, fifty-four cents must be paid to the US government. The second tariff is an "*ad valorem*," tax, requiring 2.5% of the value of the ethanol being imported be paid as tax. For example, say that one million gallons of ethanol was brought into the US from Brazil, and that the US price of ethanol is \$2.00 per gallon. The company in the US buying the Brazilian ethanol would have to pay the US government $(1 \text{ million gallons}) \times (\$0.54 \text{ per gallon}) = \$540,000$, and also $(1 \text{ million gallons}) \times (\$2.00 \text{ per gallon}) \times (0.025) = \$50,000$ to the US government. This example is illustrated in Figure 6.

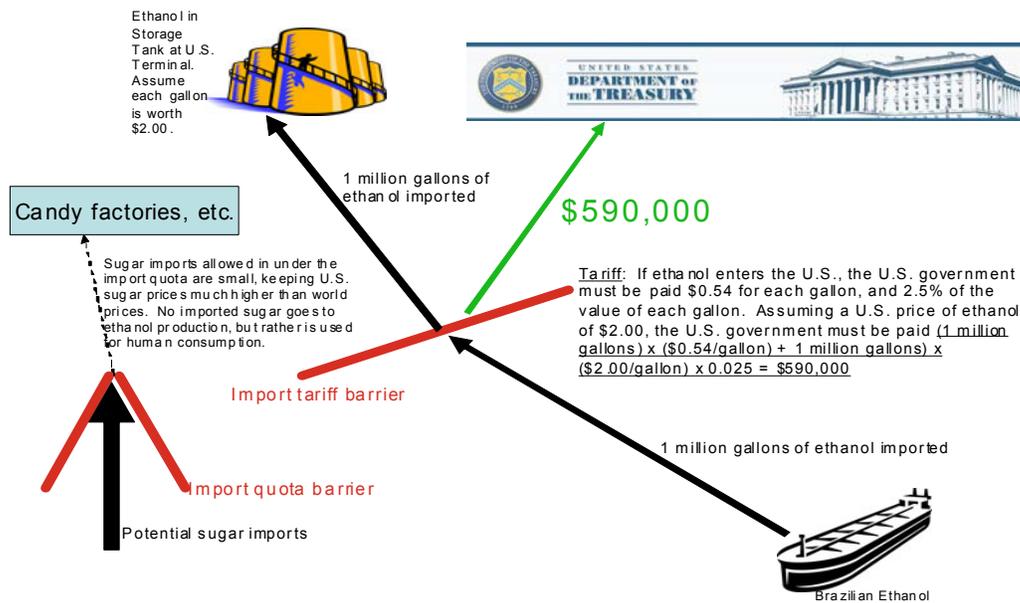


Figure 6. Example of the ethanol tariff and the sugar import quota.

Not all countries are subject to the ethanol tariffs, however. Under the Caribbean Basin Initiative (CBI), qualifying Caribbean and Central American countries can send ethanol to the US duty free, but most of that ethanol is required to be produced from “regional feedstocks” (that is, from sugar or corn grown in the qualifying countries, and not imported from non-qualifying countries). In itself, this loophole in the tariff would have little impact in US markets, since the ethanol production capacity of these countries from their own feedstocks is minimal. However, the CBI also allows these countries to import feedstocks, and then process them into ethanol, and ship the ethanol to the US, as long as the total amount shipped does not exceed 7% of US ethanol consumption (Office of the United States Trade Representative, 2005). In 2006, US consumption of production of ethanol was approximately 4.86 billion gallons. 653 billion gallons total were imported, with 434 million gallons coming directly from Brazil (and so subject to the ethanol tariffs)³⁰, while most of the remainder came from CBI countries (Nilles, 2007; Renewable Fuels Association, 2007a). The Renewable Fuels Association (RFA) has supported the tariff, arguing that it prevents foreign ethanol producers from gaining access to the \$0.51 tax credit available to US ethanol producers. http://www.ethanolproducer.com/article.jsp?article_id=2809.

Another way around the US ethanol tariff would be for US companies to import sugar cane, and then process that cane into ethanol, for example, assuming that using the cane as a feedstock is more effective than corn, the USDA estimated that if sugarcane were imported into the US at world prices, ethanol could be produced from that cane at an average cost of \$0.81 per gallon, compared to USDA’s estimates of \$1.05 per gallon when using corn. (United States Department of Agriculture, 2006, p. 26). But as illustrated in Figure 6, US sugar policy has long

³⁰ Recently, South American ethanol producers have been contemplating building ethanol factories in CBI countries to take advantage of their US tariff exemptions (United States Foreign Agriculture Service, 2006).

placed strict import quotas on foreign sugar. These quotas have caused the US price of sugar to be roughly double the world price for many decades. Thus, producing ethanol in the US from domestic sugarcane is not economically competitive with producing with US-produced corn. However, if sugarcane could be imported freely, the cost competitiveness could change significantly, making US sugar import quotas a crucial element of US ethanol policy.

State and Local Motor Fuel Taxes (Nominally Paid by Terminals)

State and local motor fuel taxes differ by location, but are important, and often are greater than the 18.4¢ federal tax. Like federal taxes, these state and local taxes are generally levied at the terminal. Recently the average state tax on gasoline or gasoline-ethanol mixtures has been 27.1¢ per gallon, and ranged from 8¢ per gallon in Alaska, to 41.7¢ per gallon in Hawaii (American Petroleum Institute 2006). Local taxes of this sort average about two cents per gallon nationwide, which gives an average state and local tax of about 29.1¢ per gallon. In Figure 2, these taxes are also shown by the arrows from F-1 and F-2 that head into state and local government coffers. Federal motor fuels and gasoline taxes are paid into the US Highway Fund. Funds for the VEETC, however, come from the General Fund of the US Treasury.³¹

State Tax Exemptions, Tax Credits, and Cash Payments to Ethanol Producers

Many states offer direct payments and/or tax relief to ethanol producers. Connecticut provides an example of a tax exemption: for every gallon of ethanol that an ethanol plant in Connecticut produces and puts into a tank truck bound for a terminal, the state of Connecticut allows the ethanol plant to take off one cent from its taxes. Similar state tax exemptions are available to ethanol producers in Alaska, Connecticut, Hawaii, Idaho, Illinois, Minnesota (for E85), and South Dakota (National Conference of State Legislatures 2007, Neely 2007). The tax exemptions offered by these states are small relative to state tax credits and cash payments to ethanol plants offered by Indiana, Kansas, Maryland, Minnesota, Mississippi, Missouri, Montana, North Dakota, Oklahoma, Pennsylvania, South Dakota, Texas, Wisconsin, and Wyoming. Many of these states provide tax credits of twenty cents per gallon, and some even offer forty cents per gallon (National Conference of State Legislatures 2007). Minnesota provides an example of a producer payment, which we illustrate in Figure 3. Ethanol producers in Minnesota receive from the state of Minnesota a cash payment of \$0.20 per gallon produced, on the first 15 million gallons produced. (This limits the total annual payment to any one producer to \$3 million.) In addition, Minnesota limits to \$34 million the total amount paid annually for this program (Minnesota Office of the Revisor of Statutes 2006).

³¹ Before 2004, funding for ethanol subsidies came from the US Highway Funds, which is financed by federal motor fuels taxes. But as the volume of ethanol production and consumption grew, the Highway Fund began losing more and more money to ethanol subsidization, which concerned those interested in continued construction and maintenance of US highways. As a result of political pressure from these parties, the funding of ethanol subsidies was switched from the Highway Fund to the Treasury's General Fund in the American Jobs Creation Act of 2004.

Who Nominally Receives a Subsidy versus Who Really Receives a Subsidy

It is fairly common knowledge that the benefits of a subsidy or the costs of a tax can be passed from market to market via market linkages. It is rare, for instance, that a proposal is made for a new tax on a type of business without businesses of that type arguing that the cost of the tax will “just be passed along to the consumer.”³² Similarly, when industries receive a subsidy, they often claim that this enables them to lower their prices, thus benefiting the consumer:

A 10% blend of ethanol receives a federal tax credit of 5.1 cents per gallon, and these savings can be passed along to consumers at the pump - an instant tax credit for buying an American-made product. (American Coalition for Ethanol, 2007)

There is a wide agreement among economists, however, that the benefits of subsidies and the costs of taxes are usually shared by consumers and producers all along a vertically-linked market chain. With Figure 8 we begin an illustration of why benefits of a subsidy generally are shared.³³ Figure 8 is a simplified demand and supply diagram for the ethanol market. (We are thinking of this market as the one in which terminals sell ethanol to service stations, shown by the combination of links F-1 and F-3 in Figure 1.)³⁴ Before any subsidy is provided, the ethanol market’s equilibrium price is established as p^* , and quantity at q^* , where the supply and demand curves intersect. After the provision of, say, a 10 cent subsidy per gallon of ethanol, a ten cent “wedge” is driven between the price suppliers receive for ethanol and the price demanders pay for it. That is, the price that demanders pay is 10 cents less than the effective price terminals receive. Also, in economic equilibrium it must be that the quantity supplied equals the quantity demanded. As a result of the subsidy, demanders pay a price p^d which is lower than p^* , and suppliers receive a price $p^s = p^d + 10¢$, which is higher than p^* . The quantity supplied and demanded is q^{**} . Thus, though the subsidy is nominally provided to the supplier, both the supplier and demander share its benefits.

³² One of many examples that can be found on the Internet is from the Oregon Brewers’ Guild web site, where the Guild argues against a proposed dime per bottle increase in the state beer tax: “This legislative session will again see an attempt to raise Oregon’s beer excise tax. The fact remains it would be a tax on one specific industry – the Oregon beer industry... Ultimately, all costs and taxes are passed along to the consumer.” (Oregon Brewers’ Guild, 2006).

³³ Figures 8, 9, and 10 are not meant to form a complete theoretical model, but rather are simply aids to our intuition-based example. (In a more complete model, the multiple curve shifts would need to be shown as price changes in a market affecting other markets, and then those price changes lead to further shifts, etc.)

³⁴ Concerning figures 8, 9, and 10, we ask those readers who have never taken a class in basic economics to bear with us, and trust that most of our paper will be understandable to those who customarily do not think in terms of supply and demand diagrams. Supply and diagrams can be very helpful tools for organizing one’s thoughts about the economic effects of government policies, and so we have elected to use them, but not rely exclusively upon them, in making our arguments.

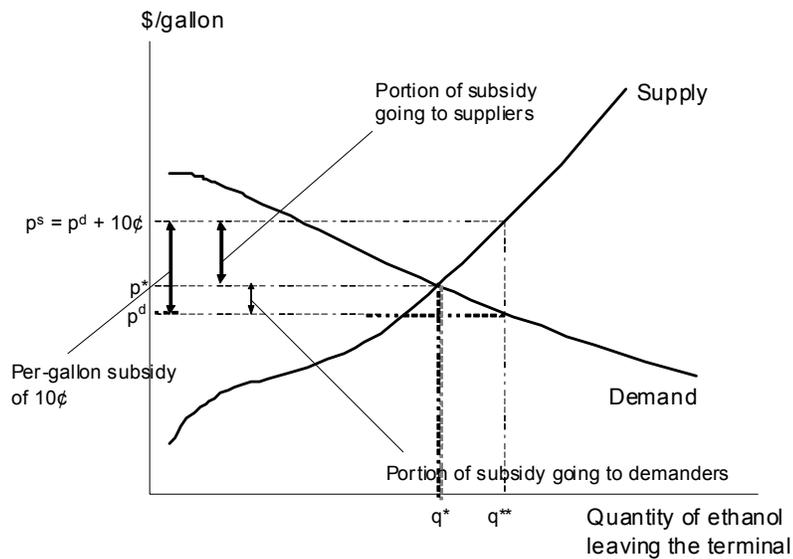


Figure 8. A simple model of an ethanol subsidy.

Our intuition should tell us that prices in downstream markets will fall—that is, because service stations pay less for some of the fuel they buy, their lower costs and competition among them lead them to sell their product for less to consumers. For the sake of illustration, assume that at F-1, the terminal sells ethanol to the trucking company. At the same time, at F-2, the terminal sells gasoline to the trucking company, and that a truck is filled with 90% gasoline and 10% ethanol, which is called E10.³⁵ Basically, as illustrated in Figure 9, because the price of one of their inputs to E10 falls, the service stations’ supply curve for E10 shifts out, resulting in a fall in the price consumers pay for E10, where the new price is p_{E10}^{**} , which is less than the original price p_{E10}^* .

³⁵For simplicity, assume that the ethanol and gasoline are blended by the movement of the truck on the way to the service station, and that then the trucking company sells the blended product, E10, to the service station. Also assume that the terminal is the “blender of record,” and so nominally receives the subsidy. In reality, it is rarely the case that an independent trucking company takes possession of the product. Often the trucks are owned by the same company that owns the terminal. Sometimes the trucks are owned by the same company that owns the service station. Sometimes the trucks are independently owned, and they are merely paid for their services by the service station. All of these situations could be analyzed by changing the economic model in different ways. But for the sake of illustration, assuming that the trucking company takes possession of the fuel is easiest here. No matter whether the trucking company takes possession of fuel or not, the results of the analysis in the retail market always show a decrease in the retail price and an increase in the retail quantity.

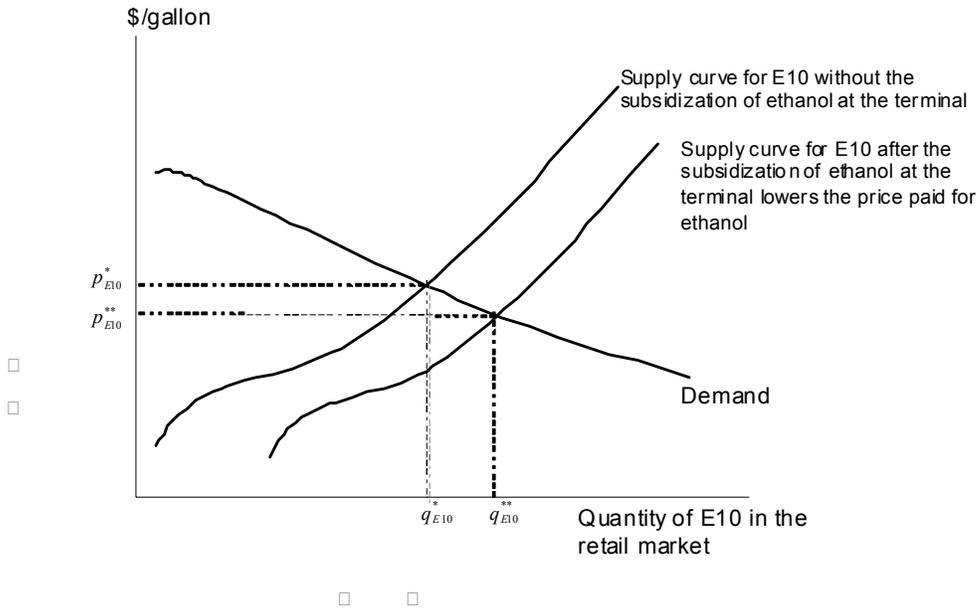


Figure 9. The subsidy of ethanol at the terminal rack lowers prices in downstream markets, such as in the retail market for E10.

Figure 10 shows how the increased production of ethanol affects markets upstream from the subsidized market. Because more ethanol is being produced, demands for inputs rise, leading to rises in the prices of the inputs. That is, we expect the price of corn to rise, as well as the prices of farmland, farm labor and farm management.

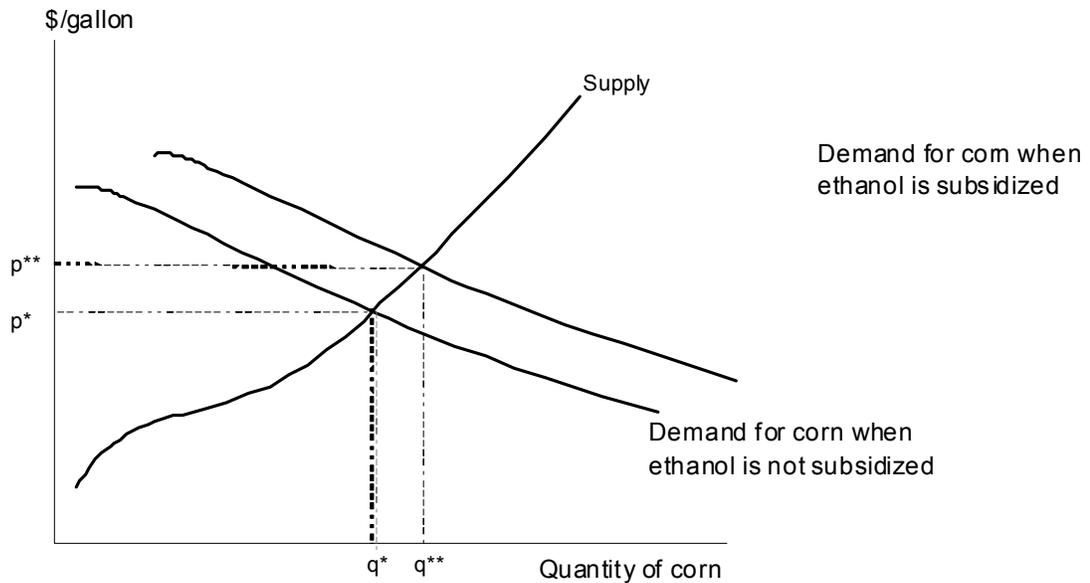


Figure 10. The subsidy at the terminal raises prices in upstream markets, such as the corn market.

Figures 9 and 10 illustrate a qualitative conclusion that we can make about the ethanol subsidy: it raises the prices in markets upstream, and it lowers prices in markets downstream. That is, all markets, at least conceptually, have participants affected by ethanol policy. But by how much? We address this quantitative question in the following.

Which Prices Change a Lot, and Which Change Only a Little?

We have concluded the following, which is a view held widely among economists: the ethanol tax credit raises prices upstream from the subsidy, and lowers prices downstream. So, to some degree—maybe a large degree, maybe a negligible degree—we expect the subsidy to cause the price of corn, farmland, farm labor, and farm management to rise, and the price of motor fuel to fall. In all cases, we can expect taxpayers to have to pay higher taxes to finance the subsidy (or else pass the government debt along to their children and grandchildren).

The pertinent question of how the tax credit affects various groups in society, then, is not one of direction, but rather one of magnitude. The magnitudes of the price changes have important implications for income redistribution. If ethanol policy makes the price of motor fuel fall by a lot but affects taxes little, we might conclude that this is good for the average American, who drives every day and pays federal taxes every year. On the other hand, if ethanol policy ends up only negligibly lowering the price of motor fuel, raising per-family federal taxes significantly, and raising the price of farmland significantly, then many would view the income distribution consequences to be unfair. For such effects would constitute an income transfer from the average American to the average owner on corn-growing farmland, and a high percentage of US farmland is owned by individuals much wealthier than the average American.³⁶

The Importance of the Flexibility in Movement of Factors of Production

Let's give the name "factors of production" to the various inputs that are necessary for a product to be produced. Taking the production of corn as an example, land is a factor of production that must necessarily be devoted to corn production if there is to be any meaningful amount of corn production. Fertilizer is not absolutely necessary for corn production, but it usually helps. Similarly herbicides, farm equipment, and diesel fuel are usually factors of corn production in the US. But none of these factors of production will produce corn without human labor, working in tandem with human knowledge and decision-making. For this reason, we also will call labor and farm "management ability" (which we might also call "know-how" or "human capital") factors of production.³⁷

In thinking about the economic effects of government policy, one of the most important concepts is the *flexibility* that factors of production have to move or be moved among different

³⁶ For example, in 2002 half of government commodity payments went to farms with incomes exceeding \$60,580 per year. The median US household income in 2002 was \$42,409 (McDonald, Hoppe, and Baker, 2005).

³⁷ It may at times seem a little dehumanizing to call human beings and their labor and knowledge "factors of production," as if they were no more than cogs in an impersonal production machine. Still, because land, fertilizer, farm equipment, etc., cannot produce corn on their own, human beings are a necessary part of the production process. So in our discussion we will use the term "factors of production" to refer to human beings, with the acknowledgement that humans certainly are much more than simply factors of production.

sectors of the economy.³⁸ To understand why flexibility of movement is important, think of the case of what happens to human labor and know-how when an industrial factory closes down in a small city. In general, the people who are hurt most by the shut-down are those that are less flexible in their ability to move out of town to find another job that requires the sort of know-how similar to what they developed while working in their original job in the factory. If the knowledge they have obtained through work experience is very specific to a particular industry, they may find it quite difficult to find a comparable job elsewhere. For instance, consider what would happen if the bottom dropped out of the timber market and the timber industry began to lay off workers. An Oregon lumberjack who has spent the past twenty years learning how to fell timber may well not find it easy to transfer that experience to working in a factory or working as a computer technician after he is laid off by the timber company. As a result, after losing a job in which he was paid not just for his labor but also for his industry-specific knowledge, the ex-lumberjack may be forced to work in a low-skilled job for much less pay. He still gets paid for his labor, but not much for his knowledge, because lumberjack knowledge doesn't really make him much better at washing dishes or selling real estate, for example.³⁹ In general, because they have not accumulated much experience in a particular job, younger people are more flexible in their ability to move in and out of economic sectors than are older people. If the lumberjack's daughter is seventeen when the timber company shuts down, it will be relatively easy for her to finish high school, then move away, either to go to college or to begin building experience in another job.

Flexibility in factor movement also is important in the other direction. Say that a government policy leads to a boom in the nation's timber industry, with timber prices rising greatly. The timber company probably will want to harvest more timber, and to do so it would like to hire additional experienced lumberjacks. But all the experienced lumberjacks may already be employed with other timber companies, and also not desire to sell their houses, take their children to new schools, and leave relatives to move to a new place. If it takes several years of lumberjacking experience to become a proficient lumberjack, then lumberjack know-how does not have much flexibility in movement. As a result of the government policy lumberjack salaries tend to increase, as timber companies compete to entice experienced lumberjacks to come work for them. Thus, we see that⁴⁰ the less flexible labor and know-how are in moving between sectors, the more forces that increase the price of their products also increase their pay. If government policy increases the price of timber, then lumberjack salaries will rise a lot if it is

³⁸ Economists often find it useful to formalize this idea of flexibility, using a mathematical concept called "elasticity." We avoid such formalization in this chapter.

³⁹ Housing and home ownership often play another important role in determining the flexibility of labor and know-how to move to other economic sectors. The ex-lumberjack may live in a small town far away from other good economic opportunities. When the timber company closes its doors, prices in the local housing market might drop a good deal, because it is not feasible for homeowners to physically move their houses and the land their houses sit on to another town. If the mortgage on his house is paid for, sometimes it makes more sense for the ex-lumberjack to continue living in that house, and work a low-paying job, than to sell the house for very little, then move to another town where housing will cost him much more.

⁴⁰ Here and in various other places in this chapter, we could be a little more accurate by stating "all else held equal" before our claims. After all, many things besides movement flexibility can affect how lumberjack salaries react to government policy. In this part of our discussion, we want to focus on and isolate the effect of flexibility, so we are assuming that these other things do not change. Of course, in reality they may change, and need to be accounted for in a complete analysis.

very difficult for timber companies to find experienced lumberjacks. If government policy decreases the price of timber, then lumberjack salaries will fall a lot if lumberjacks and their work knowledge cannot easily move into other jobs.

Flexibility Movement in the Automobile Fuel Sector

Relating the timber industry example above to the motor fuels sector, and its corn-ethanol and petroleum branch lines, the implication is that to understand who gains and who loses from ethanol, it is vital to examine the flexibilities in movement of the factors of production. We will examine the corn-ethanol branch line, the petroleum branch-line, and then the motor fuels main line, in turn.

The Corn-Ethanol Branch-Line

Our discussion above leads us to the following conclusion: *those factors of production in the corn-ethanol branch line that have the least flexibility in movement will gain most from a government policy subsidizing ethanol, and be hurt the most if government discontinues such a subsidy.*

Given the complicated framework of the automobile fuel sector's corn-ethanol branch-line, (which is actually simplified in Figure 1), we come to the question of which of the factors of production presented in Figure 1 have good flexibility to move in and out of the sector, and which have poor flexibility. It probably makes sense to assert that the transportation services—the truck and its driver, that is, can enter and exit this sector with relative ease. Trucks are fairly easily rented and sold, and they can be used for hauling many other sectors of the economy. Of course, as with all factors, the supply of trucking services is more flexible in the long-run than in the short-run. Given enough time, many trucks can be either manufactured or taken from other sectors to be brought into the corn-ethanol sector. We conclude that ethanol policy will have minimal impact on trucking companies and their employees.

Farm labor may also leave and enter agriculture with relative ease. Remember here that we are separating the actual physical labor of the farmer from what he knows about farming. The physical demands of farming involve driving, some heavy lifting, etc. These efforts can be used in most jobs that require physical labor, and it would probably be fairly easy to attract more physical labor into agriculture by simply advertising a wage a little higher than the going wage for unskilled workers. We conclude that ethanol policy will have minimal impact on farm hands who are paid mostly for their labor and little for their know-how.

On the other hand, especially if not given much time, farm know-how may be much more difficult to move in and out of the agricultural sector. The experience and studying which have up to now enabled a veteran farmer to farm efficiently, may not provide knowledge that is particularly useful in managing a restaurant or selling real estate, for example. And if one wanted to attract more know-how into agriculture, undoubtedly it would take time for people to study and gain the experience necessary. We conclude that in the short run⁴¹, people who know a lot about

⁴¹ Following a long and perhaps unfortunate tradition among economists, we will not define the term “short run”

corn farming will gain from the ethanol subsidy. Demand for what they provide goes up, and it is not easy for new know-how to be developed to compete with their existing know-how.

In the long run, however, especially as generations turn over, farm “know-how” is extremely flexible in moving in and out of agriculture. Even if it is difficult for a 60-year-old to move out of farming and into another occupation, this transition is relatively easy for a recent high school graduate. The large exodus to cities of the US rural population in the post-World War II generation mostly consisted of graduates from rural high schools moving into cities and towns for work or further study, and not replacing their parents on the farm. It may seem overwrought to worry about the effects of ethanol policy on people who will be farming a generation from now. But US commodity policies that were began over seven decades ago during the Great Depression are still impacting US agriculture today, so perhaps it makes sense to look ahead.

A good argument can be made that farmland is the least flexible of the factors of corn production. This not to say that the supply of farmland is totally inflexible. Clearly, as we have seen over the past couple of decades, agricultural land near urban areas can be moved from agriculture into shopping malls, golf courses, and housing subdivisions. This option is less available for the large portion of agricultural lands that do not lie near major population centers. The best alternatives to using such land in agriculture—perhaps turning it into a hunting range or a wildlife sanctuary—have a far lower return for the investment than does keeping the land in agriculture. Therefore this type of land does not flexibly flow between agricultural and non-agricultural uses.

After corn has been trucked to an ethanol factory, the factory processes it into ethanol using “ethanol factory services” (that is, the machines, the energy, the labor management skills, etc.). How flexible ethanol factory services are to move in and out of ethanol production depends very much on the length of time that is allowed for movement. Existing ethanol factories tend to run very near full capacity, with three shifts of workers covering all 24 hours of the day. Therefore, if only given a year or two, there isn’t much room for existing ethanol plants to expand production in response to government policy. This implies that if the government announced today that a greater ethanol subsidy would be provided starting tomorrow, this would certainly benefit existing ethanol factories. While an individual factory could not expand its output much in response to the higher subsidy, neither could competing factories expand their output. See Figure 11, where the supply curve is very steep because of the inflexibility of ethanol factory services. When the ethanol factory shifts the demand for ethanol factory services, in the short-run new factories cannot be built, and existing factories cannot be expanded much. As a result, the quantity of factory services provided increases little, but the amount paid for these services increases a lot. Therefore, the profits of existing factories rise sharply. We witnessed this type of occurrence in 2006, when high oil and expectations about the Energy Policy Act of 2005 sharply raised the price of ethanol, and thereby caused the demand curve for ethanol factory services to shift out greatly. Existing ethanol factories made very high profits in 2006.

exactly, but are thinking in terms of a few years.

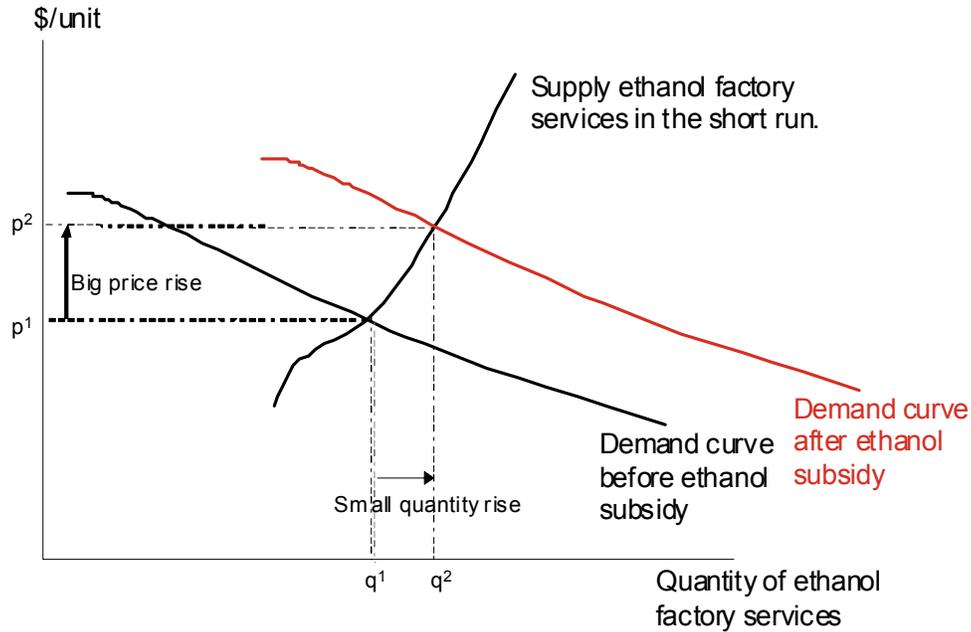


Figure 11. A large price rise comes about because of an outward shift in demand for a factor that does not move in and out of the market flexibly. An example is ethanol factory services in the short run.

Results in the long run can differ sharply, however, from those in the short run. For in the long run, investors will react to the high profits of existing factories by building new factories and expanding old ones. This has very much been the case in 2006 and 2007. Dozens of ethanol factories were being built in those years. As shown in Figure 12, in the long run the supply curve for ethanol factory services is much flatter than in the short run. Just as in Figure 11, as a result of the announcement of a higher subsidy demand for ethanol services shifts out. But because ethanol factory services can easily move into the market, the result of the demand shift is much more of an increase in quantity, and much less of an increase in price. Worse yet for owners of existing ethanol factories, investors will continue building new ethanol factories until the monetary returns from building one equal the returns investors could get in similar investments outside the ethanol sector. That is, competition will continue to enter and drive until it no longer can profit from entering.

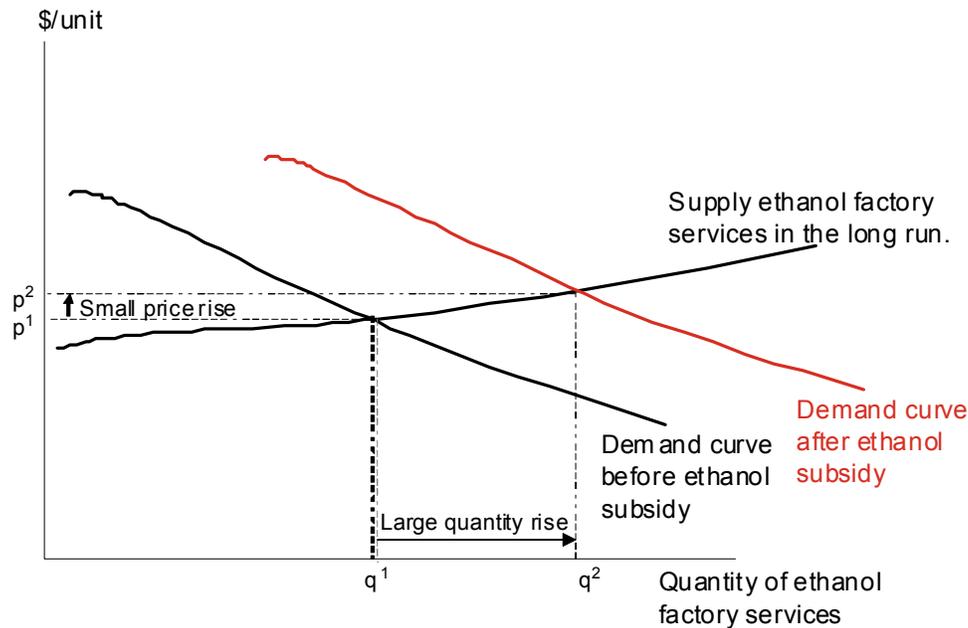


Figure 12. Only a small price rise comes about because of an outward shift in demand for a factor that moves in and out of the market flexibly. An example is ethanol factory services in the long run.

We have argued that the factors that gain the most from an ethanol subsidy are those that are least flexible in supply. All factors are more flexible in supply in the long run than in the short run. We have argued that almost all factors—farm labor, farm know-how, grain elevators, transportation, and even factories, can move into the ethanol sector flexibly in a few years’ time. The least flexible factor in supply is farmland. It is relatively difficult to find new farmland to bring into the biofuels sector. As a result, we conclude the following:

Over the “short run” (a few years’ time) an increase in a subsidy to ethanol will mainly benefit owners of existing ethanol factories, people with farm know-how, and owners of farmland. In the long run, farmland owners will reap the greatest benefits from the higher subsidy.

The Petroleum Branch Line

The petroleum branch-line’s initial resource is crude oil. Of course, crude oil is traded all over the world in huge quantities. In the US in 2006, a little under five billion gallons of ethanol was consumed in the US. But over 100 billion gallons of gasoline was consumed in the US, and this was only a fraction of world gasoline consumption. Therefore, using ethanol policies to encourage the substitution of ethanol for gasoline in the world should not be expected to have much impact on the world price of crude oil as the amount of net energy that can be obtained from corn is too small a fraction of the amount of energy produced with crude oil. This implies that crude oil is quite flexible in supply to the US. Since ethanol policy has little effect on the world price of crude oil it has little effect on those American companies that supply crude oil

from domestic wells.

On the other hand, it is not at all easy to build new crude oil refineries. So, to the extent that domestic ethanol policy causes ethanol to be substituted for gasoline, the demand for refinery services are lowered, and the price that can be gotten for refinery services will fall. This helps explain the traditional opposition of oil conglomerates to ethanol subsidies.

The Motor Fuels Main Line

In the motor fuels main line, gasoline, E10, and to a minor extent E85 are moved from terminals to the consumer. The services that retail service stations provide are quite flexible in supply. It does not take long to build new service stations. Besides, it makes little difference to service station owners whether they are selling E10 or gasoline.

The implication of our discussion above is that we cannot expect ethanol policy to measurably affect the price of gasoline. Rather, the causation runs in the opposite direction: in general, the price of ethanol is determined by the price of gasoline, as discussed in Chapter 2.

A Political Ratchet: On the Irreversibility of Ethanol Investment

Another question is how flexible factors are in moving *out* of ethanol production and into an alternative use. It is crucial for policy makers to understand this concept and its implications. Some factors are reasonably flexible—the transportation trucks and rail cars can be moved to alternative activities with relative ease. But other factors are considerably less flexible. It would be difficult to move some forms of labor and know-how out of the sector, especially in any kind of short run. Ethanol factories are built in rural communities, and thus one of the political justifications for providing subsidies to ethanol is to create factory jobs in rural areas. If workers and managers own homes in a small town, then when an ethanol plant shuts down it may be impossible for them to sell their homes without a huge loss in equity, and therefore they may not be able to get out of the town that they moved into earlier, when they anticipated that ethanol markets would remain strong, and government policy would remain favorable, for many years to come. Even less flexible are the buildings and machines that make up the ethanol plant itself. Clearly it is not generally feasible to move the buildings. And many of the machines used in an ethanol plant are not very useful in other industries.

This irreversibility of bringing factors into ethanol production causes the subsidy policy to act like a political ratchet. It is easy enough politically to cause the subsidy to go up: corn farmers and ethanol producers influence their congressional representatives, and everyone refers to energy self-sufficiency and rural job creation. But once in place, it may well become politically infeasible to bring the subsidy back down. For, after the economy is finished building new ethanol factories, in response to the subsidy, what then? We've already argued that when the building process is through, many ethanol factories will not be making large profits. The factories and their workers, then, would be quite vulnerable if, for example, any of the following transpired: 1) the government decided to remove or lower the subsidy, 2) world oil prices fell and remained low for an extended period, and/or 3) droughts led to poor corn harvests in consecutive years. In any such circumstance, it will be extremely difficult for government to tell factories that

are losing money and workers who are losing jobs, “Sorry, but that’s the free market.” Rather, it will be politically expedient to raise subsidization levels. Thus, a major concern is that ethanol subsidies are relatively easy for governments to get into, but very difficult for governments to get out of.

Conclusions

We have explained and reviewed ethanol policy as it currently stands in the US, and have also discussed the claims of various groups interested in ethanol policy. We have argued that current ethanol policy has the following economic consequences:

- 1) It raises the price of farmland
- 2) It leads to private industry investments in new ethanol factories, which once in place will be very difficult politically to stop supporting
- 3) It may increase jobs in the rural Midwest, but it also may shrink the economies and decrease jobs elsewhere.

The obvious question is whether the benefits of 1), 2), and 3) are worth cost of the policy. An increase in the price of farmland is good for people who own farmland, but bad for people who want to buy farmland. In this sense, one person’s loss is another’s gain, and in this sense it is difficult to classify policies that raise the price of farmland as good or bad. Current ethanol policy transfers wealth from the average taxpayer to the average owner of farmland.

Consequence 2) is disconcerting. By supporting the ethanol industry, are federal and state governments promoting a policy—indeed creating an entitlement—that will be later politically impossible to rescind? The desirability of consequence 3) is difficult to judge. Are there reasons to tax away jobs in other states in order to support job creation in the rural Midwest? Of course, other government policies tax away jobs in the Midwest in order to create jobs in other states. (For historical political reasons, a disproportionate number of military bases are located in the southeast, for instance.) But without keeping score on this type of grand scale, it is hard to justify, from the point of view of national well-being, a policy that takes jobs from one part of the country in order to create them in other parts of the country.

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