

The Takeaway

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U.S. Ethanol Policy: The Unintended Consequences

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The Energy Independence and Security Act of 2007 (EISA) mandated a steep rise in domestic ethanol production. The goals were to ease dependency on imported petroleum and to cut greenhouse gas emissions. A new blend of ethanol and conventional gasoline was to cost motorists less. EISA mandated ethanol production to grow from 4.9 billion gallons in 2006, to 36 billion by 2022. Today, at 14 billion gallons, we're not even halfway there. EISA envisioned that cellulosic ethanol would provide the future growth, but reasonable production costs remain elusive. The unintended consequences of the policy, especially those influencing world food prices, are negative and far outweigh the positives.

GOOD INTENTIONS

Initially, lawmakers envisioned that by jumpstarting a U.S. biofuels industry, four intended consequences would result: 1) the American motorist would see lower prices at the pump; 2) while taxpayers would forego tax revenue, lower pump prices would more than compensate; 3) the U.S. would build energy security as domestic ethanol replaced oil im-

ports from the Middle East; and 4) since corn plants absorb CO₂ from the atmosphere, greenhouse gas emissions would fall significantly.

There was little or no discussion of unintended consequences for food prices. After all, trends in food prices had been flat for several decades.



WHAT'S THE TAKEAWAY?

Corn-based ethanol has had only small price, energy security, and environmental benefits

Yet, the unintended consequences on food prices have been large and negative

Rich consumers can substitute away from higher-priced foods, but the world's poor have no such options

Repealing EISA would bring food prices down, while keeping market incentives for ethanol use intact

DID THE BENEFITS MATERIALIZE?

Cheaper gas? First, from the consumer's perspective, the current blend of E10 (or 10% ethanol) gasoline offers pros and cons. The btu efficiency of a gallon of ethanol is about 40% less than a gallon of conventional gasoline. So, an E10 blend requires 4% more fuel than conventional gasoline, costing the consumer an extra 13 cents per gallon. On the positive side, the refining costs of making E10 and the costs of crude oil are lower with ethanol. On balance, these effects do outweigh the lower efficiency of E10, so that the motorist saves about 6.5 cents per gallon with E10 (Griffin).

Revenue-neutral? Second, most Americans are not aware that ethanol blenders receive a 45 cent per gallon federal subsidy. For a gallon of E10, Uncle Sam pays 4.5 cents per gallon. On net, the motorist/taxpayer is only slightly better off by 2 cents a gallon, or about \$3 billion per year.

Better energy security? Superficially, this benefit looks large. Comparing June 2011 ethanol production of 910,000 barrels per day against total petroleum imports of 11.8 million barrels per day, it is tempting to conclude that our ethanol policy has boosted our energy security by 7.7%. But this conclusion is wrong, for several reasons. Because of its lower btu efficiency, ethanol only displaces 655,000 barrels, or 5.6% of imported petroleum. Further, the percentage of import dependency is a misleading indicator of security. The world oil market is global, as are its market effects. Even though the U.S. imports no oil from Iran, for example, a disruption of Iranian supplies would trigger world-wide increases in all oil prices—even domestic oil prices.

Ethanol is a clumsy tool for promoting oil security. During a supply disruption, we need a source that can be turned on for the period of the disruption. Ethanol clearly doesn't meet this criterion; production cannot be ramped up on short notice. Through the Strategic Petroleum Reserve, the U.S. already has a formidable source of oil that can be quickly pumped from the massive salt domes along the Gulf Coast and processed in nearby refineries.

*Ethanol is a clumsy tool
for promoting oil security*

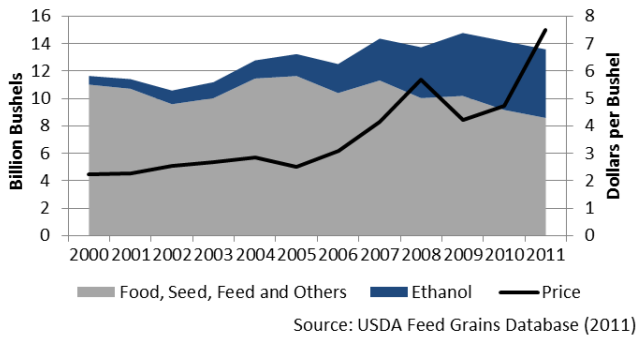
Eco-friendly? Finally, ethanol was anticipated to slash greenhouse gas emissions. Since in growing corn, it absorbs CO₂ from the atmosphere and then releases it when consumed as ethanol, one may think that ethanol is environmentally neutral. But a life-cycle analysis that includes the CO₂ emissions in plowing, planting, applying fertilizer, harvesting the corn and delivering it to the ethanol plant, producing the ethanol, and distributing it tells another story. A 2008 study by the Argonne National Laboratory estimates that the life-cycle CO₂ emissions to produce one gallon of conventional gasoline emits 12.5 kilograms, whereas the life-cycle emissions of btu-equivalent ethanol emits 10 kilograms—a 20% reduction. Since in 2011, ethanol displaced 655,000 barrels per day of gasoline, the CO₂ emissions saved amounted to 25.2 million metric tons annually. Compared to total U.S. and world emissions, the effects are miniscule—0.42% of U.S. and 0.08% of world emissions.

*Eco-friendly by 8
hundredths of 1 percent?*

**UNINTENDED CONSEQUENCES:
RISING WORLD FOOD PRICES**

While the intended outcomes have been small but positive, the unintended consequences on food prices have been the polar opposite. Disentangling the effects of ethanol mandates from rising oil prices, fertilizer costs, Chinese soybean imports, etc., is not trivial. Figure 1 offers some clues. From 2000 through 2005, corn production destined for ethanol production grew as ethanol displaced MTBE as an oxygenate for gasoline. Meanwhile, the price of corn fluctuated between \$2 and \$2.50 per bushel, and corn production destined for food purposes was stable. Even up until 2007, rising overall production allowed corn for ethanol purposes to grow without displacing its use for food. But after 2007, the EISA's ethanol mandates drove up ethanol production at the expense of food uses. From 2007 to 2011 corn used for food purposes (including seed and other non-ethanol uses) fell by almost 3 billion bushels. By 2011, 37% of the corn crop went towards ethanol production, and corn prices stood at a lofty \$7.50 per bushel.

Figure 1: U.S. Corn Uses and Price History



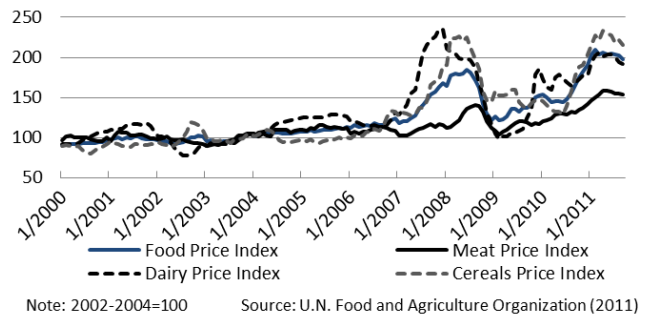
Corn is not a minor, isolated part of U.S. or world agriculture. The U.S. is the largest producer of corn and its exports account for 53% of world corn exports. The meteoric rise of corn prices caused farmers to increase corn acreage at the expense of other grain products. Out of a total U.S. farm acreage of 305 million acres harvested, corn acreage grew from 72.4 million acres in 2000 to 84 million acres in 2011. With total harvested acreage showing little change, the growth in corn acreage has meant smaller plantings of other grains like soybeans, wheat, and rice. With the U.S. being a major exporter of these other grains, their world prices have more than doubled between 2007 and 2011.

With all grain prices rising sharply, it was only a matter of time before broad indexes of world food prices would be affected (Figure 2). Between January 2007 and September 2011, the U.N.'s aggregate index of food prices (FAO Food Price Index), after adjusting for inflation, increased by 68%, cereals by 69% and dairy products by 46%. Meat prices have risen more slowly, but future increases are likely.

These simple facts tell a persuasive causal story that runs from ethanol mandates to corn prices, then to production and prices of other grains, and finally to prices of retail food products. One study (Hayes et al, 2009) quantifies how a \$1 per bushel increase in corn prices impacts a wide variety of food products. For example, between 2005 and 2011, corn prices rose by \$5 per bushel, implying these price increases: beef (18.5%), pork (16%), poultry (17.5%), eggs (27.5%), milk (10.5%), cheese (9%), sugar and sweets (3.5%).

That being said, U.S. ethanol policy is not the sole culprit behind the world food price increase. Even though the timing of the higher prices coincides

Figure 2: Monthly Inflation-Adjusted FAO World Food Price Indices



with the 2007 ethanol mandates, Abbott et al point to soybean exports to China and the E.U.'s own biofuels policies as the main co-contributors to the big jumps in grain prices. Since 2005, U.S. soybean exports to China have doubled, driven by greater demand for grains to feed livestock as meat consumption rises. Meanwhile, the European Union's biofuels mandates grew the percentage of transportation fuels containing biofuels from 0.2% in 2001 and are mandated to reach a 10% minimum target by 2020. Substantial acreage in Europe and Brazil has already been diverted to these non-food uses.

EFFECTS AT HOME AND ABROAD

Americans spend on average 11.4% of their disposable income on food (USDA 2010a). When food prices rise, we can find ways to spend less: by substituting into cheaper or less processed products, eating out less, or eating less meat and more vegetables. Because of these options, the aggregate U.S. consumer price index for food increased by only 16.2% from January 2007 to October 2011 (Bureau of Labor Statistics). Even so, this increase implies an additional annual expenditure of \$160 billion. Even if only a quarter of the additional expenditure is due to our ethanol policies, there is an annual loss to American consumers of \$40 billion.

This is not a negligible loss, but around the world higher food price increases have been truly devastating. The IMF reports a 40% increase in its world food price index, and the U.N. reports a 46% increase over the period 2007 to 2011. In many developing countries like Kenya, Pakistan and Cameroon, food expenditures absorb at least 40% or more of the average citizen's income. When cereal grain prices jump by 67.4% as they did over the last year, the poor must simply con-

sume less; there are no cheaper foods to substitute towards. Citing World Bank data, the Food and Agriculture Organization reports that rising food prices plunged nearly 70 million people into extreme poverty in 2010-2011 (FAO, 2011a).

LET'S END THE EISA MANDATES

The realized benefits of our ethanol policy have been disappointingly small. Motorists/taxpayers enjoy a slight benefit of about \$3 billion per year. Oil security is a complex issue and is better dealt with through our Strategic Petroleum Reserve. And corn-based ethanol has done little to reduce the nation's carbon footprint. In contrast, the policy's unintended consequences for food prices raise grave economic and ethical issues.

Three key policy changes can help: a repeal of the ethanol mandates in the Energy Independence and Security Act of 2007, an elimination of the ethanol subsidy of 45 cents per gallon, and an elimination of the tariff on cheaper, more eco-friendly Brazilian ethanol imports. Congress wisely allowed the subsidies and the tariff to expire on December 31, 2011. But the most important step—repealing the 2007 ethanol mandates—remains. A repeal would ease pressures on food prices almost immediately. Corn prices would fall and the steady diversion of other crop land to corn production would halt, causing prices of other grains to fall too.

Would these policy changes bankrupt the domestic ethanol industry and send corn prices back to their 2005-2006 levels, causing new hardships for the

farm sector? A return to 2005-2006 prices seems very unlikely. With oil prices at \$100 per barrel and an existing infrastructure of ethanol plants, ethanol will remain a necessary oxygenate and attractive additive to conventional gasoline.

Instead of marching blindly ahead to the 2022 mandated target of 36 billion gallons, let's reassess our ethanol policy. To be sure, we should continue to support R&D for advanced biofuels such as cellulosic ethanol. In the interim, we should dismantle the ethanol mandates and trust markets to sort out the proper mix of ethanol in gasoline.

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