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SOCIOECONOMIC ISSUES AND BIOFUEL ENERGY

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Biofuel policies have arisen as a confluence of policies which are a subset of energy, environmental, agricultural and trade legislation designed to obtain multiple goals, including energy security, environmental quality (reduced local air pollution and GHG emissions), improved farm income and rural development, and induced technological change. Other stated political goals include increased domestic energy production that creates 'green' jobs and foreign exchange savings with reduced crude oil imports.

Although biofuel production and consumption are mostly concentrated in the United States, Europe, and Brazil, more than 60 countries have implemented biofuel policies. The most important polices are blending mandates (e.g., in the United States) or mandatory targets (e.g., in the European Union); subsidies aimed to support biofuel consumption (i.e., tax credits or tax exemptions) and production (e.g., ethanol production), subsidies on biofuel feedstock production (e.g., U.S. corn); and binary sustainability standards where each type of biofuel is required to reduce GHGs by a different percentage compared to the gasoline/diesel it is assumed to replace. Life cycle assessment (LCA) along with empirical estimates of GHG emissions due to indirect land use changes is the measure used.

Although the economics of each of these individual policies are unique, higher feedstock prices result from the higher biofuel production which always replaces some gasoline so crude oil prices decline. The effect of biofuels is to lower average fuel prices to consumers except with a mandate alone, when the fuel price could go up or down (de Gorter and Just, 2009).

There are many policy questions surrounding biofuels (see de Gorter and Just 2010 and de Gorter et al. 2013 for surveys).

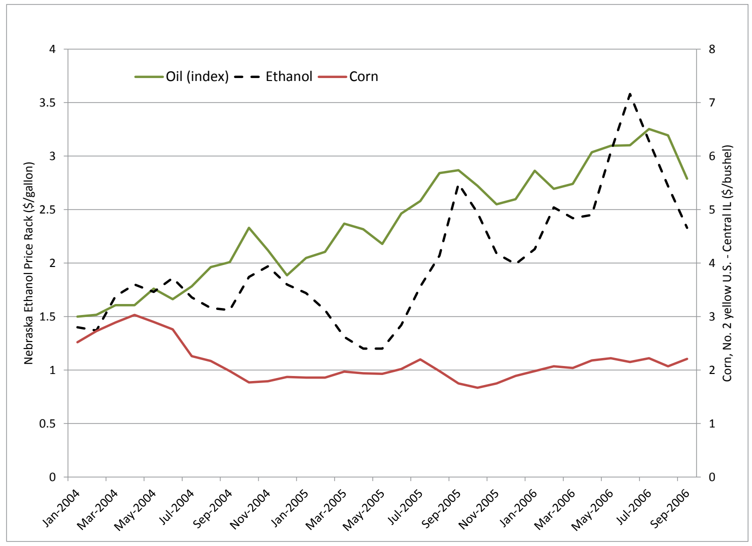

Figure 1. Oil, Ethanol, and Corn prices Jan. 2004 - Sept. 2006.

Two prominent issues we assess here is their impact on food commodity prices and GHG emissions. Biofuels policy has such a big impact not only because of the demand shock in crops but also because it created a direct link between crop and energy prices for the first time ever; before energy prices only affected crop prices through input costs. Now, for example, for every one cent per gallon increase in the ethanol price, corn prices increase four cents per bushel (this occurs regardless of how much ethanol goes into ethanol). Because crops compete for the same land and are substitutable in demand, all grain/oilseed prices went up together and all other biofuel production worldwide therefore had additive effects. The large corn-ethanol price multiplier, coupled with comparable price links in biodiesel and Brazilian sugarcane-ethanol markets has been the main cause of the turmoil in world grain/oilseed prices witnessed in the past half-decade. Although corn prices did not move for 33 months leading up to October 2006, ethanol and oil prices doubled (Figure 1). Then corn-ethanol prices became linked with the U.S. farm price of corn increasing 88 percent (KC #2 white corn 107 percent) in five months, precipitating the Mexico Tortilla Crisis in January 2007, the India wheat import ban one month later (the first of many developing country policy responses to come) and the doubling of the U.S. mandate in December 2007 (Figure 2). By then, corn and ethanol prices were in lockstep and continue to this day, as are biodiesel and oilseed oil prices, while sugar and sugarcane-ethanol prices have been strongly correlated in Brazil.

The corn-ethanol price link is determined by several key factors: how much ethanol is produced from a bushel of yellow corn; how much co-product – called dried distillers grains with solubles, DDGS – is produced in the process of producing ethanol (DDGS is subsequently used as a corn substitute to feed animals); what the relative price is of DDGS and corn; and whether corn oil is also extracted and sold as biodiesel which reaches much higher prices than ethanol. Figure 3 plots actual versus predicted corn prices from this formula summarized in de Gorter et al. (2013). Prediction errors are mostly due to ethanol production capacity constraints.

Biofuels policies do not only affect crop price levels but also their volatility as U.S. biofuels policies interact with each other and also with biofuels policies in the rest of the world, thereby increasing the complexity of the economics of commodity-price volatility. The interaction effects not only depend on the source of the shock (oil prices versus crop supply/demand shocks) or which biofuel policy determines the world biofuel market price (e.g., tax credit versus mandate), but also on the interactions across the various environmental, energy and agricultural policy instruments within a country as well as across countries. One example is when the United States was the world's largest exporter of ethanol in 2011, including to Brazil. The two countries' ethanol prices were linked, causing market shocks in the sugar market to reverberate in corn markets. The tax credit with exports increased U.S. ethanol prices, and when the tax credit expired, U.S. and Brazilian ethanol prices plummeted.

Mandates are typically implemented with tax credits (exemptions outside the United States). In this situation, the tax credit reduces fuel prices, thus increasing fuel (and hence gasoline) consumption (de Gorter and Just, 2009). This negates the stated policy goals of increased energy security, environmental quality and farm incomes.

Another area of interest with respect to biofuel policies is the net effect on the environment. Most often, the addition of biofuels increases fuel consumption and hence externalities associated with vehicle miles traveled which are far greater than that due to GHG emissions. Regardless, a mandate is superior to a tax credit in that regard as the former results in a lower level of total fuel consumption, GHG emissions and miles traveled for the same quantity of ethanol.

Some studies show biofuels increase welfare by increasing a country's terms of trade in the crop exported and crude oil imported, like in the United States. Biofuels cause higher corn prices and lower crude oil prices.

Finally, binary sustainability standards have become a big controversy where U.S. corn-ethanol, for example, is required to reduce GHGs emissions by 20 percent relative to the gasoline it is assumed to replace. These numbers are based on

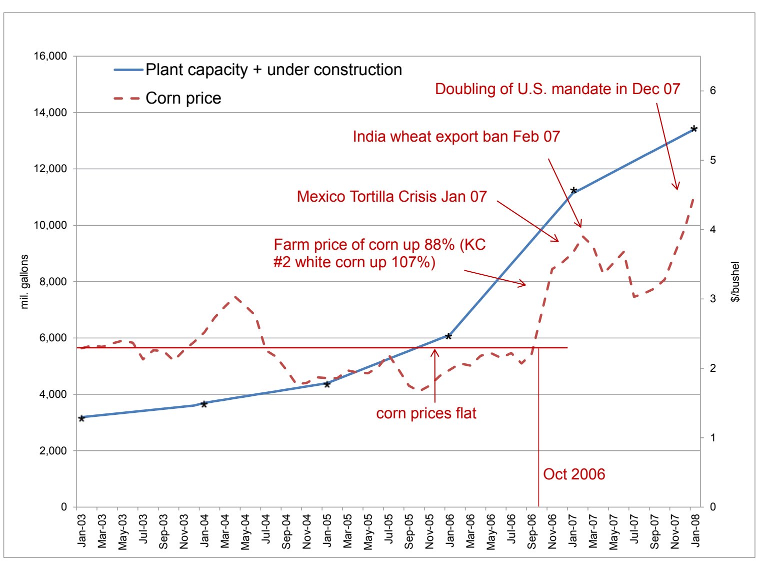

Figure 2. Ethanol Plant Capacity and U.S. Farm Price of Corn.

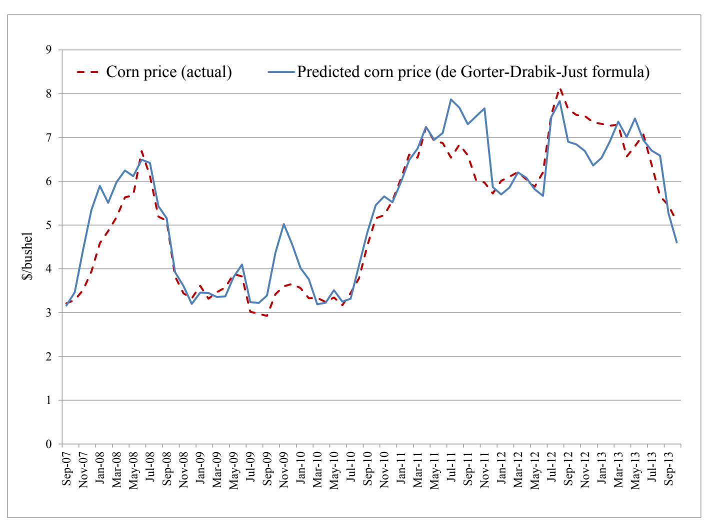

Figure 3. Predicted versus Actual Corn Prices.

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LCA, a "well to wheel" measure of GHGs emissions in the production of gasoline, and a "field to fuel tank" measure for ethanol production. The problem with this policy measure is that it does not take into account market "leakages" that may offset the implied savings measured by LCA. Two examples come to mind. First, higher corn prices means more grassland and forests will be converted into cropland, causing huge upfront GHG emissions. Second, more biofuels lower crude oil prices, so other sectors and countries might consume more oil. Research shows that this latter leakage is so large that the U.S. corn-ethanol does not meet the sustainability threshold, independent of whether the indirect land use leakage is included or not (Drabik and de Gorter, 2013).

CONCLUSION

The construction of biofuel production facilities has created short-term jobs in rural communities but biofuel production is very capital intensive and so requires few long-term laborers. Some studies warn that biofuels net contribution to rural development has been very small (Swenson, 2012; Low and Isserman, 2009). These analyses do not take into account of the fact that biofuel policy is a double edged sword in trying to improve farm incomes and rural development. The higher crop prices due to biofuels are an implicit tax on value-added agriculture (e.g., livestock, dairy and poultry). This reduces the income of these farmers and local economic activity. Meat and poultry production constitutes a significant amount of economic activity beyond the basic production and wholesale value stage, unlike ethanol. Elam (2012) argues meat and poultry contribute to about 11.5 million direct-employment jobs in food processing, retailing and food service. The net impact of biofuels on rural areas is therefore unknown and can very well be negative.

Finally, a purported benefit of biofuels was to reduce taxpayer costs of crop subsidy programs. After October 2006 when biofuels had its first impact on grain/oilseed prices, both loan deficiency and countercyclical subsidies declined as they depend on the level of market prices. But politicians have reacted by proposing a vastly reformed Farm Bill now under consideration where direct payments are eliminated and the countercyclical subsidy program replaced by a more pernicious program that not only has higher target prices but also provides an incentive for producers to plant for government program payments instead of market signals, and will distort production decisions. Meanwhile, "revenue insurance" programs are introduced that cover "shallow losses" of crop insurance, the latter of which has become very costly to taxpayers in this high price era.

Most of the so-called reforms are largely cynical, because in this new era of high prices and record farm incomes, direct payments (where most of the "cuts" fall) were politically unviable and likely to end anyway; and countercyclical and loan deficiency payments (which are paid out when prices are low) are unlikely to be triggered. These distortions have implications for crop production, commodity prices, federal outlays, the environment, and U.S. international trade commitments.

REFERENCES

de Gorter, Harry, and David R. Just. (2010). "The Social Costs and Benefits of Biofuels…"Applied Economic Perspectives and Policy Vol. 32, Number 1:4-32.

__________. (2009). "The Economics of a Blend Mandate for Biofuels." American Journal of Agricultural Economics Vol. 91: No. 3, August, pages 738-750.

de Gorter, Harry, et al. (2013). "The Perverse Effects of Biofuel Public-Sector Policies." The Annual Review of Resource Economics. Volume 5. DOI: 10.1146/annurev-resource-091912-151933

Drabik, Dusan, and Harry de Gorter. (2013). "Emissions from Indirect Land Use Change…" Review of Agricultural and Applied Economics. XVI, Number 2: 3–15.

Elam, Thomas E. (2012). "Ethanol Production: Economic Impact on Meat and Poultry Consumption, Value, and Jobs." FarmEcon LLC October 30.

Low, Sarah A. and Andrew M. Isserman. (2009). "Ethanol and the local economy…" Economic Development Quarterly. 23,1: 71-88, February.

Swenson, David A. (2012). "Estimating the Importance of the Ethanol Industry to the Iowa Economy in 2011." January. https://www.econ.iastate.edu/research/other/p14755

Figure 1: Rausser, Gordon C., and Harry de Gorter. (2013). "U.S. Policy Contributions to Agricultural Commodity Price Fluctuations, 2006–12." WIDER Working Paper No. 2013/033, UNU-WIDER, March.

Figure 2: adapted from Rausser, Gordon C., and Harry de Gorter. (2013). "U.S. Policy Contributions to Agricultural Commodity Price Fluctuations, 2006–12." WIDER Working Paper No. 2013/033, UNU-WIDER, March.

Figure 3: updated from de Gorter, Harry, Dusan Drabik and David R. Just. (2013). "Biofuel Policies and Food Grain Commodity Prices 2006-2012: All Boom and No Bust?" AgBioForum. 16(1): 1-13.

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