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Political Economy of Biofuel

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Production of ethanol and biodiesels has dramatically expanded since the beginning of the new millennium. The use of biofuels is central to many of the proposed policies to address climate change impacts. Most of the studies on the economics of climate change policies employ a *social welfare economic* perspective. The common conclusion of these studies is that the best policy to mitigate environmental externalities while maximizing social welfare is to introduce incentives that nudge producers of energy to pay the price of externalities associated with greenhouse gas (GHG) emissions, which will favor clean biofuel products. Furthermore, economists have found that current policies are inefficient and costly.

About Models Economists Use to Evaluate Biofuel Policies: Social Welfare Models and Political Economy Models

Social welfare models used by economists aim to maximize the sum of the welfare of consumers and producers minus the costs of environmental side effects of production and government expenditures (de Gorter and Just, 2010; de Gorter, Drabik, and Just, 2013; and Chen and Khanna, 2013). This type of analysis can be undertaken from the perspective of one country or the global economy. In contrast, models of political economy (Anderson, Rausser, and Swinnen, 2013) assume that political outcomes are the result of interactions among various power groups within a political system. For example, decisions are different under a dictatorship versus a democracy, and are affected by the voting system. Political economy models assume that political outcomes reflect the weighted net benefits accrued by interest groups from policies. Some political economy models assume that political outcomes also reflect macroeconomic considerations, such as economic growth, unemployment, and balance of trade.

Policies, however, are not created by economists, but by politicians. The analysis of policy choices by politicians is done using models of political economy. This article takes a political economic approach to identifying some of the key factors in the formulation of biofuel policies in the United States, the European Union (EU), and Brazil. Our analysis is conceptual, but illustrates recent evidence of this approach. We consider both macro-level indicators—economic growth, unemployment, and balance of trade—that are emphasized by the executive branch as well as the considerations of interest groups in determining policies.

Macro-Level Considerations

National policy makers—the President, congressmen and women, and senators—are judged by the performance of the macro-economy. During the 1992 presidential election campaign, James Carville coined the phrase "It's the economy, stupid" to identify the key factor affecting voting. In assessing biofuel policies, relevant macro measures include balance of trade, government expenditures, greenhouse gas emissions (GHG), and the security of energy supplies. One of President Obama's stated objectives was to reduce the balance of trade deficit, and substituting imported oil with domestic biofuel does just that. Furthermore, much of the gasoline replaced by biofuels has been exported. While in 2005 the United States consumed 141 billion gallons of gasoline, in 2011 consumption declined to 134 billion gallons. Simultaneously, ethanol consumption increased significantly while U.S. gasoline production still remains above its long-run trends (Hochman, Barrows, and Zilberman, 2013).

Increased use of biofuels also affects balance of trade by reducing the price of fuel due to increased supply. This effect might have been partially mitigated by a reduction of exports from the Organization of Petroleum Exporting Countries (OPEC) and shift of oil to domestic consumption (Hochman, Rajagopal, and Zilberman, 2011). Higher ethanol production did not reduce earnings from corn exports despite a decline in the exported volume from 49 million metric tons (MT) in 2000 to 42 million MT in 2011. Introduction of ethanol has contributed to increased corn prices as well as the value of corn exports, which have increased 180% from 2000 to 2011.

Balance of trade considerations have also been important in Brazil. The major reason Brazil introduced biofuel in 1975 was its dire balance-of-trade situation that did not allow it to import oil (Moraes and Zilberman, 2014). The discovery of large oil reserves in Brazil has reduced the importance of the biofuel program, which is capturing only a small share of the potential area for biofuel production in Brazil—8 million hectares out of a potential 60 million hectares (Youngs and Somerville, 2012). It seems that Brazil prefers to improve its balance of trade situation by investing in oil development rather than continuing to invest in biofuel (Khanna, Nunez, and Zilberman, 2014).

Another macro-objective is energy security—reduced probability of supply disruption because suppliers are politically unstable or unreliable. While balance of trade aims to reduce the trade deficit regardless of the source, energy security prioritizes some exporters over others, for example Canada and Brazil over the Middle East. Yet, balance-of-trade considerations still dominate, as suggested by the United States imposition of an import tariff on Brazilian ethanol, which ended on December 31, 2011.

Another macro-consideration is the contribution of biofuel to the budget deficit. The production of biofuel in its early stages and the development of second-generation biofuel require government outlays. But, the U.S. government has already committed to significant subsidies to farmers when agricultural commodity prices are low, thus a rise in commodity prices may reduce income support for farmers and replace it with biofuel support (Babcock, 2013), although the net effect of all subsidies requires further study. In Brazil and the EU, taxation of gasoline is an important source of government revenue and, when biofuel is taxed at a lower level, it is less appealing from a government revenue perspective. The transition of Brazil from an importer to an exporter of oil made biofuel more attractive, as domestic consumption of ethanol allows gasoline to be exported, which is also taxed and is a source of government revenue (Khanna, Nunez, and Zilberman, 2014).

The lower taxation of biofuels compared to gasoline also reflects concern about climate change. The introduction of the Renewable Fuels Standards (RFS) in the United States restricts the total life-cycle GHG emissions of biofuels to below 80% of those of gasoline. However, climate change is a less important policy consideration than balance of trade, since oil and coal replaced by biofuels and natural gas are exported to Europe. Concern about climate change in the EU is also limited, as we have seen expansion in the use of coal in Germany as a result of the containment of nuclear power.

Micro-Level Considerations

Traditionally, political economic research has investigated the attitudes of various interest groups towards policies and the impacts of these groups on policy formation. The key interest groups in the biofuel debate include consumers, the agricultural sector, environmentalists, the fossil fuel industry, alternative energy producers, the transportation industry, and others.

Food and Fuel Consumers

The impact of biofuel on domestic consumers in the United States is relatively small. The impact on retail food prices was estimated to be only 5.2% in 2008 when concern about the impact of biofuel on food prices reached its peak (Harrison, 2009). Additionally, there may be some benefit from reduction in fuel prices, estimated to be about 3% in 2007 due to biofuel (Rajagopal et al., 2007). The higher commodity prices associated with biofuels, especially during periods of low inventories of agricultural commodities (Wright, 2014), have higher relative impacts on consumers in developing countries who allocate a higher share of their incomes to food. Agricultural producers in developing countries may benefit if they are net sellers of commodities. The prices of agricultural commodities would have increased further without the adoption of genetically modified organisms (GMOs) after 1995 (Barrows, Sexton, and Zilberman, 2014). Consumers in developing countries benefit much less from reductions in fuel prices, primarily because many do not own cars.

The Agricultural Sector

U.S. farmers as a whole have benefitted from biofuels because they increase overall demand for agricultural commodities. The gains for the agricultural sector from biofuels are apparent from the rise in prices of agricultural land since 2007, despite the financial crisis. Similarly, sugarcane producers in Brazil benefitted from biofuels. Corn producers who face growing demand for corn syrup are indirect beneficiaries from the rise in the price of sugarcane. Farmers from developing countries, even with extreme levels of poverty, benefitted from the price effect of biofuel while

the main losers in these regions were urban consumers and the landless (Huang et al., 2012).

Environmentalists

The perspective of environmentalists on biofuels has changed. When biofuels were introduced, they seemed to provide significant GHG emissions benefits and environmentalists supported them. The emergence of studies that doubted biofuel's contributions to GHG emissions reductions and the suggestion that biofuels may lead to deforestation have led environmentalists to hold negative attitudes towards first-generation biofuels while holding more positive ones about second-generation biofuels (Delshad et al., 2010). The environmental perspective on biofuels is evolving in that not all biofuels are treated alike. Palm oil biodiesel produced in Indonesia and biodiesel from soybean are viewed even less favorably than corn ethanol (Laborde and Valin, 2012).

Oil Companies and Producers

Basic economic analysis suggests that oil producers oppose biofuels because their production is likely to reduce the price of oil. The perspectives of individual oil companies vary. Some companies, such as BP and Shell, invest in biofuel technology. But the enthusiasm of oil companies for biofuel may be mitigated since they have to share a significant amount of the rent with farmers and, thus, biofuel is likely to be less profitable for these companies than oil. This perspective may explain why Petrobras, the leading oil company in Brazil, tends to emphasize investment in petroleum over biofuel (Moraes and Zilberman, 2014). Companies that obtain most of their revenue from oil or shale gas see biofuels as a competitor. Some companies may expect that, in the long run, GHG regulations may reduce the demand for fossil fuels even further. Thus, oil companies may oppose biofuels because they reduce companies' capacity to sell fossil or shale fuels in the short-term before strict regulations of biofuel and GHG emissions are introduced.

First-Generation Biofuel Producers

Much of the production of first-generation biofuels is controlled by corn or sugarcane producers who have invested in refineries. This group benefits from biofuels both because of the direct gains and because of its impact on commodity prices, whether in corn or sugarcane. There are also companies that have invested in refineries. While earnings have been unstable and there have been significant losses in the past, biofuel refiners have become more competitive over time and are now able to survive without subsidies (Babcock, 2013). In the United States, many of them would like to see the blend wall removed or the mandate increased. In Brazil, they hope that the upper limit on fuel prices will be removed so that producers there may prosper (Moraes and Zilberman, 2014).

Second-Generation Biofuel Producers

At the onset of the movement towards second-generation biofuel production, organizations that promoted second-generation biofuels tended to shed negative light on first-generation biofuels to justify large government expenditures as well as subsidies for their new products. Furthermore, with the existence of a blend wall, second-generation biofuels may find first-generation biofuels to be competitors in supplying a given market. But the relationship between first- and second-generation biofuels is complex. The economic viability of biofuels has been demonstrated by first-generation biofuels. The high price and seemingly slow progress of second-generation biofuels may lead opponents of the technology to advocate reducing support for both first- and second-generation biofuels.

Producers of Other Alternative Energy

Biofuels are among many sources of alternative energy, and these other sources, such as solar and wind, are also competing for government support. There is an implicit competition between solar and wind power, which may be used to fuel electric vehicles, and biofuels. Even new providers of natural gas through fracking and other means may see investment in biofuels as a competitor, despite natural gas being a nonrenewable, albeit cleaner fuel, than oil.

Automobile Companies

The automobile sector is diverse and different companies have different relative advantages. Companies such as Tesla that promote electric cars may see investment in biofuels as a distraction to the "real" backup technology. Some traditional automobile companies, especially ones with large capacity for production of flex fuel cars, will be supportive of the expansion of biofuel.

Companies may be hesitant to support raising the blend wall substantially because they may be worried about the performance of their cars when using blended fuels. If the United States wants to displace gasoline with ethanol, a major challenge of current policy is to increase use of ethanol beyond E10. One way to do this is to expand the availability of E85 (Babcock and Pouliot, 2013).

Automobile companies prefer clarity about the future of fuel in order to optimize the design of their cars. For example, car companies can tweak engines to be more efficient and take advantage of the higher octane content of ethanol if they are assured a large supply of ethanol will be available.

Other Groups

There are many other parties who have a stake in the biofuel debate that will affect their involvement in the

policy arena. For example, airlines have realized that they will likely always be dependent on liquid fuels and, as Europe and other countries consider penalties for GHG emissions from transportation, there will be a premium for cleaner, alternative fuels. Thus, airlines will support investments in biofuel research. The military will continue to need fossil fuel, but may look at biofuels and other cleaner fuels as important investments for the future. Certain municipalities that see the relative advantage of production and refining of biofuels may support policies to enhance them. Universities and other organizations that support investments in research to increase knowledge about biofuels will back them as well.

Conclusions and Final Remarks

We have offered a framework to analyze the political economic forces that affect biofuel policies in the United States and globally. This framework assumes that policies are determined as a result of the weight given to macro-economic factors such as balance of trade, government budget deficit, and climate change, as well as the interests of specific groups, including consumers, farmers, and oil companies, among others. Much of the support for biofuel has been linked to its contribution to improved balance of trade and energy security, and less so to slowing climate change. We also argued that interests of oil companies in the United States and Brazil have curtailed the expansion of biofuels. Learning by doing that improved the economic viability of first-generation biofuels in the United States and Brazil helped to sustain it politically. While U.S. and Brazilian farmers are supportive of biofuels for the most part, it does not seem that U.S. consumers are very interested or concerned about biofuels either way, while consumers in developing countries are more likely to be concerned about biofuel because of food price inflation associated with it. Environmentalists are lukewarm towards biofuels at best, and oil producers may be ambivalent or even opposed.

It seems that the use of first-generation biofuels in the United States will continue in its limited form and production of sugarcane biofuel feedstock in Brazil will expand. Expansion of first-generation biofuels will depend on improvements in agricultural productivity and increases in energy prices. The large-scale expansion of biofuels will be dependent on improvements in the cost-effectiveness of second-generation biofuels both in terms of feedstocks and the refining process. It will also depend on the economics of substitute energy sources and concerns about climate change. Commercial interest and investment in second-generation biofuels will depend on government support for research and early introduction of the technology, which may include mandates and subsidies during a transitional period.

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