A Summary of Findings:
Determining the Regional Economic Values of Ethanol Production in Iowa Considering Different Levels of Local Investment

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An Overview of the Research Problem and Approach

There is limited credible economic impact analysis of the emerging ethanol industry in Iowa and in the nation. Indeed, much of the research that is relied on by policy makers and advocates is based on poorly specified industrial accounts in modeling systems that were not designed to accommodate the modern and rapidly expanding ethanol industry. Coupled with this problem are other analytic issues and concerns:

- Analysts often "created" new jobs in the corn producing sector of the economy, a sector that continues to produce a surplus of corn and which annually requires less labor as a result of technological innovations.
- Analysts frequently boosted economic activity in the transportation sectors even though the haulage differences among surplus grain (or fed grain products) and ethanol were not articulated well, or at the outset evident.
- Some researchers often injected a price premium into farmer incomes without determining the net regional effects on farm income or costs or the uses to which that income might be put.
- The cost impacts of higher corn prices locally on other corn users or on other industries that handle and distribute grain were ignored.
- The economic consequences of new plant construction was commonly allocated to the rural economy at the location of the plant unmindful that the vast majority of the components that capitalize an ethanol plant as well as the higher valued engineering, architectural, and specialized construction talent inevitably come from outside of the region of study. Further, naïve analysts were prone to add construction impacts to ongoing, operational impacts.

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- Most importantly, the cost and revenue structure of modern ethanol producing facilities had not been systematically reconciled with actual the industrial impact modeling systems that are necessary for this kind of study.

This research addresses all of these issues and more. It sifts through the analytic limits of previous research and creates an ethanol impact modeling prototype for studying the regional effects of the placement of an ethanol plant. This research also provides some insight into the potential regional economic impact gains (or potential losses) that might be attributed to different levels of local ownership of the plants.

This research should be helpful for regional economists, policy makers, advocates, and citizens as they evaluate the changes accumulating to rural areas as a result of the boom in ethanol plant construction and operations. We only summarize the major findings in this short report.

The Findings

Our research directly confronts the generally limited economic analysis that has been conducted by advocates, academics, and government agencies on the regional economic impacts of ethanol in the U.S. For this study we employ an economic impact definition that seeks to identify the net new economic product generated in an area as a result of ethanol industrial activity. Economic product represents simply and solely the value-added payments that are made by the industry. These payments consist of payments to workers as salaries and benefits, payments to investors (or investor-owners), and indirect tax payments to governments that are part of the production process. These are the first levels of economic effects that we seek to measure properly, and our modeling structure transparently specifies the values that we are measuring and how we arrived at those amounts.

An ethanol plant has important commodity supply requirements. It needs new-to-the-region inputs to convert corn into ethanol. As the corn already exists and the plant is not altering the overall production of agricultural goods in the region, we do not count the corn as a net new product as many analysts and advocates mistakenly do. The plant does need important inputs to process the grain, however. These include natural gas or other fuels, electricity, water, enzymes and chemical inputs, perhaps a reconfigured rail distribution system locally, along with a host of financial, technical, mechanical, waste discharge, and service inputs that keep a modern plant running. All of these examples constitute net new input demands in the region that are directly attributable to the placement of the plant in the area. Hence, the plant creates in indirect impact on supplying industries and bolsters their sales and employment.

Lastly, when workers at the plant and workers in the supplying industries receive their pay, they convert it into household spending. This induces a third round of economic activity.

Table 1 demonstrates the basic economic impacts of a 50 MGY dry-milling ethanol plant in a three county region of Iowa (TriCo) in which it is assumed that there is no local ownership in the plant.

Table 1

TriCo Baseline Economic Impacts

	Direct	Indirect	Induced	Total	Multiplier
Output	**118,648,636**	**13,301,156**	**1,546,605**	**133,496,397**	**1.13**
Value Added	**18,405,433**	**6,011,897**	**942,326**	**25,359,656**	**1.38**
Jobs	**35**	**75**	**23**	**133**	**3.79**

This prototypical ethanol plant generated $118.65 million in simulated sales for 2005 based on the labor of 35 workers. In so doing it made payments to value added of $18.4 million. It further stimulated $13.3 million in input sales in the region, which required 75 more jobs to produce and generated $6.01 million in value added. It is clear that the job effects of this plant are greater in the supplying industries than in the capital-intensive direct industry. Last, as the workers convert their earnings into consumption, they induce $1.55 million in additional output in the region, which requires 23 jobs and sustains $942,326 in value added.

We can add all of these categories of economic data together to get total economic impact estimates. Considering direct, indirect, and induced effects, this plant links to $133.5 million in regional sales, $25.4 million in value added, and 133 jobs. The table also lists multipliers. Multipliers are simply the ratio of total impacts to direct impacts.

The output multiplier is 1.13 (remembering that we have excluded the corn from this analysis – we are not causing more regional agricultural commodity), the value added multiplier is 1.38, and the jobs multiplier is 3.79. In order, these multipliers mean that for every $1 in output, an additional $.13 in (non-corn) purchases were made from the regional economy. For every $1 in value added generated in the plant, $.38 in additional value added were supported in the rest of the economy. And for every job in the plant, 2.79 jobs were sustained in the remaining economy. The jobs multiplier is relatively high compared to other industries because this industry is considered capital intensive relative to its labor demands. It is very atypical of most manufacturing firms in Iowa primarily because the labor needs of a modern plant are very low relative to the total value of production.

The previous example assumed complete external ownership. As the payments to local investors constitute enhancements of local household income, we get increases in area economic activity when those payments re-enter the region of study. Using modeled assumptions about the likelihood that those payments will be spent locally, we will get inducements or bumps in local spending by these recipients for household goods and services. As local ownership increases, and payments are shifted to local households, then their collective consumption boosts the amount of induced value-added generated in

the region. In this modeling structure, a 25 percentage point increase in payments to local owners resulted in an increase of 29 jobs to the study region.*

Having developed and documented this analytic capacity, we then looked at three ethanol plants in Iowa. These operations have a local investor component, but their locations, the industrial characteristics of the host regions, and the degree of local ownership differed markedly among the three plants.

In each plant we first calculated a baseline value where no local ownership is assumed. We next added the amount of local ownership actually residing in the study region that the plants provided us and allowed value added payments to accrue to those local owner-investors to demonstrate the differences in the regional economic impacts. Local ownership was determined by calculating the amount of shares that existed within the postal codes that were in the region that primarily supplied the feedstocks to the plant, its labor, and where residents were likely to shop for everyday goods and services. Every example had a region of a different size.

Our three modeled comparisons had different levels of local ownership, using our definitions of the primary region affected by the plant: 27 percent, 63 percent, and 73 percent. They were located in geographically distinct and separate areas of the state, and they contained a range of primarily rural to primarily metropolitan area economies

We compared the no local ownership assumption with the actual amounts of ownership identified in our research to gauge the job difference in the three instances attributable to returns accumulating to local investors. These differences are gross estimates and do not account for the opportunity cost of the investment; i.e., the historical returns for the money put into the plants.

- For the firm that had 27 percent local ownership, the local ownership dimension accounted for 47 more jobs over the baseline consideration.
- For the firm with 63 percent local ownership, the local ownership dimension added 80 more jobs.
- For the firm with 73 percent local ownership, the local ownership dimension added 53 more jobs.

These values will vary by level of local ownership and the overall characteristics of the local economy in which the plant resides. However, so long as returns to investors are robust and competitive with other investment alternatives, higher levels of local ownership yield higher job impacts for rural areas, *provided those returns are higher than all other uses to which investors had historically put their money*. And that is the supposition right now with the ethanol boom.

* This estimate of boosted jobs does not discount the opportunity cost of the investment; that is, all investors had, historically, used their investment in ethanol plants for some other income-producing activity. Consequently, the actual bump to the induced values net of opportunity costs is much lower. If the returns to these investors over the duration of the investment are twice all other options, then we would say that half of this increment is due to new dividends, and so on.

It is instructive to also note that the potential gains from local ownership can work in reverse if the fortunes of these plants wane. Robust local gains may become local losses if plants are not able to produce future investor payments at levels simulated for the study year (2005) or expected for the current production year. Over time, as investors' collective comfort with risk changes, they may divest their holdings, which lowers the local impact effects, as well. Accordingly, local ownership is a fluid concept in an increasingly fluid industry.

Conclusions

This research was designed to provide policy makers, planners, and advocates credible baseline information on the economic impact dynamics of modern ethanol plants. The research also helps quantify the obvious: higher local ownership levels yields higher economic impacts during a period where returns are strong, as they currently are. There are many dynamics of a changing biofuels economy that are not covered in this research to include changes in returns to farmers who produce corn or purchase corn for animal feed, other handlers and warehousers of grain, "down-stream" economic activity that might accumulate to blenders and distributors of ethanol, local government fiscal impacts, or the net regional outcomes in light of all associated production subsidies at the local, state, and federal government levels.

These findings refer solely to the economic product that is produced directly by an ethanol plant in consideration of that plant's linkages to regional industries, to regional investors, and to regional opportunities for household spending.