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 massive surplus of corn and which annually sheds workers 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.
- Analysts 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.
- Analysts often ignored the cost impacts of higher corn prices locally on other corn users or on other industries that handle and distribute grain.
- Analysts indiscriminately allocated all of the plant construction effects into the region of analysis 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 almost always come from outside of the region of study. In addition, naïve analysts often added temporary construction effects to operational effects.

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- Most importantly, the cost and revenue structure of modern ethanol producing facilities had not been systematically reconciled with actual industrial impact modeling systems.

This research addresses all of these issues and more. It sifts through the analytic mistakes or shortcomings 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 intelligence on another important factor in this emerging economic force in Iowa: it measures the potential regional economic impact gains (or potential losses) that might be attributed to different levels of local ownership of the plants.

This study's has three important results:

> First, it transparently demonstrates the typical regional economic impacts of a new modern dry-milling ethanol plant, and it places that impact in a rural, regional setting.
>
> Second, it shows the regional economic impact gain potential, given 2005's production characteristics, of local ownership in an ethanol plant.
>
> Third, it uses that modeling structure to simulate the regional economic impacts of several existing plants in Iowa of different sizes considering their actual levels of regional ownership versus a situation where there was not local ownership. Local ownership is not to be confused with farmer ownership, as many are inclined to do.

This research represents a comprehensive look at these topics and 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

This research directly confronts the generally poorly specified economic analysis that has been conducted by advocates, academics, and government agencies on the economic impacts of ethanol in the U.S. The research operates under an economic impact definition that seeks to identify the net new economic product that is 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.

In generating that product 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. 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 bolters their sales and their employment.

Last, 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 takes 23 jobs and sustains $942,326 in value added.

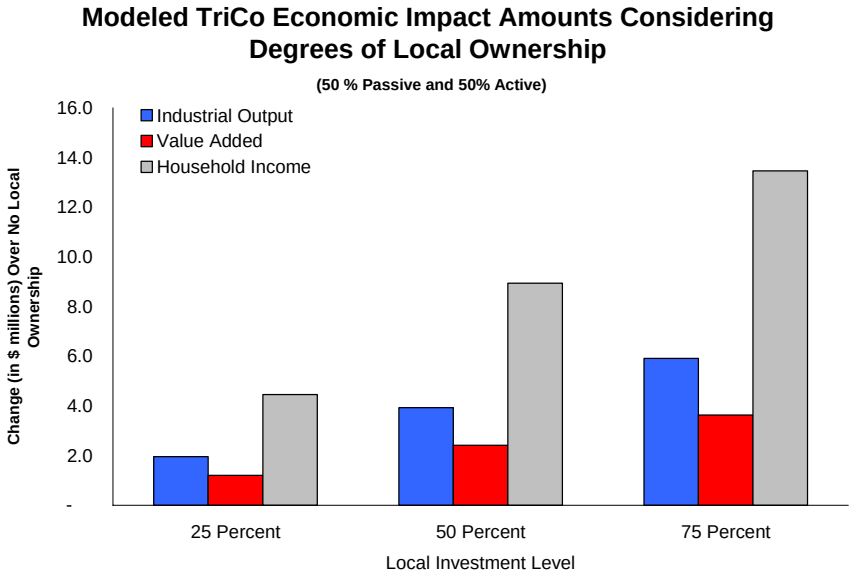
We can add all of these categories of economic data together to get total economic impact estimates. All told, considering direct, indirect, and induced effects, this plant links to $133.5 million in regional sales, $25.4 million in value added, and 133 jobs. The table also lists multipliers. Multipliers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

Figure 1, below demonstrates what happens as we achieve higher degrees of local ownership in our baseline prototypical situation. As the payments to local investors constitute enhancements of local household income, we get large increases in the area. Given assumptions about the likelihood that those payments will be spent locally that are specified in the larger study, we get increases first in regional sales (industrial output) effects in the household spending sector, and accordingly, the generation of regional value-added (or more accurately, regional economic product). 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. While the numbers are not displayed in this figure, each 25 percentage point increase in payments to local owners resulted in an increase of 29 jobs to the study region.

Figure 1



Having developed and documented this analytic capacity, we then looked at four ethanol plants in Iowa. Three of these plants actually have a local investor component, and one is completely externally owned. The locations, the industrial characteristics of the host regions, and the amount of local ownership differed markedly among our 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.

The findings are displayed in Table 2 by plant measured. The titles are self explanatory and the impacts differentials are evident, as also are the ranges in baseline values generated from our plants. All of these analyses were simulations based on the TriCo model research and were not based on actual plant revenues and costs. Job, payroll, and plant size characteristics from these firms were actual, however.

Table 2: Summary of Simulated Impacts Considering Different Levels of Local Investment

Plant A Ethanol Impacts: 100 Percent Externally Owned					
	Direct	Indirect	Induced	Total	Multiplier
Output	181,584,000	27,145,891	2,520,973	211,250,864	1.16
Value Added	31,334,326	8,598,854	1,570,476	41,503,655	1.32
Jobs	43	71	36	150	3.49

Plant B Ethanol Impacts: No Local Ownership					
	Direct	Indirect	Induced	Total	Multiplier
Output	123,394,584	21,260,142	2,883,450	147,538,176	1.20
Value Added	17,401,964	7,829,329	1,606,048	26,837,341	1.54
Jobs	35	100	40	175	5.01

Plant B Ethanol Impacts: 63 Percent Ownership					
	Direct	Indirect	Induced	Total	Multiplier
Output	123,394,584	21,260,142	8,075,354	152,730,080	1.24
Value Added	17,401,964	7,829,329	4,769,388	30,000,681	1.72
Jobs	35	100	120	255	7.28

Plant C Ethanol Impacts: No Local Ownership					
	Direct	Indirect	Induced	Total	Multiplier
Output	215,631,008	32,039,446	2,090,568	249,761,022	1.16
Value Added	30,832,502	11,378,242	1,170,624	43,381,368	1.41
Jobs	43	119	28	189	4.40

Plant C Ethanol Impacts: 27 Percent Local Ownership					
	Direct	Indirect	Induced	Total	Multiplier
Output	215,631,008	32,039,446	5,370,682	253,041,136	1.17
Value Added	30,832,502	11,378,242	3,180,471	45,391,215	1.47
Jobs	43	119	75	236	5.49

Plant D Ethanol Impacts: No Local Ownership					
	Direct	Indirect	Induced	Total	Multiplier
Output	113,490,000	37,175,182	7,685,206	158,350,388	1.40
Value Added	28,560,466	16,585,715	4,731,329	49,877,511	1.75
Jobs	40	136	90	265	6.63

Plant D Ethanol Impacts: 73 Percent Local Ownership					
	Direct	Indirect	Induced	Total	Multiplier
Output	113,490,000	37,175,182	12,169,428	162,834,610	1.43
Value Added	28,560,466	16,585,715	7,530,687	52,676,868	1.84
Jobs	40	136	143	318	7.95

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 mix 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.

- 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.

The information in Table 2 display findings based on a range of plant configurations, different primary regions, and different overall industrial structures in the areas that we studied. Plant A, with no local ownership, had the lowest baseline jobs multiplier owing primarily to the configuration of its primary economic region. The simulated baseline job impact values of Plant D were much higher because its primary region consisted of two metropolitan counties with very extensive and diverse industrial structures. The values for the other two study plants fit between these extremes.

It is instructive to also note that the ostensible gains from local ownership can work in reverse if the fortunes of these plants wane. Robust local gains become robust 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 quantifies 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.