A Case Study on the Impact of an Ethanol Plant on Corn Price

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Abstract

An increase in corn prices of the local area tend to occur when an ethanol plant begins operation. The objective of this research is to evaluate the impact of a corn processing ethanol plant on corn price levels. Results indicate that farmers in the nine-county area surrounding Macon, Missouri have seen increased farm revenues to $4.12 million annually, or a weighted average corn price increase of $0.12/bushel. This is an increase of about $0.10/bushel for all corn sold in the surrounding region, and a $0.19/bushel increase for corn sold directly to the ethanol plant. For the case of a $0.12/bushel weighted average corn price increase, a land value increase of $161/acre to reflect the increase in returns per acre was estimated. Thus, landowners are the actual benefactors of an increase in corn price from ethanol production.

Introduction

Ethanol production is continuously increasing - shown through the 200 million gallons of ethanol produced in 1980, compared to over four billion gallons projected to be produced in 2006 (Renewable Fuels Association). The Energy Policy Act of 2005 will greatly enhance ethanol production by causing expansion of existing facilities and by stimulating interest in building new facilities. An advantage of increased ethanol production is an increase in local corn price. However, little is known about the exact corn price impact from opening an ethanol plant. The objective of this research is to provide an estimate of corn price impacts from opening an ethanol plant. A secondary objective is to analyze the expected, versus actual land price increase, by determining returns per acre from the increase in corn price. To analyze these issues a case study approach was used to look at a producer-owned ethanol plant in Northeast Missouri.

Each year considerable local, state, and federal monies (in the form of tax credits, tax rebates, and ethanol production incentives) are allocated for ethanol production. These monies have a two-fold purpose. First, increased ethanol usage reduces domestic dependency on crude oil and increases demand for corn and other biomass feedstocks. Secondly, economic development is used as a motivation for building ethanol production plants. While the community and regional economic impacts of ethanol plants have been well studied, the corn price impacts from an ethanol plant are less understood due to supply-demand factors that continuously change.

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Some argue there are large changes in corn price levels, while others argue there isn't an observed change in price levels. McNew and Griffith (2005) analyzed the effect of ethanol plant openings on corn price. Their results showed a positive impact on corn price, with sizes of impact varying by location. They reported an average corn price increase of $0.125/bushel. In analyzing the start-up of seven ethanol plants, Urbanchuk and Kapell (2002) found corn basis to strengthen by around $0.10/bushel.

For the current study, the ethanol plant study had a utilization-to-production ratio of roughly 25 percent at the time of the analysis. That is, the ethanol plant utilizes eight million bushels of corn annually, of the approximately 34 million bushels produced in the nine county area surrounding the plant (these counties represent the area from which over 95 percent of the corn is sourced). This 25 percent level can be used as a baseline in adjusting for relative corn price level impacts in other areas. This study concludes with an assessment of the likely impact on land values from an ethanol plant opening. The land value impact can be scaled relative to the supply-utilization ratio used.

Background for this Case Study

In May of 2000, Northeast Missouri (NEMO) Grain Processors opened the first Missouri producer-owned ethanol plant near Macon, Missouri. The new generation cooperative organizational structure is limited to agricultural producers and its producer-owners receive profits in direct proportion to their contribution of feedstocks (corn in our case) to the business. For instance, suppose membership in ownership of the ethanol plant requires the delivery of 20,000 bushels of corn and members deliver two million bushels of the annual ethanol plant processing capacity. The requirement to deliver a total of 20,000 bushels per year is one percent of the two million bushels all producer-members deliver. Thus, a member delivering one percent of membership requirements receives one percent of the ethanol plant operating profits. NEMO Grain Processors members were required to buy shares of stock to be an owner of the ethanol plant. Each share purchased (initially costing $2,500) required delivery of 1,000 bushels of corn annually (Livingston, Reynolds, and Tretcher). The marketing year was broken into quarters, and producer-owners delivered one-fourth of their allotment on a quarterly basis. Knowing that the utilization of corn for ethanol is constantly growing, the board of directors had many expectations for the plant including their main goal of adding value to corn by creating a new market for it (Livingston, Reynolds, and Tretcher).

To evaluate the ethanol plant corn price impact, an interview was conducted with NEMO Ethanol commodities marketing manager, Matt Gerhold. The interview was designed to provide both background information and specifics to the operations of this particular ethanol plant. The ethanol plant recently expanded to twice its original capacity, so the processing capacities changed significantly relative to regional production.

The interview revealed that 309 members of NEMO Grain supply 27 percent of corn. The remaining 73 percent is sourced from the open market in northeast Missouri. Corn from the open market is delivered from as far away as 60 miles. About 90 percent of the corn originates on-farm. Twenty percent of the members are within a twenty-five mile radius, 70 percent are within a fifty-mile radius and the remaining ten percent are within a one hundred mile radius. In 2002, from 8,000,000 bushels of corn, NEMO Grain produced 22,000,000 gallons of denatured ethanol and 66,000 tons of distilled dried grains (DDGs).

Data

Cash price data for January 1998 through December 2002 was obtained from Gerhold and DTN AgDayta. Gerhold provided the cash price data NEMO paid for corn delivered to the ethanol plant and a local elevator's cash price data was obtained from DTN Agdayta. The average cash price paid at NEMO Grain was $1.96 per bushel, with a standard deviation of $0.244 and minimum cash price of $1.42 and maximum of $2.57. The average local cash price paid in Macon was $1.76 per bushel with standard deviation of $0.189, minimum cash price of $1.30 and maximum of $2.35.

Change in Corn Price Levels

This section details the price impact that was derived from the direct and indirect price effects from NEMO Grain beginning operation. The direct impact refers to the premium that NEMO Grain pays for corn. This premium is paid due to convenience yield. Convenience yield is the willingness of firms to hold stocks of commodities, when storage is not profitable, to enable

the business to continue to operate. For our analysis this is analogous to producers storing grain locally, when it is not profitable to store. This is required in order for them to meet their contractual obligation because it is cheaper than breaking the contract. The direct impact on corn price will be measured by comparing the price that NEMO Grain pays to the price paid by a local Macon elevator.

The direct impact was computed by finding the average price premium that NEMO Grain pays for corn compared to a local Macon elevator. Figure 1 is used to show the difference between the NEMO Grain price and the cash bid at the local elevator. NEMO Grain was found to pay, on average, $0.09/bushel more than the local Macon elevator. From this, $0.09 is taken times the 8,000,000 bushels of corn that NEMO Grain purchases annually leading to a direct impact that totals $720,000 annually.

The indirect impact was computed by examining factors affecting the corn price spread between a local Macon elevator and a Kansas City, MO elevator. Figure 2 is used to graphically represent the trend of the spread over time.

To empirically examine this change the following regression relationship was estimated:

(1) $Cash_{NEMO}$-$Cash_{Kansas\ City}$ = f (Trend, Ethanol Plant Opening, Cash Price, Diesel Price).

This equation is specified to account for the possibility of market spreads trending over time due to other supply-demand factors outside the scope of our study and due to transportation cost changes (diesel price was used as a proxy for a change in transportation rates). The variable of interest is when NEMO Grain began operation.

The results from estimating equation (1) are presented in Table 1. The statistical analysis performed indicates that the ethanol plant operations strengthened the corn price spread by slightly over $0.10/bushel. The finding of a $0.10/bushel corn price impact is similar to the corn price impact reported by McNew and Griffith and Urbanchuk and Kapell. The only other statistically significant variable of interest is the change in cash corn price level, $0.256/bushel impact. The interpretation of this variable is that for each $1/bushel increase in the cash corn price the spread strengthens by $0.256/bushel, which captures local non-ethanol plant supply-demand factors.

The direct and indirect impact were combined to compute an overall economic impact affecting the price received of all bushels of corn sold in the surrounding area. The economic impact from the indirect increase in price of corn was $0.10/bushel. 34,000,000 bushels of corn produced in the nine county area (Missouri Department of Agriculture) surrounding Macon was taken times $0.10/bushel, with an indirect impact equalling $3,400,000 annually.

Economic Impact and Land Values

An overall economic impact due to increased corn prices was computed by simply adding the direct ($720,000) and indirect ($3.4 million) economic impacts together to come up with $4,120,000 annually.

The impact a new ethanol plant can have on local land values can be substantial. The increase in land value occurs because a higher corn price, holding yields constant, increases the net return per acre. This in turn allows farmers to bid up cropland rental rates, which raises land values due to a higher net present value of the rental income stream. For the land assessment values, weighted averages of the nine-county were taken of the corn price direct and indirect impact to obtain an average of $0.12/bushel corn price increase. Assuming an average corn yield of 110/bushel/acre with a trend yield of an increase of 1/bushel/acre every three years, an ethanol plant life expectancy of fifteen years, an interest rate of 6.5 percent, and an inflation rate of 3 percent, an increase in land value on a per acre basis of approximately $161/acre was determined. This increase is expected to be realized within one to three years following the ethanol plant opening, while farmers develop confidence in the long-term price level increase. To test the estimate of how land values increase from ethanol plant operations, the previous estimate was compared to land value increases reported in the Missouri land values survey data (Plain and White) from 1999 through 2003. The change in land values for the region where the ethanol plant is located was then compared to a regional, similar land capability potential. The region where the ethanol plant is located had land values increase by $228/acre over the period while the comparison regional land values increased by

$58/acre, which is a difference of $169/acre. This difference is approximately what was estimated to be the size of the land values impact. Note, the information was also checked to determine whether significant changes in cropping patterns occurred over the study period for the regional around the ethanol plant (Missouri Agriculture Statistics Service). No significant change in cropping patterns was discovered.

Conclusions

Ethanol production facilities have significant impacts on corn price levels and local land values for areas surrounding the facility. As ethanol production continues to expand, the agricultural industry will continue to see these impacts. Farmers will have the opportunity to increase the demand for corn, achieve better corn prices, and decrease the U.S. dependencies on foreign crude oil. Ethanol production does and will continue to significantly impact the local economy and farm income.

The findings here support that notion that while farmers receive a higher price for their corn due to an ethanol plant, the price is capitalized back into the land. Thus, landowners will typically benefit from the presence of an ethanol plant in the local area, as farmers bid up rental rates to reflect the higher per acre revenue from a higher corn price.

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Table 1. Empirical Results From Estimation of Equation Price Spread Model

	$/bu impact on price spread	***t-Statistic***
Intercept	($0.6951)*	-6.01
Ethanol plant Opening	$0.1018*	3.004
Trend (other supply-demand factors)	-0.0001	-0.185
Cash corn price (price level factor)	$0.2557*	5.477
Diesel (transportation factor)	-0.0149	-0.28
R-squared	0.2670	

*Note, * denotes statistical significance at the 99% confidence level.*

Figure 1. Corn Price Difference Between NEMO Grain and a Local Macon Elevator

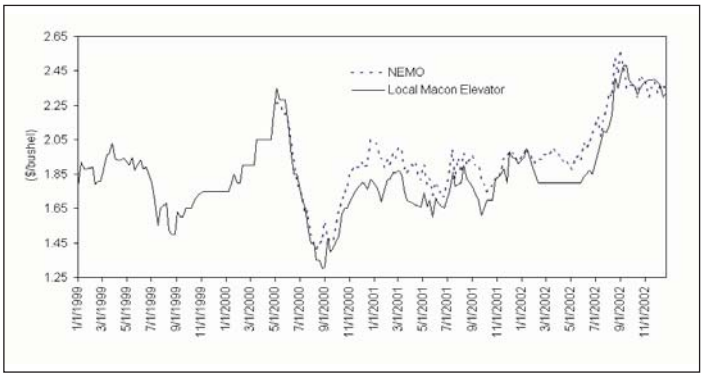

Figure 2. Trend in Corn Price Spread between Local Macon Elevator to Kansas City