Impacts of the U.S. Ethanol Boom on Corn Transportation Markets

Agricultural & Resource Economics UCDAVIS

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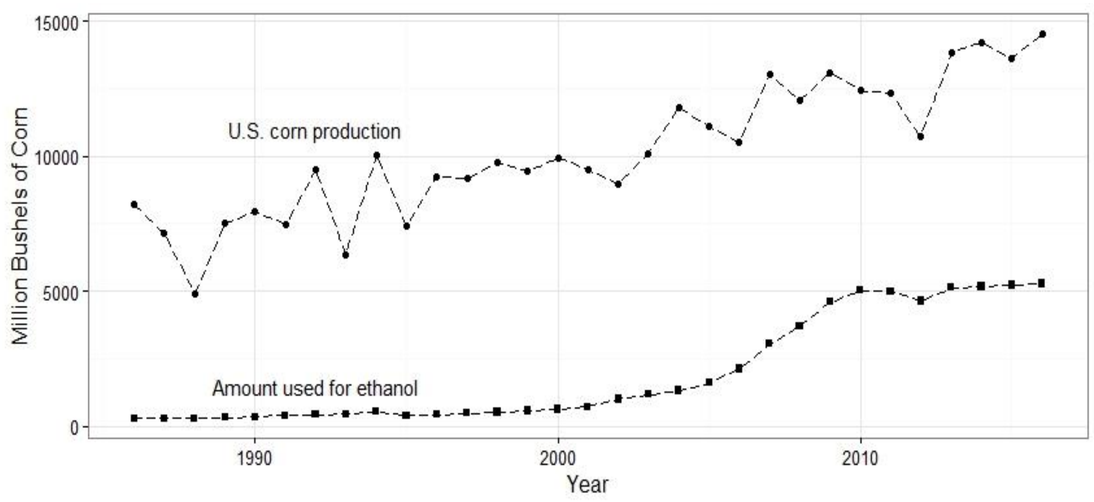
RESEARCH QUESTION

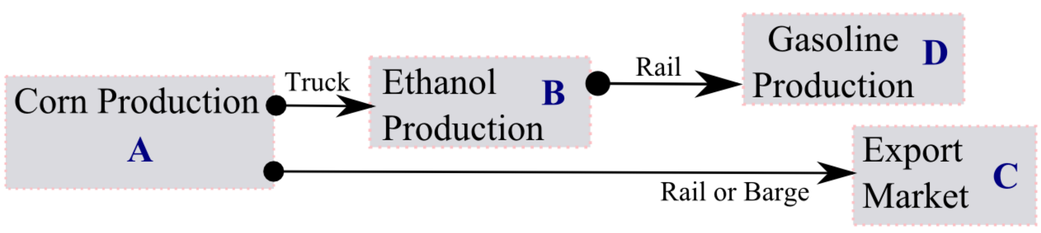
Has the ethanol boom changed commodity freight markets? This poster investigates how the U.S. ethanol boom may have changed intermodal and intramodal relationships in grain and oilseed transportation markets.

BACKGROUND

The Energy Policy Act authorized the Renewable Fuel Standard (RFS) program, which requires a minimum amount of ethanol to be used in motor fuel. In 2007 the Energy Independence and Security Act expanded the program, nearly doubling the ethanol mandate (RFS2). Per USDA Feed Grains Yearbook Tables, 13 percent of U.S. corn consumption went to fuel production in the 2002-2003 marketing year. 44 percent went to fuel in the 2015-2016 marketing year. U.S. Department of Energy data shows this trend in the graph below.



The literature has documented effects of the ethanol boom on cropping patterns (Wallander, Claassen, and Nickerson 2011) and commodity storage markets (Carter, Rausser, and Smith 2013) within the United States. However, the indirect effects of the ethanol boom are also of interest to transportation industry stakeholders. For railroad firms, agricultural commodities generate lower revenues per a ton-mile than other types of freight. Therefore, railroads rely on high volumes to cover the fixed costs of operating in many regions.



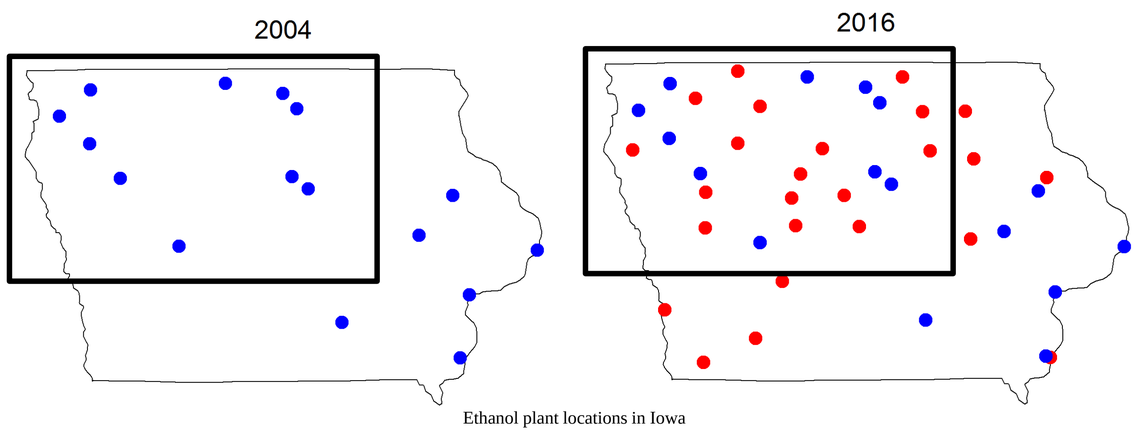
Corn is typically shipped short distances via truck and long distances via rail and barge. Production of ethanol in corn production regions, such as Iowa, might increase the use of truck transportation of corn. I have obtained detailed rail receipts and am currently combining these with elevator-level cash bids to learn more about how the ethanol boom has influenced geographic pricing patterns and competition in grain freight markets.

CONTRIBUTION

The relevant literature has focused on regulation targeting the rail industry or on market power. In contrast, I evaluate the indirect effects of energy policy on agricultural freight markets. Furthermore, this is the first research to consider how the ethanol boom has influenced dry bulk freight demand.

WHY NORTHWEST IOWA?

- Two crops dominate farm acreage
- Many rail carriers serve the region
- Relatively far from a major waterway
- Spatial variation in the number and locations of ethanol plants over time

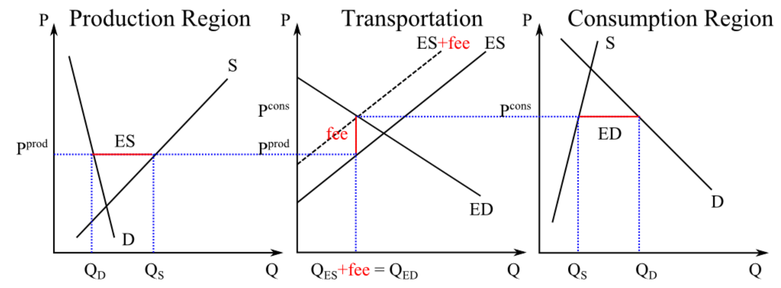


Ethanol plant locations in Iowa

DATA AND ESTIMATION STRATEGY

Data	Source
Corn and soybean acreage	NASS
Diesel prices Rail and barge cost indices	USDA Grain Transportation Report
Ethanol plant locations	Renewable Fuels Association
Shipment-level data (all modes) Shipment-level data (rail only)	2012 Commodity Flow Survey Confidential Waybill Sample
Local commodities prices	GeoGrain

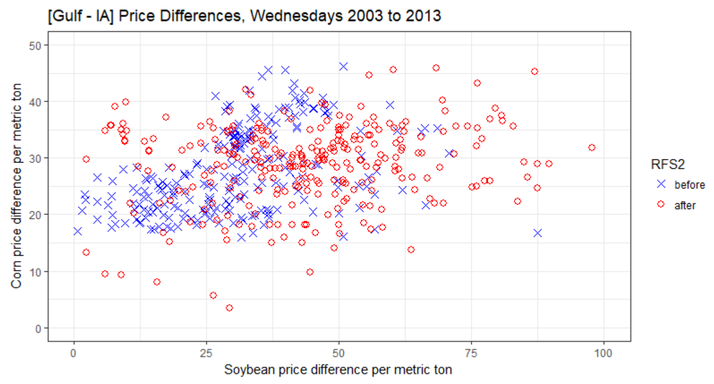
Commodity Flow Survey Microdata show truck shipments of grain and oilseed in Iowa are typically 100 miles or less. Ethanol production takes place in Northwest Iowa and from any location there are several biorefineries within a 100 mile radius. These facts suggest that a large proportion of corn produced in Northwest Iowa now travels shorter distances to ethanol plants instead of further distances for processing or export.



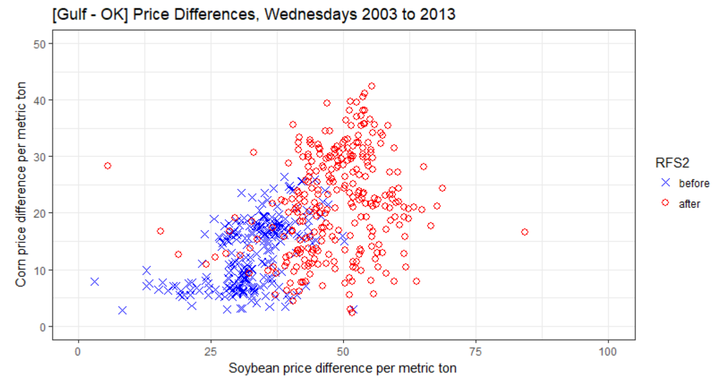
Transportation supply and demand is derived from excess supply in production regions and excess demand in consumption regions. Therefore, I predict the ethanol boom should have increased transportation demand in regions close to production, but should not change export or other processing demand.

$$\underbrace{\left|\frac{Basis_A - Basis_B}{Basis_A - Basis_C}\right|}_{pre\ boom} < \underbrace{\left|\frac{Basis_A - Basis_B}{Basis_A - Basis_C}\right|}_{post\ boom}$$

A persistent change in relative prices should be evident in cash bid data. Specifically, the corn price difference between local elevators in Northwest Iowa should have increased relative to the price difference of export destinations.



The figure above plots AMS corn and soybean basis, the Louisiana Gulf 30 day delivery bids and Northwest Iowa immediate delivery bids. Before RFS2 was implemented, corn and soybean bases were more tightly related than after implementation. Log-log model regressions confirm that a percentage change in corn basis due to a percent change in soybean basis is lower than before RFS2. This implies the cross-price elasticity of corn and soybean transportation demand changed after RFS2 was implemented.



For a comparison to Northwest Iowa, the figure above plots an area without ethanol production, central Oklahoma. The prices used here are Gulf 30 day delivery bids and Oklahoma immediate delivery bids. The relationship between corn and soybean transportation demand is not dramatically different after RFS2.

The next step for this project is to begin precise geospatial analysis of the cross-price elasticities using elevator-level bids, rail receipts, ethanol plant locations, and district hog production. Corn is a key ingredient in hog feed and according to NASS data, Iowa hog inventories have steadily increased more than 25 percent between 2005 and 2015.

REFERENCES

Carter, C. A., G.C. Rausser, and A. Smith. 2013. "Commodity storage and the market effects of biofuel policies." AJAE.

Wallander, S., R. Claassen, and C. Nickerson. 2011. "The ethanol decade: an expansion of US corn production, 2000-09."

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