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Ethanol's Affect on Basis in the Corn Belt

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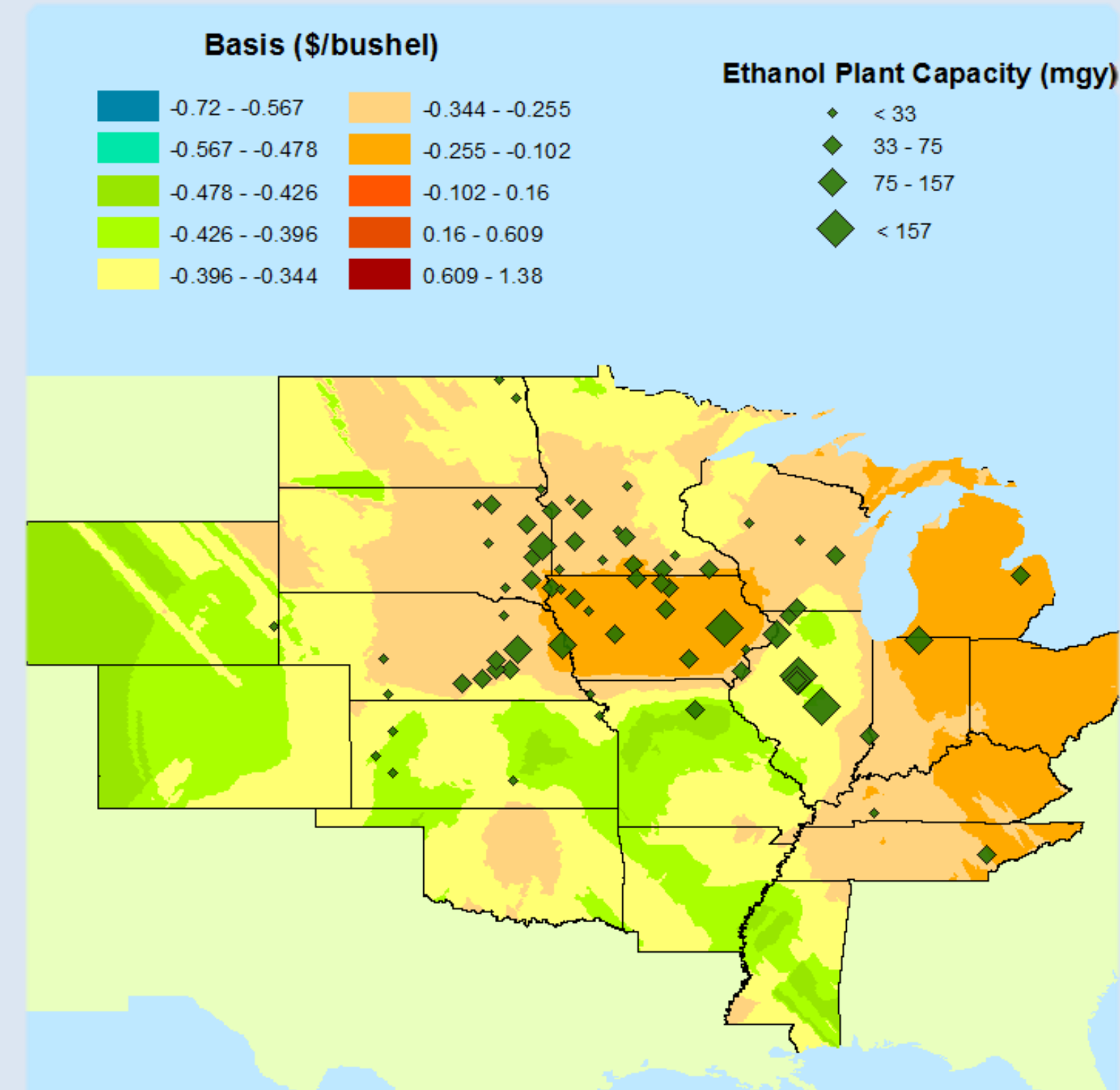
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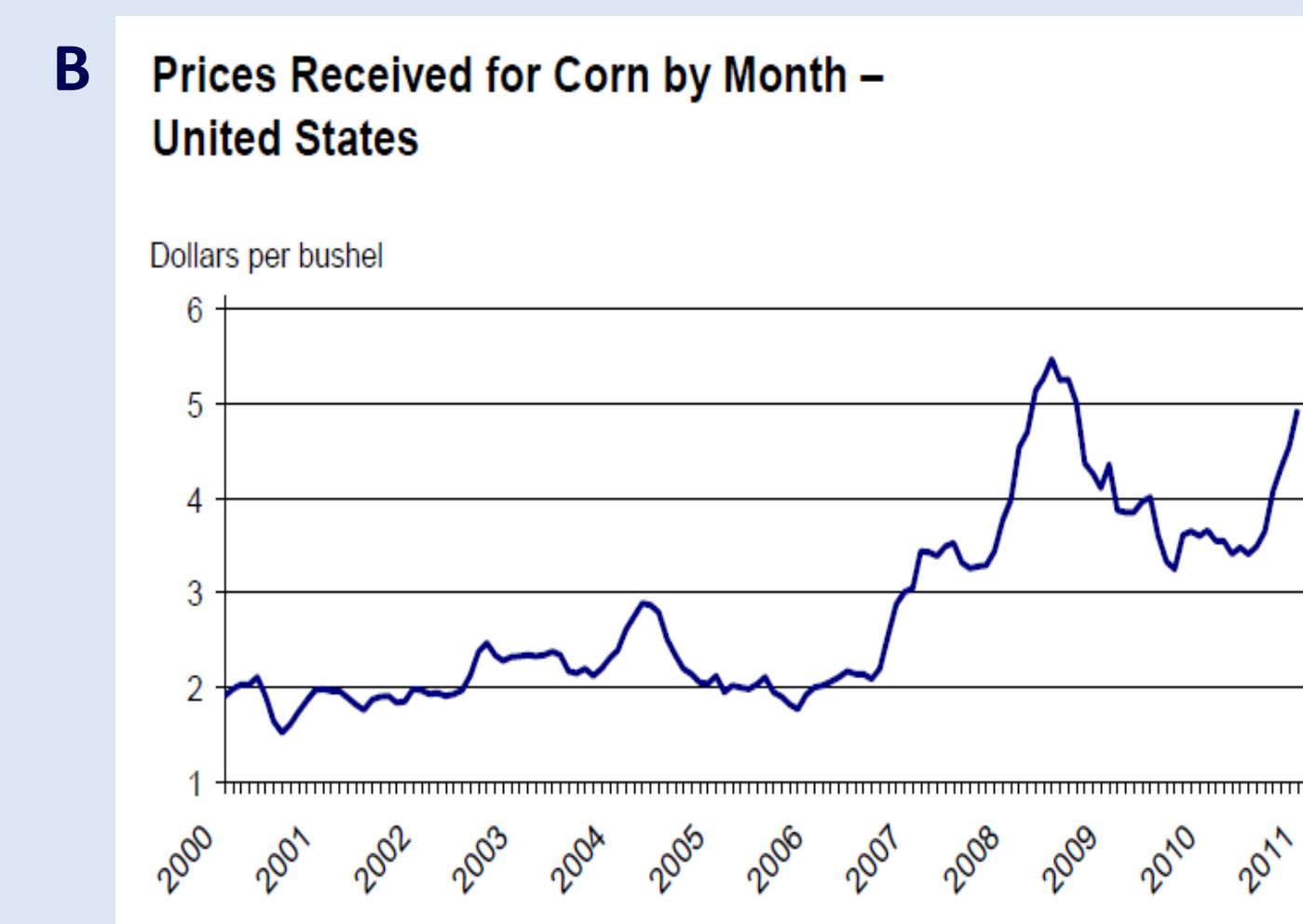
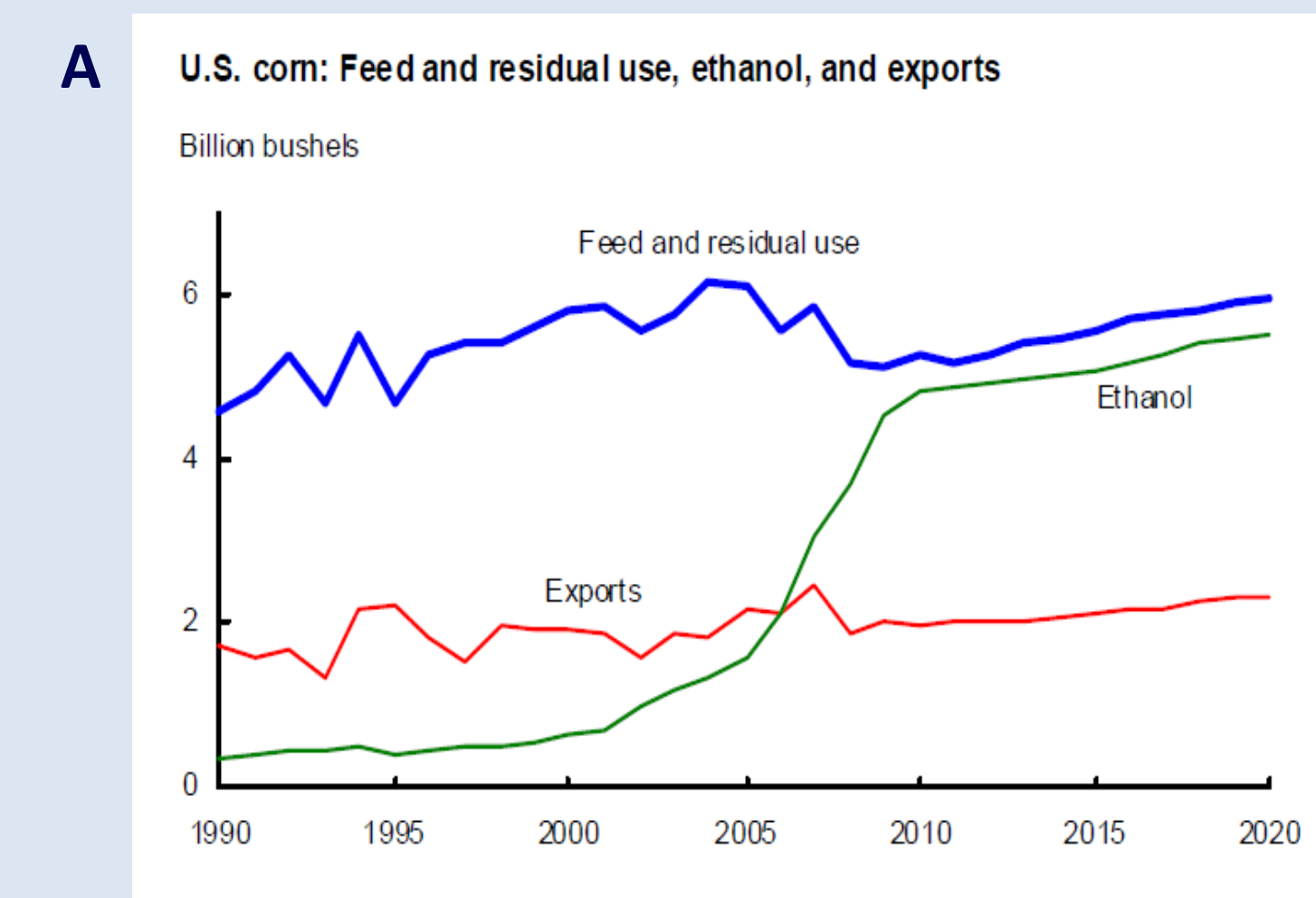
Ethanol plants and predicted basis as of July, 2005



- 1,480 basis observations
- 71 ethanol plants
- Minimum basis: \$-0.72
- Maximum basis: \$1.38
- Strongest basis area in Iowa and Eastern corn belt states
- Weakest basis area in South and West region of corn belt

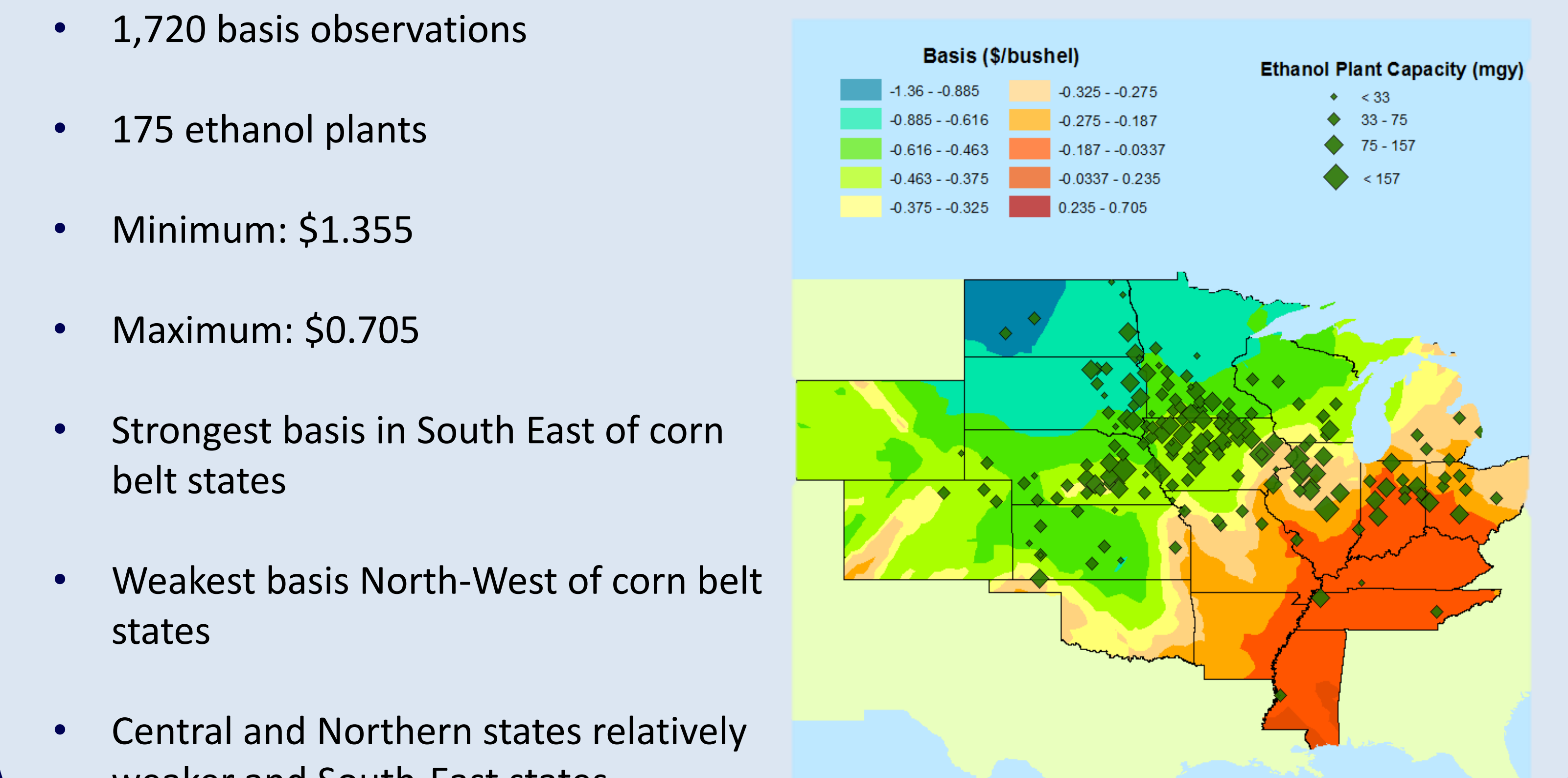
Introduction

Ethanol production in the U.S. has increased about 9.9 billion gallons between 2005 and 2011 (RFA,2011), and as of 2007 the amount of corn used for ethanol production surpassed the amount that is exported (Figure A). Over **100 new ethanol** plants opened between 2005 and 2010, and **corn prices** in the top producing states **jumped** (Figure B).



As can be seen in the basis maps to the right (2005) and the left (2010), basis levels have changed. As ethanol plants require a lot of corn, it is logical to question what **affect** the **new ethanol plants** have on **local corn price**. Also, the closer the source of corn is to the plant, the less transportation costs are incurred, and as such, the higher the net price seen by corn producer, which indicates there is a **spatial relationship** between ethanol **plant location** and **capacity** and **local corn basis**.

Ethanol plants and predicted basis as of September, 2010



- 1,720 basis observations
- 175 ethanol plants
- Minimum: \$1.355
- Maximum: \$0.705
- Strongest basis in South East of corn belt states
- Weakest basis North-West of corn belt states
- Central and Northern states relatively weaker and South-East states relatively stronger than in 2005

Description of Data

Short Summary:

- Timeline: July 2005 through September 2010
- 19 states, maximum of 3,341 basis locations, including 84 ethanol plants
- Maximum of 175 ethanol plants, with capacities ranging from 1 to over 400 million gallons per year

Variables:

- Basis from daily elevator prices-daily near-by Future price aggregated to monthly
- Annual corn production by county
- Monthly ethanol plant capacity and ownership regime
- Other variables include: transportation cost proxy (diesel price), industrial electricity price, population, average industrial wage, average income, water availability

Sources

- Corn cash prices from DTN, My DTN Cash Bids
- Futures prices come from the Chicago Board of Trade
- Corn production information comes from USDA-NASS
- Ethanol plant information comes from the Renewable Fuels Association Annual Industry Outlooks from 2005-2010, and the Nebraska Energy Office
- Diesel prices and Electricity prices come from EIA
- Population, wages, income and water availability come from the US Census Bureau
- Figure A comes from USDA-NASS, found at: usda.mannlib.cornell.edu/usda/nass/AgriPric//2010s/2010/AgriPric-12-30-2010.pdf
- Figure B comes from USDA-ERS, found at: www.ers.usda.gov/Publications/OCE111/OCE111d.pdf

Econometric Model

To account for the **endogeneity** of plant location and capacity decisions, as well as for time invariant characteristics of each state, a state level **fixed effects, two stage least squares** model is used. The first stage is used to determine estimated distance weighted draw radius.

First Stage:

$$\frac{\text{Catchment}_{jt}}{d_{ij}} = \alpha_0 + \alpha_1 \text{Wage}_{jt} + \alpha_2 \text{Electricity}_{jt} + \alpha_3 \text{Income}_{jt} + \alpha_4 \text{Pop}_{jt} + \alpha_5 \text{Water}_{jt} + \alpha_6 \text{State}_j + \alpha_7 \text{Ownership}_j + u_{jt}$$

Second stage:

$$\text{Basis}_{it} = \beta_0 + \beta_1 R_{ij} \left(\frac{\text{Catchment}_{jt}}{d_{ij}} + \beta_2 \text{Ownership}_j \right) + \beta_3 \text{Transportation}_{it} + \beta_4 \text{State}_i + \beta_5 \text{Production}_{it} + e_{it}$$

- i is the elevator indicator, and j is the ethanol plant indicator
- R is a dummy variable indicating if elevator i is in ethanol plant j 's catchment region
 - R is 0 if the ethanol plant is not open