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Fueling America Through Renewable Resources

Policy Options for Integrated Energy and Agricultural Markets

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Market Integration

- In the past, agricultural markets have been well integrated.
- Markets for different energy commodities, especially liquid energy products, also have been tightly linked.
- But agricultural markets and energy markets have not been closely correlated.

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Agricultural and Energy Historic Price Correlations

Data Pair	Correlation Coefficient
Crude-gasoline	0.98
Crude-ethanol	0.88
Gasoline-ethanol	0.86
Ethanol-corn	0.25
Crude-corn	0.16
Crude-soybeans	0.13
Corn-soybeans	0.72

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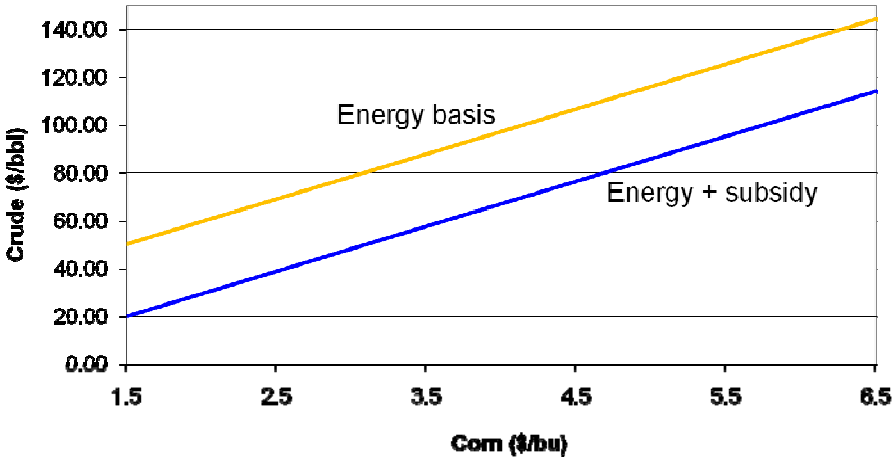
Breakeven Corn and Crude Prices with Ethanol Priced on Energy Basis with and without Federal Subsidy



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Model Integrating Corn and Energy Markets

- Partial equilibrium model encompassing corn, ethanol and by-products, crude oil and gasoline
- Endogenous variables:
  - Gasoline supply, demand, and price
  - Ethanol supply, demand, and price
  - Corn supply and price
  - Corn use for ethanol, domestic use, and exports
  - DDGS supply and price
  - Operating costs of corn production

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Model Description

- The model is driven and solved by market clearing conditions that corn supply equal the sum of corn demands and that ethanol production expands to the point of zero profit
- Exogenous variables include crude oil price, corn yield, ethanol conversion rate, ethanol subsidy rate and mechanism, and gasoline demand shock

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Policy Simulations

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- For each demand scenario, we simulate the following policies:
  - Fixed subsidy of 45 cents/gallon
  - No ethanol subsidy
  - A variable ethanol subsidy beginning at $70 oil and increasing $0.0175 for each dollar crude falls below $70
  - A renewable fuel standard of 15 billion gallons for corn, such as contained in the energy bill
  - Combination of the RFS and subsidy

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Simulation Assumptions

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- We assumed a 5% gasoline demand shock to account for income and population growth between now and 2015 – a bit higher demand at any given oil price
- We assumed a 40% export demand shock to account for the fall in value of the US$
- These shocks were not applied to $40 and $60 oil price cases

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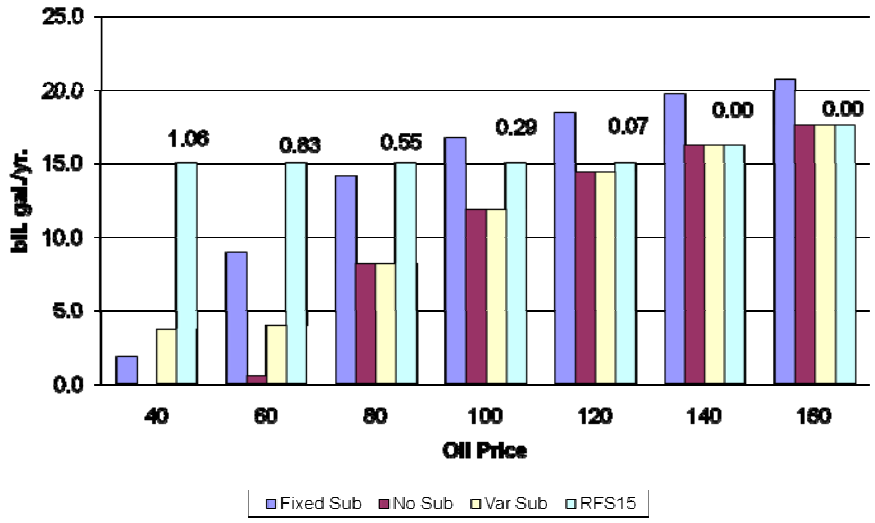
Ethanol Production



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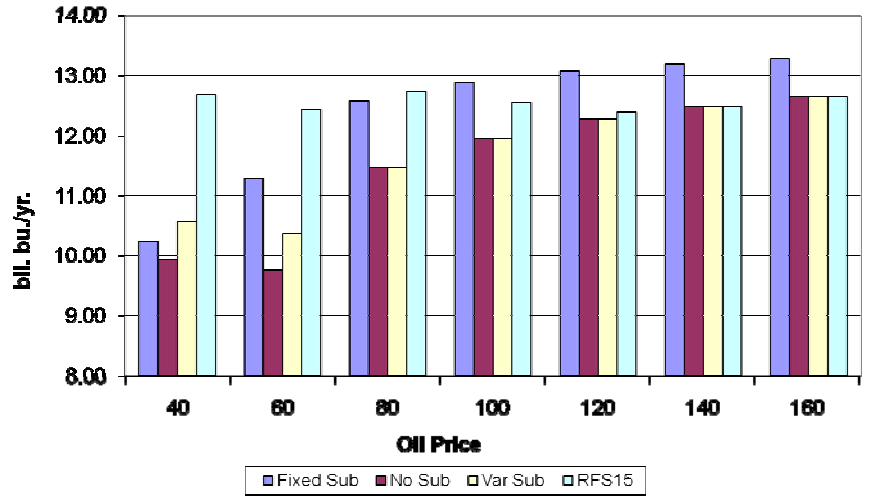
Corn Production



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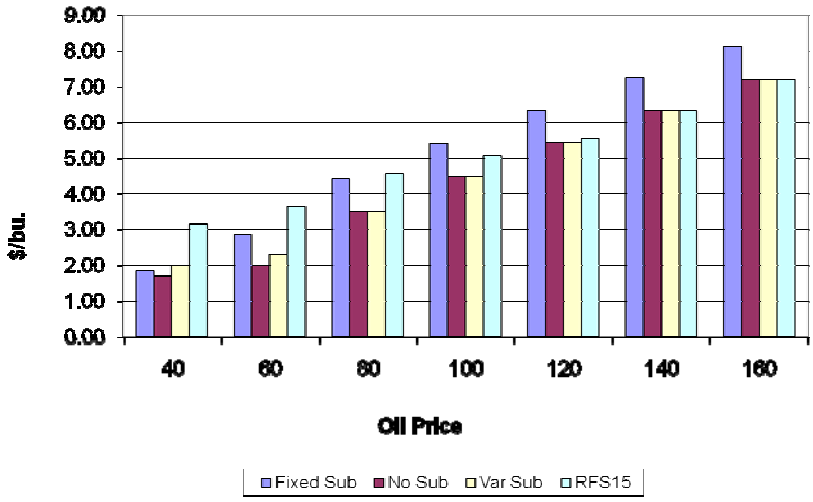
Corn Price



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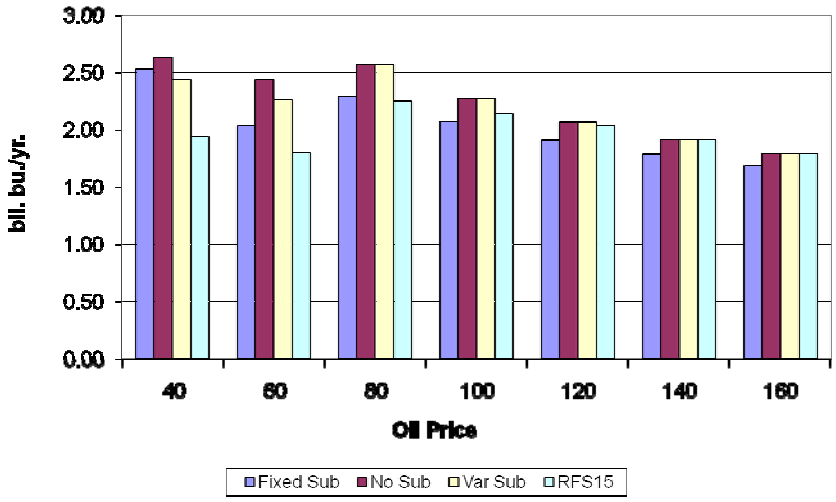
Corn Exports



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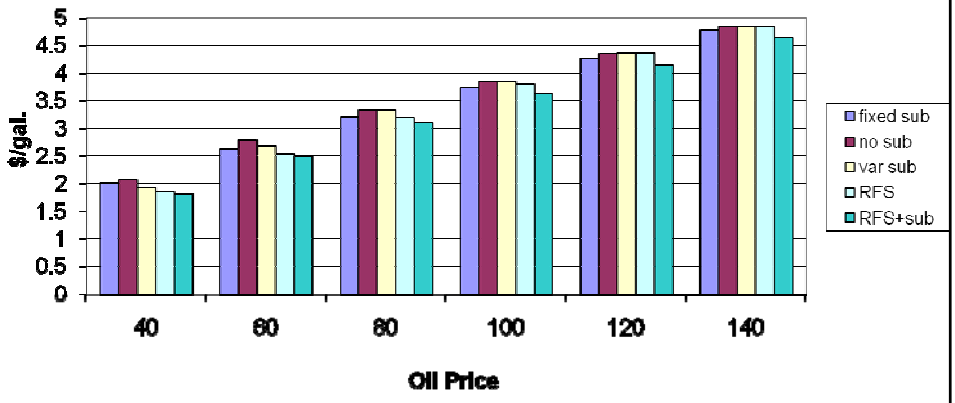
Retail E10 Price

5% demand shock



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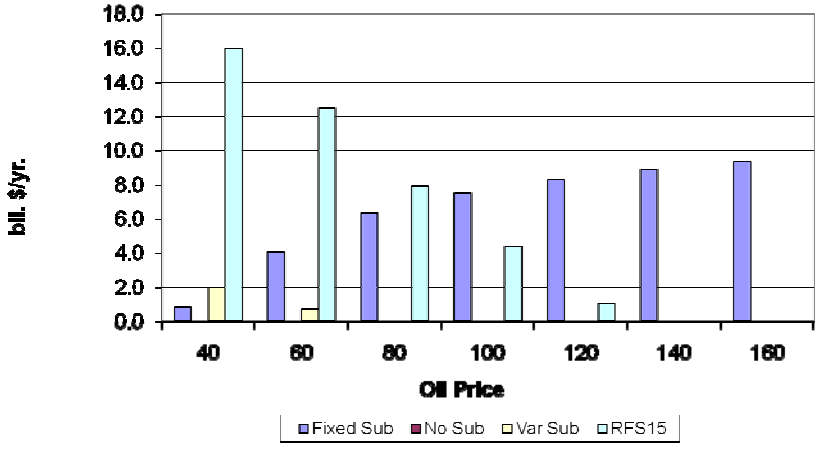
Policy Costs



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Sensitivity to 30% Corn Yield Increase

(compared with the base cases)

- Ethanol production up substantially
- Corn price down 15-39% depending on the case
- Corn production up 7-22% depending on the case
- Larger share of corn used for ethanol in all cases except RFS at lower oil prices
- Sensitivity results conform to expectations – yield increase means lower corn price, more corn produced, more profitable ethanol, and more ethanol production

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Conclusions

- Model results clearly illustrate the linkage between crude oil prices and corn prices and therefore with most agricultural commodities.
- There are substantial differences among the policy alternatives evaluated.
- At high oil prices, oil price trumps policy.
- At high oil prices, the RFS generally is not binding, but the subsidy still has an impact.
- When the mandate is binding, the subsidy serves to reduce the price of blended fuel.
- These model results are consistent with the firm level results illustrated earlier.

Thanks very much!

Questions and Comments

For more information:

http://www.ces.purdue.edu/bioenergy

http://www.agecon.purdue.edu/papers/