U.S. Farm Subsidies and the Biofuel Industry

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Poster prepared for presentation at the Agricultural & Applied Economics Association 2010 AAEA, CAES, & WAEA Joint Annual Meeting, Denver, Colorado, July 25-27, 2010

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Introduction

- Biofuels have been promoted as a "silver bullet" to energy problems in the United States: provide an alternative, renewable energy source and increase farm income.
- The U.S. government supports biofuel production with a $0.46 tax credit, a mandate of 36 billion gallons by 2022, a $0.54 import tariff, and agricultural subsidies for feedstock inputs.
- While the United States has modified its farm support programs, they still create controversy in world trade negotiations.
- What effect would a reduction in farm supports have on the biofuel and allied industries?

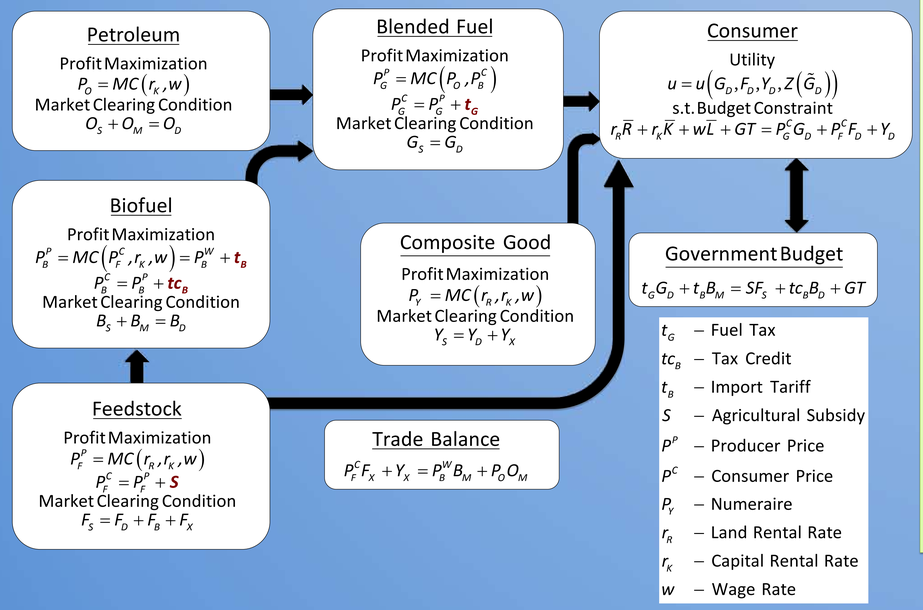
Objectives

- Develop a general equilibrium model to investigate the price, production, and use effects of reducing agricultural supports by 15% on biofuel and allied industries.
- To specifically identify the interaction between the significant policies affecting the biofuel industry.
- Quantify the analytical results using a computable general equilibrium model.

Theoretical Model

We assume:

- Five profit-maximizing, competitive production markets with constant returns to scale technology (Feedstock, Biofuel, Petroleum, Blended fuel, and Composite good).
- A representative consumer maximizes a C^2, strictly quasiconcave utility function subject to his/her income earned on the factors of production.



Analytical Result

$$\frac{1}{\lambda}\frac{du}{dS_O} = \overbrace{\left(\frac{u_Z}{\lambda}\frac{\partial Z}{\partial G_D}\frac{\partial G_D}{\partial O_D} + t_G\frac{\partial G_S}{\partial O_D}\right)\frac{dO_D}{dS_O} + \left(\frac{u_Z}{\lambda}\frac{\partial Z}{\partial G_D}\frac{\partial G_D}{\partial B_D} + t_G\frac{\partial G_S}{\partial B_D} - tc_B\right)\frac{dB_D}{dS_O}}^{\text{Environmental Effect}} + \overbrace{t_B\frac{dB_M}{dS_O}}^{\text{Tariff Effect}} - \overbrace{S_O\frac{dF_S}{dS_O}}^{\text{Subsidy Effect}}$$

$$\overbrace{\underbrace{-(1-\varepsilon_O)O_M\frac{dP_O^W}{dS_O} - P_O^W\frac{dO_M}{dS_O}}_{\text{Petroleum}} \underbrace{-(1-\varepsilon_B)B_M\frac{dP_B^W}{dS_O} - P_B^W\frac{dB_M}{dS_O}}_{\text{Biofuel}} \underbrace{+(1-\varepsilon_F)F_X\frac{dP_F^W}{dS_O} - P_F^W\frac{dF_X}{dS_O}}_{\text{Feedstock}}}^{\text{Trade Effects}}.$$

- A change in agricultural supports impact social welfare through biofuel, food production, and international trade markets.
- This result suggests that a socially optimal policy needs to account for environmental as well as economic impacts.
- The welfare impact of agricultural supports depend on the level of policies in related industries.

15% ↓ Agricultural Support

15% ↓ w/ mandate

Empirical Model

- Computable General Equilibrium: 36 commodity markets,
- Data from the U.S. Department of Commerce, U.S.D.A., Energy Information Administration

Market Level Impacts (% change)		
	15% ↓ Feedstock Supports	15% ↓ w/ Mandate
Blended Fuel		
Price	0.01	-1.05
Demand	- 0.01	0.13
Ethanol		
Price	0.28	4.28
Demand	- 0.81	**61.54**
World Price	- 0.15	**28.47**
Imports	0.03	6.46
Petroleum Input		
Price	0.00	-0.27
Demand	0.03	-2.21
World Price	0.02	-1.27
Imports	0.00	-0.32
Corn		
Price	0.92	3.89
Demand	- 0.74	**14.67**
World Price	1.03	-2.39*
Exports	-0.51	1.22

* Due to the low constant elasticity of transformation

Welfare Impacts (% change)		
	15% ↓ Feedstock Supports	15% ↓ w/ Mandate
Household Consumption		
Corn	- 0.90	- 3.77
Livestock	0.01	-0.63
Manufactured Food	- 0.01	- 0.26
Blended Gasoline	- 0.01	1.03
Factor Wages		
Labor	0.00	0.01
Capital	0.00	0.01
Land	0.01	**4.35**
Equivalent Variation ($ million)	**98.89**	**- 2,708.53**

Government Cost/Revenue ($ millions)		
	15% ↓ Feedstock Supports	15% ↓ w/ Mandate
Fuel Tax	3	- 342
Tax Credit	12	**- 1,988**
Import Tariff	0	87
Corn Subsidy	249	86
Other Sources+	-11	293
Total	253	- 1864

\+ Other sources include income tax and business taxes on all other production activities.

Summary

- The 15% reduction in agricultural supports raises the feedstock price which causes biofuel production to decrease and price to rise
- The biofuel consumption mandate creates demand for biofuel which translates into demand for the feedstock crop.
- The mandate effects dominate the reduction in agricultural supports but cause severe distortions in commodity and land prices ultimately resulting in a $2.71 billion loss in welfare.

Conclusions

- The biofuel tax credit and mandate stimulate the feedstock market making current agricultural supports redundant.
- Agricultural supports have little impact of on fuel prices.
- Biofuel policies cause agricultural producers to bid up the price of land and food around the world.
- Reducing support policies could save the government $253 million while the mandate causes expenditure to rise $1.8 billion.
- Replacing agricultural supports on feedstock crops with a biofuel consumption mandate could provide the same support while appeasing WTO member countries.

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This research project was partially funded by the University of Idaho Student Grant Program Grant BD2051