Ethanol Subsidies, Who Gets the Benefits?

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Outline

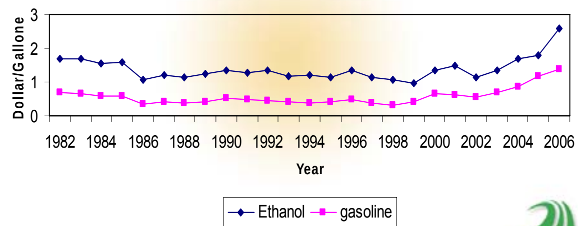
-Introduction and literature review

-Subsidy received by the ethanol industry
- **-A competitive framework**
- **-Special cases**
- **-In the presence of fuel standard**

-Impacts of the subsidy on the price of corn (farmer share)

-Subsidy received by land owners

Introduction



Literature Review

-Theory of tax incidence: This theory mainly elucidates that the statutory incidence of a tax (or a subsidy) can be different from its economic incidence

-Incidence of gasoline taxes: Consumers bear almost the full burden of gasoline taxes in the US

Subsidy Received by the Ethanol Industry

An Analytical Model (No Fuel Standard)

-A blender produces a homogeneous blend product using gasoline and ethanol with a HD1 production function $B = B(G, E)$

-Supply of gasoline is a function of its price and the crude oil price $G^S = G(P_G, P_O)$

-Supply of ethanol is a function of its price prices of corn and natural gas $E^S = E(P_E, P_C, P_N)$

-The government pays a flat subsidy (*S*) per unit of ethanol

Subsidy Received By the Ethanol Industry

An Analytical Result (No Fuel Standard)

$$\frac{dP_E}{dS}=\frac{\alpha\eta_G+\sigma}{\alpha\eta_G+(1-\alpha)\eta_E+\sigma}$$

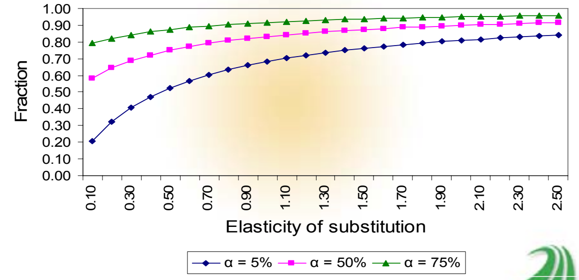
η_G **Supply elasticity of gasoline with respect to its price**

η_E **Supply elasticity of ethanol with respect to its price**

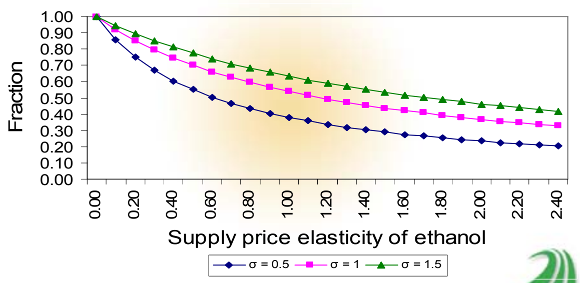
σ **Elasticity of substitution between gasoline and ethanol**

α **Share of ethanol in total blend production costs**

Share of the subsidy on ethanol received by the ethanol industry (no fuel standard)



Share of the subsidy on ethanol received by the ethanol industry (no fuel standard)



Share of the subsidy on ethanol received by the ethanol industry (with fuel standard)

-Fuel Standard: $\bar{\gamma}=\frac{E}{E+G}$

-Production Function: $B=\min\left[\bar{\gamma}E,(1-\bar{\gamma})G\right]$

-Subsidy Received: $\frac{dP_E}{dS}=\frac{\alpha\eta_G}{\alpha\eta_G+(1-\alpha)\eta_E}$

Share of the subsidy on ethanol received by the ethanol industry (fuel standard with limited capacity of ethanol production)

-The State of the Union: $\bar{\gamma}=\frac{E}{E+G}=0.15$

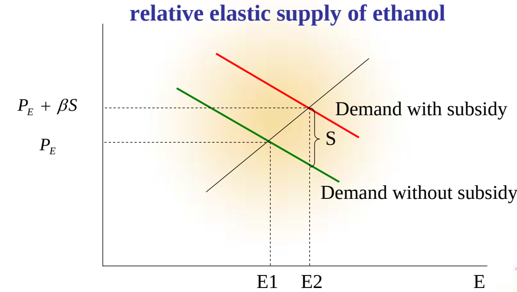
-This required 35 billion gallons ethanol in 2007

-The current capacity of ethanol production is 5.3 billion gallons

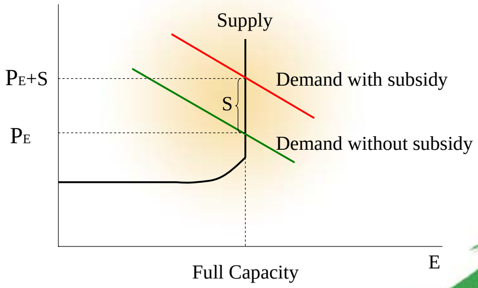
-This can generate a market power for the ethanol industry

$$\frac{dP_E}{dS}=\frac{\alpha\eta_G}{\alpha\eta_G+(1-\alpha)\eta_E}=1 \xrightarrow{\hspace{2em}} 0$$

Share of the subsidy on ethanol received by the ethanol industry in a competitive market with a relative elastic supply of ethanol



Share of the subsidy on ethanol received by the ethanol industry in a competitive market with limited production capacity



Subsidy received by the corn producers
An Analytical Model

-Ethanol production function $E = E(C)$

-Demand for corn in other industries $O = O(P_C)$

-Supply of corn $C^S = S(P_C)$

Subsidy received by the corn producers
An Analytical Result

$$\frac{dP_C}{ds} = \frac{\dfrac{\theta \eta_E^D}{q}}{\dfrac{\theta \eta_E^D}{q} + \dfrac{(1-\theta)\eta_O^D}{P_C} + \dfrac{\eta_C^S}{P_C}} > 0$$

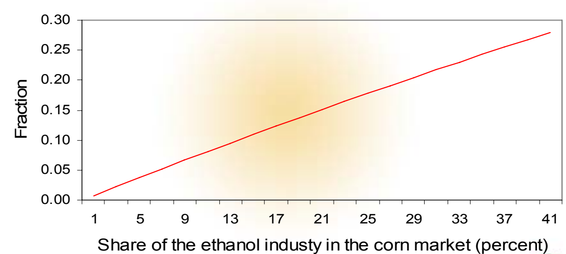
η_C^S **Supply elasticity of corn**

η_E^D **Elasticity of demand for corn by the ethanol industry**

η_O^D **Elasticity of demand for corn by the other corn users**

θ **Market share of the ethanol industry in the corn market**

Share of the subsidy on ethanol received by the corn producer



Subsidy received by land owners

-In the future, the demand of ethanol industry for corn will increase sharply

-This will push up the demand for land

- Since the supply of land is limited, land owners will capture most the benefits from a higher price of corn, including subsidy benefits

Conclusion

-In a competitive market with no fuel standard the ethanol and gasoline producers share the ethanol subsidy according to their supply elasticities and the elasticity of substitution between ethanol and gasoline

-In the presence of fuel standard and a limited production capacity of ethanol, the ethanol industry has the potential to capture the whole ethanol subsidy

-Ethanol industry passes a portion of the ethanol subsidy to the corn producer. This portion increases with the share of the ethanol industry in the corn market

-Farmers pass a large portion of their share from the ethanol subsidy to land owners