The Economics of Biofuel Policies

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Key biofuel policies

(1) Do NOT discriminate against international trade

- Consumption subsidies (e.g., tax credit or exemptions)
- Blend mandates

(2) Discriminate against international trade

- Production subsidies (for biofuel and feed-stock)

- Import tariffs/quotas
- 0,1 sustainability standards (e.g., U.S. requires a 20% reduction in CO_2e for corn-ethanol relative to gasoline it is assumed to replace)

"The Theory of Biofuel Policy"

- Complex interactions between policies within a country and across countries – key is how world biofuel prices determined
- Corn prices always linked to ethanol prices
- Ethanol price linked to oil price if tax credit binding
- Otherwise, ethanol price floats up and away from oil prices if mandate is binding

Outline of Presentation

- How to calculate ethanol price premium due to policy (big)
- How to calculate multiplier effect on corn price (also big)
  - But net effect on corn prices not as big as you think b/c of ‘water’
- Environmental Cost/Benefits
  - Rectangular DWCs big due to ‘water’
  - GHGs only 2.8% of total external costs of fuel consumption
  - Leakages in fuel market (iOUC) swamp iLUC

What is ethanol price premium due to ethanol policy?

- Was it greater than the tax credit of $0.485/gal?
  - Yes
- Why?
  - Mandate is binding
- Mandate always binding? Maybe *de facto*
  - No choice b/c few E-85 outlets, or
  - Environmental regulations, or
  - Some other country determines ethanol price

How to calculate ethanol price premium due to policy?

- Difference between observed ethanol price and that with no policy
- The no policy ethanol price very low because:

$$= 0.7 \cdot P_G - (1 - 0.7) \cdot t$$

  - P_G is price of gasoline, t is fuel tax and 0.7 reflects fewer miles from a gallon of ethanol

- 1st term reflects *consumers* willingness to pay
- 2nd term reflects penalty due to *volumetric* fuel tax

How big is the gap between observed ethanol price and no policy price?

- Big
- In 2010, was $0.65/gal
- Tax credit was $0.45/gal
- Do you add the two?
  - No. The tax credit subsidizes fuel consumption when the mandate is binding (so contradicts all environmental and energy security goals)

What is the effect of this ethanol price premium on corn prices?

- Δ corn price in $/bu = about 4 times Δ ethanol price in $/gal
- Formula is $\left(\frac{\beta}{1-\delta}\right) = 3.79$

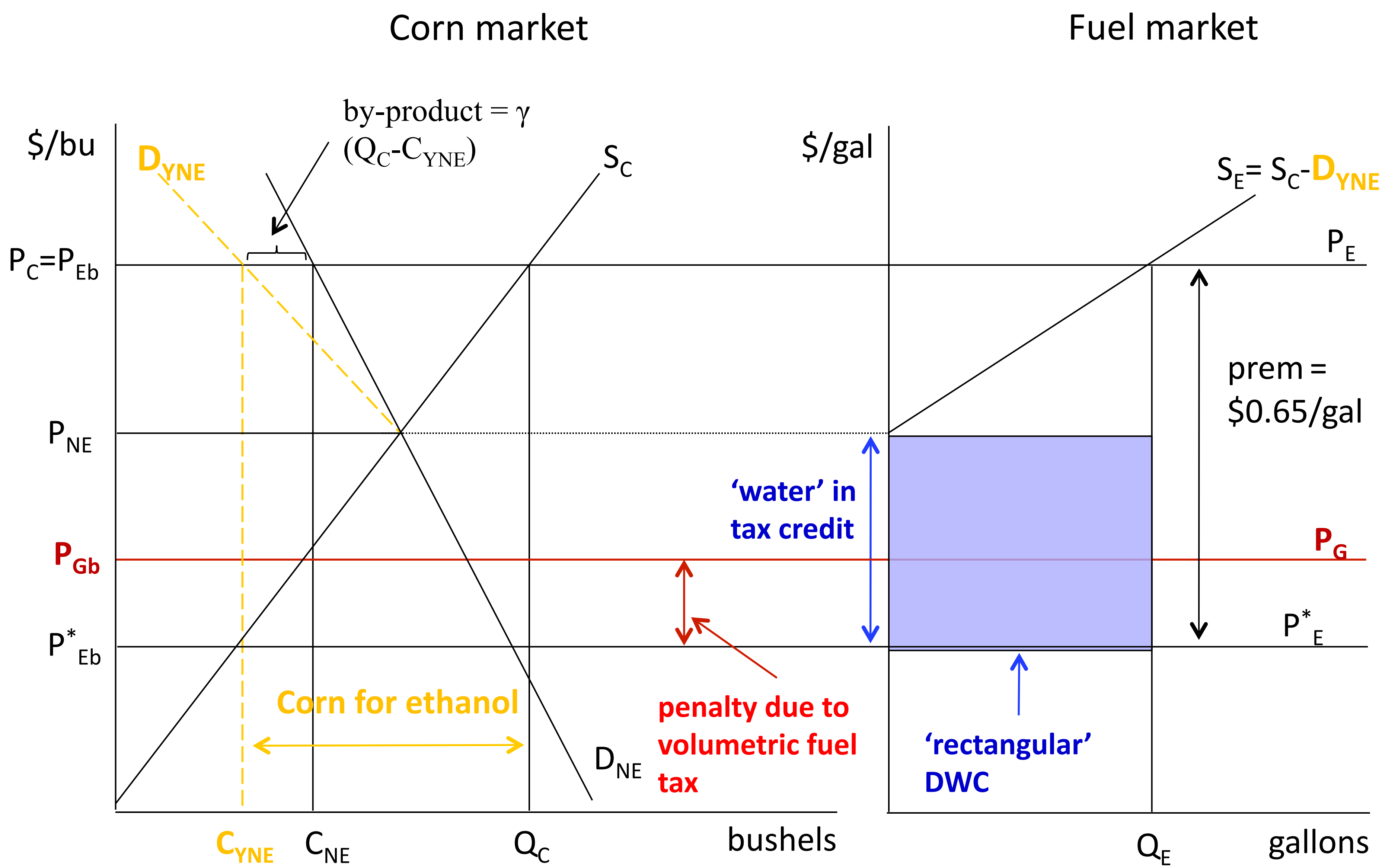
β = 2.8 (gals of ethanol from 1 bu of corn)

δ = corn-equivalent by-product value $\sim 26\%$

So price premium of $0.65/gal means corn prices went up about 4 times that? ($2.49/bu or a 93% increase in 2010?)

- No because of ‘water’ in the price premium
  - Intercept of ethanol supply curve above the no policy ethanol price
  - ‘Water’ means there is redundancy in the policy price premium

Effect of a biofuel policy on the corn market



So what is net effect in 2010?

- Ethanol price premium: $2.49/bu
- 'Water': $1.33/bu
- Net change in corn price: $1.16/bu
  - +43%
  - not +93% if ignore 'water'

How about production subsidies for corn and ethanol?

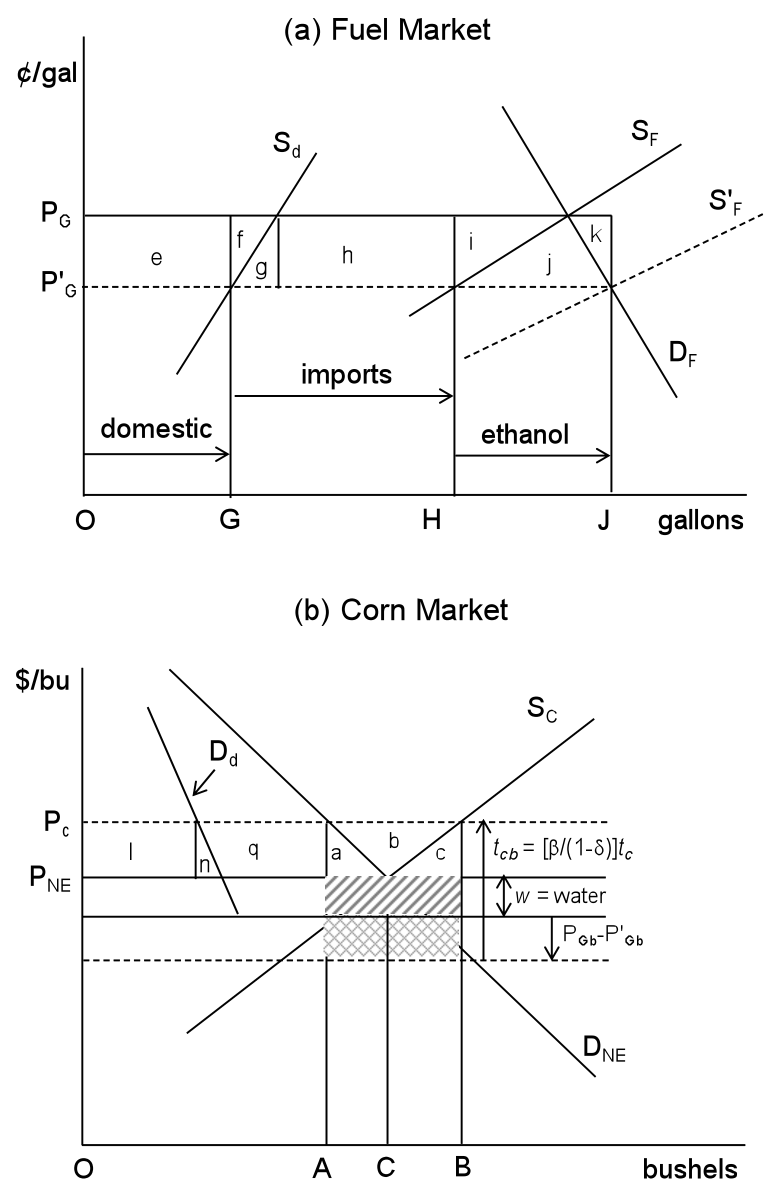
- Do you add them? No (increase corn price 196% if added all 4 policies up)
- Effect of each subsidy depends on what is determining ethanol price

But our empirical estimate of biofuel policy effects on corn prices is understated

- Other biofuel policies have increased ‘water’
- Biofuels had multiplier effects
- Non-linear effects with low stocks

But effect of biofuel policies worldwide could have been much bigger if stated targets, mandates and subsidies were actually implemented

Cui et al. (2011) Welfare Effects of a Tax Credit



Source: de Gorter and Just *AJAE* 2009 May.

Central values for external costs of fuel consumption (Parry et al. *JEL* 2007)

	cents/gal
Fuel-related costs	
GHGs	6
Oil dep.	12
Mileage-related costs	
Local pollution	42
Congestion	105
Accidents	63

GHGs as a % of total: 2.8%

Set oil dependency value at 0

- RFA billboard on Washington D.C. buses showing gasoline prices increasing 95% if there was a short corn crop scared the hell out of me
  - so decided to be conservative and set energy security value to be 0

Implications for the Welfare Economics of Ethanol Policy

------2009 ($ bil.)------

	Calibrate baseline model to:	
	Tax Credit	Mandate
Benefits		
Terms of Trade	5.8	5.5
Fuel tax revenues	2.1	3
Costs		
Triangular DWCs	1.7	1.8
Rectangular DWC	0	4.8
Costs of Externalities		
GHGs‡	0.4	0.6
Miles traveled#	-	8.9
Total net benefits	**5.8**	**-7.6**

‡ Incl. domestic GHGs only (2nd column incl. byproduct & inter'l GHGs)

'' Congestion, accidents, pollution

Effects of the Tax Credit (2009 bil. $)

	Calibrate baseline to:	
	Tax Credit	Mandate
Terms of Trade	5.8	-0.4
Costs of Externalities		
GHGs	0.4	0.1
Miles traveled	-	1.4
Net	5.4	-2.7

Ethanol and corn production subsidies exacerbate this difference

Implications for Market leakage?

- *Indirect input use change* (iIUC): e.g., market leakage in corn market leads to indirect land use change
- *Indirect output use change* (iOUC): e.g., market leakage in fuel market leads to indirect fuel use change
- Is iLUC important? No. EPA 0,1 sustainability standard still not met as iOUC dominates (even if incl. byproduct GHGs and cut EPA's iLUC in half)

Summary

- Ethanol price premium due to policy high and $\beta/(1-\delta)$ very high so ΔP_C very high
- But not as high as you think b/c of 'water' in this ethanol price premium
  - But this has implications for welfare analysis b/c of high 'rectangular' DWCs
- Non-GHG externalities other factor dominating welfare analysis
- Leakage in form of iLUC insignificant relative to leakage in the form of iOUC so EPA's 0,1 sustainability standard still not met

Readings

Drabik, Dusan. (2011). "The Theory of Biofuel Policies and Food Grain Prices." Charles H. Dyson School of Applied Economics and Management Working Paper # 2011-20, Cornell University, 12 December. http://dyson.cornell.edu/research/researchpdf/wp/2011/Cornell-Dyson-wp1120.pdf

de Gorter, Harry, and David R. Just. (2011). "The Social Costs and Benefits of Biofuel Policies with Pre-Existing Distortions." Chapter 10 in U.S. Energy Tax Policy, Gilbert Metcalf, editor, Cambridge University Press.

Drabik, Dusan, Harry de Gorter and David R. Just. (2010). "The Implications of Alternative Biofuel Policies on Carbon Leakage." Charles H. Dyson School of Applied Economics and Management Working Paper # 2010-22, Cornell University, November.

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