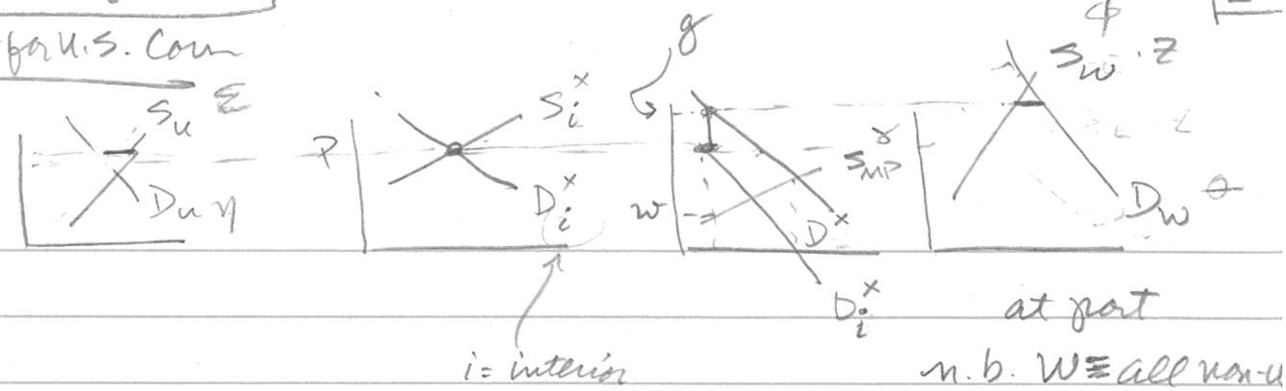
ECG 742 HW assignment

Market for U.S. Corn



n.b. $W \equiv$ all non-U (ROW)

1. $D^x(P) = D_W(P) - S_W(P)$ and $Q_I^\circ = Q_c^\circ - Q_s^\circ$

imports = consumption − production

Q1: What is $\frac{\partial \ln D^x}{\partial \ln P}$?

$D_W(P) = S_W(P) + D^x(P)$

$$\theta = \beta\phi + (1-\beta)\eta_x \Rightarrow \eta_x = \frac{1}{1-\beta}\theta - \frac{\beta}{1-\beta}\phi,$$

where $\beta = \frac{Q_s^\circ}{Q_c^\circ}$ (self-sufficiency fraction)

2. $S_i^x = S_u - D_u$

Q2: What is $\frac{\partial \ln S_i^x}{\partial \ln P}$?

$S_u = D_u + S_i^x$

$$\Sigma = \alpha\eta + (1-\alpha)\Sigma_i^x \Rightarrow \Sigma_i^x = \frac{1}{1-\alpha}\Sigma - \frac{\alpha}{1-\alpha}\eta$$

where $\alpha = \frac{Q_c^\circ}{Q_s^\circ}$ (fraction of U.S. production consumed)

$\simeq .6$ for U.S. corn

3. Consider $S_W(P) \cdot Z$

$\frac{d\ln P}{d\ln Z}$ and $d\ln P_i/W$ for $S_W(P)\cdot Z$ and $D_u(P)\cdot Z$

$$Q_u^*(P) \overset{①}{=} Q_\circ^I(g) \overset{②}{=} S_M(w)$$

$$g \overset{③}{=} w + P$$

$D_W(g) = S_W(g) \cdot Z + Q_I$ (Change in Imports by W)

$$\theta\, dg = \beta[\phi\, dg + dZ] + (1-\beta)\, dQ_I$$

$$\Rightarrow dQ_I = \frac{\theta - \beta\phi}{1-\beta} dg - \frac{\beta}{1-\beta} dZ$$

$$S_u(P) = D_u(P) + Q_x$$
$$\varepsilon\, dP = \alpha \eta\, dP + (1-\alpha)\, dQ_x$$

or

$$\Rightarrow dQ_x = \frac{\varepsilon - \alpha\eta}{1-\alpha}\, dP \qquad \text{(Change in Exports by U)}$$

Inland-to-port prices

$$g = P + w$$
$$dg = b\,dP + (1-b)\,dw, \qquad b \equiv \frac{P^\circ}{g^\circ} \quad \text{(Inland price share)}$$

<u>Equilibrium</u>:

① $$\overbrace{\frac{\theta - \beta\phi}{1-\beta}\, dg - \frac{\beta}{1-\beta}\, dz}^{d\ln Q_I} = \overbrace{\frac{\varepsilon - \alpha\eta}{1-\alpha}\, dP}^{d\ln Q_x}$$

② $$\overbrace{\gamma\, dw}^{d\ln Q_M} = \overbrace{\frac{\varepsilon - \alpha\eta}{1-\alpha}}^{d\ln Q_x} dP$$

③ $$dg = b\,dP + (1-b)\,dw$$

② → ③ ⇒ 3': $$dg = \left[b + \frac{(1-b)(\varepsilon - \alpha\eta)}{\gamma(1-\alpha)} \right] dP$$

3' → ① ⇒ $$\left\{ \frac{\theta - \beta\phi}{1-\beta} \left[b + \frac{(1-b)(\varepsilon - \alpha\eta)}{\gamma(1-\alpha)} \right] - \frac{\varepsilon - \alpha\eta}{1-\alpha} \right\} dP = \frac{\beta}{1-\beta}\, dz$$

$$\Rightarrow dP = \frac{\beta/(1-\beta)}{\underbrace{\frac{\theta-\beta\phi}{1-\beta}\left[b+\frac{(1-b)(\varepsilon-\alpha\eta)}{\gamma(1-\alpha)}\right]-\frac{\varepsilon-\alpha\eta}{1-\alpha}}_{\equiv A<0}}\,dZ$$

$$dg = \frac{\frac{\beta}{1-\beta}\left[b+\frac{(1-b)(\varepsilon-\alpha\eta)}{\gamma(1-\alpha)}\right]}{A}\,dZ$$

$$d\ln(g/P) = dg - dP$$

$$= \frac{\frac{\beta}{1-\beta}\left[b+\frac{(1-b)(\varepsilon-\alpha\eta)}{\gamma(1-\alpha)}-1\right]}{A}$$

$$= \frac{\beta}{1-\beta}(1-b)\left[1-\frac{\varepsilon-\alpha\eta}{\gamma(1-\alpha)}\right]$$

$$\Rightarrow \text{sign } d(g/P) = \text{sign}\left(1-\frac{\varepsilon-\alpha\eta}{\gamma(1-\alpha)}\right)$$

$$\frac{g}{P}\uparrow \text{ if } 1 > \frac{\varepsilon-\alpha\eta}{\gamma(1-\alpha)} \iff \gamma(1-\alpha) > \varepsilon-\alpha\eta$$

MP S elast.   S elast   D elast.

$$\iff \left(\text{or } \varepsilon < \alpha\eta + (1-\alpha)\gamma\right)$$

Tending to make $\frac{g}{P}\uparrow$ (P falls by more than g):

- γ big (w constant)
- α small (most of U.S. production is exported
- ε or $|\eta|$ small (U.S. price greatly affected.)

n.b. sign of $d(g/P)$ doesn't depend on ϕ or θ (world parameters)