J. Hartwick
April 2, 2012

Econ 390
FISHERY

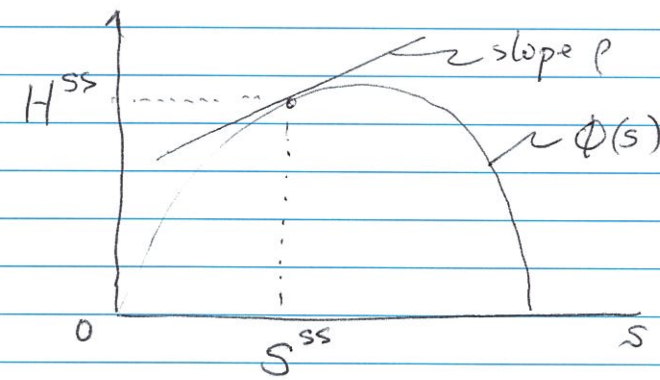
Simple Private Property Fishery

dynamics:

$$\frac{\dfrac{d\left(p_t - C_H(t)\right)}{dt}}{p_t - C_H(t)} + \phi_S(t) = \rho \quad ; \quad \frac{dS}{dt} = \overbrace{aS_t\left[1 - \frac{S_t}{K}\right]}^{\phi(S_t)} - H_t$$

steady state:

$$\phi_S(t) = \rho \quad ; \quad aS_t\left[1 - \frac{S_t}{K}\right] = H_t$$



Private Property Fishery with Stocks Affecting Harvesting Cost

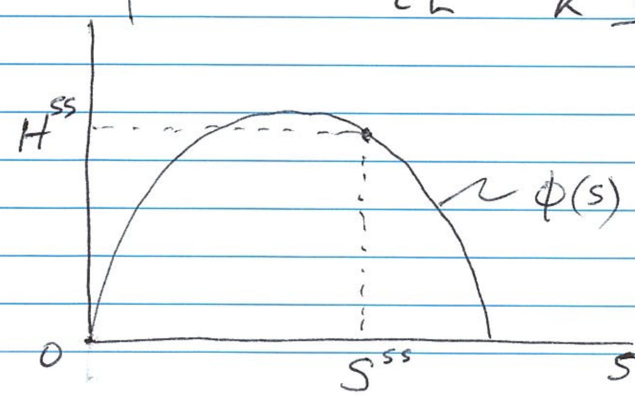
dynamics:

$$\frac{\dfrac{d\left[p_t - C_H(t)\right]}{dt}}{p_t - C_H(t)} - \frac{C_S(t)}{p - C_H(t)} + \phi_S(t) = \rho \,;$$

AND $$\frac{dS}{dt} = aS_t\left[1 - \frac{S_t}{K}\right] - H_t$$

steady state:

$$-\frac{C_S(t)}{p - C_H(t)} + \phi_S(t) = \rho \quad \text{AND} \quad aS_t\left[1 - \frac{S_t}{K}\right] = H_t$$



A Common Property "Fishery" (Brander + Taylor 1998 AER)

dynamics

$$\frac{dS}{dt} = aS\left[1 - \frac{S}{K}\right] - \overbrace{\alpha\beta LS}^{\text{harvest}}$$

each person born of population L becomes an instant fishing person.

$$\frac{dL}{dt} = \left[b - d + \gamma\alpha\beta S\right]L$$

population grows when

$[b-d]L > \gamma * \text{harvest}$

population shrinks when

$[b-d]L < \gamma * \text{harvest}$.

Another version has entry to fishery POSITIVE when current per capita harvest value exceeds current exog. wage

AND entry to fishery NEGATIVE (declining) when current per capita harvest value is less than current exog. wage.

(eg. Vernon Smith AER (about 1965) Smith won a Nobel Prize).