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RESOURCE ECON ECO 6143
MID-TERM EXAM FEB 9 2007

Q2)

1) Open access in the rural sector:

The G.E. conditions are:

$$M'(L_m) = w : [A] \text{ max. profit condition}$$

$$\frac{F(L_R)}{L_R} = w : [B] \text{ rent maximization in open access}$$

$$L_m + L_R = \bar{L} = 5 : [C] \text{ labor market clearing}$$

From [A] & [B]: $\frac{1}{2\sqrt{L_m}} = \frac{1}{\sqrt{L_R}}$

With [C] $\Rightarrow \frac{1}{2\sqrt{L_m}} = \frac{1}{\sqrt{5-L_m}}$

$$\Rightarrow 4L_m = 5 - L_m \Rightarrow \boxed{L_m^{OA} = 1}$$

$$\Rightarrow L_R^{OA} = 4$$

$$[B] \Rightarrow w^{OA} = 0.5 \Rightarrow GDP^{OA} = \sqrt{1} + \sqrt{4} = 3$$

This equilibrium is generally considered inefficient because the marginal product of workers in the rural sector is below that of the urban sector:

$$F'(L_R) = \frac{1}{2\sqrt{4}} = \frac{1}{4} < F'(L_m) = \frac{1}{2\sqrt{1}} = \frac{1}{2}$$

GDP would thus increase if some workers were to move from the rural to the urban sector.

$$T_m^{OA} = \sqrt{1} - 0.5 \cdot 1 = 0.5$$

2) Exclusive ownership in the rural sector:

Note that private property (PP) enforcement costs are not endogenous because the number of guards hired to exclude will affect the wage rate. We have:

$$\left. \begin{array}{l} M'(L_m) = w \\ F'(L_R) = w \\ L_m + L_R + 2 = 5 \end{array} \right\} \begin{array}{l} 3 \text{ equations} \\ 3 \text{ unknowns: } w, L_R, L_m \end{array}$$

We must also verify that net profits are positive in the rural sector.

$$\Rightarrow \frac{1}{2\sqrt{L_m}} = \frac{1}{2\sqrt{L_R}} \Rightarrow L_m = L_R$$

$$\Rightarrow 2L_m = 5 - 2 = 3 \Rightarrow L_m^{PP} = 1.5 = L_R^{PP}$$

$$\Rightarrow w^{PP} = \frac{1}{2\sqrt{1.5}} = 0.408$$

$$\begin{aligned} T_R &= F(L_R) - w(L_R + 2) \\ &= \sqrt{1.5} - 0.408(1.5 + 2) = -0.203 < 0. \end{aligned}$$

Net profits being negative, the exclusive ownership in the rural sector cannot be sustained because of the high transaction costs involved.

(3)

3) Number of guards = 1000.

$$\Rightarrow L_m + L_R = 5 - 1 = 4$$

$$\Rightarrow L_m = L_R = 2$$

$$\Rightarrow \mu^{PP} = \frac{1}{2\sqrt{2}} = 0.354 < \mu^{OA} = 0.5$$

It is interesting to note that the wage rate goes down as the number of guards decreases.

$$\Rightarrow \pi_R = \sqrt{2} - 0.354(2+1) = +0.3536 > 0$$

This PP equilibrium is sustainable.

$$GDP^{PP} = \sqrt{2} + \sqrt{2} = 2.828 < GDP^{OA}.$$

Even though profits are high enough to cover the transaction cost of exclusive ownership, the efficiency gain from a more restrained use of the land is not enough to cover the additional costs of exclusion. Private ownership is thus still inefficient compared to open access.

The technological innovation is obviously good for rural land owners but is detrimental to workers who receive a lower wage.

$$\pi_m^{PP} = \sqrt{2} - 0.354(2) = 0.706 > \pi_m^{OA}$$

Urban manufacture owners gain from exclusive ownership in the rural sector.