Economics 43535: Assignment 1 Key

Professor Jensen Spring 2014

1. Consider the following example of sustainable yield from fishing for yellow perch on lakes in Wisconsin. Sustainable yield as a function of fishing effort (labor) e is

$$SY(e) = 300e - e^2.$$

Assume price per fish is constant (like Gordon), and for convenience set it to 1. Then the associated total revenue, average revenue, and marginal revenue curves for the fishing "industry" on this lake are

$$TR(e) = 300e - e^2,$$
$$AR(e) = 300 - e, \text{ and}$$
$$MR(e) = 300 - 2e.$$

Also assume the total cost of fishing effort is

$$TC(e) = 50e,$$

so the marginal cost and average cost of fishing effort are both constant at 50, or

$$MC(e) = AC(e) = 50.$$

a. What is the market outcome in this market under perfect competition (open-access fishing)? In particular, determine:
(1) the level of effort e_O. **(10 points)**
(2) the size of the catch C_O. **(10 points)**

Open access effort given by TR(e) = TC(e) or $300e - e^2 = 50e$, which implies $e_o = 250$.

Corresponding catch given by $SY(e_o)$, so $C_o = 300(250) - (250)^2 = 12{,}500$.

b. What is the socially efficient outcome in this market? Again, determine:
(1) the level of effort e_S. **(10 points)**
(2) the size of the catch C_S. **(10 points)**

Socially efficient effort given by MR(e) = 0, or $300 - 2e = 0$, which implies $e_s = 150$.

Corresponding catch given by $SY(e_s)$, so $C_s = 300(150) - (150)^2 = 22{,}500$.

c. What is the outcome that would occur if the fishers merged and formed a monopoly? Now determine:

(1) the level of effort e_M. **(10 points)**
(2) the size of the catch C_M. **(10 points)**
(3) profit. **(10 points)**

Profit maximizing effort given by MR(e) = MC(e) or 300 – 2e = 500, so e_m = 125.

Corresponding catch given by SY(e_m), so $C_m = 300(125) – (125)^2 = 21{,}875$.

Profit given by TR(e) – TC(e) = $300(125) – (125)^2 – 50(125) = 15{,}625$.

2. Compare and contrast these three outcomes. **(30 points)**

Numbers computed correspond directly to the diagram drawn in class showing $e_m < e_s < e_o$ and $C_o < C_m < C_s$. Compared to the social optimum, open access (perfect competition) results in over-fishing (too much effort) and a lower sustainable yield, while monopoly results in under-fishing (too little effort) but also a lower sustainable yield. However, monopoly is better than competition in the sense that less effort is used to catch more fish. I was hoping to see some discussion of the fact that the socially efficient outcome, which maximizes sustainable yield, is not obtained by the market with either perfect competition or monopoly, but might be attained with an intermediate form of competition (i.e., with a market structure somewhere between monopoly and perfect competition, or an oligopoly).