

Section Exercise for February 10/11

1) Let's go back to 1900, when the monopoly Standard Oil Company was producing 60 million barrels of oil a year and selling them at a price that corresponds today to \$30/barrel. Standard Oil was, then, the only significant oil company in the United States. The demand curve for oil over a year in 1900 was, roughly: $P = \$90/\text{barrel} - 0.000001Q$; that is to say, the willingness-to-pay for the first barrel of oil was \$90, and thereafter every million-barrel increase in annual production required a price decline of \$1 to call forth purchasers. Standard Oil's considerable fixed costs were amortized at a rate of \$600,000,000/year. Standard Oil's variable costs—the cost it has to pay for processing each barrel of oil given that it has already established its refineries, pipelines, intellectual property, and so forth—are constant at \$10/barrel and so equal to its marginal cost.

a) What is the consumer surplus received by the consumers of Standard Oil monopoly's production?

The maximum willingness-to-pay is \$90/barrel. The minimum of those who buy is the market price: \$30/barrel. The average willingness-to-pay is \$60/barrel. The average surplus to the consumer is \$30/barrel. At 60 million barrels/year, that is a consumer surplus of \$1.8 billion/year.

b) What are the profits of the Standard Oil monopoly?

Selling oil at a price of \$30/barrel with \$10/barrel of variable costs produces an operating margin of \$20/barrel. Producing at a scale of 60 million barrels/year gives it an operating cash flow of \$1.2 billion/year. Subtracting off \$600 million/year in amortization of fixed costs gives it a profit of \$600 million/year.

c) What is the marginal revenue curve for the Standard Oil monopoly?

As a monopoly facing a straight-line demand, the marginal revenue curve has the same y-axis intercept and twice the slope: $MR = \$90/\text{barrel} - 0.000002Q$

d) What is the profit-maximizing production level and price for the Standard Oil monopoly?

Marginal revenue is equal to marginal cost of \$10/barrel at a scale of 40 million barrels/year and a price of \$50/barrel

e) How much profit does Standard Oil make at that profit-maximizing price and scale of production?

Selling oil at a price of \$50/barrel with \$10/barrel of variable costs would produce an operating margin of \$40/barrel. Producing at a scale of 40 million barrels/year would give it an operating cash flow of \$1.6 billion/year. Subtracting off \$600 million/year in amortization of fixed costs would give it a profit of \$1 billion/year.

f) How much consumer surplus would a profit maximizing Standard Oil have delivered to consumers?

The maximum willingness-to-pay is \$90/barrel. The minimum of those who buy would be the market price: \$50/barrel. The average willingness-to-pay is \$70/barrel. The average surplus to the consumer is \$20/barrel. At 40 million barrels/year, that is a consumer surplus of \$800 million/year.

g) Why do you think that Standard Oil in 1900 was not producing at what you just calculated was the profit-maximizing scale and price?

Suppose that some other robber baron of the day—J.P. Morgan or E.H. Harriman or Theodore N. Vail—were to try to compete with Standard Oil. They would have to invest at a scale that would give them fixed costs amortized at \$600,000,000/year. If, after entry, the two firms then split the market at the profit-maximizing position as a cozy oligopoly, they would each charge \$50/barrel and each sell 20 million barrels—giving each, after their \$10/barrel variable costs, an operating cash-flow of \$800 million/year and a profit of \$200 million/year. That might tempt a competitor to enter, and then Standard Oil would find itself making not \$600 million/year but only \$200 million/year.

By aggressively expanding well beyond the profit maximizing point, Standard Oil is sending a very strong signal to potential competitors that they should

stay away—that Standard Oil will not politely share they market should they enter.

John D. Rockefeller Sr. and his fellow investors and executives also viewed themselves as, to some degree, holders of a public trust. They thought that they were storing up treasure in heaven by delivering ample consumer surplus through an efficient large-scale operation that sold people power, heat, and light at a reasonable price.

h) What is the maximum possible societal surplus attainable from the oil industry in 1900?

The number of possible barrels of oil that could be produced and sold for less than the consumer willingness-to-pay is 80 million barrels/year at a cost of \$10/barrel. The average willingness-to-pay would then be \$50 barrel, for an average surplus over cost of \$40 barrel. Total consumer surplus would then be \$3.2 billion/year. On the producer side, surplus would -\$600 million/year—it would be selling its oil for variable cost, and there are the fixed costs to amortize.

Total societal surplus would then be \$2.6 billion/year.

The Standard Oil monopoly in 1900 was then delivering \$1.8 billion/year of consumer surplus plus \$600 million/year of profit to Standard Oil.

A profit-maximizing monopoly that was protected against entry in 1900 would have been delivering \$800 million/year of consumer surplus and making \$1 billion/year of profits.

By trying to discourage entry by competitors—by “limit pricing”—(and by seeking to do some good while also doing very well for themselves) John D. Rockefeller, his executives, and his investors chose to buy insulation against competition and an extra \$1 billion/year of consumer surplus to their customers by sacrificing profits of \$400 million/year.