

ECO 610

Fall 2016

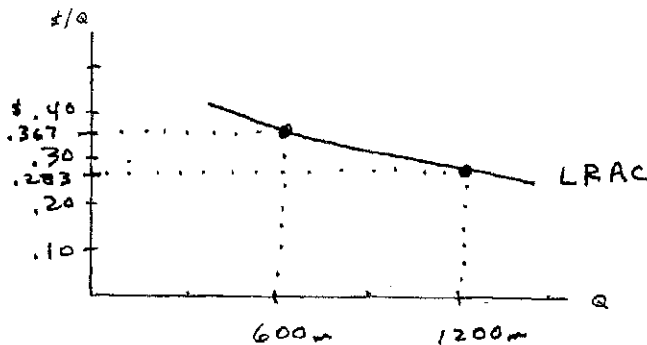
Problem Set #5 KEY: 6 points total

1. You work for 4M—Middle Mississippi Mining and Manufacturing Co. Your company produces tape (good Y). To produce this tape 4M must spend \$100 million to perfect the process of working with chemical adhesives, attaching these adhesives to cellophane, and manufacturing and packaging tape. Once this setup cost is incurred, each roll of tape can be produced at a cost of \$.20 each. Thus, $TC(Y) = \$100m + .20Y$.

Given that 4M has made the investment in developing the know-how for manufacturing tape, much of this knowledge can be applied to producing related products, such as adhesive message notes (good X). For an additional \$20 million investment, you can ramp up production of stick-up notes (not to be confused with Post-It notes, which are trademarked by the 3M Company). These stick-up notes can be produced at a cost of \$.05 per pack. Thus the total cost of producing tape and stick-up notes together is given by $TC(X,Y) = \$120m + .05X + .20Y$.

Finally, a stand-alone company that did not produce tape would have to incur an initial investment of \$50 million in order to begin producing stick-up notes from scratch. Its total cost function would be $TC(X) = \$50m + .05X$.

- a) What does the LRAC for tape look like, i.e. are there economies or diseconomies of scale? Hint: calculate the cost of producing 600 million and 1200 million rolls of tape.



$$TC(Y) = 100m + .20Y$$

$$\text{if } Y = 600m, TC = 100m + .20(600m)$$

$$TC = \$220m$$

$$ATC = \frac{220}{600} = \$,367$$

$$\text{if } Y = 1200m, TC = \$340m$$

$$ATC = \frac{340}{1200} = \$,283$$

LRAC is downward sloping,
indicating economies of scale.

- b) Does it make sense for 4M to produce both tape and stick-up notes, i.e. are there economies of scope? Hint: compute $TC(0, 600m)$, $TC(100m, 0)$, and $TC(100m, 600m)$.

Economies of scope if $TC(100, 600) < TC(0, 600) + TC(100, 0)$

$$TC(0, 600m) = \$100m + .20(600m) = \$220m$$

$$TC(100m, 0) = \$50m + .05(100m) = \$55m$$

$$TC(100m, 600m) = \$120m + .05(100m) + .20(600m) \\ = 120m + 5m + 120m = \$245m$$

$$\$245m < \$220m + \$55m$$

so economies of scope. It makes sense to produce both tape and stick-up notes.