Economics 100M Winter 2013
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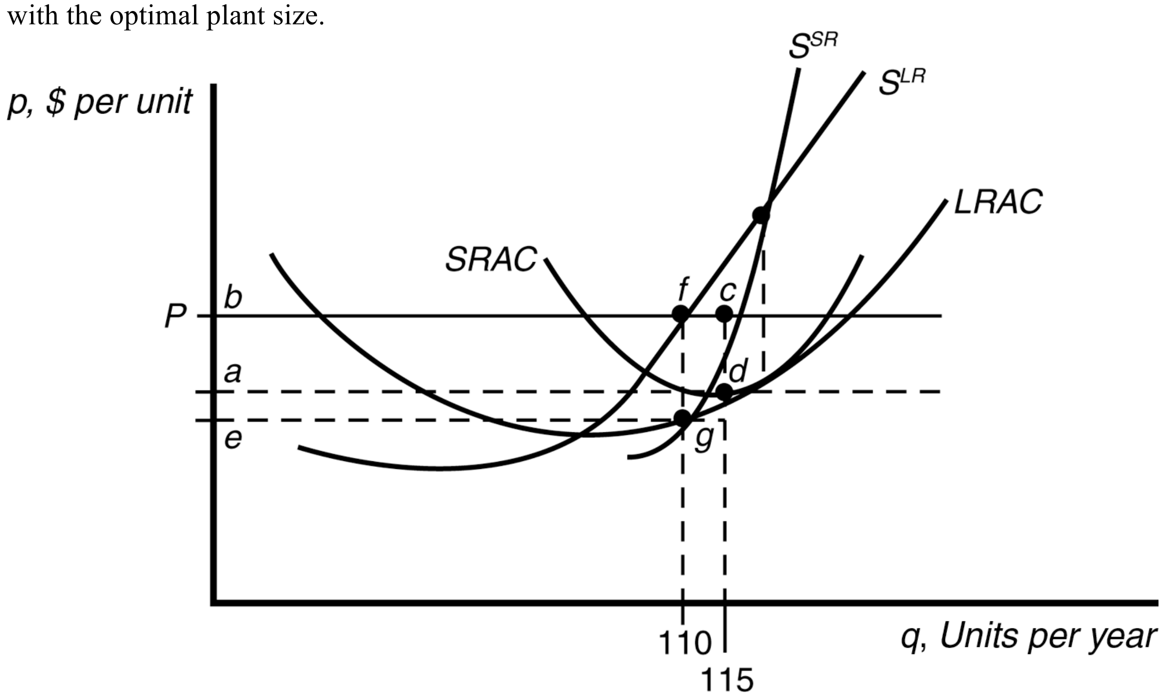
Solutions to Practice Problems from Chapter 8

Part 1:

21. The "logic" behind the first claim is that the firm chooses not to charge the full price of one of the inputs, the rent. The "logic" for the second claim is that since it is charged a lower price for one of the inputs, the output price is also lower. Neither claim makes sense for a profit maximizing firm in a competitive industry.

24. Such a tax will not affect the marginal cost. However, the tax incidence will be shared by the grocers and the consumers. The amount of tax passed on to consumers will be determined by the demand elasticity of grocery bags.

26. See Figure. In this case the firm is producing more than the long-run profit-maximizing output level of 110. Profits are currently equal to area abcd but would be increased to area ebfg with the optimal plant size.



32. Marginal cost is computed by taking the derivative dC/dq. Profits are maximized by setting MC = MR = p. For the function given, $MC = 10 - 2q + q^2$. Thus profits are maximized when $p = 10 - 2q + q^2$. The supply curve is $p = 10 - 2q + q^2$ for $p > 9.25$.

34. In the long run, price equals marginal cost, and profits are zero. Thus given that industry output Q = nq, the following will be true in long-run equilibrium: $p = 24 - nq$. Therefore,

$24 - nq = 2q$

$(24 - nq)q = 16 + q^2$.

Solving these equations for q, n, Q, and p yields

$q = 4, n = 4, Q = 16, p = 8$.

40.

a. The total cost function is:

$$C(q) = 6860 + \left(p_T + t + \frac{7}{12}\right)q + \frac{37}{27{,}000{,}000}q^3 = 6860 + \frac{169}{12}q + \frac{37}{27{,}000{,}000}q^3,$$

then the marginal cost function is:

$$MC(q) = \frac{\partial C(q)}{\partial q} = \frac{169}{12} + \frac{37}{9{,}000{,}000}q^2$$

b. The average variable cost function is:

$$AVC(q) = \frac{VC(q)}{q} = \left(p_T + t + \frac{7}{12}\right) + \frac{37}{27{,}000{,}000}q^2 = \frac{169}{12} + \frac{37}{27{,}000{,}000}q^2.$$

Therefore, the shutdown price = $\min_q AVC(q) = \min_q \frac{169}{12} + \frac{37}{27{,}000{,}000}q^2 = \frac{169}{12}$.

c. Since the short-run supply function is the segment of the marginal cost function above the average variable cost function, and since

$$MC(q) = \frac{169}{12} + \frac{37}{9{,}000{,}000}q^2 \geq \frac{169}{12} + \frac{37}{27{,}000{,}000}q^2 = AVC(q),$$

the marginal cost curve is always above the average variable cost curve. Thus the short-run supply function is just the solution q^* to: $p = MC(q)$. Solving this equation, we can obtain the short-run supply function:

$$S(p) = q^* = 300\left(\frac{p - \frac{169}{12}}{37}\right)^{\frac{1}{2}} = 300\left(\frac{p - (p_T + t + \frac{7}{12})}{37}\right)^{\frac{1}{2}}$$

d. $$\frac{\partial S(p,t)}{\partial t} = -\frac{150}{37}\left(\frac{p - (p_T + t + \frac{7}{12})}{37}\right)^{-\frac{1}{2}} < 0$$

$$\left.\frac{\partial S(p,t)}{\partial t}\right|_{p_T=11.5,\, t=2} = -\frac{150}{37}\left.\left(\frac{p - (p_T + t + \frac{7}{12})}{37}\right)^{-\frac{1}{2}}\right|_{p_T=11.5,\, t=2}$$

$$= -\frac{150}{37}\left(\frac{p - \frac{169}{12}}{37}\right)^{-\frac{1}{2}} = -\frac{150}{37}\left(\frac{p - \frac{169}{12}}{37}\right)^{-\frac{1}{2}}$$

$$= -\frac{300\sqrt{3}}{\sqrt{444p - 6253}} < 0$$

Part 2:

1. **Give an example of an industry where the long run supply curve should be perfectly elastic.**
   Free entry and exit will do this if efficient scale (min LRAC for a firm) is small relative to demand at the corresponding price, assuming no impact on input prices or technology.
   Explain what economic differences would lead to an upward sloping long run supply curve in some other industry.
   A scarce input in the new industry (e.g., rare earths for electric vehicles) could lead to higher AC at higher industry output, and thus upward sloping LR supply.

2. **Theory suggests circumstances under which the short run industry supply curve is discontinuous. Can you think of a realistic example where this could happen?**
   If there are only a few firms and price is near AVC, then firms may shut down and restart as prices fluctuate. Mining rare earths in the US seems to be an example.
   What would be the economic impact?
   Could lead to price instability as the firms shut down and restart.