

ECON 301, Professor Hogendorn

Problem Set 8 Answers

1. *Nissan_a.*

- (a) The dealer has total revenue $TR = (30 - y)y$, hence marginal revenue $MR = 30 - 2y$. Its marginal cost is $MC = w$. Thus, the dealer should set marginal revenue equal to marginal cost, which gives $y^* = \frac{30 - w}{2}$. At that quantity, the price and profit are:

$$p^* = 30 - \frac{30 - w}{2} = 15 + \frac{w}{2}$$
$$\pi^* = \left(15 + \frac{w}{2} - w\right) \frac{30 - w}{2} = \left(15 - \frac{w}{2}\right)^2$$

- (b) Since the dealer wants to sell $y^* = \frac{30 - w}{2}$ cars and it needs one car per car sold, this is also the demand curve for cars from this dealer. The inverse demand curve is $w(y) = 30 - 2y$.
- (c) For Nissan, total and marginal revenue are

$$TR = (30 - 2y)y \quad MR = 30 - 4y$$

Nissan's marginal cost is 5, so its optimal quantity is $30 - 4y = 5 \Rightarrow y^* = 6.25$. Then it can charge $w^* = 17.5$ per car. Its profit is $(17.5 - 5)6.25 = 78.125$. Using the expression from (a), the dealer's profit is then 39.06.

- (d) If Nissan operated the dealership directly, it would behave just like in part (a) except it would take w as 5 since that is its marginal cost. Using the expressions from (a), Nissan would sell 12.5 cars at a price of 17.5 each. Its profit would be 156.25, which is greater than the combined profits of Nissan plus the independent dealership found in (c). This illustrates the *double monopoly markup*.

2. *Normal_a*. The first number in each pair is the payoff of the row player and the second payoff is for the columns player. (T,L) and (B,R) are Nash equilibria. Note that (M,C) is not a Nash equilibrium because if the row player deviated from M to T, her payoff would increase from 4 to 5.
3. *Tractors_a*. If we write this as a matrix game, it looks like:

		John Deere	
		P	H
Case	P	1,1	(3,4)
	H	(5,3)	1.5,1.5

There are two Nash equilibria, so it's a type of coordination game.

Now suppose one firm can move first. Case moves first, it would choose Hungary, and John Deere could gain 1 by moving first instead. If John Deere moves first, it chooses Hungary and Case could gain 2 by moving first instead. Therefore, Case will bid \$1,000,001 and go first. (b) is the answer.

4. *CreditCards_a*.

(a) From the production function,

$$y = K^{0.3}L^{0.8} \Rightarrow L^{0.8} = K^{-0.3}y$$

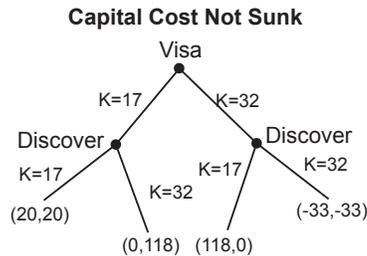
Thus, the short-run conditional factor demand for labor is

$$L(y|K) = K^{-0.375}y^{1.25}$$

With both the rental rate and the wage set to 10, the short-run total cost is

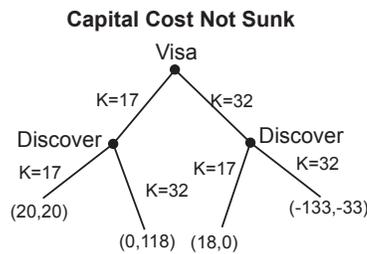
$$TC(y|K) = 10K + 10L(y|K) = 10K + 10K^{-0.375}y^{1.25}$$

(b) The extensive form game tree is:



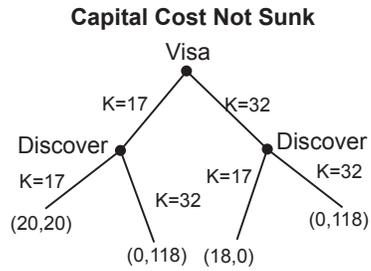
(c) The equilibrium of the left hand subgame is $K=32$ and the equilibrium of the right hand subgame is $K=17$. By backward induction, Visa chooses $K=32$, preempting Discover. Discover does not have a credible threat to choose $K=32$ in this case.

(d) The simpler way to treat the change is to subtract 100 from Visa's payoffs when it chooses $K=32$ and leave everything else unchanged:



This does not change the equilibrium, but it does make it sub-optimal: Visa gets 18 whereas it could get 20 from a cooperative contract where both choose $K=17$. Discover would also gain from the contract, going from 0 to 20.

A more subtle point is that the 100 cost to Visa may be counted in the short run total fixed cost that determines which firm get to sell 100 units. In that case, Discover now wins even in the case where both firms pick $K=32$:



Now the equilibrium of both subgames is for Discover to choose $K=32$, and the equilibrium of the whole game has Visa indifferent and choosing $K=17$. Visa would like to write the same contract discussed above, but its gain of 20 is not sufficient to compensate Discover for its loss of 98.