ECON 2201 Practice Problems

Robert Szarka

December 11, 2011

Second revision, with hints and short answers plus a correction to #2.

1   Chicken

Consider the game of Chicken: two players drive at one another at high speed down the middle of the road; each player may play SWERVE or STRAIGHT; because of the high speed, the players can't observe the other player's action before choosing their own; if both players play STRAIGHT, they crash and possibly die (-10); a player who plays SWERVE is embarassed in front of their friends (-1), and if the other player plays STRAIGHT they are embarassed even more (-5); a player who plays STRAIGHT while the other plays SWERVE is a hero and gets free beer and a date with an attractive member of the appropriate gender (+10).

1. Draw the strategic (normal) form representation of this game.

2. Draw the extensive (game tree) form representation of this game.

3. Find any pure-strategy Nash equilibria.

4. Find any mixed-strategy Nash equilibria.

5. Suppose one player can precommit to their strategy. How might this change the game?

2   Eat a Peach

Suppose the demand for peaches is described by the function $Q = 20 - 2P$ while the supply of peaches is described by the function $Q = 2P - 4$, where Q is peaches per day and P is dollars. Graph the supply & demand in the usual manner, labeling everything appropriately. Find the equilibrium price and quantity and label them on your graph. What is the total revenue at the equilibrium price? What is the price elasticity of demand at this price? Is this the price at which total revenue is maximized? If not, would the maximum revenue occur at a lower or higher price?

3 Cheap Apples?

The market for apples in Storrs is in equilibrium at a price of $1/apple and a quantity of $1,000$ apples/week before the town council passes a law limiting the price of apples to $0.90 each. Illustrate the effect of this new price ceiling on a graph and describe its effects in terms of social welfare.

4 *Les hommes politiques dire les choses darndest*

NPR recently reported[1] that French President Nicolas Sarkozy plans to levy a carbon tax on households and businesses. They quote him as saying (through a translator) that: "This tax will in no way reduce household income or a business's competitiveness. We will refund every cent, either through tax deductions or refunds to those who don't pay taxes." Imagine that you are an angry French citizen. Explain (*en anglais!*) to Carla Bruni-Sarkozy's less famous husband how the carbon tax will make French voters worse off

5 "I Rob Banks"

In the imaginary state of Calitexacut, the average armed robbery results in a five year prison term and the average murder results in a twenty year prison term; but Calitexacut recently passed the Three Strikes Law, which mandates life in prison with no possibility of parole for anyone convicted of three felonies (such as armed robbery or murder). Career bank robber P.B. Floyd lives, loves, and robs banks in Calitexacut and has already been convicted of two armed robberies. Floyd is planning another bank robbery tomorrow despite the Three Strikes law. How does the Three Strikes Law impact Floyd's decision about whether to shoot the bank guard while robbing the bank?

6 Production Under Perfect Competition

Suppose a perfectly-competitive firm faces short-run production costs of $C(q) = q^2 + 30q + 400$. If the market price is $50, how much output will the firm produce? Graph the firm's short-run supply function. *Hint: MC=2q+30*

7 Production Under Monopoly

Suppose a monopolist has long-run total cost of $C(q) = q^2 - 5q + 100$ and faces inverse market demand of $p = 55 - 2q$. What quantity will the monopolist produce? What will the price be? Graph demand, marginal revenue, and

---

[1]http://www.npr.org/templates/story/story.php?storyId=121274671

marginal cost and indicate consumer surplus and deadweight loss on the graph.
Hint: MC=2q-5

8   More Production Under Monopoly

Suppose a monopolist faces inverse demand of $p = 10 - q$, short-run variable costs of $VC(q) = q^2$, unavoidable fixed costs of 10, and avoidable fixed costs of 15. How much output will the firm produce? How much profit will it make?
Hint: MC=2q

Short Answers

Not all of these are the complete answers I would expect on an exam, but they should be enough to check whether you have the right idea.

1. There are two pure-strategy Nash equilibria: {SWERVE,STRAIGHT} and {STRAIGHT,SWERVE}. There is also a mixed-strategy Nash equilibrium where each player plays SWERVE with $\frac{5}{16}$ probability.

   If one player can precommit to a strategy, they will commit to playing STRAIGHT, which then makes responding with SWERVE the best option for the other player.

   Note: This "first-mover advantage" is a feature of many games. For example, von Stackelberg analyzed a game where one of two Cournot duopolists can precommit to a quantity, forcing the other duopolist to choose a lower quantity they would choose in a standard Cournot game. However, moving first isn't advantageous in all games. Would you want to precommit to an action in a game of Matching Pennies or Rock, Paper, Scissors?

2. The market is in equilibrium at $p^* = 6$ and $q^* = 8$, with $TR = 48$ and $\varepsilon^d = \frac{3}{2}$. However, TR reaches a maximum of 50 where demand is unitary elastic (equiv. where $MR = 0$), which occurs at $p = 5$.

3. The price ceiling is effective, so there is deadweight loss from the inability of market participants to (legally) make some mutually-advantageous exchanges. To the extent that producers and consumers work around this limitation (e.g. via a black market), resources are wasted. To the extent that officials in Storrs work to enforce the price celing, resources are wasted. To the extent the price ceiling creates a shortage, apples would have to rationed on the basis of something other than price. For example, producers could discriminate between buyers (e.g. on the basis of race) without any cost to themselves. Or access to the limited supply of apples might be rationed by queuing: the cost to a consumer would then be the sum of the price and the value of the time spent waiting in line, and the time spent waiting is wasted.

4. The key to understanding this issue is seeing that the real income of French citizens depends not on the number of euros in their pay packet, but on the utility they are able to achieve. Their utility, in turn, depends on a combination of the goods they consume and the leisure they enjoy. A carbon tax will impact the production of virtually every good in the French economy: for a given amount of inputs, including labor time, France will produce less output. Thus, on the whole, French citizens will have to consume less. Sarkozy appears to be neglecting to count the real costs of his policy. *Sacrebleu!*

   But aren't French citizens, on the whole, made better off if we "stop global climate change"? Maybe. This assumes that the unilateral reduction of emissions in France has an appreciable effect on climate change. It may not, if France's reduction has no effect on the behavior of other countries and France's reduction is not by itself enough to make a difference. French consumers may even switch to importing products whose production is carbon-intensive from countries without a carbon tax, where it is now relatively cheaper to produce them. Although the question asks about costs, the benefits also seem questionable.

5. The key to this problem is that the Three Strikes law, by raising the cost of getting caught robbing the bank, lowers the marginal cost of shooting the guard.

6. Assume that all fixed costs are unavoidable. Then, at a price of $50 the firm will produce 10 units. (They lose $300, but that's better than losing $400.)

   The firm's short-run supply curve will be the portion of the marginal cost curve above the shutdown point. To find the shutdown point (given that all fixed costs are unavoidable), we need to find the price at which the firm just covers variable cost even though it's producing the optimal $q^* > 0$. This means we first need a way to find the q^* that corresponds to a given price. Since $MR = p$, the usual $MR = MC$ rule gives us that $q^* = \frac{1}{2}p - 15$. Armed with this information, we can substitue for q in $q^2 + 30q = pq$ and solve the resulting quadratic equation to find that the shutdown point is where $p = 30$. (This may seem obvious from the rule for q^* above, but this won't be true for every cost function.)

7. The monopolist will produce 10 units at a price of $35. Remember to use our trick for linear demand curves to get $MR = 55 - 4q$. Your triangle of deadweight loss should have an area of $50; your triangle of consumer surplus should have an area of $100.

8. The best the monopolist can do without shutting down is to produce 2.5 units at a price of $7.5, yielding a profit of $-12.5. Therefore they will do better to produce nothing and "eat" the unavoidable fixed costs of $10.