Microeconomics I

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Suggested Exercises 5

Perfect competition

1. MWG 10.C: 1, 2, 3, 4, 6, 7, 8*, 9, 10, 11.

   * 10.C.1 and 10.C.3 can be combined as an individual problem.

   ** 10.C.2, 10.C.4, and 10.D.2 can be combined as a group problem.

   ** 10.C.6 and 10.C.7 can be combined as a group problem.

   * 10.C.9 and 10.C.11 can be combined as an individual problem.

2. MWG 10.D: 2, 3, 4.

   * 10.D.3 and 10.D.4 can be combined as an individual problem.

3. MWG 10.E: 1*, 2, 3.

   - 10.E.3: highly recommended for those who are interested in regulatory economics.

4. MWG 10.F.1, 2, 3, 7.

   * 10.F.2 and 10.F.3 can be combined as an individual questions. In 10.F.3, please consider when taxes are small, and assume instead $\phi'' > 0$.

5. MWG 10.G: 1, 2, 3, 4.

6. Varian 10: Farmers produce corn from land and labor. The labor cost in dollars to produce y bushels of corn is $c(y) = y^2$. There are 100 identical farms which all behave competitively.

   (a) Derive the individual and market supply of corn.

(b) Suppose that the market demand of corn is $D(p) = 200 - 50p$. Find the equilibrium corn price and quantity sold.

(c) What is the equilibrium rent on the land?

7. * Imperfect Financial Market (Based on Michelacci and Schivardi, 2008): An entrepreneur E has a Bernoulli utility function

$$u(x) = x - \frac{x^2}{2\gamma},$$

where x is the money she can enjoy and γ is an exogenous parameter. Assume that γ is large enough so that her marginal utility from money is never negative. (More precisely, $\gamma > y$ where y is introduced below.)

(a) How does E's risk attitude vary with γ?

The entrepreneur has an investment opportunity, or a project. This project costs one euro, and gives a return $y > 0$ if the project succeeds and zero if it fails. The successful probability is $p \in (0, 1)$. Assume that $py > 1$.

(b) If E has initial wealth one euro, which can be used to start the project or consumed directly, when will E undertake the project? How the entrepreneur's risk attitude affects her investment decision?

Suppose that E has no initial wealth and has to borrow from a financial market, where

- liquidity supply is unlimited (i.e., competing lenders will lend any amount as long as they find it profitable); and
- interest rate is zero (e.g. lenders' only alternative for their money is to consume it directly, and all lenders have Bernoulli utility function $u^L(x) = x$, where x is the money to be enjoyed).

Also assume that when the project fails E cannot be forced to repay her debt or punished (i.e., she is protected by limited liability).

(c) Suppose that, upon borrowing, E is agreed to repay lenders b when the project succeeds. Write down the condition under which the project can be financed.

(d) Show that in this market, E always prefers the project to be financed. Also show that when E is risk neutral, her payoff from raising the investment fund and conducting the project is equal to the investment surplus (the project's expected return minus cost).

Now, let us introduce imperfect protection to investors. Suppose that when the project succeeds, E only needs to repay the debt with probability α, and with probability $1-\alpha$ she can run away and enjoy the whole y. In other words, $\alpha \in (0,1)$ measures the effectiveness of financial contract enforcement.

(e) Find the condition under which the project can be financed. What is the impact of α on E's ability to raise fund?

(f) What are the entrepreneur's preferences on α at the *ex post* (i.e., when the project has started) and *ex ante* (i.e., before the finance is secured) stages? What is the policy implication of this result?

Monopoly

1. MWG 12.B: 1, 2, 3, 4, 5, 6, 7*, 8*, 9*, 10*.

   ** 12.B.2, 12.B.3, and 12.B.4 can be combined as a group problem.

   * 12.B.5 and 12.B.6 can be combined as an individual problem.

   ** 12.B.7 and 12.B.8 can be combined as a group problem.

   ** 12.B.9 and 12.B.10 can be combined as a group problem.

2. ** (Three independent questions from Varian)

   (a) Consider a monopolist with CRS technology. The inverse demand facing the monopolist is $p(q,t)$, where q is output and t is a parameter that shifts demand. Find the optimal response of equilibrium monopoly output to a marginal change in t. What is the optimal response if $p(q,t) = a(q) + b(t)$?

   (b) Varian 14: Consider a common price discrimination practice called "two part tariff:" the firm charges a lump sum fee to have the *right* to purchase a good, and

then charge a per-unit cost for consumption of the good after that. Find a real life example.

Suppose that all consumers have identical utility functions $u(x)$ and a monopolist has cost function $c(x)$. Will the monopolist produce more or less than the efficient level (i.e., the one under perfect competition) if it can use two part tariff?

(c) Consider a monopolist with no production cost and faces two markets with demand function $x_1 = a_1 - b_1 p_1$ and $x_2 = a_2 - b_2 p_2$, where x_i and p_i are the quantity sold and price charged in market $i = 1, 2$. Suppose the monopolist can charge different prices for different markets, but not within the same market.

i. Find the conditions on (a_1, b_1, a_2, b_2) such that the monopolist will optimally choose *not* to price discriminate while still selling positive quantities.

ii. Find the same conditions for demand functions $x_i = A_i p_i^{-b_i}$, $i = 1, 2$, and constant marginal cost $c > 0$.

3. Varian 14: In the class we derived the monopolist's optimal quantity to sell on the market. Now try with the case where the monopolist optimally chooses the price to sell the good. Show that the two approaches have the same result.

4. * (Tirole) A power plant (or a hotel, or an airline) faces two types of demand: off-peak ($q_1 = D_1(p_1)$) and peak ($q_2 = D_2(p_2)$), where $D_1(p) = \lambda D_2(p)$ with $\lambda < 1$. (For simplicity, the demands are independent.) The marginal cost of production is c (as long as capacity is not satiated). The marginal cost of investing one unit of capacity is γ. The same capacity serves peak and off-peak demands.

(a) Show that if off-peak demand is small relative to peak demand (where "small" is to be defined), the monopolist equates marginal revenues to c and $(c + \gamma)$ respectively.

(b) Treat the case in which off-peak demand is not small. Solve the case in which demands have constant elasticity.

5. * (Kreps) Consider a monopoly that faces a downward sloping demand curve $X = D(p)$ and constant unit costs c. We are interested in how this monopoly will adjust the price it charges as c changes. Let $p(c)$ be the monopoly price, as a function of c.

(a) If demand is linear $X = A - p$, show that less than the full change in costs is passed on to the consumer. That is, $dp(c)/dc < 1$.

(b) Suppose that demand takes the form $X = p^{-\alpha}$ for $\alpha > 1$. Find out $dp(c)/dc$.

(c) For which demand function (if any) will the monopoly precisely pass on to consumers any cost increase, i.e., $dp(c)/dc = 1$ for all c.