Rettevejledning, Mikro B, juni 2012

Problem 1

Consider an exchange economy in which there is uncertainty, as the economy will end up in one of two possible states. In state 1, Andy has an initial endowment of 24 units of the aggregate consumption good, while Bernie has 12. In state 2, Andy has an initial endowment of 12 units of the aggregate consumption good, while Bernie has 24. Prior to one of the states being realized, perfectly competitive markets are opened for trading state contingent goods.

Both agents have von Neumann-Morgenstern preferences, both represented by the utility function $\pi \cdot \ln(x_1) + (1-\pi) \cdot \ln(x_2)$, with π being the probability of state 1 occurring, $0 < \pi < 1$.

- Illustrate the set of possible allocations in an Edgeworth Box; is there aggregate risk in the economy?
- Identify the Walrasian equilibrium when $\pi = 2/3$, using the price of the good delivered in state 2 as numeraire, $p_2 = 1$.
- Identify the Walrasian equilibrium when $\pi = 1/3$.
- Compare the two equilibria and comment; especially as to how well off the two agents are in each case.

Answer:

There is no aggregate risk, total endowments being 36 in both states (Nechyba p. 591).
Equilibrium price is found solving equilibrium for market 1, using Walras' law, and the fact that both consumers have Cobb-Douglas preferences: $\pi \cdot (24 \cdot p_1 + 12)/p_1 + \pi \cdot (12 \cdot p_1 + 24)/p_1 = 36$, obtaining the equilibrium price $p_1^* = \pi/(1-\pi)$. Hence, the equilibrium price for commodity one becomes 2 and ½, respectively, in the two cases.
When π is 2/3, the equilibrium price is high, because state 1 is more probable; A consumes (20, 20), while B consumes (16,16).
When π is 1/3, roles are reversed. B is better off because here he is a seller of the most precious commodity, being associated with the more probable state.

Problem 2

A firm, Speedeliver, is handling packages and is placed close to the fitness club, BeautiFit. Both firms act in perfectly competitive markets.

Speedeliver's personnel are able to catch glimpses of the attractive fitness customers as well as hear the upbeat music, and this increases their work motivation as well as their productivity.

- If both firms are independently maximizing profits, will the outcome be efficient? If you think so, please argue why; if you think not, how can the situation be remedied to ensure an efficient outcome?
- What would Coase argue?

Answer:

There is a positive externality from Beautifit to Speedeliver, so increasing business activities in the former will increase the sum of profits. Hence, independent profit maximization will not be efficient (maximize the sum of profits). The firms might merge, or Speedeliver may subsidize BeautiFit's production. Coase would argue that when transactions costs are not too high, the two firms will negotiate, resulting in an efficient outcome (Nechyba p. 759-762).

Problem 3

A college town has 1000 "old" students graduating and thus leaving the campus. Each of them owns a used car. The quality of a car is given by a parameter g. The distribution of qualities is uniform from 1000 to 1999, i.e. there is one car of quality $g = 1000$, one of quality 1001, etc. up the best car having $g = 1999$. The students leaving all have the same preferences: An "old" student, knowing his car has quality g, is willing to sell it for $\$\,g$ or more. The college community is growing, so more than a thousand "new" students are moving into campus. A new student is willing to pay up to $\$\,k\cdot g$ ($1 < k < 2$) for a car of quality g. We assume that if a car is trade, the price is determined by the buyer's willingness to pay. We assume that each old student knows the quality of his or her car, whereas the new students know only the distribution of qualities. Finally, we assume that all students are risk-neutral.

- Express the equilibrium price for used cars as a function of the parameter k.
- What happens as k converges to 1? As k converges to 2?
- Please comment on these results and on the role k plays.

Answer:

At price p, qualities lower than p will be supplied, giving the average quality $(1000 + p)/2$ (treating quantity as a continuous variable, to simplify), yielding willingness to pay: $k\cdot(1000 + p)/2$. Solving the equation $p = k\cdot(1000 + p)/2$, we get equilibrium price, when not all cars are traded, to be $p^*(k) = 1000\cdot k/(2-k)$, with all cars of quality less than $g^*(k) = 1000/(2-k)$ being traded. For $k \geq 4/3$, all cars are traded, and price becomes $\underline{p}(k) = k\cdot 1500$, and the market outcome is efficient, albeit with income distribution being different from the case of symmetric (or perfect) information.As k converges to 1, no cars are traded; The larger the k, the relatively more valuable a given car is to a new than to an old student, hence improving market conditions, overcoming the inefficiencies of asymmetric information.

Problem 4

Consider a perfectly competitive market for a good. Assume that the government decides to introduce a unit tax.

- Explain how the tax incidence ("who bears the tax burden?") depends on how elastic or inelastic the demand side, and the supply side, respectively, is with respect to price changes
- Explain how the unit tax will cause a deadweight loss.
- How do the degrees of elasticity on the two sides of the market affect the size of the deadweight loss?
- How do the two elasticities depend on production technology of firms, and the degree to which consumers can substitute from this good to other goods?

Answer:

The more elastic demand is with respect to prices (elasticity measured in absolute value), the less incidence for the demand side; and vice versa. The same holds true for the supply side. There is a deadweight loss, because the tax distorts price signals, creating a wedge between the price suppliers receive and the price customers pay, reducing consumers' surplus and producers' surplus by more than the tax revenue. The more elastic the two sides, the more the equilibrium quantity will be reduced, and the larger the deadweight loss (the intuition being that high elasticities mean a stronger distortion impact of the tax). High absolute values of elasticities occur if firms can produce "close to constant returns to scale" (flat MC-curves), and if consumers have near substitutes for the good taxed, respectively. See Nechyba p. 672-677.

Problem 5

Consider the company PigRail running a local train, bringing commuters from a suburb into the city. The demand for train rides is, on a daily basis, $D(p) = \text{Max}\{1200 - 10\cdot p, 0\}$, with p being the ticket price. The train company has the cost function $C(x) = x^2/20 + 10000$, with x being the number of customers. PigRail can act as a monopolist.

- Which ticket price should PigRail set, how many customers will it have, and how much profit will the company earn?
- Assume now that the local government wants to enforce an efficient outcome. Which price should it force PigRail to set; and how will this affect the number of customers and the profits earned?
- Answer the two questions above if fixed costs are not 10000, but 20000.

Answer:

The relevant part of the inverse demand function has the expression $120 - 0.1\cdot x$. Solving MR = MC, i.e. $120 - 0.2\cdot x = 0.1\cdot x$, we see that the monopoly chooses to have 400 costumers paying the ticket price 80, earning profits of 14000. The perfectly competitive outcome is found by solving $MC(x) = 120 - 0.1\cdot x$, getting the price be 60, with 600 costumers, and profits of 8000. Doubling the fixed costs does not change price or quantity for either monopoly or perfect competition, but does of course affect profits, implying negative profits in the perfect competition case. Hence, the company will want to produce nothing (and eventually pull out of the market completely) if forced to charge the price of 60, so the government will have to subsidize (through taxes, probably) PigRail, or nationalize, to ensure train rides for the commuters.

Problem 6

Art and Bob live in the same building and enjoy having lights outside; this light is a public good, one unit costing 1 \$. Let G be the quantity of light (for simplicity, assume it is a continuous variable), and let x be money available for other consumption, after having contributed to the outside light. Art's preferences are represented by the utility function $u_A(x_A,G) = x_A - 1/G$, while Bob has utility function $u_B(x_B,G) = x_B - 3/G$. Initially, they both own 10 \$.

- Find the Lindahl equilibrium implementing an efficient quantity of outside light
- How does the quantity depend on the initial wealth distribution? Is this a general result?

Answer:

Solving FOC: $MRS_A + MRS_B = 1$, i.e. $1/G^2 + 3/G^2 = 1$, gives us $G^* = 2$, with Lindahl prices $t_A = MRS_A(G^*) = ¼$, $t_B = MRS_B(G^*) = ¾$. So A ends up with private consumption 9½, and B with 8½.

G^* is independent of wealth distribution; this is only because both agents have quasi-linear preferences (Coase, Nechyba p. 1053-1054).

Ref.: mtn, 10. juni 2012