

cover page for a written examination/test

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Each question should be answered on TiU exampaper, each furnished with the candidate's name and ANR number. If candidates are unable or unwilling to answer a question, they must nevertheless submit a sheet of paper containing details of their name and ANR, together with the number of the question concerned. The 6 digit ANR number is printed on the TiU card.

- Candidates are allowed to use a calculator but no books.
- Candidates are allowed to bring 1 (one) A4 page to the exam with notes.
- This exam consists of 1 question.
- Candidates must write clearly.
- Candidates must convince us that they understand the material of this course. Motivate your answers!
- There is no reason to panic! If you feel that you miss relevant information to answer a question, state this explicitly and assume the information that you need. Then we can see whether we can give points for this.
- If you don't write anything, we cannot give you any points!

Question 1 (25 points)

This exam is based on a paper by Mark Armstrong entitled “Search and ripoff externalities”. This paper was not discussed in class. But do not panic, we will talk you through the paper.

In this question, we consider two models with “naive” consumers; that is, consumers who do not behave in a “fully rational way”. The way they behave “irrationally” differs between the models, potentially leading to different conclusions.

In each model, there is a fraction $\sigma \in [0, 1]$ of rational or “savvy” consumers and a fraction $1 - \sigma$ of non-rational or non-savvy consumers. In each model, we have a core-product with demand $Q(P)$ with $Q'(P) < 0$ where P denotes the price of this core-product. This product is produced with a constant marginal cost technology where marginal costs are denoted by C .

Model I: add-on pricing A monopolist sells a core product and an add-on product. For the core product you can think of a printer. The add-on is then a toner or ink-cartridge. The add-on is produced at constant marginal costs normalized to 0 (zero). Demand for the add-on per customer –once (s)he bought the core-product– is given by $q(p) = 1 - p$ where p denotes the price of the add-on. All consumers see and understand the characteristics and price P of the core-product.

Non-savvy consumers find it hard to figure out the price of the add-on when they are buying the core-product. Hence, they base their decision on whether to buy the core-product (or not) on an expected price p^e for the add-on. Once they buy the add-on, their decision is based on the real price of the add-on. We assume that non-savvy consumers have the correct expectation for the add-on price. That is, in equilibrium it is the case that $p^e = p$. Finally, the expectation p^e is not affected by the price P that consumers observe for the core-product. [hint: if this reminds you of “passive beliefs”, you are correct.]

- (a) (2 points) Show that the surplus a consumer receives from the add-on product when paying a price p equals $s(p) = \frac{1}{2}(1 - p)^2$. [hint: draw the demand curve for the add-on and locate the relevant triangle]
- (b) (2 points) Argue why demand for the core-product can be written as $Q(P - s(p))$. [hint: why can we interpret $s(p)$ as a subsidy on P ?]
- (c) (2 points) Argue why the firm’s optimization problem can be written as

$$\max_{p,P} (\sigma Q(P - s(p)) + (1 - \sigma)Q(P - s(p^e))) (P - C + p(1 - p)) \quad (1)$$

Let P^*, p^* denote the profit maximizing prices for the monopolist. That is, the prices that solve equation (1). Then, in equilibrium we have $p^e = p^*$.

- (d) (3 points) Show that the prices P^*, p^* satisfy the following conditions:

$$Q'(P^* - s(p^*))(P^* - C + p^*(1 - p^*)) + Q(P^* - s(p^*)) = 0 \quad (2)$$

$$Q(P^* - s(p^*))(1 - 2p^*) - \sigma Q'(P^* - s(p^*))(P^* - C + p^*(1 - p^*))s'(p^*) = 0 \quad (3)$$

[hint: make sure that you explain why there is no term $(1 - \sigma)Q'(P^* - s(p^*))(P^* - C + p^*(1 - p^*))s'(p^*)$ in equation (3).]

- (e) (2 points) Use equations (2) and (3) together with the expression for $s(p)$ derived under (a) to show that

$$1 - 2p^* - \sigma(1 - p^*) = 0 \quad (4)$$

- (f) (2 points) How does utility for the savvy and non-savvy consumers vary with σ ?
- (g) (4 points) Explain why $\sigma = 1$ leads to $p^* = 0$ and $\sigma = 0$ to $p^* = 0.5$. [hint 1: we are looking for an intuition here, not a mathematical derivation; hint 2: what do “0” and “0.5” mean in this case?]
- (h) (3 points) There is a discussion whether or not add-on goods form a separate relevant market. Explain how to use a SSNIP test in an abuse case. Argue whether the add-on market in the model above is a separate relevant market. What is the role of σ here?

Model II: bill shock In this model, only one product is sold; but under different conditions. The savvy consumer pays the price P for the product. The non-savvy consumer thinks he pays P , but actually pays $P + R$. Think here of buying a flight ticket at price P and finding out at the airport that you need to pay R for excess luggage. The savvy consumer knows this and only brings one bag as hand luggage. The non-savvy consumer has to pay R for his additional bags. Or the on-line check in is free and checking in at the airport costs R . The savvy consumer uses the on-line check in, the non-savvy consumer finds out at the airport that he has to pay R to check in.

The product is sold in a perfectly competitive market with constant marginal cost C . The additional service bought by the non-savvy consumer at price R is produced at cost normalized to 0.

- (i) (1 point) Explain why under perfect competition, the price equals $P = C - (1 - \sigma)R$.
- (j) (1 point) What is the total price paid by the non-savvy consumer?

Discussion: policy implications The government wants to start a campaign to educate consumers. This consumer education is aimed at turning non-savvy consumers into savvy ones. The government claims that such a policy improves welfare for all consumers. In other words, the policy leads to a Pareto improvement among consumers.

- (k) (3 points) Discuss the claim made by the government in the light of model I and II above.