

ECON6002 HKU Final Examination Answers - Version 1 (Quantitative & Qualitative)

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1. Consider stock exchanges (e.g. HKEX or NYSE or NASDAQ): are they MSPs? If yes, what are the multiple sides? Describe the relevant network effects (direct and/or indirect). Be precise.

Key network effect is indirect: stock issuers (companies who list) and investors (who will buy and sell stocks).

Some people have tried to argue (incorrectly) that there is an indirect network effect between buyers and sellers of stocks. The reason this is incorrect is that when investors join a stock exchange they are ex-ante more or less identical (they will sometimes buy and sometimes sell stocks).

There is however a direct network effect among investors: more investors create more liquidity which is desirable for each individual investor when joining a stock exchange.

Other potential players who might create additional indirect network effects with stock issuers or investors are marketmakers, brokers etc.

2. Consider a monopoly two-sided platform connecting sellers (S) and buyers (B). Demands are given by:

$$N_S = \alpha_S N_B - P_S$$

$$N_B = U_0 + \alpha_B N_S - P_B$$

where $U_0 > 0$; $0 < \alpha_S, \alpha_B < 1$.

Assume the platform has 0 costs so that its profits are simply:

$$\Pi_P = P_B N_B + P_S N_S$$

a) Derive the platform's profit-maximizing prices (P_S^*, P_B^*) and resulting optimal profits Π_P^* . Briefly interpret the expressions obtained. In particular, explain when and why P_S^* can be negative.

(Hint: start by determining (N_B, N_S) solely as functions of prices (P_S, P_B) , then plug them into the expression of platform profits; take first order conditions and solve in (P_S, P_B) . Also, for interpretation, it is convenient to denote $\bar{\alpha} \equiv \frac{\alpha_B + \alpha_S}{2}$ and assume it is fixed).

Demands as functions of prices only:

$$\begin{aligned} N_B &= \frac{U_0 - P_B - \alpha_B P_S}{1 - \alpha_B \alpha_S} \\ N_S &= \frac{\alpha_S U_0 - \alpha_S P_B - P_S}{1 - \alpha_B \alpha_S} \end{aligned}$$

After optimizing over prices:

$$\begin{aligned} P_B^* &= \frac{U_0 (1 - \bar{\alpha} \alpha_S)}{2 (1 - \bar{\alpha}^2)} \\ P_S^* &= \frac{U_0 (\alpha_S - \bar{\alpha})}{2 (1 - \bar{\alpha}^2)} \end{aligned}$$

P_S^* is negative if and only if $\alpha_S < \alpha_B$, i.e. if sellers care less about buyers than buyers care about sellers. This is consistent with the pricing principles we have seen in class together (sessions 2 and 3).

b) Suppose now that buyers care not just about the number of sellers, but also about their quality. However, they cannot observe quality so their demand for the platform is based on the expected *average quality* \bar{q} of sellers who join the platform:

$$N_B = U_0 (\bar{q}) + \alpha_B N_S - P_B$$

There are two types of sellers: a proportion λ is of high quality $q = 1$ and the remaining proportion $(1 - \lambda)$ is of low quality $q = 0$. Assume seller quality is uncorrelated with seller fixed costs, so that realized seller demand is:

$$N_S = \bar{\lambda} (\alpha_S N_B - P_S)$$

where:

- $\bar{\lambda} = 1$ if the platform allows participation of all sellers willing to pay P_S
- $\bar{\lambda} = \lambda$ if the platform restricts entry only to high-quality sellers

Using the same kind of calculations as in a), it can be shown that *after optimizing over prices*, the expression of platform profits is:

$$\Pi_P = \frac{(U_0(\bar{q}))^2}{1 - \bar{\lambda} \times (\alpha_S + \alpha_B)^2}$$

Assuming $U_0(\bar{q}) = \sqrt{\bar{q}}$, determine the condition under which the platform prefers to exclude low-quality sellers (i.e. restrict entry to high-quality sellers only). Briefly interpret the condition obtained.

It is easily obtained that the condition for exclusion to be optimal is:

$$\frac{(U_0(1))^2}{1 - \lambda(\alpha_S + \alpha_B)^2} > \frac{(U_0(\lambda))^2}{1 - (\alpha_S + \alpha_B)^2}$$

which is equivalent to:

$$(\alpha_S + \alpha_B)^2(1 + \lambda) < 1$$

Thus, exclusion is less likely when preferences for quantity α_S and α_B are higher; it is also less likely when the fraction λ of high quality sellers is higher.

3. Suppose you are running a business (a start-up or a business division within a large company like Yahoo! or Google) which aims to become the leading intermediary between online video content providers and advertisers. Specifically, the goal is to connect sellers of online video advertising space (content websites which contain videos, such as NBA.com, Wall Street Journal, Discovery Channel, etc.) with buyers of online video advertising space (advertisers such as Coca-Cola, IBM, Nike, Panasonic, etc.).

a) There are two polar modes in which your intermediary could function: merchant mode vs. two-sided platform mode. Briefly describe what you think each of these two modes would look like in this particular context. Be specific and emphasize the differences between the two.

The merchant mode consists in acquiring advertising space (not acquiring content as some of you wrote!) from content providers, possibly aggregating space from several providers and then reselling that space (or bundles of space) to advertisers.

The TSP mode consists in running an eBay-type platform for content providers to sell ad space to advertisers.

There is no direct interaction/sale between content providers and advertisers in the merchant mode...

b) What do you see as the key economic tradeoffs (i.e. pros and cons) between the two modes of intermediation described in a) above? Again, make your arguments specific to this context (online video advertising).

The most important advantage of the merchant mode here is the ability to combine ad space from multiple content providers (such space has significant complementarities) and then extract higher prices from advertisers for ad campaigns spanning multiple sites.

Of course, there is also the usual advantage of breaking the chicken-and-egg problem.

The advantages of the TSP model are that it requires less capital to buy the ad space upfront and it involves less risk (no inventory).