

AFRICAN ECONOMIC RESEARCH CONSORTIUM

Collaborative Masters Programme in Economics for Anglophone Africa (Except Nigeria)

JOINT FACILITY FOR ELECTIVES (JFE) 2008
JUNE – OCTOBER 2008

HEALTH ECONOMICS I

First Semester: Final Examination

Duration: 3 Hours

Date: Monday, August 11, 2008

INSTRUCTIONS:

This examination has **THREE SECTIONS**. You are required to answer **SIX QUESTIONS** in total: **ONE QUESTION** in **SECTION A**, **BOTH QUESTIONS** in **SECTION B** and **ANY THREE QUESTIONS** in **SECTION C**.

SECTION A

Answer ONE question from this section

Question 1 (15 marks)

In Santerre and Bennett (1992) a short-run total variable cost function was estimated for a sample of 55 for-profit hospitals in Texas (*t*-statistics are in parentheses below the estimated coefficients).

$$\begin{aligned} \ln \hat{STVC} = & 1.31 + 0.47 \ln q + 0.8 \ln w + 0.73 \ln QUALITY + 0.11 \ln CASEMIX \\ & (0.69) (3.31) \quad (4.42) \quad (2.58) \quad (1.48) \\ & + 0.29 \ln k + 0.07 \ln DOC \\ & (3.16) \quad (0.88) \end{aligned}$$

$$R^2 = 0.95, \quad N = 55$$

Where $STVC$ = short-run total variable cost, q = a measure of output (total inpatient days), w = average wage rate or price of labour, $QUALITY$ = measure of quality (number of accreditations), $CASEMIX$ = an indicator of patient case-mix (number of services), k = a measure of capital (beds), and DOC = number of admitting physicians. All variables are expressed as natural logarithms (\ln), so the estimated coefficients can be interpreted as elasticities.

- (a) How much of the variation in STVC is explained by the explanatory variables? How do you know that? **(1 mark)**
- (b) Which of the estimated coefficients are not statistically significant at 0.05 significance level? Explain. **(2 marks)**
- (c) Does the estimated coefficient on output represent short-run economics or diseconomies of scale? Explain. **(3 marks)**
- (d) What are the expected signs of the coefficient estimates on w , $QUALITY$, and $CASEMIX$? Explain. **(2 marks)**
- (e) Provide an economic interpretation of the magnitude of the estimated coefficient on w . **(2 marks)**
- (f) What do the estimated coefficient on k and DOC suggest about the amount of capital and physicians at the representative hospital? **(2 marks)**
- (g) Suppose the variance of the error term for the regression varies with the number of services in hospital, i.e., $Var(e_i) = \sigma_i = \sigma CASEMIX_i$. How can the problem be corrected? **(3 marks)**

Question 2 (15 marks)

Consider the model on physician behavior discussed in class. Suppose the physician's fee is $R + p_s x$ with $R > 0$, where R is part of payment that is independent of services provided, and p_s is the per unit price. Assume that quality of care is not contractible and the physician chooses both quantity (x) and quality of care (e), with total cost $c(e)x$, to maximize his/her aggregate profit. Patient's benefit derived from care is $B(e, x)$ and $B_x > 0$, $B_e > 0$, $B_{xx} < 0$, $B_{ee} < 0$, $c_e > 0$, $c_{ee} > 0$ and $c > p_s > 0$. The patient's net benefit is $NB^0 = B(e, x) - p_d x$ and $n(NB)$ is the number of patients cared for by the physician and $n'(NB) > 0$.

- (a) Set up the physician's maximization problem and derive the first order conditions. **(3 marks)**

- (b) The first order conditions can be rewritten as:

$$\frac{B_x - p_d}{NB/x} \left[\frac{(R/x) + p_s - c}{p_s - c} \right] = -\frac{1}{\epsilon_{nNB}} \text{ where } \epsilon_{nNB} = n' \frac{NB}{n}$$

$$\text{and } \frac{(R/x) + p_s - c}{c} = \frac{\epsilon_{ce}}{\epsilon_{ne}} \text{ where } \epsilon_{ce} = c' \frac{e}{c}, \text{ and } \epsilon_{ne} = n' \frac{\partial NB}{\partial e} \frac{e}{n}$$

Explain the meaning of the terms in the equations: the numerators and the denominators. **(3 marks)**

- (c) Assuming no supply side cost sharing, i.e., $R = 0$, show what happens to quantity of service if there is a fall in the patient's responsiveness to a change in net benefit.
- (d) Show that a fall in physician fee will reduce the quality of care. **(4 marks)**

SECTION B

Answer **BOTH** questions in this section

Question 3 (20 marks)

Imagine a pharmaceutical that has manufactured a drug to treat ulcers. Assume the drug (U) is able to treat the wound and also provides pain relief for 3 hours per dose. The incumbent drug (I) provides 5 hours of pain relief per dose. Assume linear consumption technology.

- (a) What risk does the drug company face with regard to its entry into the market? **(3 marks)**
- (b) Suppose the drug is allowed to enter the market. A marginally innovative drug, (N) which provides the same wound treatment as U but provides 7 hours of pain relief per dose also enters the market. To what extent will the success of N depend on full health insurance? **(3 marks)**
- (c) Now suppose a representative consumer bears some cost and his/her income for drugs is \$20. Assume also that only drugs I and U are in the market. The price of drug I , P_I , is \$4 and P_U is \$5. What determines the success of drug U in the market? Explain and illustrate on a graph. **(5 marks)**
- (d) Suppose P_U doubles and P_I does not change. What happens to the market share of U ? Explain and illustrate on a new graph. **(5 marks)**
- (e) What role do prices play in ensuring market share? **(4 marks)**

Question 4 (20 marks)

Consider the moral hazard model discussed in class. The patient's utility of the consumer is $V_I = \int U(y - \pi - c(m(s)), H(s, m(s)))f(s)ds$ where y is income, m is the expenditure for treatment, $c(m(s))$ is the coinsurance paid by the consumer, s is the severity of illness and there is a range of potential severities with distribution in density $f(s)$. $H(s, m(s))$ is health status $\pi = \int (m(s) - c(s))f(s)ds$ is the premium and it must cover expected costs. The consumer chooses $m(s)$ to maximize the expected utility.

- (a) Assuming s is observable, set up the maximization problem. Show that the first order condition can be written
as $U_H H_m = EU_x$, where $EU_x = \int U_x(y - \pi - c(s), H(s, m))f(s)ds$.
Interpret **(5 marks)**
- (b) Now assume that s is not observable but π is fixed. Show that the first order condition now is: $H_m U_h = c'(m)U_x$ for each s . Interpret. **(5 marks)**
- (c) Assuming the first order condition in (a) above gives the optimal level of expenditure, how does the equilibrium in (b) compare with that of (a)? Explain. **(5 marks)**
- (d) What is the problem with your conclusion in (c) above? **(5 marks)**

SECTION C

Answer any **THREE** questions from this section

Question 5 (15 marks)

Questions on epidemiology:

- (a) Explain the role of the elasticity of prevalence in the demand for prevention and its impact on the growth of an epidemic. **(8 marks)**
- (b) Explain the role of the elasticity of prevalence in the effectiveness of a Pigouvian subsidy to eradicate an infectious disease. **(7 marks)**

Question 6 (15 marks)

Questions on moral hazard:

- (a) Critique the conventional theory of moral hazard. **(8 marks)**
- (b) How can the critique above be applied to the result and the recommendations of the RAND Health Insurance Experiment. **(7 marks)**

Question 7 (15 marks)

Questions on Grossman's model:

- (a) In the Grossman's model discussed in class, the individual can choose the optimal length of life. Why should a policy maker be interested in such results? What kind of policy implication can be drawn from the results? **(7 marks)**
- (b) Assuming health is a purely investment good, explain how an increase in wages can lead to an increase in the consumption of health care in the presence of full coverage health insurance. **(8 marks)**

Question 8 (15 marks)

Questions on managed care:

- (a) Explain two characteristics of a managed care plan. **(7 marks)**
- (b) Explain how managed care plan responds to asymmetric information in health risk (leading to adverse selection). **(8 marks)**