2017 EC782 final. Prof. Ellis

Please put only your student ID number and not your name on each of three blue books and start each question in a new blue book.

Section I. Answer any two of the following problems from this section. Section II has one more required question (empirically based), for a total of three from the whole exam. *(One of these questions from the first section may be removed from the actual final exam.) You must answer the second question.*

1. Wagstaff et al (2009) JHE "Extending health insurance to the rural population: An impact evaluation of China's New Cooperative Medical Scheme" describes China's New Cooperative Medical Scheme (NCMS), a voluntary insurance program that insures more than 80 percent of rural Chinese residents.
a) Briefly describe how this system works, and how it varies across districts.
b) Give at least two examples of how the NCMS system is similar to the Medicare program in the US for elderly and disabled enrollees.
c) Give at least two examples of how the NCMS differs from the US Medicare program.
d) Describe at least one problem with the NCMS program.
e) Wagstaff et al data suggests that out-of-pocket payments (excluding premiums) increased rather than decreased after insurance was introduced. Under what conditions is this possible?
f) How do the findings in Wagstaff et al (2009) relate to the model of Chen in Jin who also study the NCMS in China?

2. Ellis and Mwabu (EM, 2004) "The demand for outpatient medical care in rural Kenya…" estimate a model of choice of providers in Kenya in which treatment prices, travel costs, travel time, and waiting time affect the decision to seek care and choice of provider.
   a) Explain how selection should raise concerns about using prices and time variables as covariates in their model.
   b) EM use reported household income and wealth from diverse sources as their measure of household economic status. What are the weaknesses with this approach?
   c) Do all individuals have the same price responsiveness to seeking care? Who is more responsive?
   d) Few individuals in the EM sample have health insurance, but what predictions can you draw from the EM paper about who would be most likely to demand health insurance?
   e) What do Gertler and Gruber (GG) ("Insuring Consumption Against Illness" AER, 2002) show about the ability of individual households to self-insure against health shocks? Assuming sample size is not a problem, describe how you might run a model using the EM data that test the findings of the GG framework.

1

3.
a) Which of the theories identified in Case et al (2004) ("The Lasting Impact…") do they find the most support for to help understand the relationship between health and income? What empirical evidence do they offer that supports this theory?
b) What identification strategy do Case et al use to establish that the relationships found are causal?
c) What key relationship does Ruhm (2005) ("Healthy Living…") explore in his JHE paper, which is a sequel to his earlier AER paper? What mechanisms does he test to explain this relationship?
d) What identification strategy does Ruhm use to try to establish that the relationships found are causal?
e) How do you reconcile any differences between Case et al and Ruhm?
f) Make one suggested new model to estimate using the Case et al data in light of the findings from Ruhm.

4. Chia and Tsui (2005) (abbreviated here as CT) examine medical savings accounts (MSAs) in Singapore to estimate the present value of lifetime healthcare expenses (PVHE) for people at age 62 when retiring and hence unlikely to be able to add more funds to their MSA.
a) What is the economic rationale behind MSAs?
b) Give four arguments against the use of MSAs.
c) What features of Singapore make it more likely for MSAs to work there than in the US?
d) Briefly summarize the methodology used by CT to estimate the PVHE.
e) Mention at least two weaknesses of the methodology used by CT to estimate the PVHE.
f) An alternative framework for MSAs is to have contributions not depend on income and instead to reflect a person's health status using a risk adjustment framework. Discuss briefly the pros and cons of having risk adjusted contributions to MSAs. Also mention whether you think would be is feasible in the US or Singapore.

5. Applied Theory model of multi-tier, multi-period health plans

All of the commonly cited models of health plan choice and optimal health insurance use a static model, in which there is one period, and consumers choose a health plan for only one period using private information about their own health status. But in the US we often see multiple plans, such as gold and silver in the health insurance exchanges, in which private health plans differ only in their deductibles.

Einav and Finkelstein, 2010 model adverse selection in this framework while Ellis, Jiang and Manning (2015) design optimal coinsurance while assuming that there is only a single plan, and although they consider optimal insurance with multiple periods. Glazer and McGuire (2000) also provide useful ideas. Some of the Arrow Award papers are also relevant.

Assume consumers can switch between two plans once per year on January 1, and that plans differ ONLY in one dimension, their level of deductible. Assume patients only live for two years. The usual approach is to calculate the values of health plans using only one period model. How does the existence of two tiers change the value of the gold (low deductible, and silver (high deductible) plans for welfare calculations if you had to choose a plan for two periods. How valuable is the option to change plans after one year as new information becomes available.

Below is one set of assumptions. Feel free to possibly change them in your answer. A numeric solution would also be possible.

> There are two states of health, healthy state 1 with costs of C_1 and sick state 2 with costs of C_2. (Use $C_1=0$ and $C_2=100$ if you wish.)
>
> There are two types of consumers low and high risk (both live (or look ahead) only two more periods). Half of the population is of each type.
>
> Low risks have probability P_L of being sick and high risk have probability $P_H > P_L$ of being sick.
>
> Assume an insurance loading factor of α, so premiums in a plan are $\Pi=(1+\alpha)*E(loss)$ which means that full insurance is never optimal.
>
> Both H and L types have an income of Y in each period which is always greater than C_2.
>
> Assume a utility function in the absence of insurance of $U = (Y-C_i)^{1/2}$. Since with this the consumer will be risk averse, they will want to buy insurance, but not full insurance.

Let λ be the probability that low risk type become a high risk type.

> Hence transition matrices for high and low types
> Cost and transition probability

		Period 2	
		L	H
Period 1	L	$(1-\lambda)$	λ
	H	0	1

This structure simplifies the model slightly in that once in the lower deductible plan, one will never choose to leave.

The sequence of moves might be:

i. Insurer offer two plans, with deductibles Dg < Ds for gold and silver plans at breakeven premiums for both periods.

ii. High and low risk types each choose g or s for period 1.

iii. Nature decides who gets sick with probabilities P_H and P_L, and people experience utility in period 1.

iv. Nature decides which of the L types become H types for period 2

v. High and low risk types each choose g or s for period 2.

vi. Nature decides who gets sick with probabilities P_H and P_L, and people experience utility in period 2.

There are several directions in which one could go.

- One period, no pooling One could characterize the optimal one period health plans for each type.

- One period pooling. One could characterize the optimal one period health plans for each type.

- One could characterize optimal deductible when there is a single plan allowed for everyone, embracing both high and low types in the combination of period 1 and 2 where no changes are allowed. This is the optimal two period plan choice for each type.

- One could characterize the optimal deductibles in period 1 when people know they can switch later into the gold plan.

Ultimate goal of this problem is to calculate:

a.What is the option value of being given the option of changing the plan after one period?

b. How much better or worse off are consumers of each type with having this choice to make every year instead of every other year?

c. How much of a higher deductible are people willing to pay in the silver plan?

d. Ex ante, before anyone knows their type, how much better or worse off are people in expectation being given tier choice.

6. This is an original problem inspired by recent discussions with a pharmaceutical company developing a new drug.

   a) Imagine there a unique disease that newly infects 1000 people per year in the US. Since there is currently no cure, and they only live ten years with this disease, the market is only 10,000 patients currently have his disease. (Ignore the rest of the world.)

   b) Assume all patients are identical and equally valuable to society, and have the same income and willingness to pay for this drug.

   c) For simplicity, assume that a QALY is worth 100,000. That is how much each person earns and values their own life. That is also how much society values a life.

   d) Assume that consumers have a health plan that pays 80% of health costs, and they pay only 20%. Since consumers only have to pay 20% of the cost of a new drug, and others contribute through their premiums and pay the other 80%. Does this mean that the total willingness to pay is 5x100k = 500,000 per year? Is there anything wrong with this way of thinking about willingness to pay for a QALY?

   e) Now imagine a new drug is created. If the newly sick use this drug, they will all live for 20 years instead of ten, gaining ten QUALYs each. They have to keep buying this new drug for each of these 20 years to obtain this benefit. If they don't take the drug continuously, they will immediately die after ten years. Ignore all discounting. Assume that the drug's patent will only last 20 (real number is 22 years) and then be totally worthless as competition and new entry drives down the drug's price down to its marginal cost. (Implausible, but still useful)

   f) How much would you advise this new drug manufacturer to price this drug so as to maximize its profits over the life of the drug. Ignore inflation, other entry, other countries, and government regulations.

   g) What is the fair price from a social point of view for this drug, such that proper incentives exist for new drug R and D.

Section II (You must answer this question. Aim for spending 40 minutes.)

7. Original Behavioral Economics Experimental/Survey Design
    a. Choose one finding from a health economics paper from the course as a motivation, and summarize this finding in three sentences or less.
    b. Briefly describe an experiment or survey related to behavioral economics (broadly defined) that you would like to run. Briefly describe what that behavioral economics concept your experiment is related to.
    c. Clearly state what broad topic you would like to answer in your survey or experiment.
    d. Provide some detail about at least one part of your experiment/survey, and who you would like to (feasibly) have answer it.
    e. If you are proposing an experiment, describe any variations in the experiment (if any) you would make, so that two or more variations would be available to examine.
    f. Discuss in broad terms any specific control variables you would like, perhaps for examining heterogeneous treatment effects.
    g. Discuss any challenges you anticipate.
    h. Discuss anything unusual about the analysis of your data.
    i. If you are more interested in theory, you could describe the theory model that you might use and test in your experiment, but this is not required.