Written Exam at the Department of Economics winter 2017-18

**Health Economics**

Final Exam

December 21$^{st}$ 2017

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language for which you registered during exam registration.

**This exam question consists of 5 pages in total**

*NB: If you fall ill during an examination at Peter Bangsvej, you must contact an invigilator in order to be registered as having fallen ill. In this connection, you must complete a form. Then you submit a blank exam paper and leave the examination. When you arrive home, you must contact your GP and submit a medical report to the Faculty of Social Sciences no later than seven (7) days from the date of the exam.*

**High expenditure in the health care sector: Provider practice style and patient outcomes**

It is highly debated whether high expenditure in the health care sector is waste or if they in fact benefit patients in terms of better health outcomes.

**Question 1:**
Explain and illustrate how moral hazard could be a driving mechanism of high expenditures in the health care sector, and discuss means to combat moral hazard.

A growing body of literature is studying associations between health care expenditure and patient outcomes. A recent paper (Currie et al. 2016) studies how physician practice style affects costs and patient health outcomes. The paper studies 658,553 heart attack patients from Florida admitted via 149 different emergency rooms in 1992-2011. The paper tracks subsequent health expenditure and outcomes of the patients. 2,929 cardiologist (physicians with a heart conditions as their specialty) treated the patients and 59% of the patients were treated with invasive procedures (i.e., treatments that require "aggressive surgery" and are more "expensive" than other types of treatments). Due to side effects for some patients, invasive treatment may reflect medical over-use for some patient types.

To measure physician practice style, imagine that we can construct a "*patient_index$_i$*" spanning [0,1], that objectively (given state-of-the-art medical research) determines the appropriateness for a patient, $i$, to receive invasive care. *patient_index$_i$* =0 means that invasive treatment is inappropriate, *patient_index$_i$* =1 means that invasive treatment is appropriate.
For each cardiologist, $j$, we now estimate the parameters $\alpha_j$ and $\beta_j$:

$$\Pr(Invasive_{ij}) = F(\alpha_j + \beta_j * Patient\_index_i + \varepsilon_{ij}) \quad (1)$$
$$For\ each\ j=1,...,J$$

This provides two measures of physician-practice-style:
$\alpha_j$ capturing physician **Aggressiveness,** ie., the propensity for physician, j, to choose invasive treatment on the median patient.
$\beta_j$ capturing physician ***Responsiveness***, ie., the propensity that physician j choose invasive treatment for patients for whom it is more appropriate

Table 1 summarizes the probabilities of the patients receiving invasive treatment for *All* patients, as well as for the 1/3 of patients for whom invasive treatment is *less appropriate* and for the 1/3 of the population for whom invasive treatment is *more appropriate*.

**Table 1** *Descriptive statistics*

|  | **All patients** | **Patients with Low appropriateness for invasive procedure** | **Patients with High appropriateness for invasive procedure** |
|---|---|---|---|
| Patient probability of invasive procedure | 59% | 28% | 86% |
| Total hospital cost per patient | $19,380 | $16,601 | $20,099 |
| Percentage of patients that died in the hospital | 10% | 17% | 4% |

Next, we construct dummy-variables for physicians that indicate whether their *responsiveness* is low (*Low_responsiveness$_j$*, meaning that $\beta_j$ is significantly below zero) or not; and whether their *aggressiveness* is low (*Low_aggressiveness$_j$*, meaning that $\alpha_j$ is significantly less than zero), intermediate ($\alpha_j$ is not significantly different from zero) or high (*High_aggressiveness$_j$*, meaning that $\alpha_j$ is significantly larger than zero). Consider the following regression model:

$$Y_{ij} = \phi_1 * Low\_responsiveness_{ij} + \phi_2 * Low\_aggressiveness_{ij} + \phi_3 * High\_aggressiveness_{ij} \\ + \Pi Z_j + \Omega X_i + \rho patient\_index_i + \varepsilon_{ij} \tag{2}$$

$Y_{ij}$ is an outcome measure of interest for patient *i* treated by cardiologist *j*. Such an outcome could be *total hospital spending* for the admission or *patient death* in the hospital.

$Z_j$ is a vector of physician characteristics, such as age, gender, seniority and the medical school the physician graduated from, $X_i$ is a vector of patient characteristics such as age, gender, whether the patient had a previous heart attack or other comorbidities and $\varepsilon_{ij}$ is an error term.

**Question 2:**
Consider equation (2) where the outcome variable is death at hospital, i.e., $Y_{ij} = 1$ if the patient died in the hospital and $Y_{ij} = 0$ otherwise. What are the interpretations of the signs of the parameter estimates of $\phi_1, \phi_2$ and $\phi_3$?

Table 2 reports the estimated parameter estimates of equation (2) on subsamples of patients for whom invasive procedures had low and high appropriateness respectively.

**Table 2** *Parameter estimates of $\phi_1$, $\phi_2$ and $\phi_3$ in equation (2)*

| Outcome: | Patients with Low appropriateness for invasive procedure | | | Patients with High appropriateness for invasive procedure | | |
|---|---|---|---|---|---|---|
| | Invasive procedure | Died in Hospital | Total Cost | Invasive procedure | Died in Hospital | Total Cost |
| Low responsiveness, $\phi_1$ | 0,08 | -0,009 | 0,05 | -0,08 | 0,005 | -0,07 |
| Low aggresiveness, $\phi_2$ | -0,11 | 0,007 | -0,08 | -0,09 | 0,007 | -0,11 |
| High aggresiveness, $\phi_3$ | 0,17 | -0,017 | 0,13 | 0,05 | -0,005 | 0,09 |

Note: The table reports parameter estimates of equation 2. All results are statistically significant.
Controls include: patient appropriateness index, patient age categories and gender, previous heart attacks, patient comorbiditities, and physician characteristics.
Total costs are measured as an index spanning ]0;1] and captures the individual patient's percentile in the "total cost" distribution. Ie., Total costs $\sim$ 0 for the patient with the lowest associated costs, and Total costs = 1 for the patient with the largest costs.

**Question 3:**
Given the results in Table 2, explain the relationship between outcomes for patients with high appropriateness for invasive procedures and physician practice style.

**Question 4:**
Does the relationship between patient outcomes and physician practice style for patients with high appropriateness apply to patients with low appropriateness, too? Explain

**Question 5:**
Would you recommend that cardiologists change practice style in their treatment of heart attack patients? Explain

**Question 6:**
Sketch identification strategies that the literature (from the health economics course) used to determine the returns to medical spending. What were the general findings?

**US Health Policy**

In the following, the terms "Patient Protection and Affordable Care Act" and "Obamacare" refer to the health care reform passed by the US Congress in March 2010, at the time when Barack Obama was President of the USA.

**Question 7:**
Outline and describe briefly the main fundamental institutions in the US Health care sector that secured health insurance coverage in the pre-Obamacare era.

**Question 8:**
Describe the overall principles for how the Patient Protection and Affordable Care Act intended to expand insurance coverage. (Hint: You may want to use the analogy of the "three legged stool" to organize you description)

**Question 9:**
Given a standard framework of adverse selection in health insurance, show graphically and explain the equilibrium and efficient prices and quantities in a non-regulated insurance market.

The text in the box below is a quote from the current American President's (Donald Trump) election campaign on his ambition to repeal the Patient Protection and Affordable Care Act (ObamaCare)

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As it appears ObamaCare is certain to collapse of its own weight, the damage done by the Democrats and President Obama, and abetted by the Supreme Court, will be difficult to repair unless the next President and a Republican congress lead the effort to bring much-needed free market reforms to the healthcare industry.

But none of these positive reforms can be accomplished without Obamacare repeal. On day one of the Trump Administration, we will ask Congress to immediately deliver a full repeal of Obamacare.

However, it is not enough to simply repeal this terrible legislation. We will work with Congress to make sure we have a series of reforms ready for implementation that follow free market principles and that will restore economic freedom and certainty to everyone in this country. *By following free market principles* and working together to create sound public policy that *will broaden healthcare access, make healthcare more affordable and improve the quality of the care available to all Americans*.

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**Question 10:**
Given the standard "textbook" framework of adverse selection presented in Einav and Finkelstein (2011), analyze challenges the current American President will meet to "broaden healthcare access, while making health care more affordable and improving the quality of the care available to all Americans by following free market principles". Illustrate your analysis in a diagram.
(Hint: you may extend the illustration from question 9)