

Written Exam for the M.Sc. in Economics winter 2014-15

**Health Economics**

Final Exam

13. January 2015

**SUGGESTED ANSWERS**

### Question 1: Health as an economic Concept:

a. **Is the following statement true or false:**

In the Grossman model framework older individuals devote relatively more resources towards health investments, because their marginal utility of an extra life year is large.

*FALSE*

b. What is the role of “health” in the Grossman investment model, and what is the relationship between health depreciation and length of life?

*Students may start out explaining key features of the Grossman investment model. They may draw on the text book explanations (Bhattacharya, Hyde and Tu, 2014, Chap. 3)*

*In the Grossman investment model health is a human capital stock variable that evolves over time. Together with the flow of “home goods”, health serves directly as input in the individual’s utility function.*

*Some health, but not all, carries over from one period to the next: As health evolves over time it depreciates. In any period the size of the stock variable depends on the stock in the previous period, the depreciation rate, time spent on health and market inputs for health, e.g., medicine and checkups.*

*As a person age the depreciation rate increase, and eventually the stock variable reaches a certain lower threshold, and the individual passes away. However, a person can choose to invest in the health stock by devoting time to health and by buying market inputs for health. There is a negative relationship between the rate of return on these health investments and size of the health stock. In that sense the return on health investments are larger at lower levels of health. However, resources devoted to health investments could alternatively be invested in other asset markets. The opportunity costs of health investments are the interest that could be yielded by investing in the alternative investment markets plus the depreciation of health. The individual chooses optimally the health level where the marginal return on health investments equals the opportunity cost. As the depreciation rate increase by age, investments in the alternative market become more profitable. Consequently, optimal health levels decline, and eventually optimal health reaches the lower threshold and the individual dies.*

c. Explain the fetal origins hypothesis (also known as the thrifty phenotype hypothesis) and what it predicts for long run health outcomes?

*The may draw on the textbook answer referring to the “Thrifty phenotype hypothesis”, but more elaborative answers of question 1c-1e rely on (Almond and Currie, 2011).*

*The fetal origins hypothesis combines three ideas: 1) the effects of fetal conditions are persistent, 2) the health effect remain latent for many years and 3) reflect a biological mechanism of “fetal programming”.*

*Hence, the fetal origins hypothesis suggests that the individual’s health conditions are determined even before he is born, and may even only appear in later stages in life.*

- d. Is the role of health depreciation in the Grossman model consistent with the fetal origins hypothesis? Argue for your answer

*No. With depreciation, as formulated in the standard Grossman model, an adverse health shock would eventually fade out. Hence, health shocks taking place at the fetal stage would not necessarily have consequences in later life, i.e., the effects of fetal conditions are neither persistent nor remaining latent.*

- e. For each of the models (the Grossman model and the fetal origins hypothesis) explain the causal relation between health and socioeconomic disparities? Discuss the empirical the evidence?

*The answers may rely on the textbook (Bhattacharya, Hyde and Tu, 2014, chap. 4), but more elaborative answers refer to more literature from the syllabus.*

*Important indicators of socioeconomic disparities are education levels and labor market outcomes. In the Grossman model individuals with larger educations are more efficient producers of health. Hence, there is a causal relationship running from higher education to higher levels of health. Empirically, this is consistent with higher educated people being less likely to live longer, to report poor self-rated health in surveys. Moreover, more educated are more likely to take up health improving technologies such being a non-smoker, taking cancer screenings, wearing seat belts and have working smoke detectors at home (Cutler and Lleras-Muney, 2006). However, it is unclear whether such relationships are causal. For instance, schooling reforms that tended to raise education levels in Denmark had no significant effects on health outcomes later in life (Arendt, 2004).*

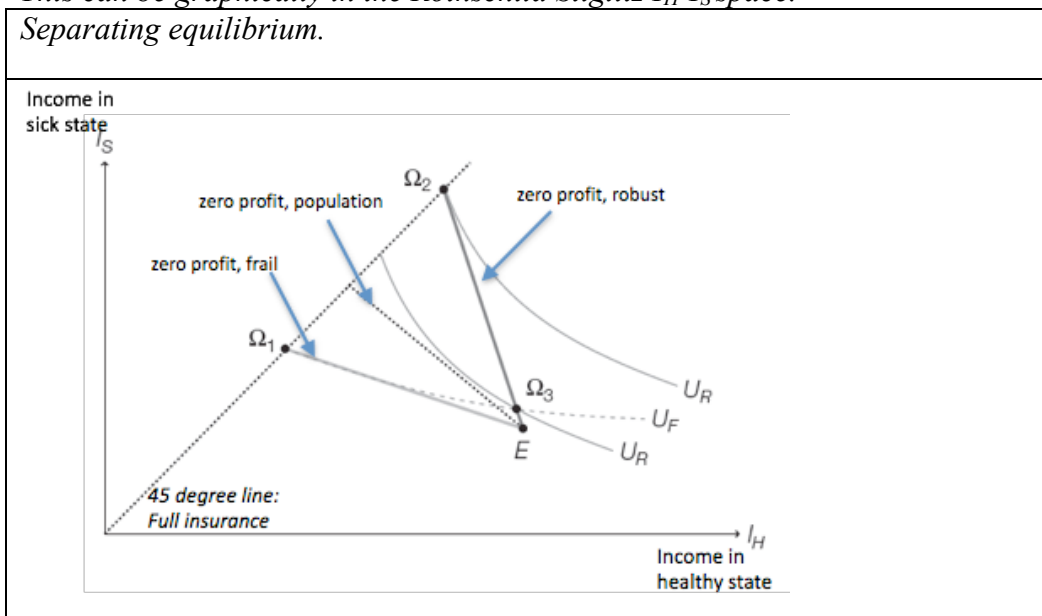
*On Norwegian data (Black et al. 2007) test whether the causality runs the other way, i.e., from health to socioeconomic status. Exploiting twin data that allows the researchers to control for twin fixed effects, they find that low birth weight (a proxy for poor initial health conditions) babies have more adverse health, education and labor market outcomes as adults. This is evidence for the causality running from health to socioeconomic status. Since birth weight is perhaps the earliest outcome one could think of, the result of (Black et al. 2007) would be consistent with the fetal origins hypothesis, i.e., birth weight is only determined by development and events in utero. However, birth weight may miss incipient fetal origins damage, and may not capture the latency of adverse health effects origin from the fetal stage. For example, by the end of World War II, the Dutch population faced a blockage by from the forces occupying forces leading to a 4-month long hunger period. Children, who ere at early fetal stages during this hunger period had normal birth weight, yet, had larger probabilities of heart failures later in life. This is evidence for the fetal origins hypothesis. Other supporting evidence is “the Spanish Flu” of 1918 (Children in utero during the flu had worse schooling outcome, compared to a control of children born just before the flu), (Almond, 2006), Phylloxera insects in French Wine yards in the late 1800’s (Banerjee et al. 2010), Ramadan exposure in early stages of pregnancy (Almond et al.).*

**Question 2: Information economics and Health policy**

- a. What are the predictions for insurance coverage for individuals with different health risk profiles (but homogenous risk preferences) in an entirely private insurance market with asymmetric information? Explain the predictions in a graphical illustration.

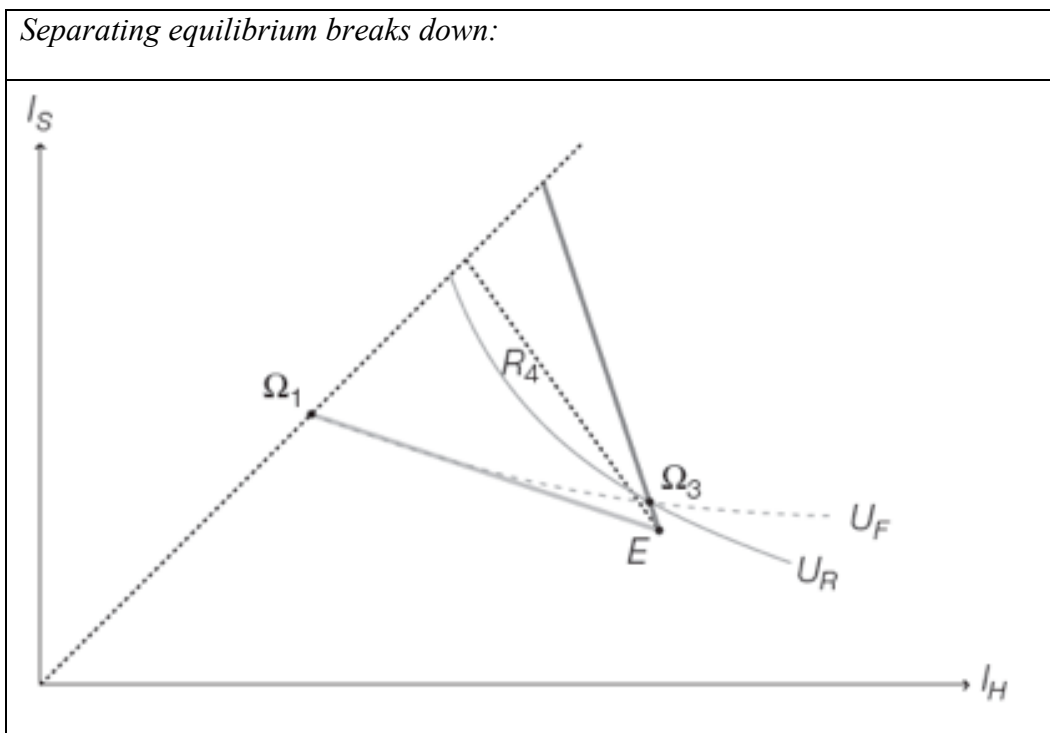
Answers can rely either on the textbook version of the Rothschild Stiglitz model (Bhattacharya, Hyde and Tu, 2014, chap. 9), (Einav and Finkelstein, 2011) or both. Due to adverse selection robust/healthy individuals will only have partial/under insurance, while frail individuals could achieve full insurance coverage. Such a separating equilibrium (i.e., a set of contracts in which each contract will attract frail or robust individuals respectively) can exist, if there are enough frail individuals in the economy.

This can be graphically in the Rothschild Stiglitz  $I_H$ - $I_S$  space.



In equilibrium  $\Omega_1$  and  $\Omega_3$  are offered. Frail individuals will be attracted to their full-insurance contract  $\Omega_1$ , while robust individuals will buy the partial contract  $\Omega_3$ . The full insurance contract for the robust individuals  $\Omega_2$  will not be offered since it would also attract frail individuals ( $\Omega_2$  is on a higher indifference curve for both types), but will lead to negative profits for the insurance company.

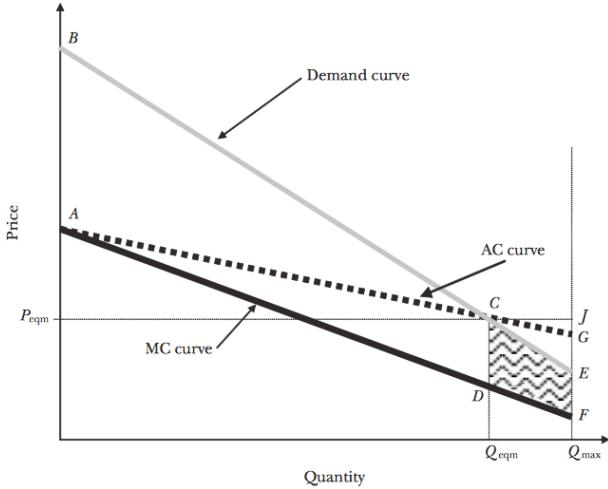
Students may show that if there too many robust individuals in the economy, not even at a separating equilibrium can exist, and the private insurance market will unravel.



In the case with too many robust individuals insurance companies could offer contracts in the  $R_4$ -area while generating positive profits. Hence, this is not an equilibrium.

Students may also show that no pooling equilibrium can exist. In the described environment of asymmetric information (the demander of insurance has more information about his health conditions than the insurance companies), no pooling equilibrium can exist, i.e., there exists no such single insurance contract that in equilibrium will attract both frail and robust individuals choosing the contract that offers the most utility, while insurance companies earn non-negative profits and no contract, if offered would attract costumers and earn at least zero profits.

The result of underinsurance of the robust individuals could also be illustrated in what (Einav and Finkelstein, 2011) refer to as the “textbook” version of adverse selection:

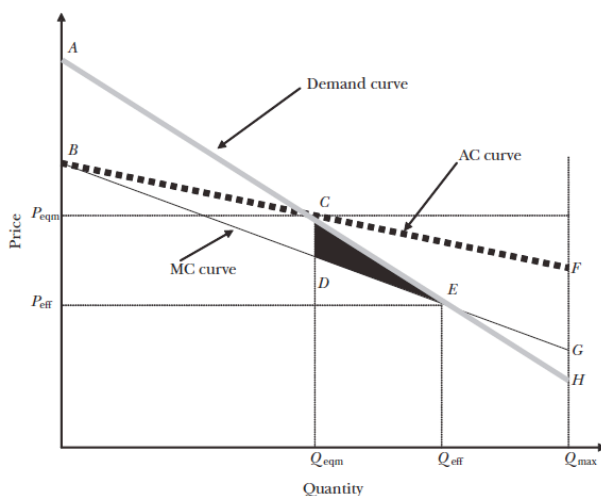


*In this setting only one contract is offered. Both the demand curve and the marginal cost curve are downward sloping, meaning that those with the highest willingness to pay for insurance are also those who infer the highest marginal costs on the insurance company. Hence, people in the right most part of the diagram are healthier and the downward sloping MC curve reflects adverse selection.*

*The equilibrium price is set where the average costs (AC) curve crosses the demand curve. The difference between  $Q_{max}$  and  $Q_{eqm}$  reflects the share of individuals who are not covered by insurance. Since these individuals are those who infer the lowest costs of the insurance companies, these would be the most robust individuals. Since the marginal costs of offering insurance to these individuals lie below their willingness to pay (the demand curve), but these contracts are not offered, the market provides underinsurance for the robust individuals. The shaded area CDEF reflects the welfare loss of this underinsurance.*

- b. Consider a situation where insurance companies face administrative costs (e.g., for marketing purposes) in a private health insurance market. Would there be any welfare losses if the government mandated insurance coverage in this setting? Explain the predictions in a graphical illustration.

*Yes. The basic analysis in the (Einav and Finkelstein, 2011) framework of question 2a does not change. The administrative costs switch the MC and AC curves upwards. In the illustration it is efficient that the most robust individuals remain uninsured. Yet, the equilibrium quantity lies below the efficient quantity, and hence, there is a welfare loss reflected by the shaded triangle CDE.*



- c. **Is the following statement true or false:**  
Because the Bismarckian systems emphasize patient choice and provider competition, Bismarckian countries rarely provide universal health insurance.

*FALSE*

- d. **Is the following statement true or false:**  
Bismarckian countries tend to have higher national health care expenditures than Beveridge countries.

TRUE

- e. Describe briefly principal policy instruments that different kinds of regimes, i.e., the Beveridge, Bismarckian and US model, use to circumvent cost control issues. What are the pros and cons of these policies?  
(hint: You may build your argumentation of the trade-offs between health outcomes, equity and cost control in different regimes)

*The answers may rely on the text book Battacharya, Hyde and Tu, 2014, chap. 15-18. The student may start by briefly explain characteristics of different health care systems. Students may list different policy instruments, describe them and discuss pro and cons. Below follows a suggestive list.*

*Beveridge models (eg., Scandinavian countries, UK, and most Commonwealth Nations): universal coverage through a single payer, publicly owned hospitals and public employed health professionals, health expenditures funded by taxes and no insurance premiums, fees or out of pocket expenditure.*

*Bismarkian model (e.g., Germany, France, Switzerland and Japan): Universal coverage through workplace and government, Insurance payments independent of medical risk and regulated private care provision*

*US model:*

*Employer based insurance, partial universal coverage via Medicare (for the old) and Medicaid (for the poor). Uninsurance. Health care providers operate on markets with only little regulation.*

*Instruments in Beveridge systems:*

***Waiting lists:***

*No pricing mechanisms to ration access to health care. Instead waiting lists are rationing by waiting.*

*Pros: In Beveridge models (with a single payer and no out-of-pocket fees for the patient) equity is a political objective, waiting list provides equal access to health care, in principle, independent of income and socioeconomic status. Moreover, Beveridge models deal with moral hazard issues, in which individuals with minor conditions or diseases that will disappear with time anyway, seek treatment. This generates scope for exploding health costs. Waiting lists exclude individuals with minor issues from treatment, since they are likely to opt out of the line.*

*Cons: People may wait extremely long to get treatment. Difficult to prioritize who values treatment the most.*

***Gatekeeping:***

*GPs / physicians serve as gatekeepers in the health care system.*

*Pros: GPs are able to screen who needs treatment and prioritize among patients.*

*Cons: Physicians Induced Demand. Asymmetric information between GPs and patients may encourage GPs to demand medical goods and services other than the patient's objectives, e.g., physician's own financial gains.*

***Health Technology Assessments:***

*Cost-effectiveness and Cost benefit analyses to prioritize treatments and medicine offered.*

*Pros: only cost-effective treatment is offered. Potential for denying very expensive medicine and procedures.*

*Cons: Politically sensitive because it implicitly puts a value on life.*

***Prospective Payments like DRG:***

*Instead of fee-for-service payments of health care providers or block grant funding of hospitals, health care providers are financed on the basis of diagnoses, rather than the treatment they supply.*

*Pros: Provides an incentive for health care providers to minimize costly procedures.*

*Cons: Potential under treatment and consequent excess mortality and morbidity. DRG creep, i.e., specialists upcode the diagnose to achieve larger reimbursement.*

*Instruments in Bismarckian systems:*

***Managed competition:***

*Competing sickness funds that are not allowed to reject individuals or earn profits.*

*Pros: Induces competition between funds, while promoting equity.*

*Cons: Risk selection/skimming. Funds use various tactics to attract robust members.*

*Managed competition leads to very similar products across sickness funds.*

***Price controls and negotiated fee schedules:***

*Prices are negotiated between providers and purchasers (sickness funds), which agree on a fee schedule.*

*Pros: purchasers exercise monopsony power, which counterbalance oligopoly power of the providers.*

*Cons: Difficult to adjudge the relative value of different types of treatments.*

*Instruments in the US model:*

***Free choice:***

*Patients have the free choice of Doctors, Hospitals and insurance plan. Doctors have the choice of setting price, where to practice, whom to treat.*

*Pros: Prices set on market basis and limits government intervention.*

*Cons: Oligopolies due to large entry costs and provider merges, Medical arms race, Physician induced demand.*

***Managed Care:***



*HMOs and PPOs. Health insurance contracts in particular for workplace contracts makes members eligible for a number of fixed suppliers. Costs are controlled by gate-keeping, monitoring, salaries, fixed payments and denials of coverage if not cost effective.*

*Pros: Reduce moral hazard, physician induced demand and premiums.*

*Cons: Only applies to people who are covered.*

### **Question 3: Pharmaceuticals**

- a. Explain problems related to self-medication and drug resistance in developing countries. (Hint: you may relate this discussion to the economics of externalities)

*The answers may rely on the textbook (Bhattacharya, Hyde and Tu, 2014, chap. 20) and (Kremer, 2002).*

*Self-medication and misuse of drugs is extremely common in the developing world. Reasons may be weak Health Care Systems and the scarcity of trained physicians. This fosters self-medication and potential drug misuse. Misuse of drugs may lead to drug resistance: The microbes develop resistance to the used drug, which makes it less effective for the next user. Thus, drug resistance is a negative externality that medicine users impose on others whenever they consume the drug. This imposes big challenges on, e.g., Malaria eradication in developing countries.*

- b. Explain the trade-offs governments face when deciding on whether or not to permit a drug on the pharmaceutical market and the strength of patents for pharmaceutical companies?

*The answers may rely on the textbook (Bhattacharya, Hyde and Tu, 2014, chap. 12).*

*Although the R&D and testing processes are long and thorough before a drug enters the market for pharmaceuticals, it is practically impossible to get full information on the qualities and side effects of a drug under consideration.*

*Say that a drug is tested and receive a single quality score,  $T$ . Good and bad drugs each have a probability distribution of  $T$ . Government institutions, like the FDA in the US, are to decide on a threshold for  $T$ , for whether or not to permit the drugs. If the threshold is set too low (hence, the government has a very permissive policy), then too many bad drugs are accepted on the market (e.g., Thalidomide in Europe in the 1950's curing morning sickness of pregnant women, but lead to increased probabilities of birth defects). If the threshold is set too high (restrictive policy), then good drugs have a harder time to get to the market.*

*The main reason for providing patents for pharmaceuticals is to give medical companies monopoly status. This allows them to earn profits and recoup their initial high R&D costs. Therefore, if a patent were too weak, then strengthening the patent would lead to higher rates of innovation, due to the increased incentive to develop new products. If the patent becomes too strong, however, customers have to pay monopoly prices for a longer period. Importantly, stronger patents also provides less incentives for the same company to develop their product further, and it creates legal barriers to subsequent innovation by other companies. Hence, the rate of innovation may decrease with too strong patents.*