Imperfect Information in Health Care Markets

Exercise Session 13 - Supplier induced demand

Questions

Arc elasticity:

$$\frac{\dfrac{NE - OE}{\dfrac{NE}{2}+\dfrac{OE}{2}}}{\dfrac{0{,}1\,NE - 0 \cdot OE}{\dfrac{0{,}1 \cdot NE}{2}+\dfrac{0 \cdot OE}{2}}}$$

Relative change in expenditures

new copayment

$= 0$ → before there was no copayment

Sum of the 2 divided by $\frac{1}{2}$

Relative increase in out-of-pocket expenditures

NE = new expenditure

OE = old expenditure

20d)

No scheme:

expected expenditure h-type:

$$p_h^{10} \cdot 10 + \underbrace{p_h^{30} \cdot 30} = p_h^{10} \cdot 10 + p_h^{30} \cdot 10 + p_h^{30} \cdot 20 = (p_h^{10} + p_h^{30}) \cdot 10 + p_h^{30} \cdot 20$$

$$= p_h^{30} \cdot (10 + 20) = p_h^{30} \cdot 10 + p_h^{30} \cdot 20$$

expected expenditure l-type:

$$p_l^{10} \cdot 10 + p_l^{30} \cdot 30 = p_l^{10} \cdot 10 + p_l^{30} \cdot 10 + p_l^{30} \cdot 20 = (p_l^{10} + p_l^{30}) \cdot 10 + p_l^{30} \cdot 20$$

Scheme from b):

h-type: $p_h^{10} \cdot 10 + p_h^{30} \cdot 20 = p_h^{10} \cdot 10 + p_h^{30} \cdot 10 + p_h^{30} \cdot 10 = (p_h^{10} + p_h^{30}) \cdot 10 + p_h^{30} \cdot 10$

l-type: $p_l^{10} \cdot 10 + p_l^{30} \cdot 20 = (p_l^{10} + p_l^{30}) \cdot 10 + p_l^{30} \cdot 10$

We know that $p_h^{10} + p_h^{30} \geq p_l^{10} + p_l^{30}$ and $p_h^{30} > p_l^{30}$

⇒ h-type gets subsidized more since there is as higher share of people causing expenditures above 20 $(p_h^{30} > p_l^{30})$

⇒ lower incentives to engage in risk selection, as the difference in expected expenditures decreases

Scheme from c):

h-type: $p_h^{10} \cdot 2 + p_h^{30} \cdot 22 = p_h^{10} \cdot 2 + p_h^{30} \cdot 2 + p_h^{30} \cdot 20 = (p_h^{10} + p_h^{30}) \cdot 2 + p_h^{30} \cdot 20$

l-type: $p_l^{10} \cdot 2 + p_l^{30} \cdot 22 = (p_l^{10} + p_l^{30}) \cdot 2 + p_l^{30} \cdot 20$

Exercise 32

In the ”first wave” model of the lecture, consider the case where marginal utility of income is constant, i.e. $u(y, t, s) = y - t - \gamma s$.

a) How much demand will the physician induce in this case?

b) Plot billed services per patient as a function of δ.

c) Consider now that inducing an additional unit of demand may be a lot harder if you already induce a lot compared to the situation where you only induce little. Use $u(y, t, s) = y - t - 0.5\gamma s^2$ to capture this situation. How does this change your answer to the previous two questions?

d) How does the shape of billed services per patient as a function of δ differ from that in the lecture where we assumed decreasing marginal utility of income?

Exc. 32 a)

Recall the variables of this model from the lecture:

a number of physicians

n number of patients

$\delta = \frac{a}{n}$ physician density

M = "desired" average amount of treatment

t working time of a physician, which can be 1 at most, more concretely:

$$t = \min\left\{\frac{M}{\delta} + s, 1\right\}$$

$$\frac{M \cdot n}{a} + s$$

$y(p \cdot t)$ disposable income, $y' > 0$, $y'' \leq 0$

$\hookrightarrow$ we assume: $y(p \cdot t) = p \cdot t$

p price per unit of medical care

s induced demand by physician

$u(y, t, s)$ utility function of the physicians, assume $u(y,t,s) = y - t - \gamma s$

So, here the utility function looks like $u(y,t,s) = \underbrace{y}_{=pt} - \min\left\{\frac{M}{\delta} + s, 1\right\} - \gamma s = p \cdot \min\left\{\frac{M}{\delta} + s, 1\right\} - \min\left\{\frac{M}{\delta} + s, 1\right\} - \gamma s$

There are two cases: (as $\frac{M}{\delta} + s < 1$ for $s \leq 1 - \frac{M}{\delta}$)

2. case: $\frac{M}{\delta} + s < 1$ $\Rightarrow u(y,t,s) = y - \left(\frac{M}{\delta} + s\right) - \gamma s = \underbrace{p\left(\frac{M}{\delta} + s\right)}_{=y} - \frac{M}{\delta} - s - \gamma s$

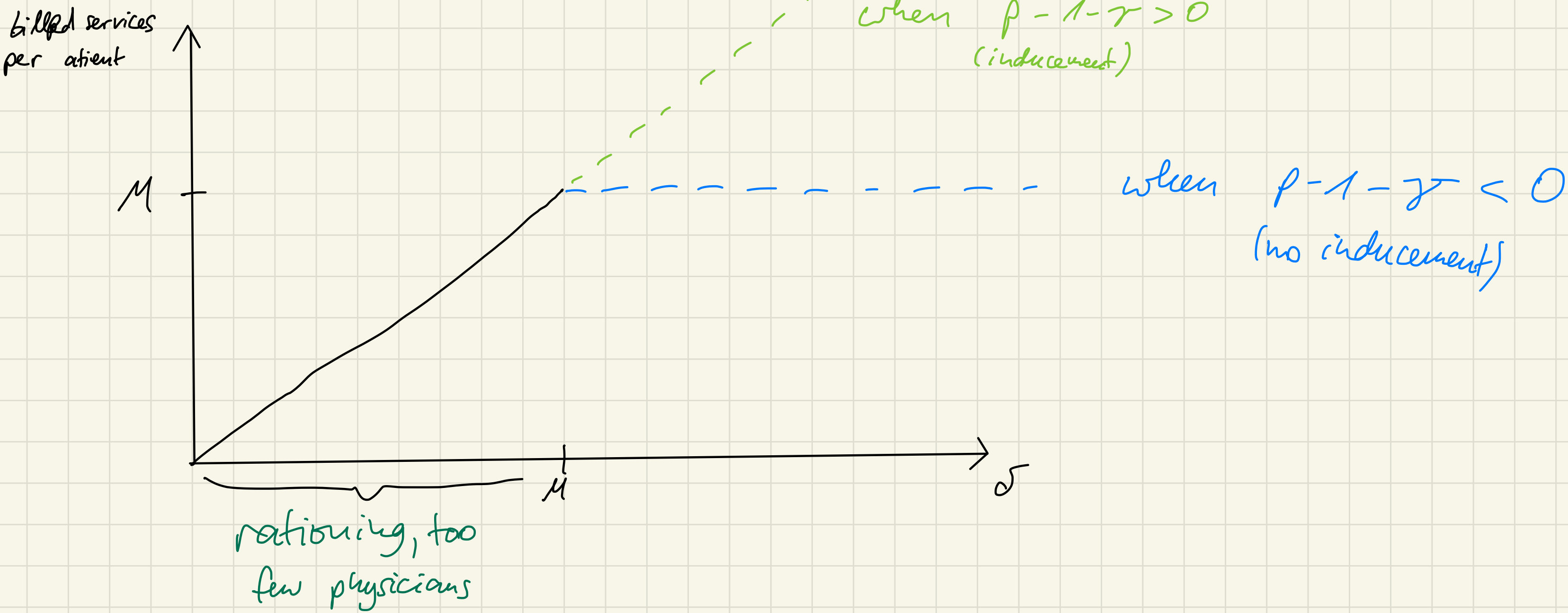
FOC: $\frac{du}{ds} = p - 1 - \gamma$

$\to$ if this is < 0: more inducement gives less utility $\to s = 0$

$\to$ if this is > 0: more inducement gives more utility $\Rightarrow s = 1 - \frac{M}{\delta}$ (to make sure that $\frac{M}{\delta} + s \leq 1$)

1. case: $\frac{M}{\delta} + s > 1$ $\Rightarrow u(y,t,s) = y - 1 - \gamma s = p - 1 - \gamma s$

FOC: $\frac{du}{ds} = -\gamma \leq 0$ $\Rightarrow$ always choose $s = 0$ (induce nothing) b)



with inducement, everyone gets $\mu + \delta \cdot s = \mu + \frac{a \cdot s}{n}$

on average

$$\leadsto \mu + \delta \cdot \left(1 - \frac{\mu}{\delta}\right) = \mu + \delta - \mu = \delta$$

c) $u(y,t,s) = y - \underbrace{\min\left\{\frac{\mu}{\delta}+s, 1\right\}}_{t} - 0{,}5\,\gamma s^2$

1\. case: $\frac{\mu}{\delta}+s > 1 \Rightarrow u(y,t,s) = y - 1 - 0{,}5\,\gamma s^2$

$$\leadsto \frac{\partial u}{\partial s} = -\gamma s \leq 0 \quad \Rightarrow \quad s = 0 \text{ is optimal}$$

2\. case: $\frac{\mu}{\delta}+s < 1$ (for $s \leq 1 - \frac{\mu}{\delta}$) $\Rightarrow u(y,t,s) = p\left(\frac{\mu}{\delta}+s\right) - \frac{\mu}{\delta} - s - 0{,}5\,\gamma s^2$

$$\rightarrow \frac{\partial u}{\partial s} = p - 1 - \gamma s \overset{!}{=} 0$$

$$\Leftrightarrow s = \frac{p-1}{\gamma}$$

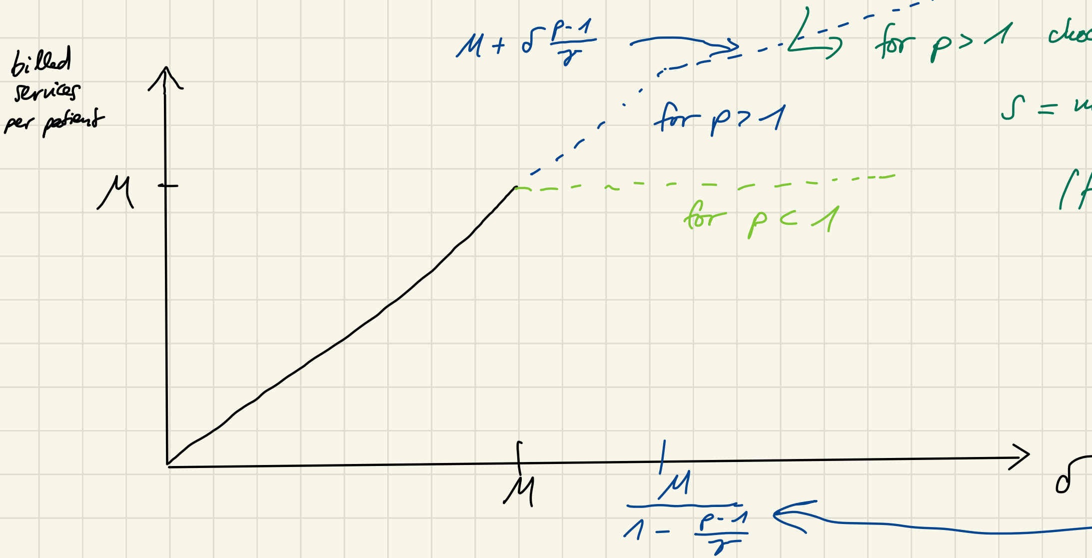
(for $p<1$, this is negative, hence choose $s=0$ in this case)

$\leadsto$ for $p>1$ choose inducement

$$s = \min\left\{\underline{\frac{p-1}{\gamma}},\ \underline{1-\frac{\mu}{\delta}}\right\}$$

are equal for the below value of δ

(to make sure that $\frac{\mu}{\delta}+s \leq 1$)



d) That pattern of an increasing, then flat, then increasing shape of the graph from the lecture is not possible with constant marginal utility of income ($\frac{du}{dy} = 1$ as opposed to $\frac{du}{dy} = \frac{1}{2\sqrt{y}}$ in the lecture)
Reason for this: The tradeoff between moral disutility from inducing and utility from income is always the same. In the lecture, it was possible since on the flat part, income was so high that inducement was not optimal but as delta increased further, income went so much down that MU of income became high enough to make inducement rational.

marginal utility

Exercise 33

Upcoding is the practice of fraudently charging for higher paying services than the ones provided. Discuss similarities and differences between upcoding and inducing demand.

Exc. 33

Similarities:
- Both have a similar incentive structure: They increase the income but have a cost that can be interpreted either as a moral cost or actual expected cost in case of detection.
- To make either of the two possible, the physician needs superior knowledge about what service is right or about the service billed / provided.
- Both induce higher costs for health insurances

Differences:
- patient overtreated in case of SID but not in upcoding
- If overtreatment implies a health risk, SID can reduce welfare (upcoding is just redistributing money)