LECTURE 4 : PROVIDER PAYMENT MODELS

① ELLIS + MCGUIRE (1986, 1990)

- Introduce a parameter of interest: α (simple utility weight): $U = u + \alpha v$ (u ↑ my utility, v ↑ yours)
- To start, let $\alpha \in \mathbb{R}$ ⇒ then rule out certain regions
- $\alpha \in [0,1]$ seems most plausible.

$U(q) = \pi(q) + \alpha B(q)$

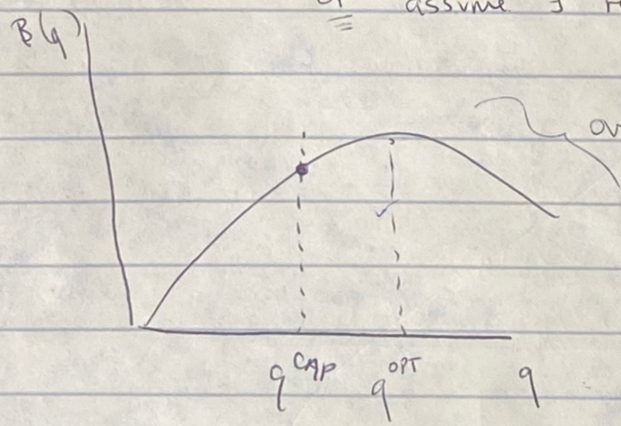
⇒ hence FOC: $\underbrace{\frac{\partial \pi}{\partial q}}_{\text{includes MB to provider}} + \overbrace{\alpha \frac{\partial B}{\partial q}}^{\text{new "wedge" between MB + MC}} = 0$

includes MB to provider = MC to provider

new "wedge" between MB + MC

What is $B(q)$? Assume $B'(q) > 0$ $B''(q) < 0$?

or assume ∃ region where $B'(q) < 0$ [overtreatment]



over-treatment region

NOTE that $\partial B / \partial q = 0$ defines q^{OPT}

Different payment mechanisms yield different $\pi(q)$ (hence, $\frac{\partial \pi}{\partial q}$)

Ⓐ CAPITATION / SALARY (Fixed cost per patient or per year)

Then $\partial \pi / \partial q = 0$:

FOC is therefore $\alpha \frac{\partial B}{\partial q} = 0$, so $\boxed{q^{CAP} = \alpha q^{OPT}}$

[What does this mean? What are policies?]

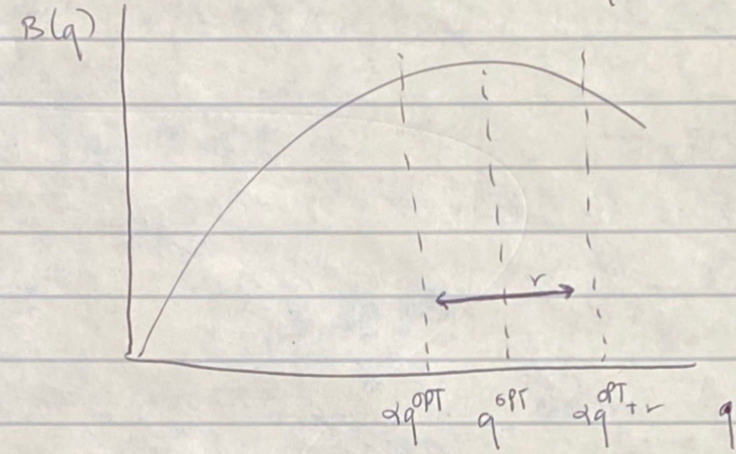
⊛ NOTE: if $\pi = R - \underbrace{c(q)}_{\text{some costs to physician}}$, how does this change the eqbm?

(B) PURE FFS. Then assume $\pi = r \cdot q - c(q)$

FOC is therefore $\underbrace{r}_{} - c'(q) + \alpha \frac{\partial B}{\partial q} = 0$

shift up n r of treatment

[if $c' = 0$, then solution is $q^{FFS} = \alpha q^{OPT} + r$]



Can we choose r so that $q^{FFS} = q^{OPT}$?

Need $r^* = c'(q^{OPT})$ from FOC

but then allows hanging

(C) MIXED PAYMENT: FFS + COST-REIMBURSEMENT

$\cancel{\pi = a + R(q) - C(q)}$

$\cancel{u = a + R(q) - C(q) + \alpha B(q)}$

$\cancel{\partial U / \partial q = R'(q) - C'(q) + \alpha B'(q) = 0}$

Let $\pi(q) = a + (r-1) q \cdot c$

two policy parameters

$\boxed{\partial U / \partial q = c(r-1) + \alpha B'(q) = 0} \Rightarrow \alpha B'(q) = (1-r)c$

$\cancel{\text{so assume } B'(q) = c}$

(for efficiency, let $B' = c$)

→ What's the intuition about r^*? If $\alpha = 1$, then $r^* = 0$ (capitation), but if $\alpha < 1$, need to incentivize effort w/ $r^* > 0$.

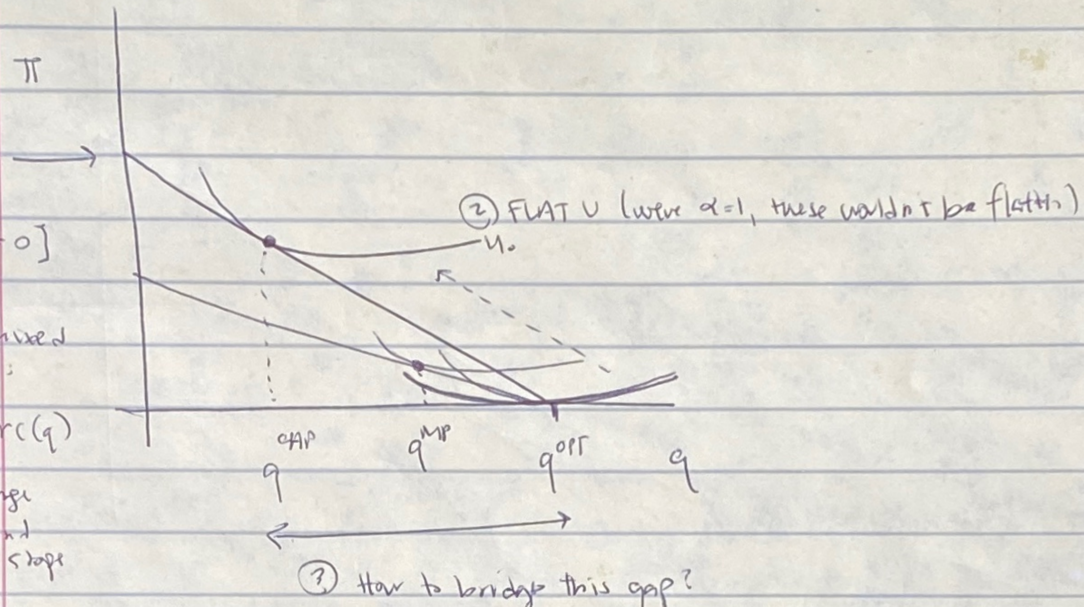
→ Choice of a gets us from αq^{OPT} to q^{OPT}?

ILLUSTRATION:

① FULL CAP: $\pi = a - c(q)$ [chosen so $\pi(q^{OPT}) = 0$]

④ Change to mixed payment: $\pi = a' - c(q) + rc(q)$

$\{a', r\}$ change intercept and slope



Ⓓ Bargaining – Should we expect MDs or patients to pick q?

Pat u: $u_{PAT}(q) = \underbrace{(aq - \frac{1}{2}bq^2)}_{\text{loss between } q \text{ ~~and 0~~}} - cq$: FOC suggests $q^{OPT} = \frac{a}{b}$.

[$1-\gamma$]

$$V_{MD}(q) = \pi(q) + \alpha \cancel{U_{PAT}(q)}\, B(q)$$
$$= R_0 - rq + \alpha\left(aq - \frac{1}{2}bq^2 \cancel{- cq}\right)$$

MDs don't care about patient cost (right?)

[γ]

FOC for provider: $-r + \alpha a - \alpha b q = 0$

$$r + \alpha b q = \alpha a$$
$$\boxed{q^{MD} = \frac{\alpha a - r}{\alpha b} = \frac{a}{b} - \underbrace{\frac{1}{\alpha}\frac{r}{b}}}$$

underprovision (how does this depend on α? r?)

What is r here?

NASH EQBM: $\left(U_{PAT}(q) - U_{PAT}(q^{MD})\right)^{1-\gamma} \left[V_{MD}(q) - V_{MD}(q^{PAT})\right]^{\gamma}$

$$\left[aq - \frac{1}{2}bq^2 - cq - a\left(\frac{a}{b} - \frac{1}{\alpha}\frac{r}{b}\right) - \frac{1}{2}\left(a - \frac{1}{\alpha}r\right)^2 - c\left(\frac{a}{b} - \frac{1}{\alpha}\frac{r}{b}\right)\right]^{1-\gamma} \cdot \left[\pi(q) + \alpha B(q) - \pi(q^{PAT}) \ldots\right]$$

If $\gamma = .5$, then $q^* = \frac{1}{2}(q^{PAT} + q^{MD})$

$$= \frac{1}{2}\left(\frac{a}{b} + \frac{a}{b} - \frac{1}{\alpha}\frac{r}{b}\right)$$

$$= \frac{a}{b} - \frac{1}{2}\left(\frac{1}{\alpha}\frac{r}{b}\right)$$

underprovision is reduced by bargaining

In general: $q^* = \frac{a}{b} - \gamma\left(\frac{1}{\alpha}\frac{r}{b}\right)$

(2) MA + MAK (2019) [heterogeneous pats, care quickly]

- quality $q \Rightarrow D(q), B(q)$

Problem: MAX social welfare: $B(q) - D(q)\cdot C(q,e) - H(q,e)$

INSURER: FOC: $\underline{B'(q)} - D'(q)\cdot C(q,e) - D(q)C_q(q,e) - H_q(q,e) = 0$

A. Can providers implement this? Suppose $\pi = T + pD(q)$

PROVIDER: $T + pD(q) - D(q)\cdot C(q,e) - H(q,e)$

FOC: $\underline{pD'(q)} - D'(q)C(q,e) - D(q)C_q(q,e) - H_q(q,e) = 0$

FOCs are same if $\boxed{pD'(q) = B'(q)} \Rightarrow$ gives a p^*.

B. What about patient selection: Now $C(q,e) = \int_0^{\bar{x}} c(x; q, e)\,dF(x)$ ← $\bar{x}$ providers dump riskiest pats

Now FOC is

$$pD'(q) - D'(q)\underbrace{\int_0^{\bar{x}} c\,dF(x)}_{\text{not social optimum of } \int_0^1 c\,dF(x)} - D(q)[c_q(q,e)] - H_q(q,e) = 0$$

* Note $\bar{x}$ is a function of $p \Rightarrow$ lower p = more dumping! So $\frac{d\bar{x}}{dp} > 0$.

* Can undo this through (partial) cost reimbursement.