Grossman's (1972) Health Capital Model

$$\text{Max } U = U(\phi, H_t, Z_t), \quad t = 0, 1, \ldots, n$$

(health as investment; health as cons.)

where H_t = health stock

$h_t = \phi H_t$: consumption of health services (ϕ = flow of services.)

Z_t = consumption of other commodities

Subject to:

$$H_{t+1} - H_t = I_t - \delta_t H_t$$

(ΔH_t; I_t: Investment in health; δ_t: depreciation rate)

: Accumulation of health stock

Production functions:

$$I_t = I_t(M_t, TH_t; E)$$

$$Z_t = Z_t(X_t, T_t; E)$$

(M_t: med, TH_t: time, X_t: input, T_t: time, E: knowledge.)

Budget constraint: total exp = total income

$$\sum_{t=0}^{n} \frac{P_t M_t + Q_t X_t}{(1+r)^t} = \sum_{t=0}^{n} \frac{W_t TW_t}{(1+r)^t} + A_0$$

(W_t: wage, TW_t: work time, A_0: asset, P & Q are prices)

Time constraint:

$$TW_t + TH_t + T_t + TL_t = \Omega$$

(TW_t: working, TH_t: health, T_t: other, TL_t: time lost, Ω: fixed time)

F.O.C :

wage · MPhealth service · Future values

① $$\frac{\pi_{t-1}}{(1+r)^{t-1}} = \frac{w_t G_t}{(1+r)^t} + \frac{(1-\delta) w_{t+1} G_{t+1}}{(1+r)^{t+1}} + \dots$$

$$+ \frac{(1-\delta_t)\dots(1-\delta_{n-1}) w_n G_n}{(1+r)^n}$$

MC

$$+ \frac{U_h}{\lambda} G_t + \dots + (1-\delta_t)\dots(1-\delta_{n-1}) \frac{U_{h_n} G_n}{\lambda}$$

MB

② $$\pi_{t-1} = \frac{P_{t-1}}{\partial I_{t-1}/\partial M_{t-1}} = \frac{W_{t-1}}{\partial I_{t-1}/\partial TH_{t-1}}$$

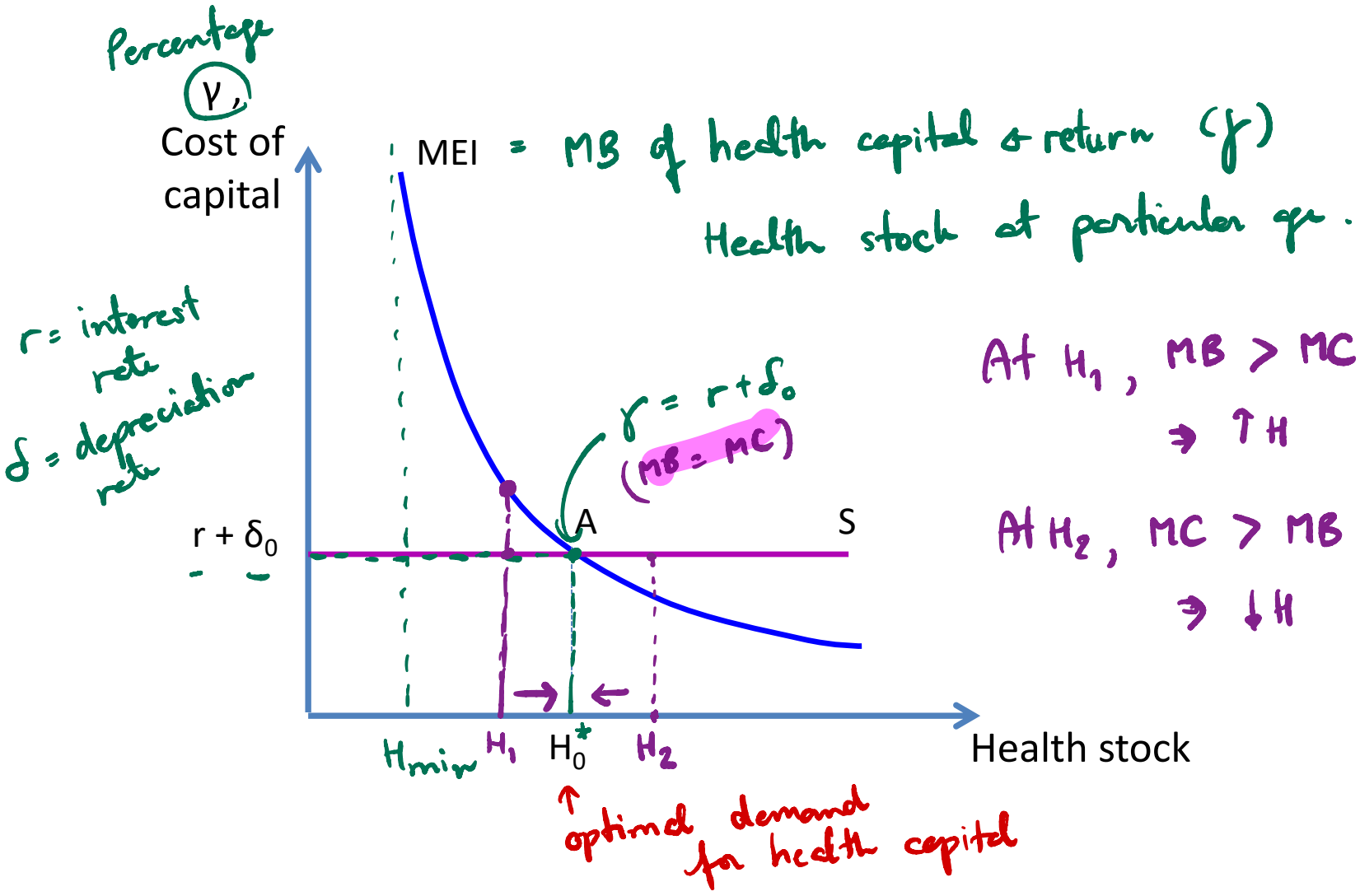
where $U_{h_t} = \frac{\partial U}{\partial h_t}$; Marginal utility of health services

$G_t = \frac{\partial h_t}{\partial H_{t-1}} = \frac{-\partial(TL_t)}{\partial H_t}$ ← marginal product of health service

π_{t-1} = marginal cost of investment in H

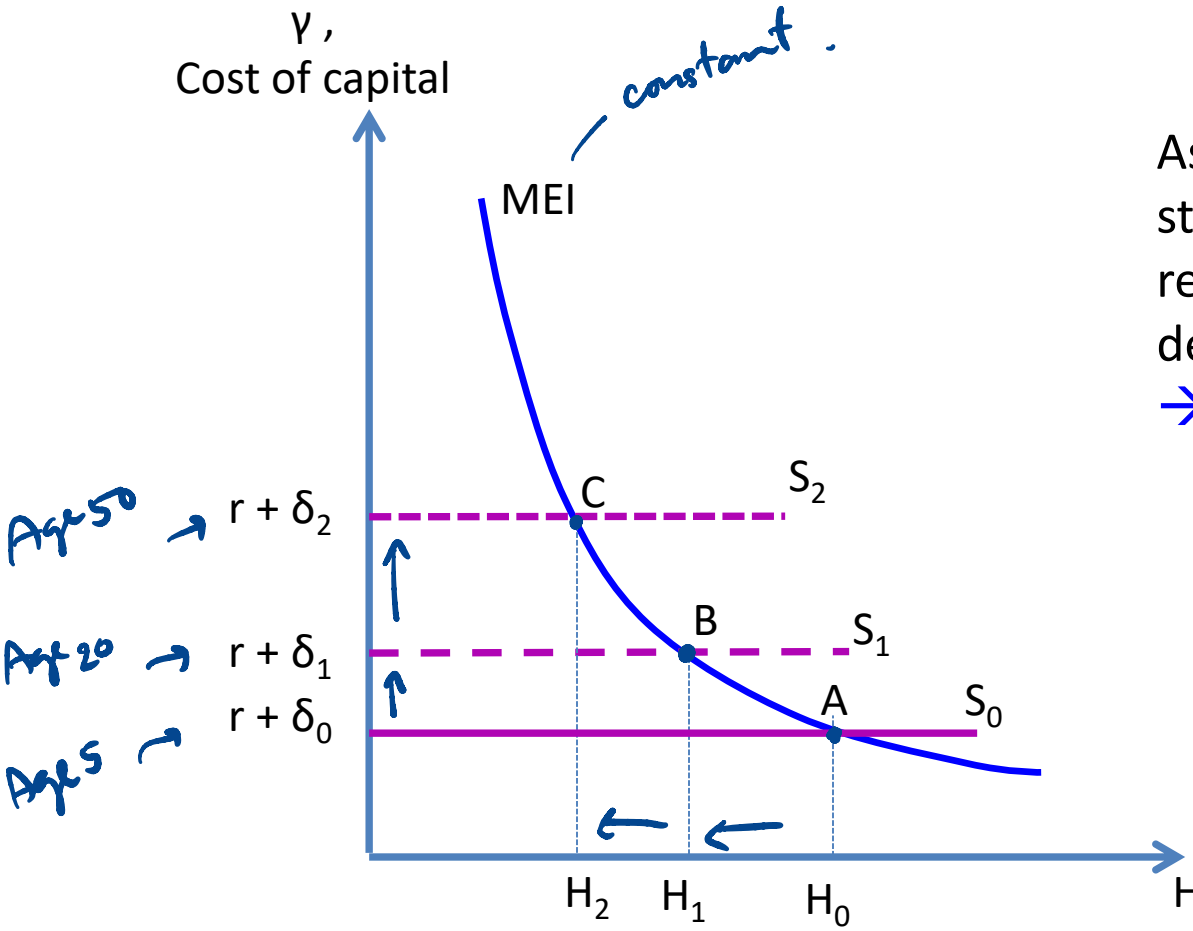
⇒ Discounted MC of H = Discounted MB of H.

Demand for Health Capital



Demand for Health Capital:

Impact of Age on Investment in Health



δ ↑

As we age, our health stock depreciates faster, resulting in higher depreciation rates.

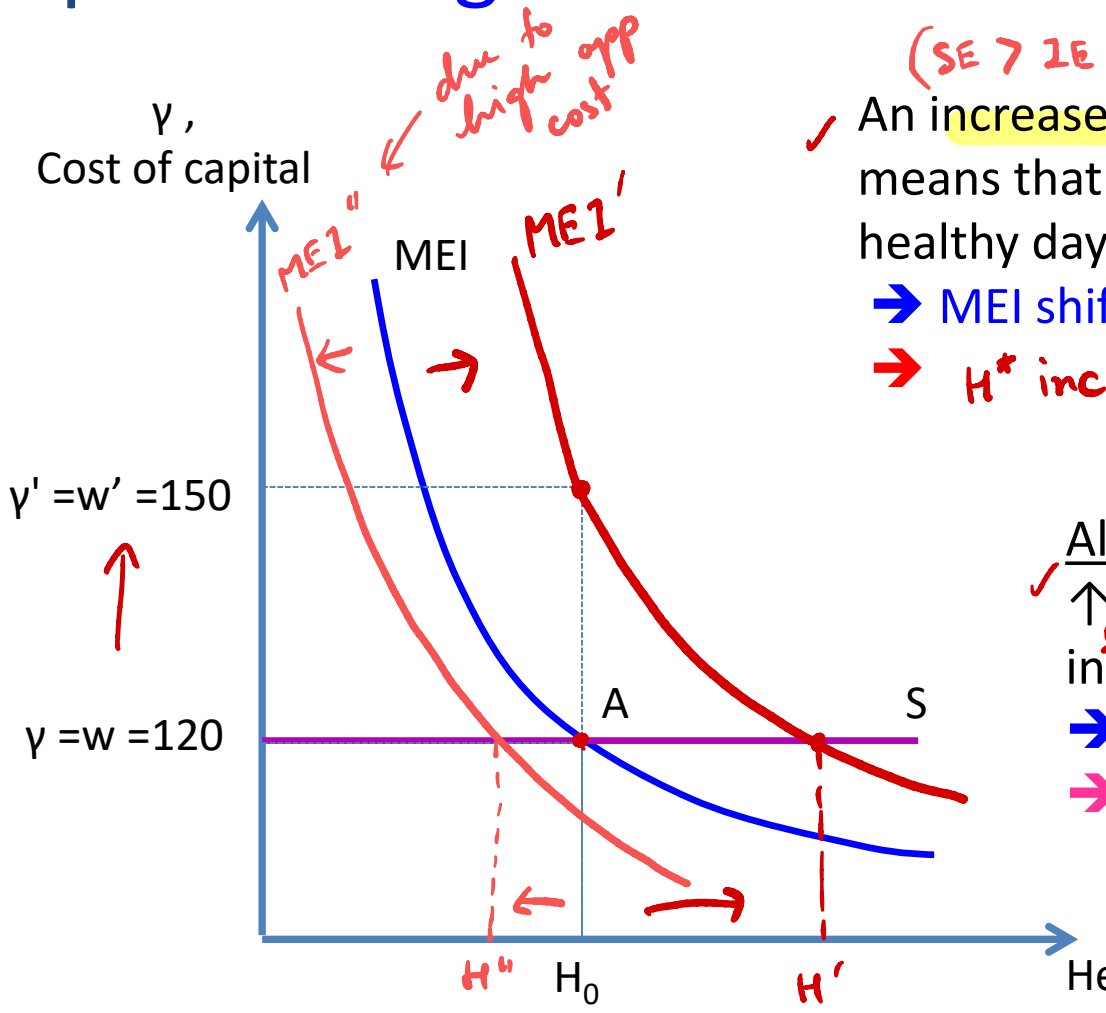
→ H^* falls.

Also, as the expected length of life is lower, MEI decreases

→ H^* decreases as well.

Demand for Health Capital:

Impact of Wage on Investment in Health



(SE > IE)

An increase in wage rate means that the return from healthy days rises.

→ MEI shifts to the right.

→ H^* increases.

Alternatively:

↑ wage → ↑ opportunity cost in producing health.

→ MEI shifts left

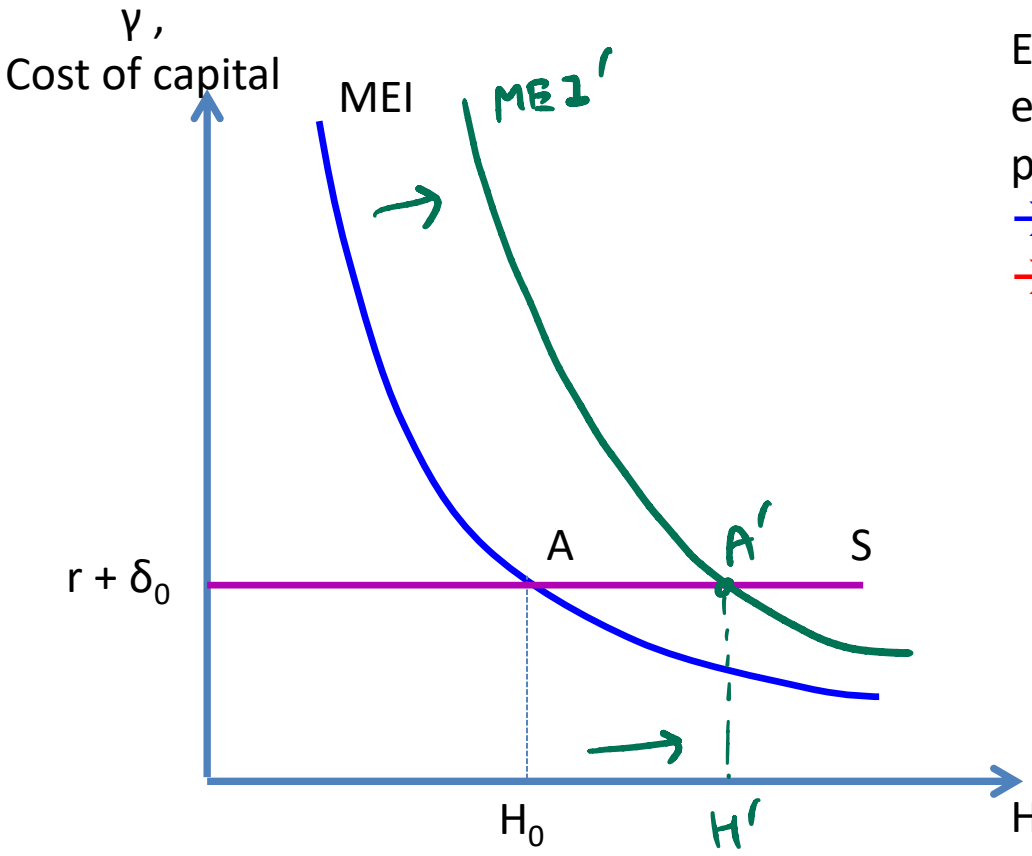
→ H^* decreases.

(IE > SE).

Demand for Health Capital:

Impact of Education on Investment in Health

↳ ↑ educ ⇒ More efficient health producer



Education improves efficiency of the health production.

→ MEI shifts to the right.

→ H* increases.

Empirical studies determine the impact of educ on health.

Conclusions

- Health can be considered as a consumption good and an investment good.
  - *Trade-offs* between consuming health and consuming other goods. → 

  - *Trade-offs* between time spent on producing health and time spent on working and on leisure.
- The demand for health capital is determined by the cost of health capital and the marginal efficiency of investment in health. (MB)
  - Factors that affect the demand for health capital are such as: age, wage, education.

health as pure investment.

weather? → MC eg. bad weather → ↑
pandemic? → ?