

# DEMAND FOR HEALTH CAPITAL

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EE 474 Health Economics

Semester 1/2013

# Topics

- The Demand for Health
- Labor–Leisure Trade-Offs
- The Investment/Consumption Aspects of Health
- Investment over Time
- The Demand for Health Capital
- Changes in Equilibrium: Age, Wage, and Education

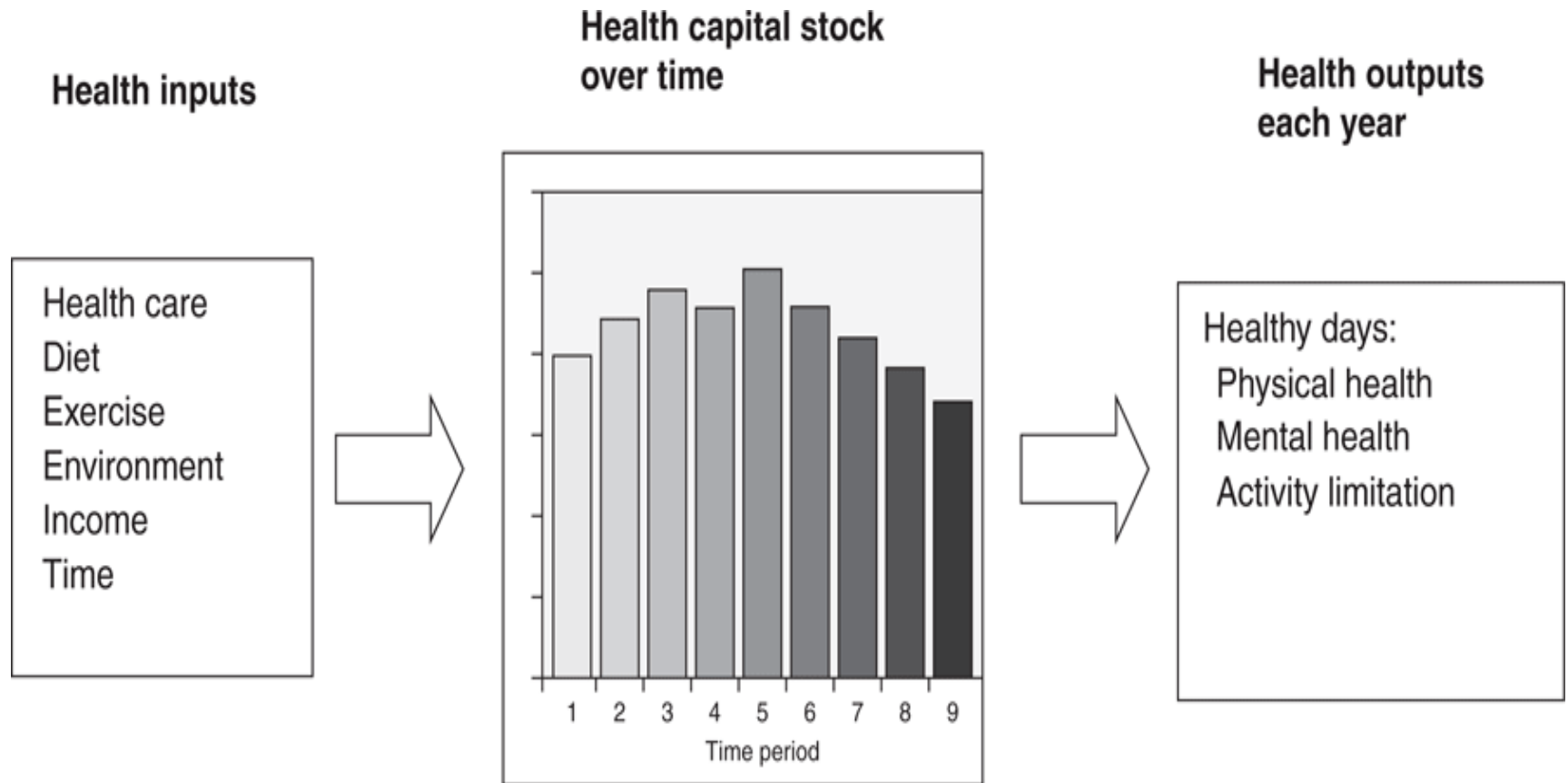
# The Demand for Health

- It is not medical care as such that consumers want, but rather health.
  - People demand medical care inputs to produce health.
- Consumers *cannot* simply purchase health from the market.
  - Instead, consumers are *health producers* (by using their own health-improving efforts in combination with purchased medical inputs).
- Health can be thought of as a *capital good*; it lasts for more than one period and depreciates over time.

# The Demand for Health

- Health can be treated both as a *consumption good* and an *investment good*.
- As a **consumption good**, health is desired because:
  - It makes people *feel better*;
  - It makes people *live longer*.
- As an **investment good**, health is desired because:
  - It *increases the number of healthy days* available to work and to earn income;
  - It *increases the productivity* when working and increase the earning for each working hour.

# A Schematic



# A Model for Time Spent Producing Health

- Production of health (*I* = investment in health):

$$I = I(M, T_H)$$

where  $M$  = medical care,  $T_H$  = time used in producing health

- Production of other goods:

$$B = B(X, T_B)$$

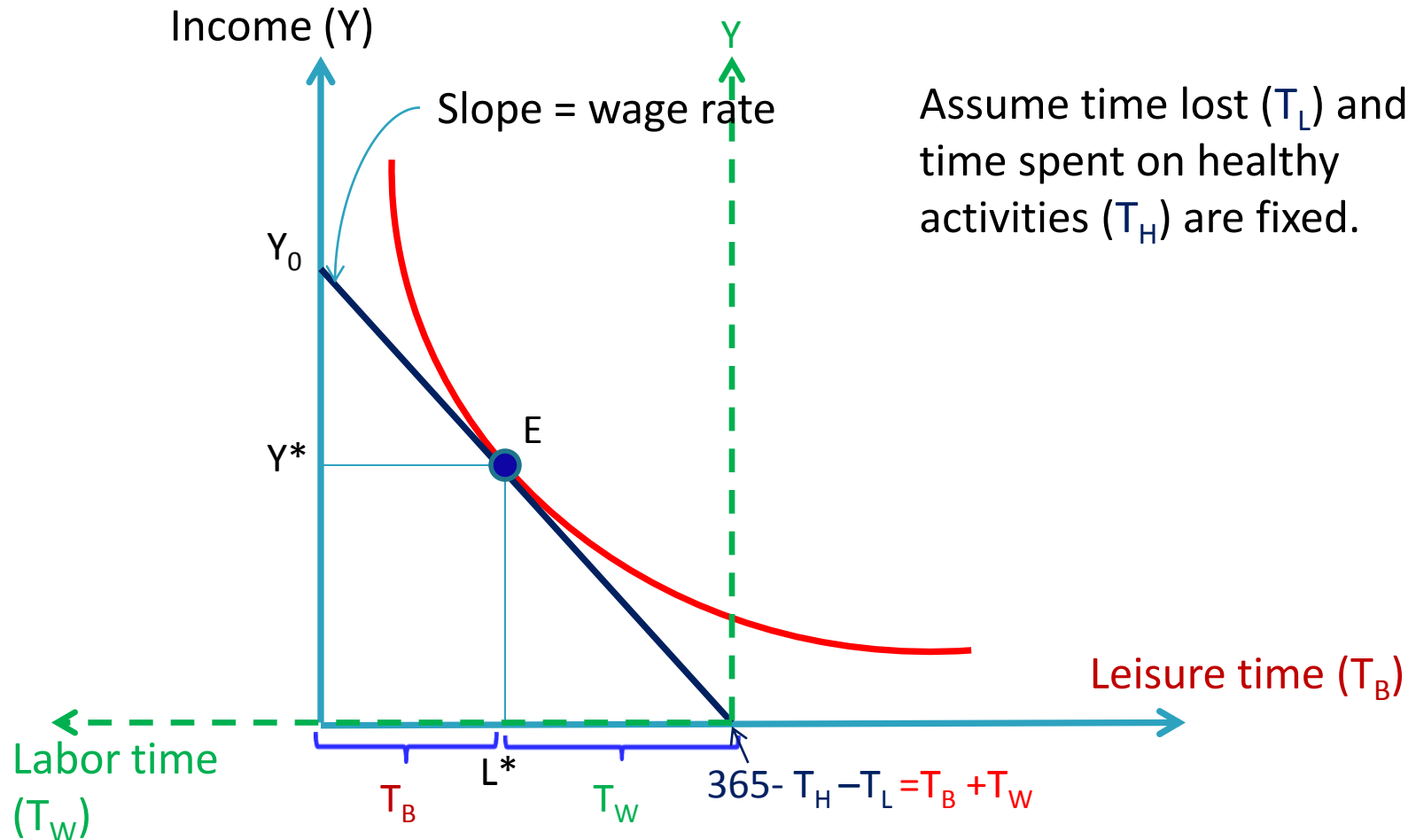
where  $X$  = purchased goods,  $T_B$  = time used producing other goods

- Total available time:

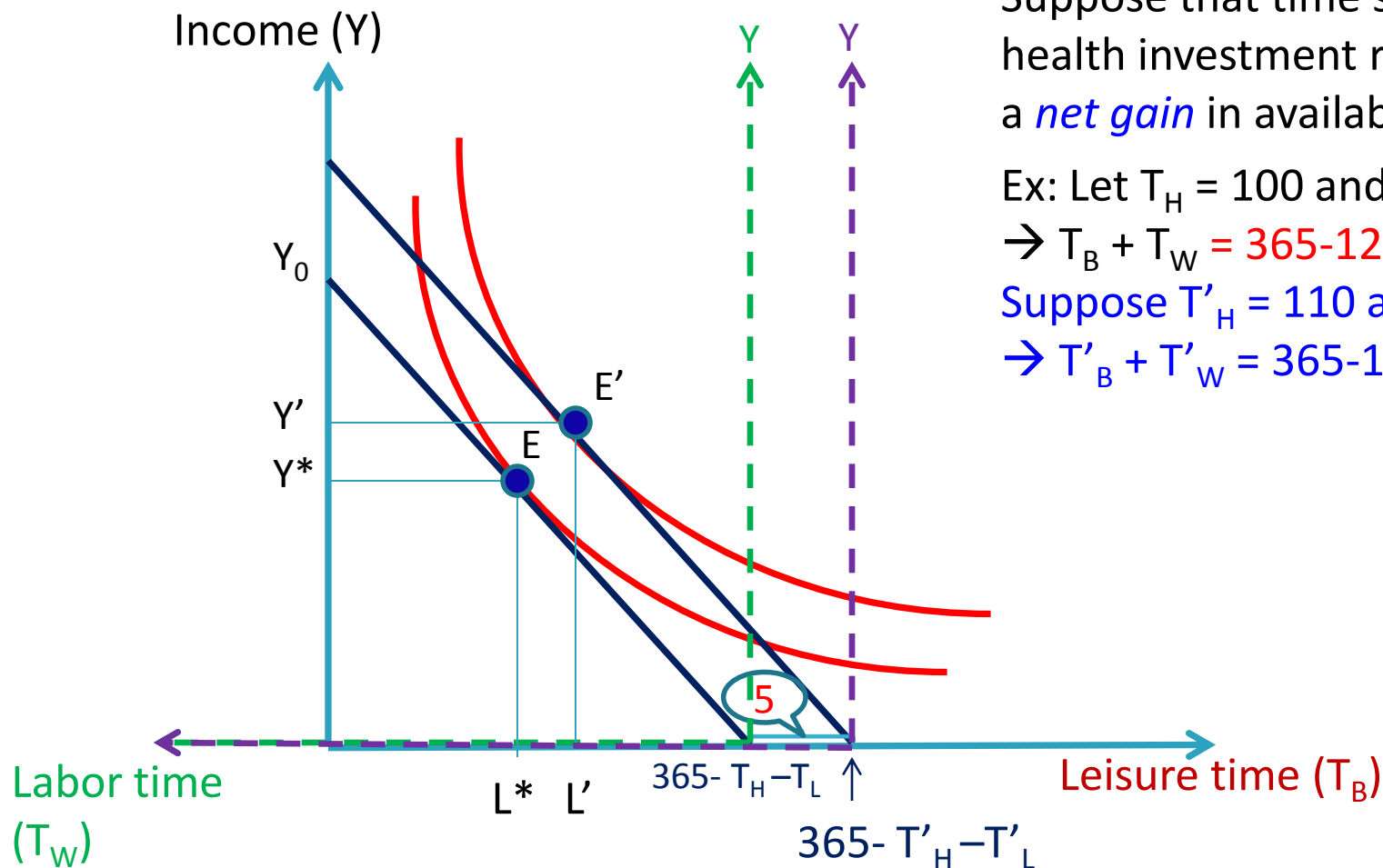
$$T = 365 = T_H + T_B + T_L + T_W$$

where  $T_H \rightarrow$  improving health,  $T_B \rightarrow$  producing other goods,  $T_L \rightarrow$  lost to illness, and  $T_W \rightarrow$  working

# Labor-Leisure Trade-offs



# Impact of Investments in Health



Suppose that time spent on health investment results in a *net gain* in available time.

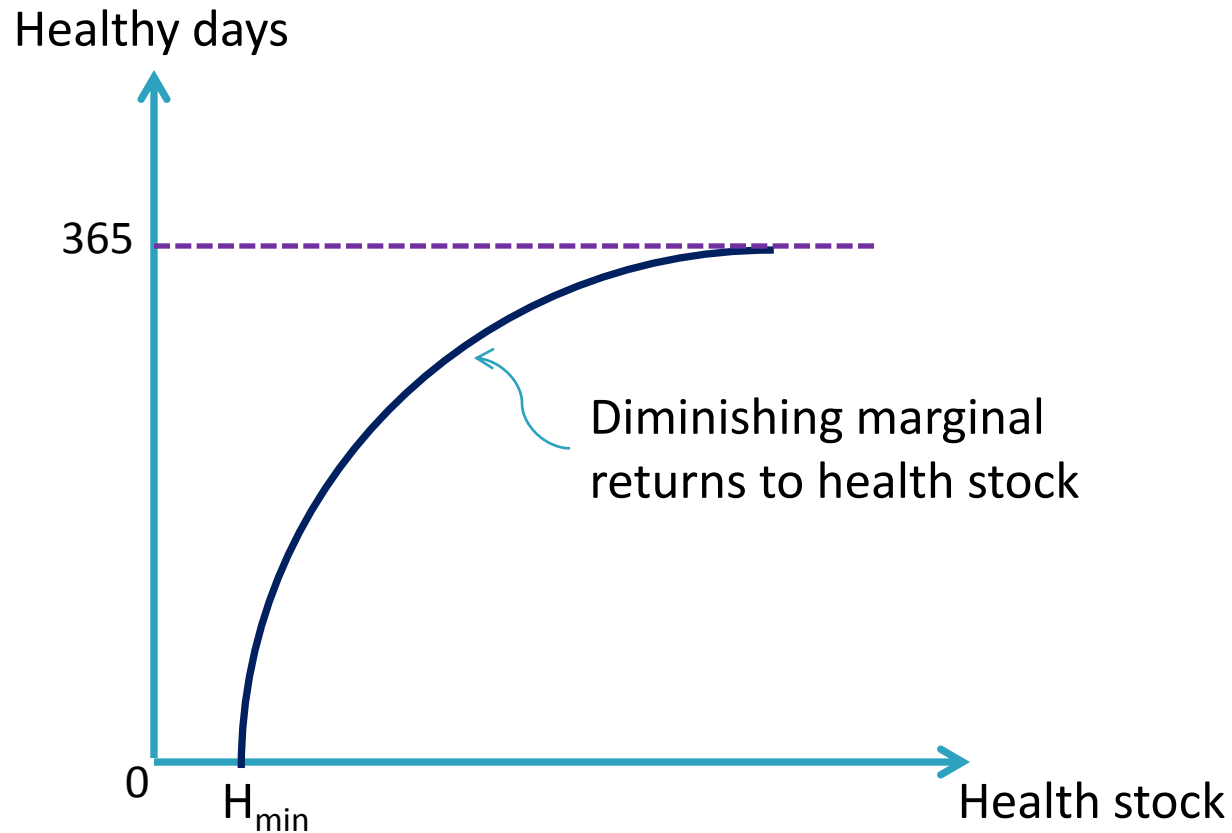
Ex: Let  $T_H = 100$  and  $T_L = 20$

$\rightarrow T_B + T_W = 365 - 120 = 245$

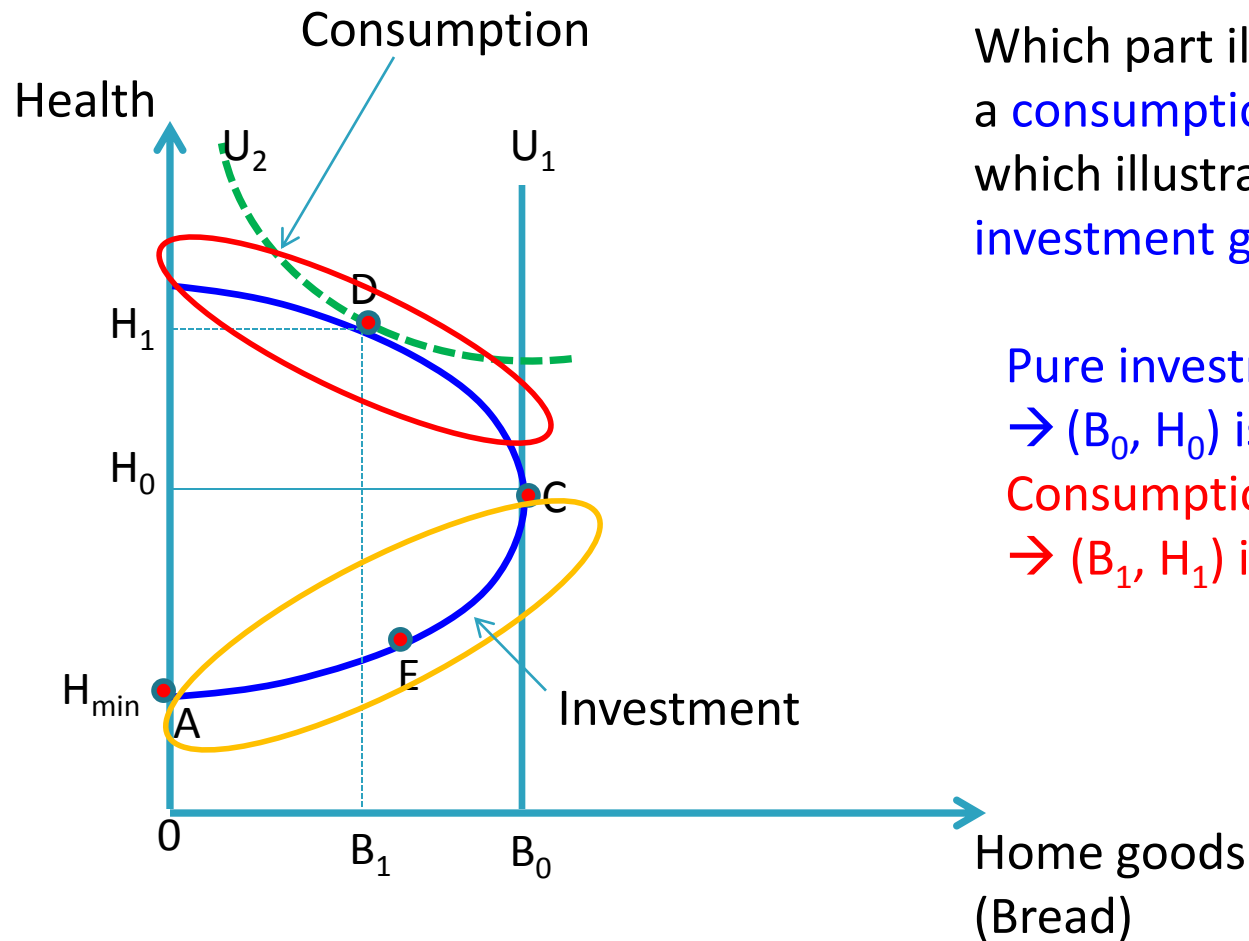
Suppose  $T'_H = 110$  and  $T'_L = 5$

$\rightarrow T'_B + T'_W = 365 - 115 = 250$

# Production of Healthy Days



# Investment/Consumption Aspects of Health: Production of Home and Health Goods



Which part illustrates health as a **consumption good**, and which illustrates health as an **investment good**?

Pure investment model

→ ( $B_0$ ,  $H_0$ ) is optimal.

Consumption-investment model

→ ( $B_1$ ,  $H_1$ ) is optimal.

# Investment in Health Over Time

- Think of health as a *capital*. So what does it *cost* to invest in **health capital**?
- Use an analogy of an investment in an X-ray machine:
  - **Costs**
  - **Future earnings → expected returns**
  - **Depreciation**
- Example: Suppose an X-ray machine costs \$100,000, and the interest rate is 5% per year.
  - How much revenue should we receive from the use of this X-ray machine to make it a good investment?

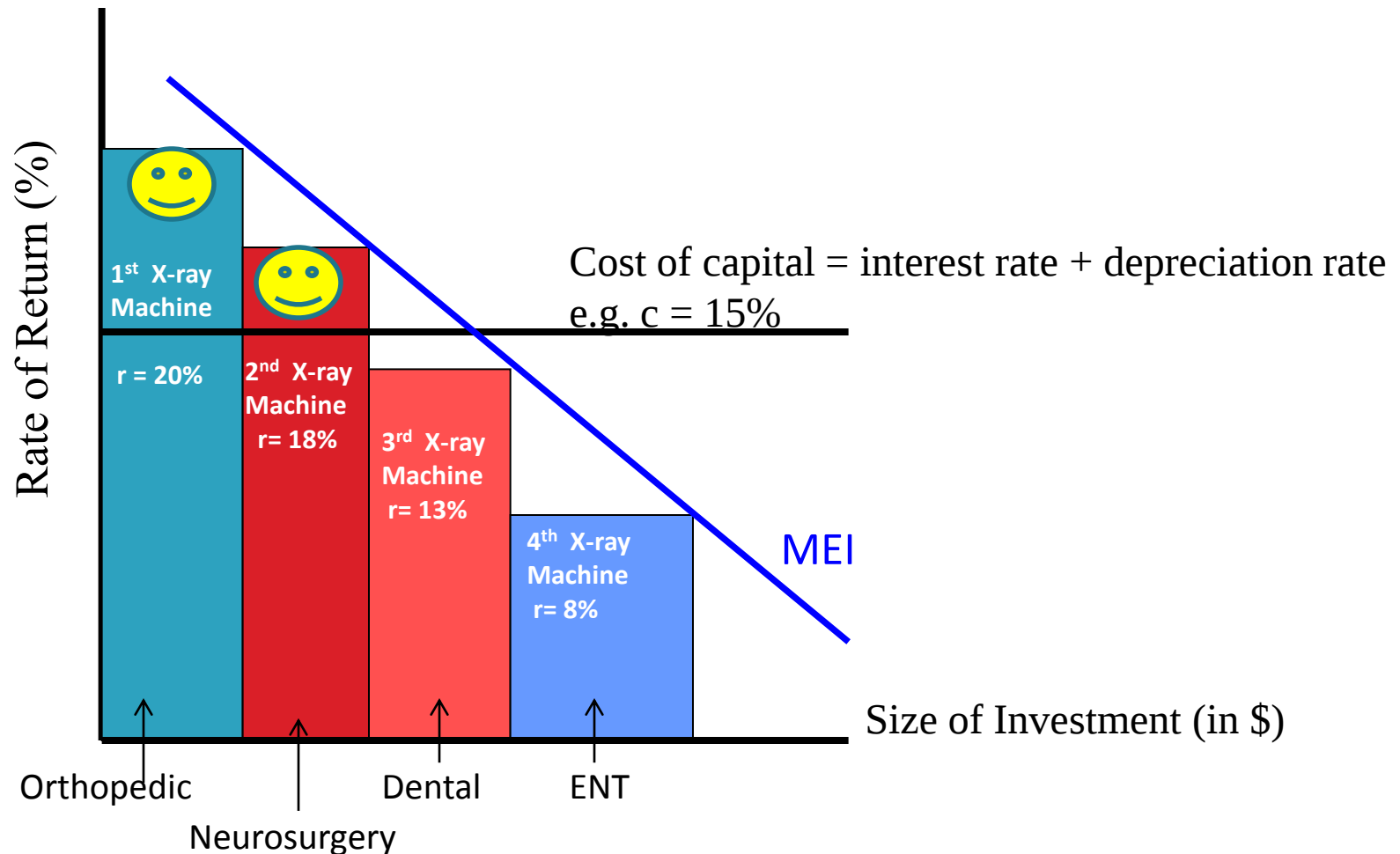
# Cost of Capital

- The *cost* of an X-ray machine = \$100,000.
- Suppose the machine wears out to half of its value within five years
  - The *total depreciation cost* = \$50,000 (i.e. \$10000/year)
- Alternative: Invest in a saving account ( $r=5\%$ )
  - Year 1:  $100,000 * 1.05 = 105,000$
  - Year 2:  $105,000 * 1.05 = 110,250$
  - Year 3:  $110,250 * 1.05 = 115,763$
  - Year 4:  $115,763 * 1.05 = 121,551$
  - Year 5:  $121,551 * 1.05 = 127,628$
  - *Total Incremental Revenue* = **27,628**
- Need the total revenue =  **$27,628 + 50,000 = 77,628$**

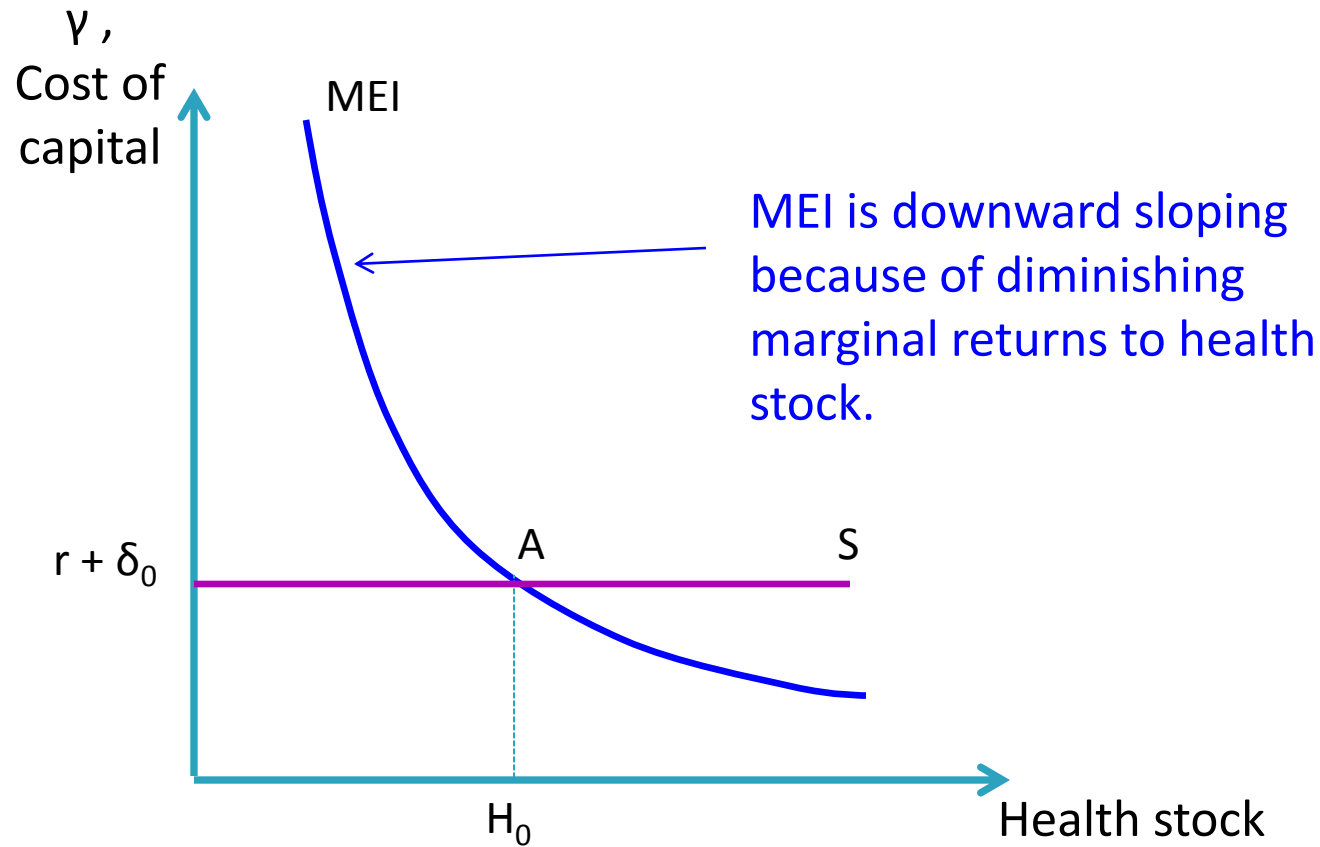
# Demand for Health Capital

- Supply Side ( $r + \delta$ )
  - Cost of capital = Forgone interest rate ( $r$ ) + Depreciation rate ( $\delta$ )
- Demand Side
  - Rate of return on investment ( $\gamma$ )
    - Example: Suppose the return from the X-ray machine is \$20,000 each year.
      - The annual *rate of return* =  $20,000 \div 100,000 = 20\%$
  - Marginal Efficiency of Investment (MEI): Describes the pattern of rates of return ( $\gamma$ ).
    - *Rate of return declines* as the amount of investment increases.
- ***Optimal demand for health occurs at the intersection of the MEI curve and the cost of capital curve.***

# Marginal Efficiency of Investment (MEI) and Rate of Return

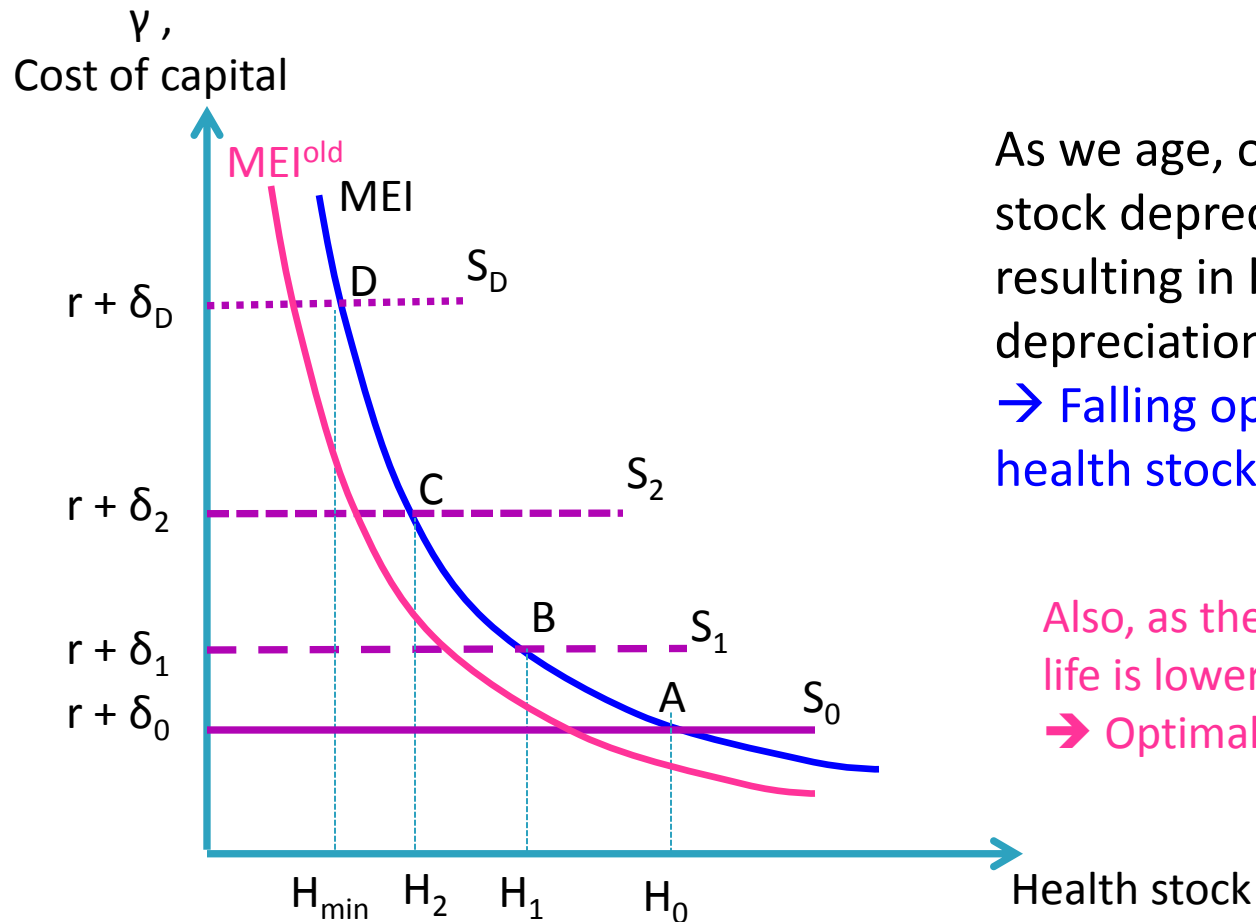


# Demand for Health Capital



# Demand for Health Capital:

## Impact of Age on Investment in Health



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

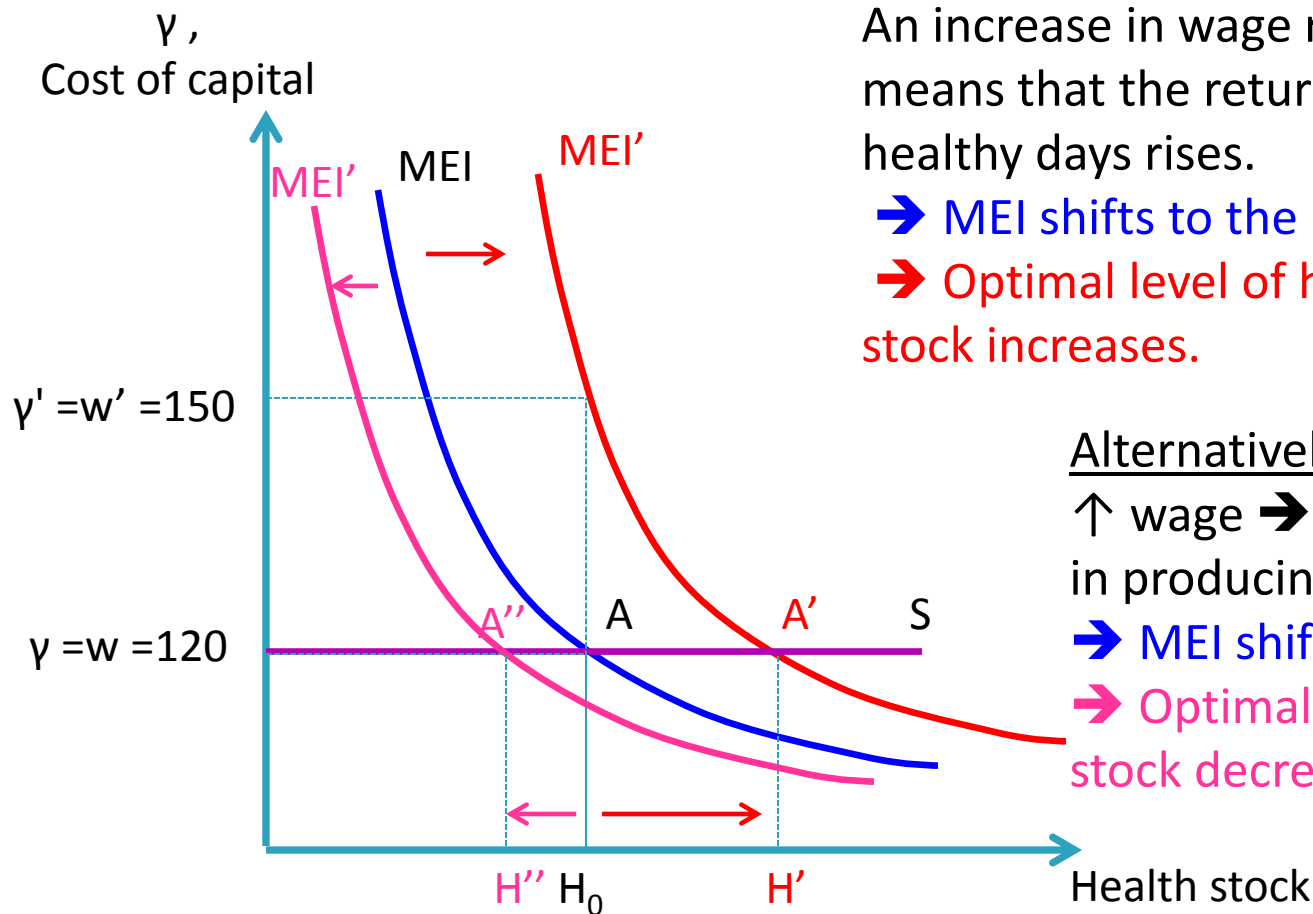
→ Falling optimal level of health stock

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

→ Optimal  $H \downarrow$

# Demand for Health Capital:

## Impact of Wage on Investment in Health



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

→ MEI shifts to the right .

→ Optimal level of health stock increases.

Alternatively:

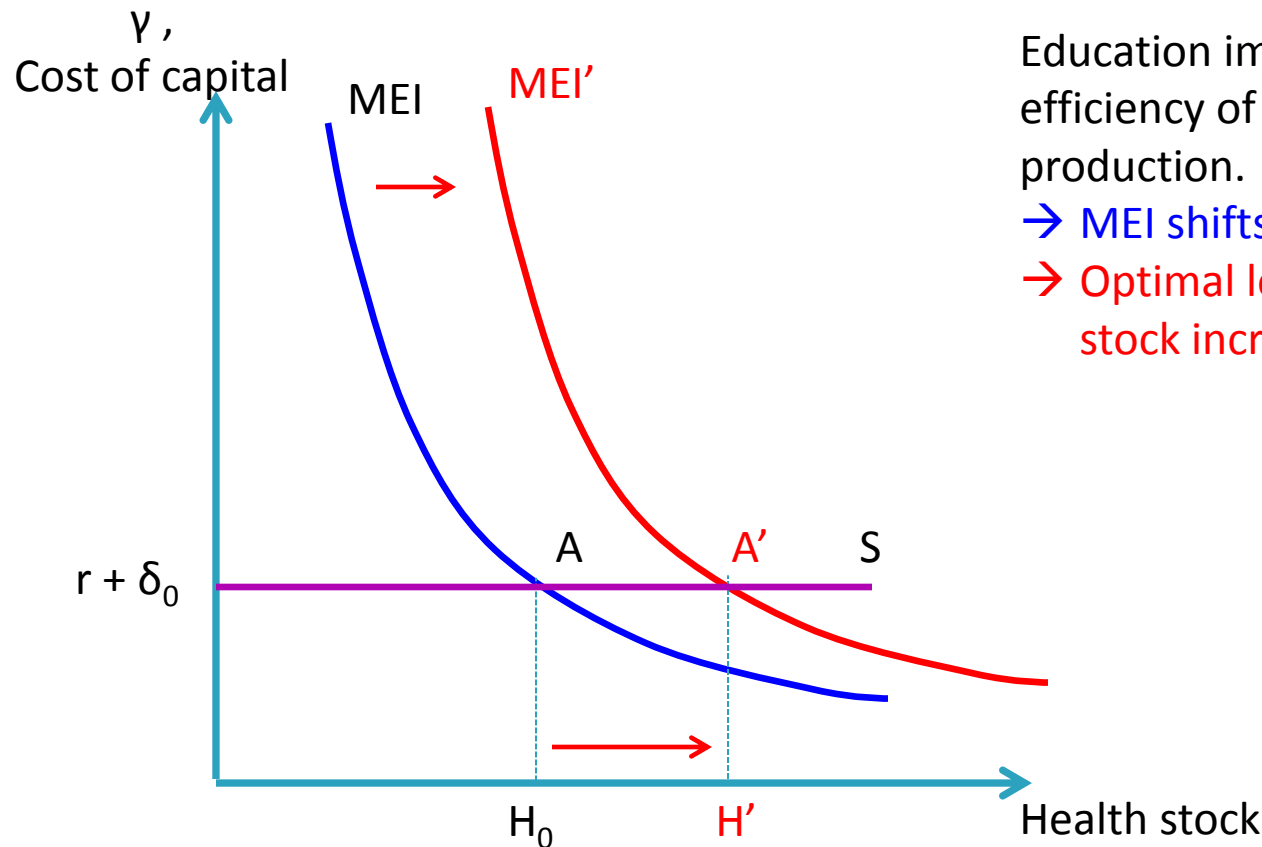
↑ wage → ↑ opportunity cost in producing health.

→ MEI shifts to the left.

→ Optimal level of health stock decreases.

# Demand for Health Capital:

## Impact of Education on Investment in Health



Education improves efficiency of the health production.

→ MEI shifts to the right.

→ Optimal level of health stock increases.

# 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**.
  - Factors that affect the demand for health capital are such as: age, wage, education.