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Demand for Health Capital

EE 474 Health Economics
Semester 1/2012

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

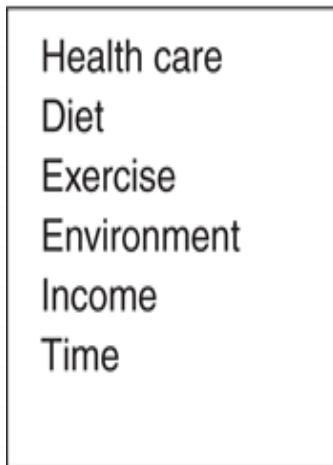
- It is not medical care as such that consumers want, but rather health.
 - People demand medical care inputs to produce health.
- Consumers *cannot* simply purchase health from the market.
 - Instead, consumers are *health producers* (by using their own health-improving efforts in combination with purchased 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

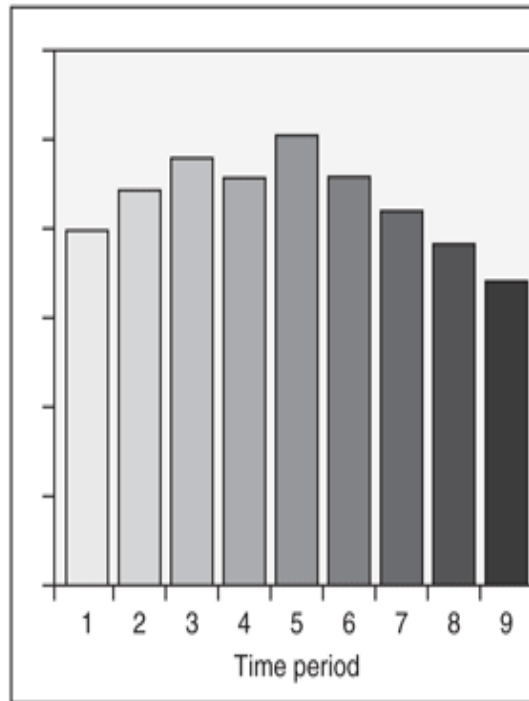
- Health can be treated both as a *consumption good* and an *investment good*.
- As a **consumption good**, health is desired because:
 - It makes people *feel better*;
 - It makes people *live longer*.
- As an **investment good**, health is desired because:
 - It *increases the number of healthy days*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

A Schematic

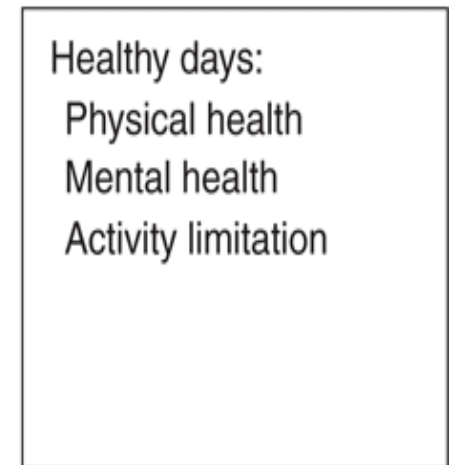
Health inputs



Health capital stock over time



Health outputs each year



A Model for Time Spent Producing Health

o Production of health ($I = \textit{investment in health}$):

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

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

o Production of other goods:

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

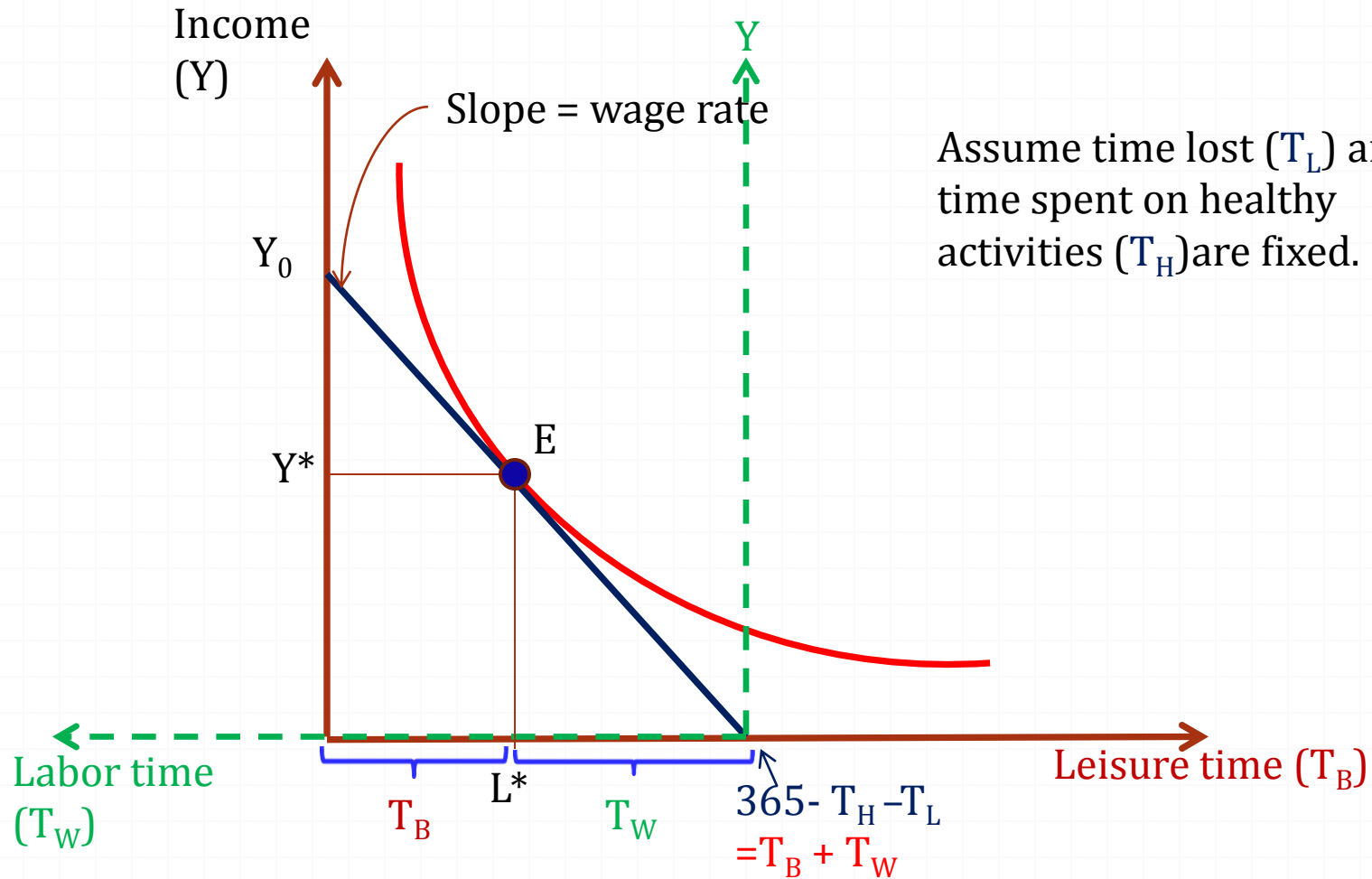
where X = purchased goods, T_B = time used producing other goods

o Total available time:

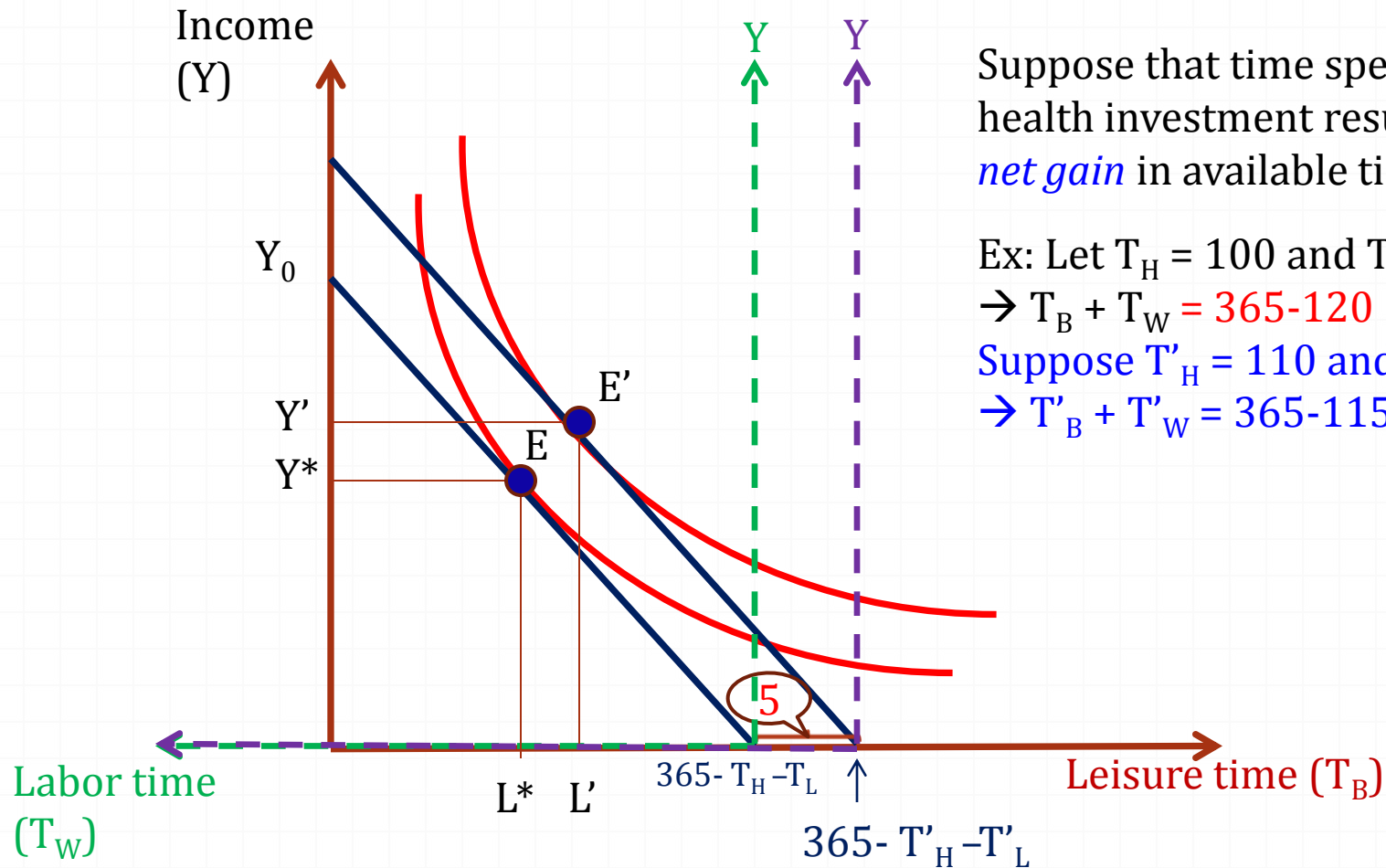
$$T = 365 = T_H + T_B + T_L + T_W$$

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.

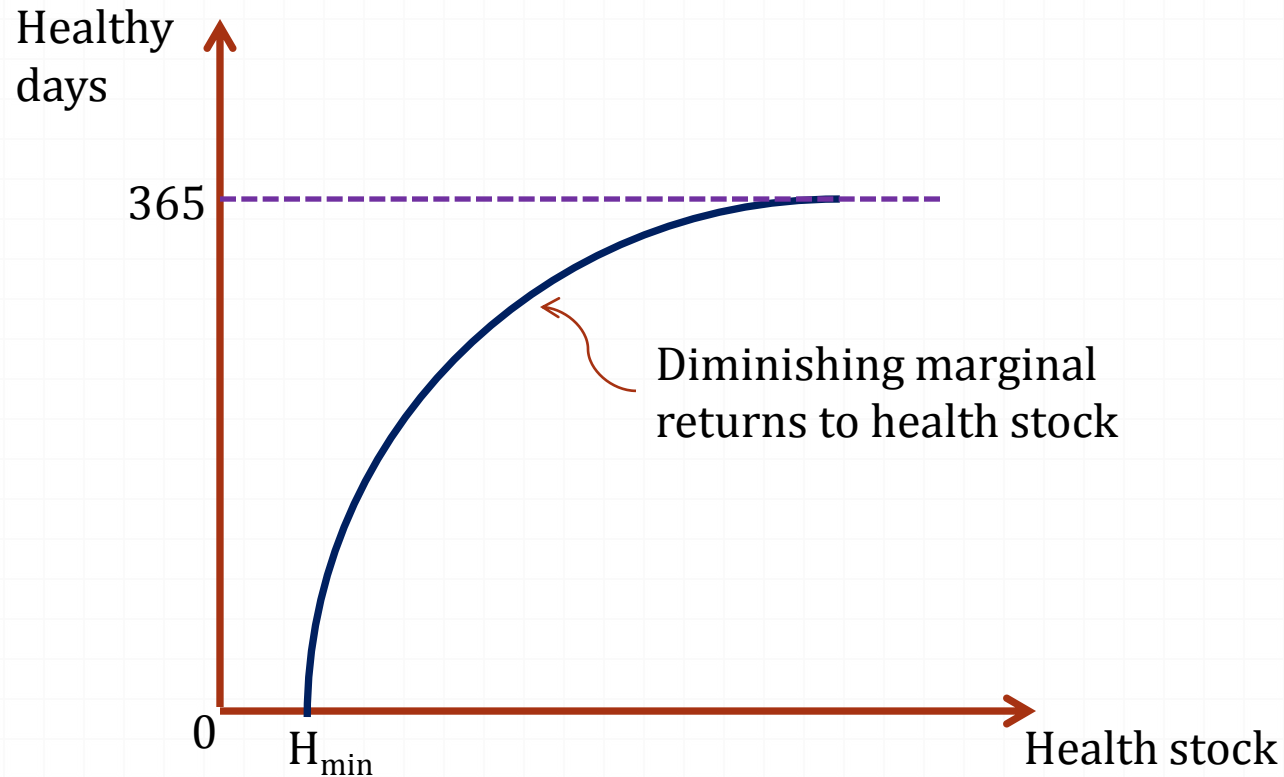
Ex: Let $T_H = 100$ and $T_L = 20$

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

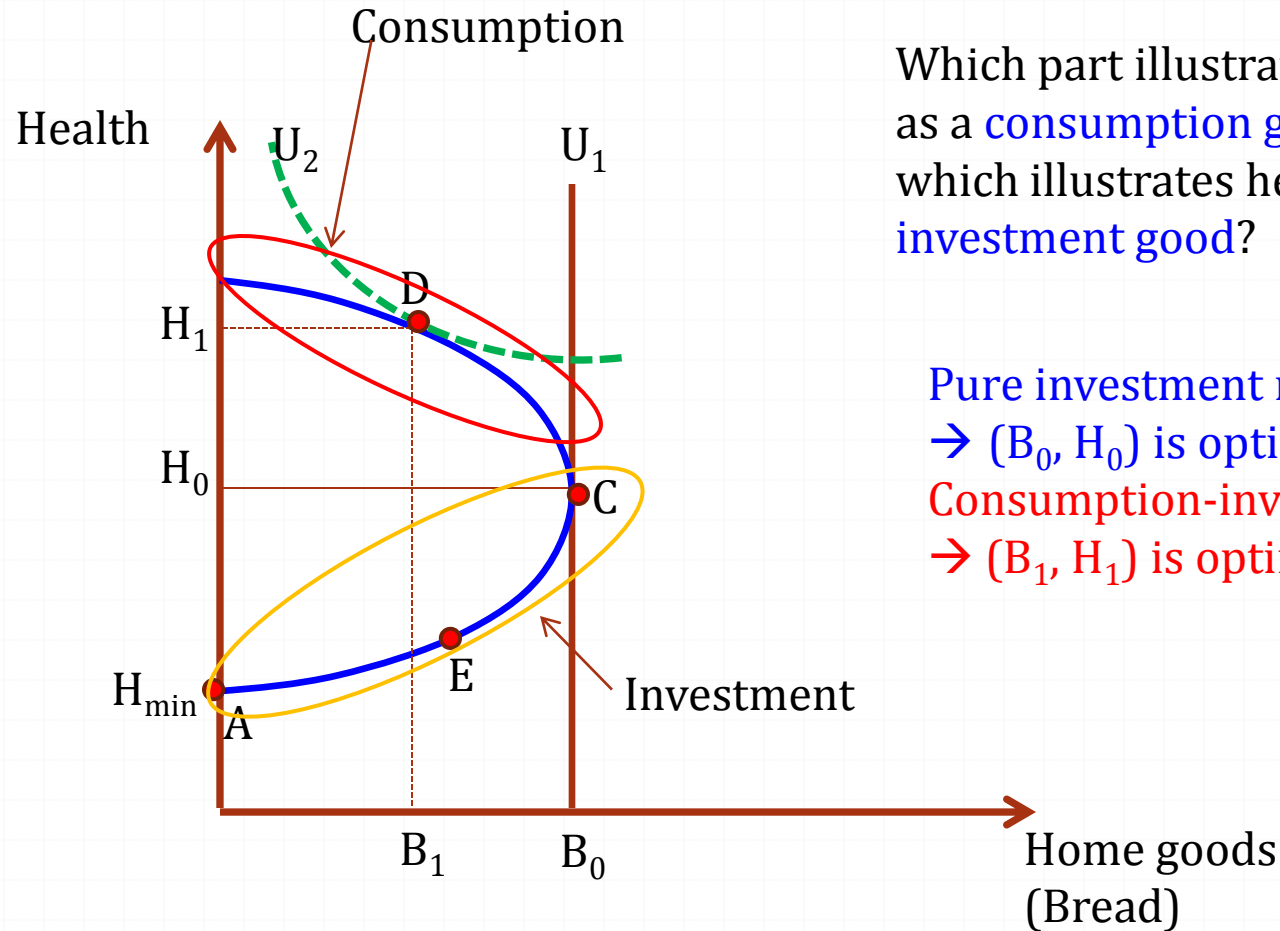
Suppose $T'_H = 110$ and $T'_L = 5$

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

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

 - Cost of capital = Forgone interest rate + Depreciation rate

- Demand Side

 - Rate of return on investment

 - Example: Suppose the return from the X-ray machine is \$20,000 each year.

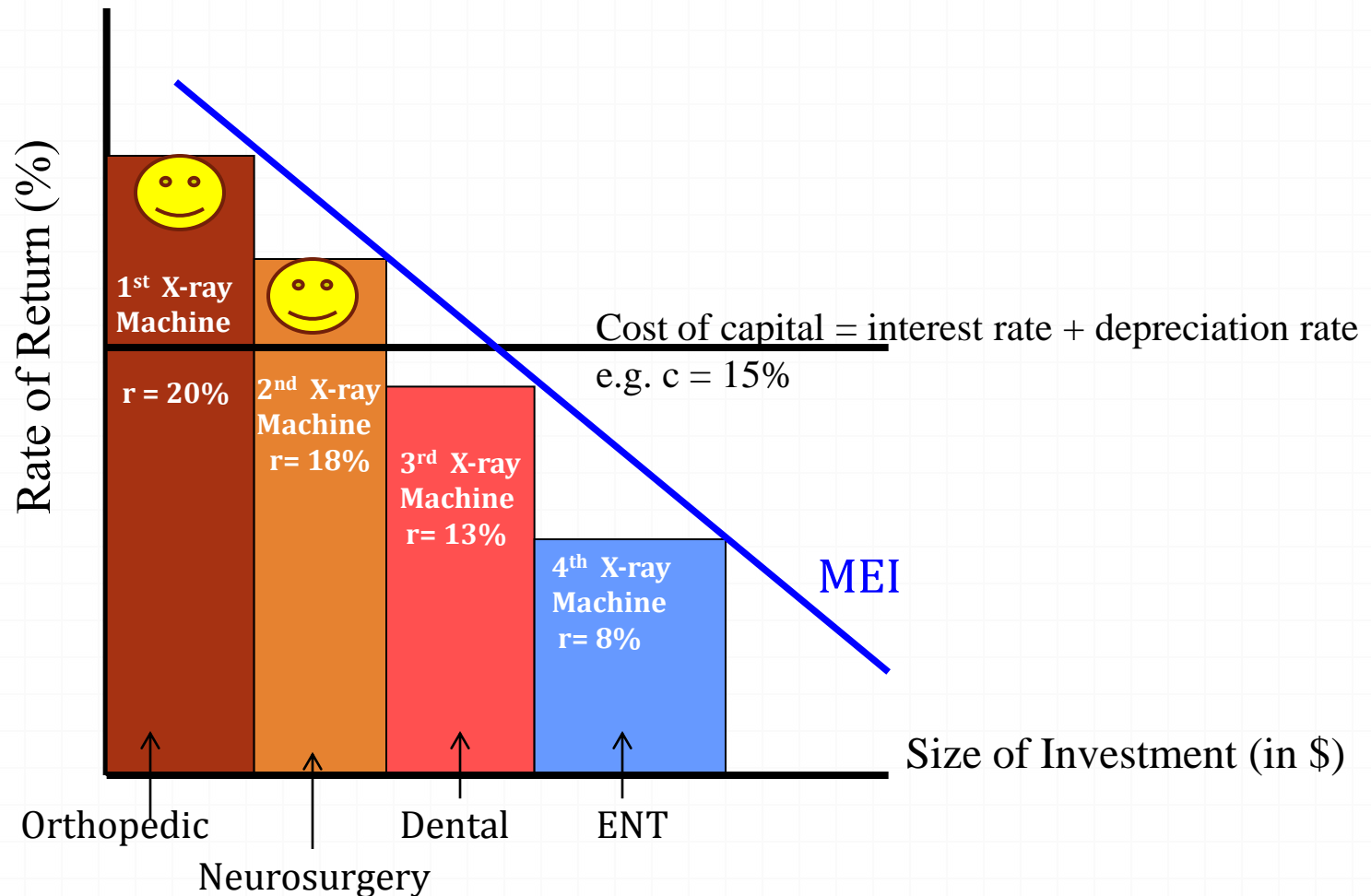
 - The annual *rate of return* = $20,000 \div 100,000 = 20\%$

 - Marginal Efficiency of Investment (MEI): Describes the pattern of rates of return (γ).

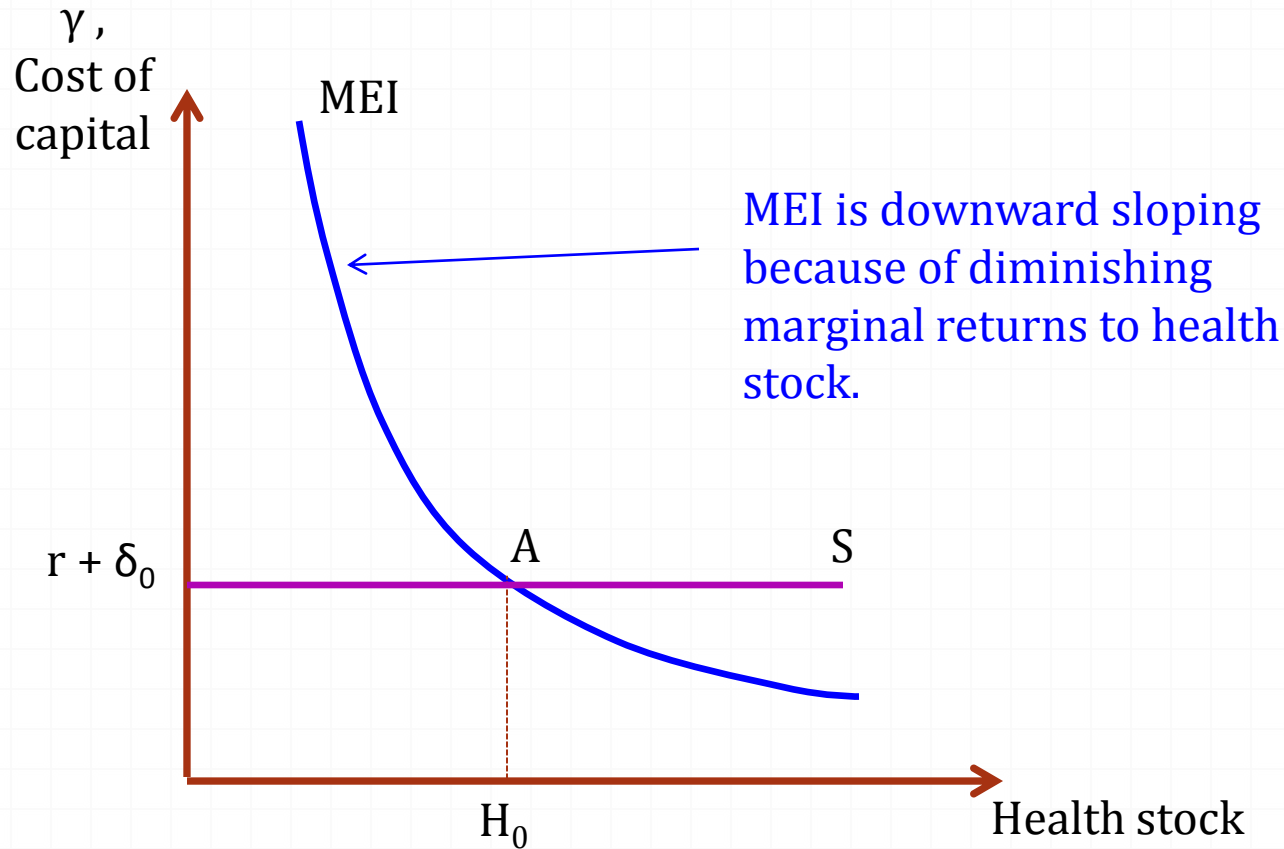
 - *Rate of return declines* as the amount of investment increases.

- ***Optimal demand for health occurs at the intersection of the MEI curve and the cost of capital curve.***

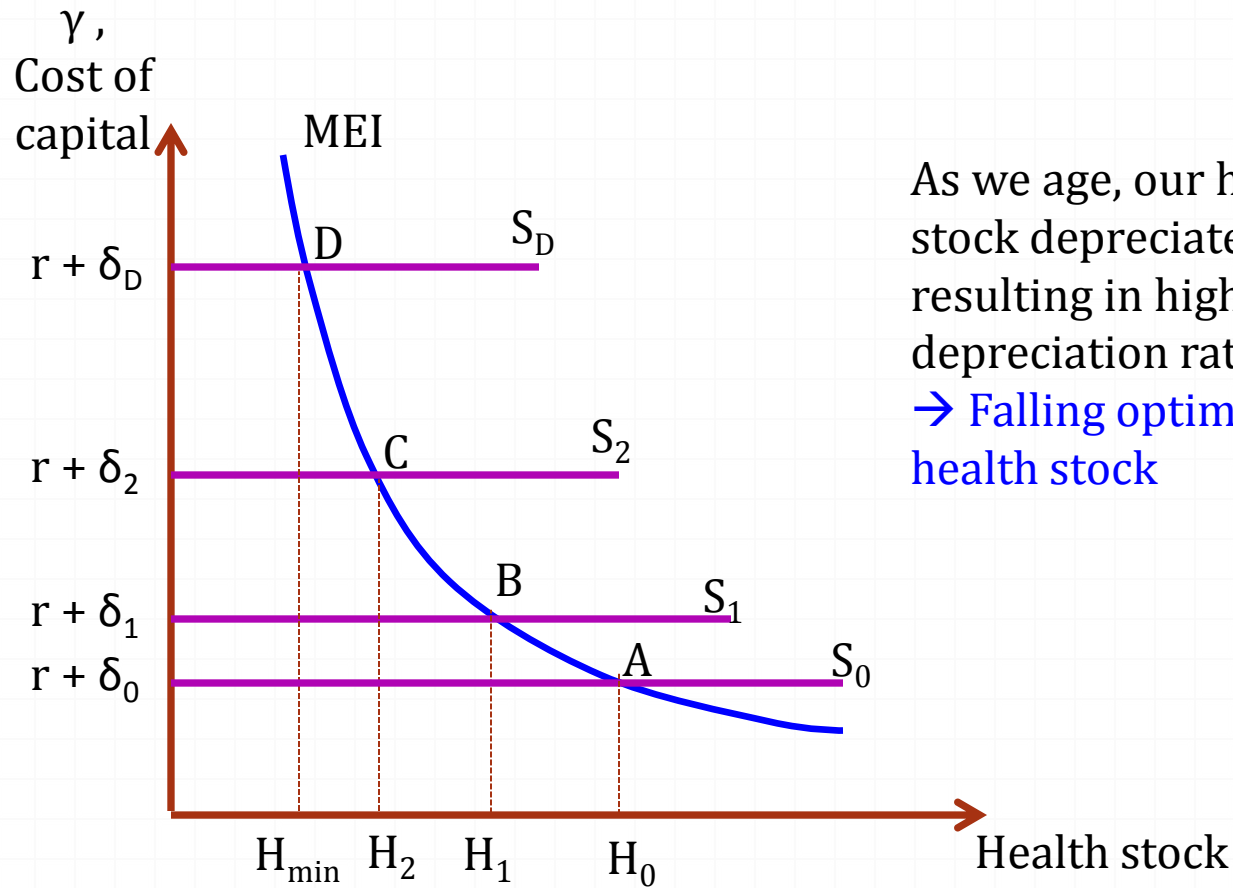
Marginal Efficiency of Investment (MEI) and Rate of Return



Demand for Health Capital

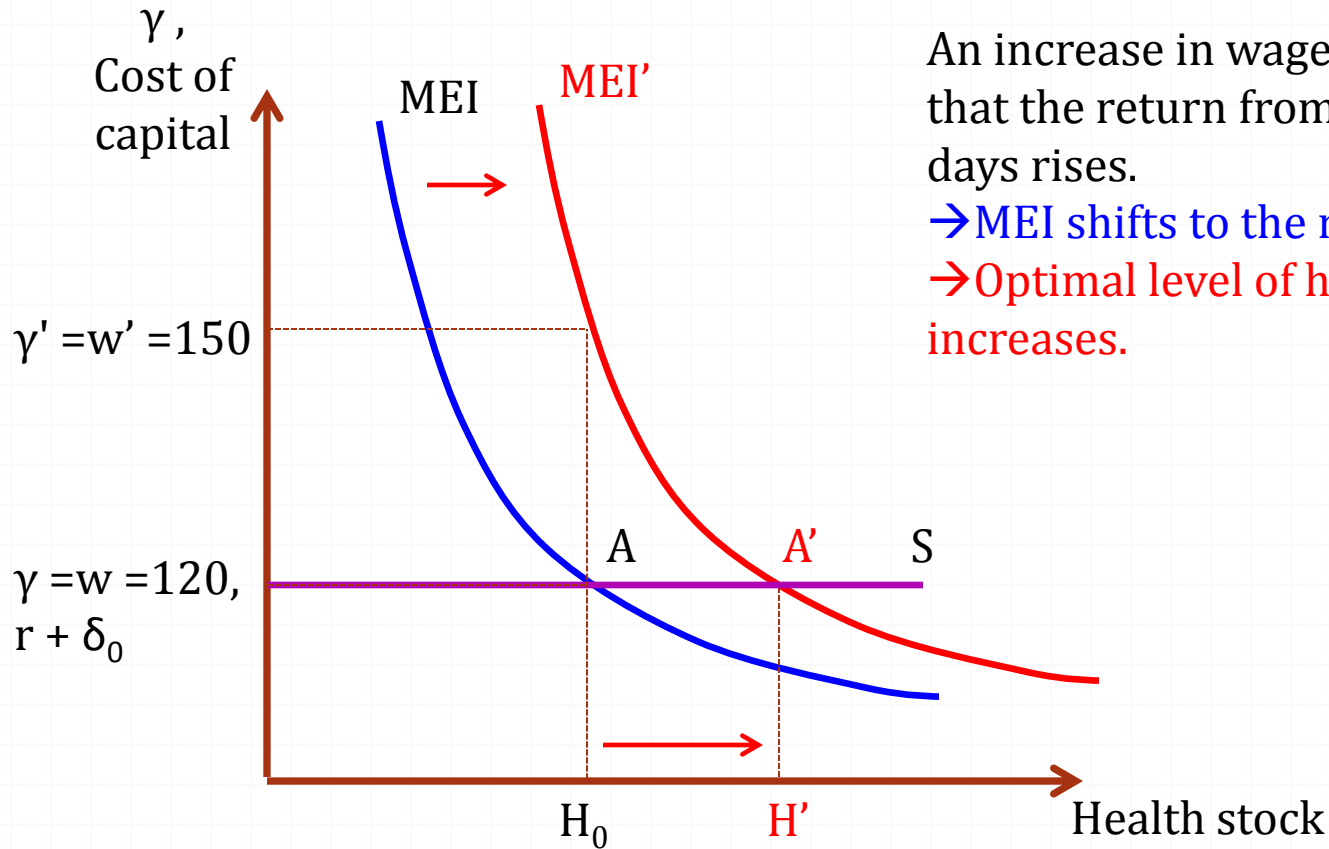


Demand for Health Capital: Impact of Age on Investment in Health



As we age, our health stock depreciates faster, resulting in higher depreciation rates.
→ Falling optimal level of health stock

Demand for Health Capital: Impact of **Wage** on Investment in Health



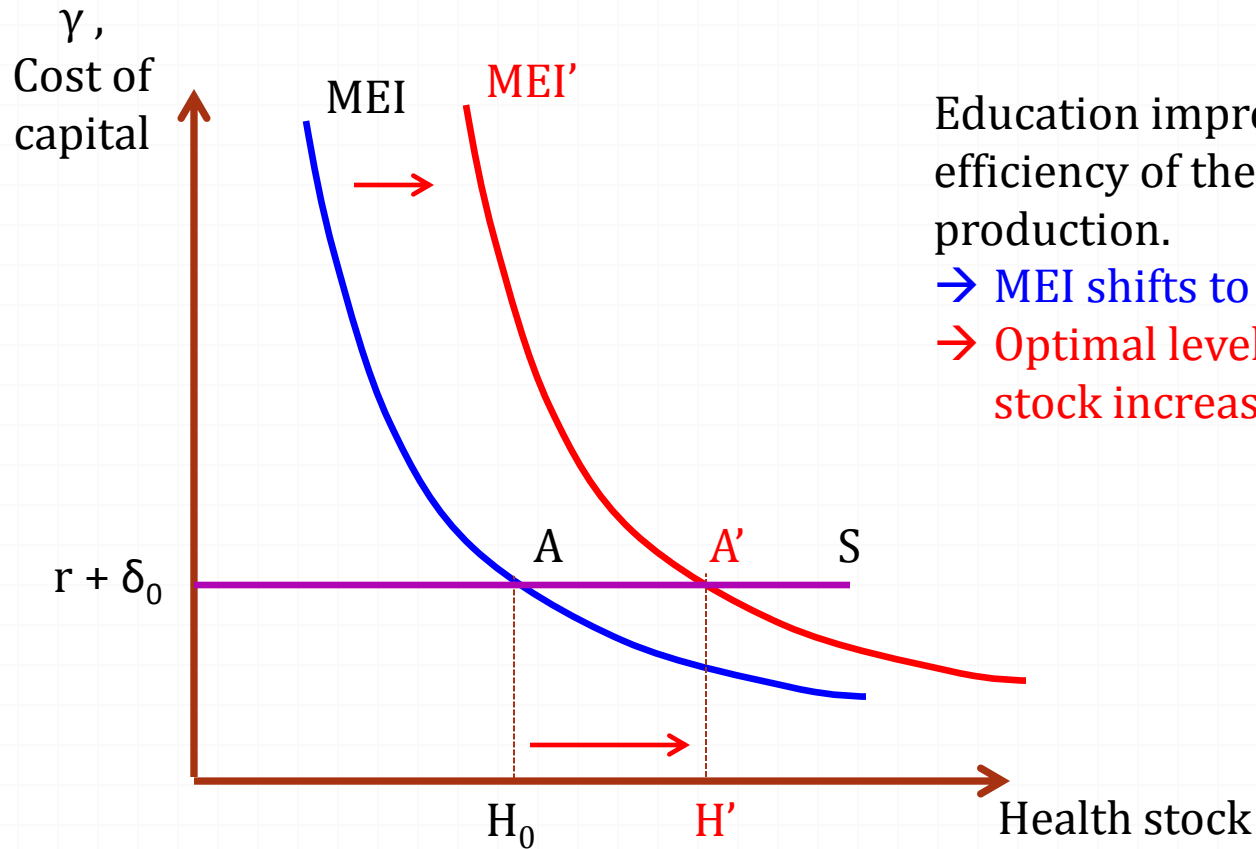
An increase in wage rate means that the return from healthy days rises.

→ MEI shifts to the right.

→ Optimal level of health stock increases.

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.