Demand for Health and Medical Care

7MHPH010 – Health Economics and Health Policy

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Outline

Firms

- Production of Health
- Grossman Health Capital Model
- Demand for Medical Care (start)

Production of Health

Utility of Health

- People do not necessarily care about consuming medical care (M) perse
- They derive utility from being healthy and from consuming other goods

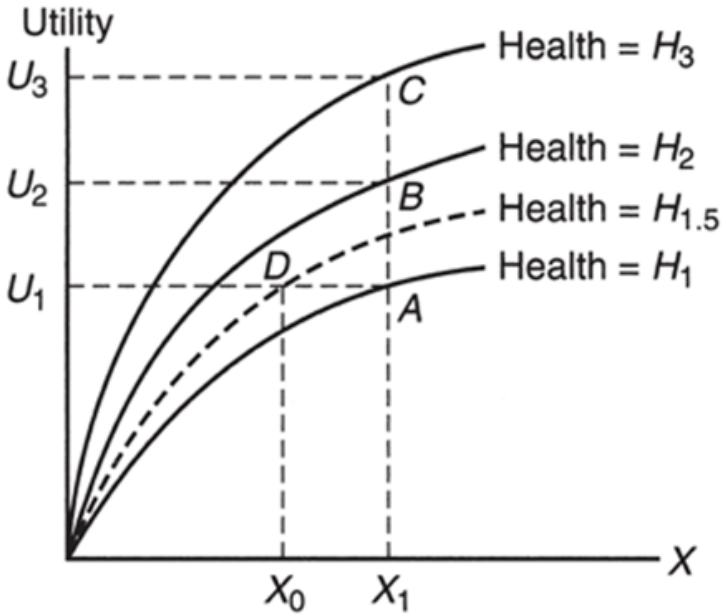
$$U = U(H, X)$$

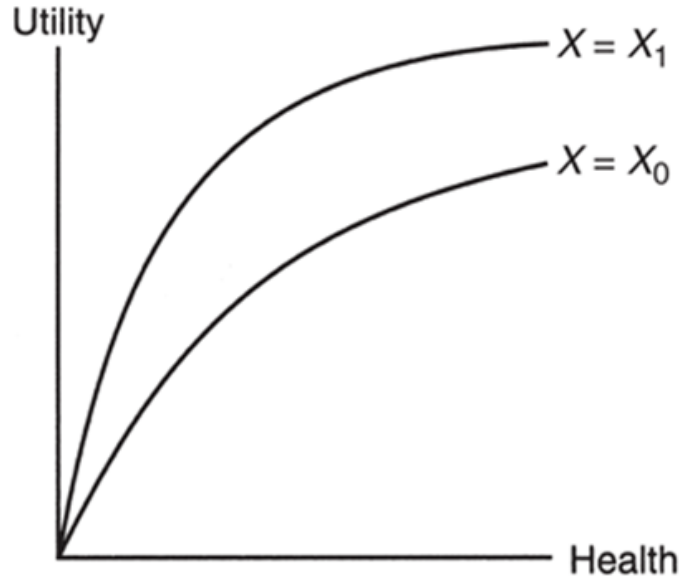
  - where H is the stock of health an individual possess
  - X is the consumption of all other goods
  - $U(\cdot)$ is the utility function
- The stock of health generates a *flow* of services that yield satisfaction (i.e. utility)
- Stock of health (H) is a produced good (more on this in a bit)
- Health is demanded for two reasons
  - Consumption
  - Investment

Production of Health

Utility of Health

- Utility increases with H and X
- Marginal utility is positive ($MU_H = \Delta U/\Delta H > 0$ and $MU_X = \Delta U/\Delta X > 0$)
- Marginal utility is diminishing ($\Delta MU_H/\Delta H < 0$ and $\Delta MU_X/\Delta X < 0$)

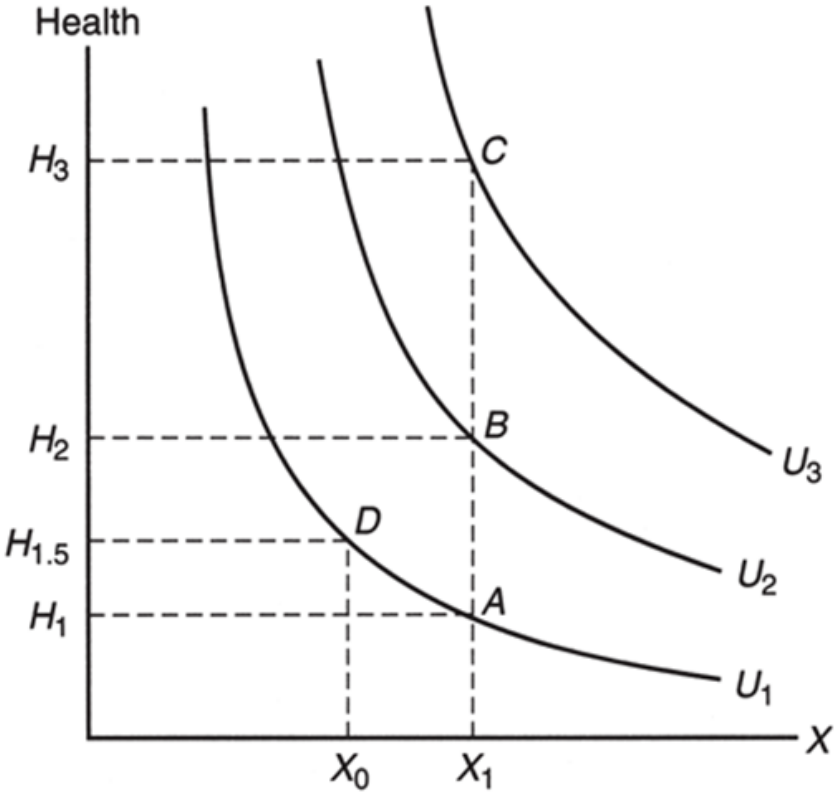




Production of Health

Utility of Health

- We can combine the previous two graphs to generate the indifference curves between H and X



- Combinations of X and H at $A(X_1, H_1)$ and $D(X_0, H_{1.5})$ are at U_1 level
- Combinations of X and H at $B(X_1, H_2)$ are at U_2
- Combinations of X and H at $C(X_1, H_3)$ are at U_3

Production of Health

Production Function

- Where does health come from?
- Earlier, in $U = U(H, X)$, we noted that H, the stock of health, is a produced good
- People produce health in the same way that firms produce goods
- Medical care is one input into the production of health
- We can think of a health production function as

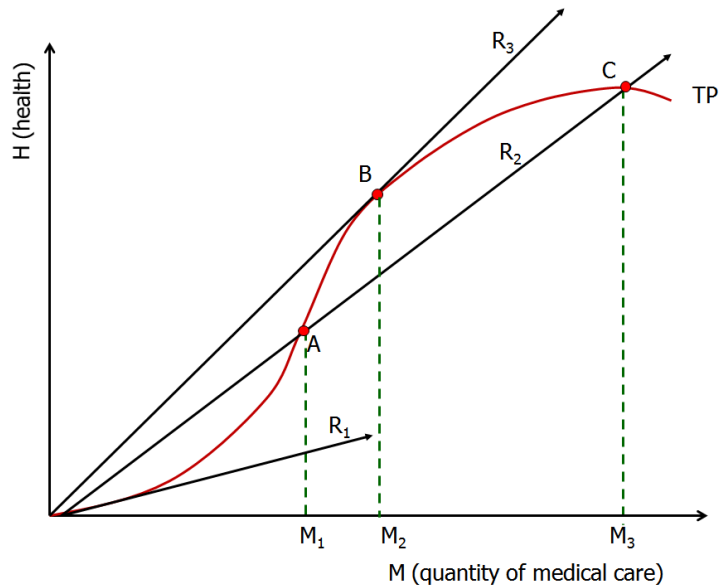
$$H = g(M, O)$$

  - where M is the medical care an individual gets
  - and O is other factors in the production of personal health, for example,
    - genetics
    - age
    - lifestyle (smoking, exercise, driving fast red cars, etc.)
    - education
    - income
  - As with any production function, we can talk about total product, marginal product and average product of health with respect to medical care M, or any of the other inputs for that matter (see lecture notes on production functions)

Production of Health

Total Product, Marginal Product and Average Product of Medical Care

- **Total product** curve for medical care
- $H = g(M, O)$ describes the relationship between composite medical input and other goods and health
- Central idea is that the curve
  - initially dishes up ("U shaped")
  - then tips over to be hill shaped
  - the point at which it tips over is the inflection point (A in the graph)

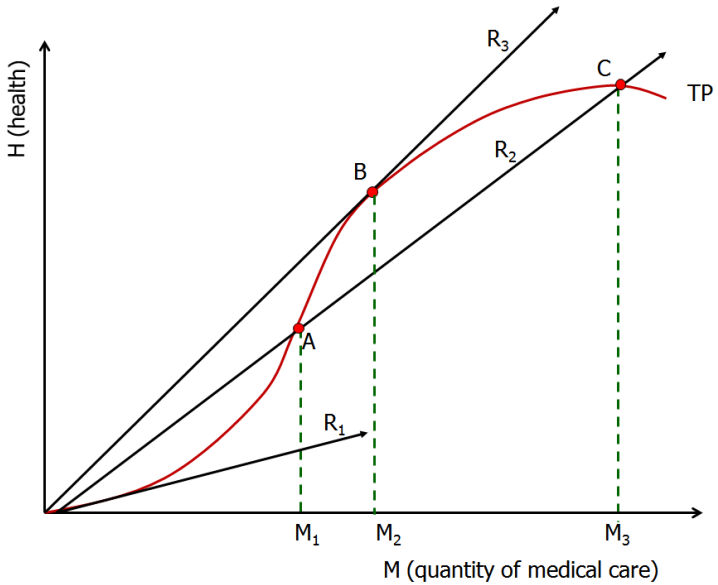


- **Average product** (of an input) is defined as the total product divided by the quantity of that input – thus, average product of health care (m) is $AP_m = \frac{H}{m}$
- **Marginal product** is defined as the change in the total product that occurs due to a unit change in an input (when all other inputs are held constant) – thus, the marginal product of medical care (m) is $MP_m = \frac{\Delta H}{\Delta m}$
  - R_1, R_2 & R_3 are rays from the origin – the slope of the ray gives AP_m
  - Slope of the TP curve (wrt to m) gives MP_m
  - At A (the inflection point) MP_m is max
  - At B AP_m is max (and is equal to MP_m)
  - At C MP_m is zero
  - **Law of diminishing returns:** If equal amounts of a variable are added and all other inputs are held fixed, the resulting increments to output will eventually diminish (i.e. $\Delta MP_m / \Delta m < 0$)

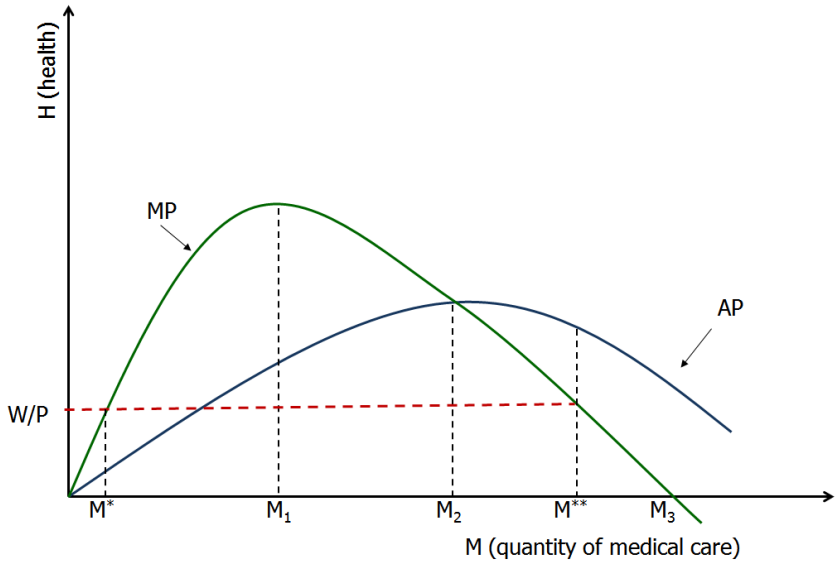
PRODUCTION OF HEALTH

HOW MUCH MEDICAL CARE TO CONSUME?

- Let W be the cost of one more unit of medical care m, and P be the worth of another unit of health H
- Use of medical care should be expanded until the value of the incremental product just equals the incremental cost of another unit of medical care
- Thus, use medical care until $P * \Delta H/\Delta m = W \Rightarrow \Delta H/m = W/P$



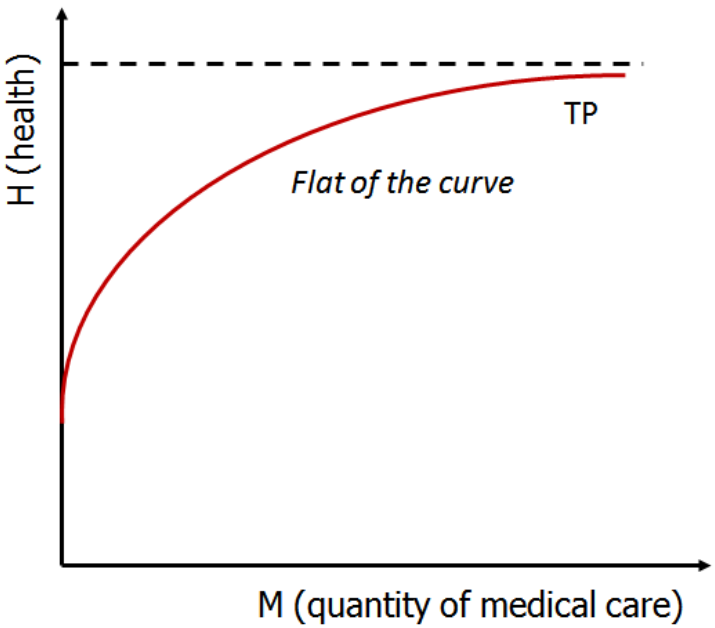
- Optimal level of input (medical care) where W/P equals MP_m, i.e. at M^{**}
- If we stopped producing at M^*, we would give up a lot of output (H) that would cost less to produce per unit than its value P
- **Bottom line** In the vicinity of the optimum point (between M_2 and M_3), we produce where the marginal product is less than the average product – with every additional unit of medical care, we will get less than the average yield of health output – we operate in the area where MP_m is decreasing ($\Delta MP_m/\Delta m < 0$)



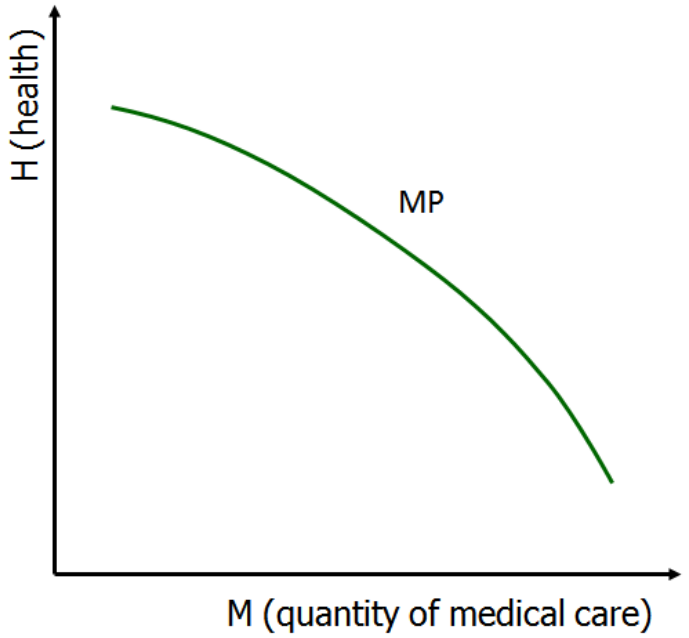
Production of Health

Total and Marginal Product

- The TP curve is upward sloping and indicates that as an individual consumes more medical care, overall health improves
- The positive intercept term represents the individuals level of health when no medical care is consumed and is a function of other factors such as lifestyle and the environment
- The law of diminishing marginal productivity accounts for the bowed shape of the TP curve



- This law is a fundamental principle of production theory and it implies that health increases at a decreasing rate when additional units of health care are consumed, holding all other inputs in the health production process constant
- MP downward sloping because the marginal product of the last unit of medical care consumed decreases as the individual consumes more medical care, reflecting the law of diminishing marginal productivity

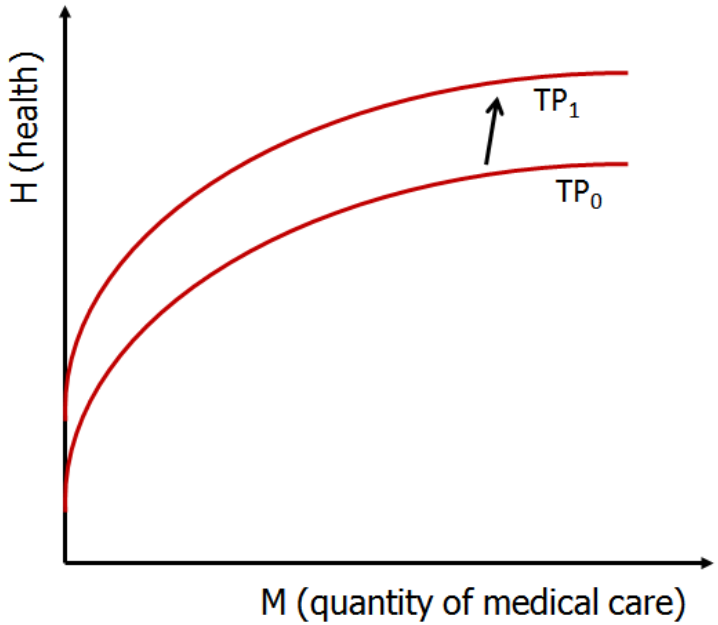


Production of Health

Change in the position of total product curve

Total Product Curve can shift or rotate due to

- Changes in technology
- Changes in any one of the other variables in the production function
  - Because the marginal productivity of medical care has changed in response to the change in the other factors



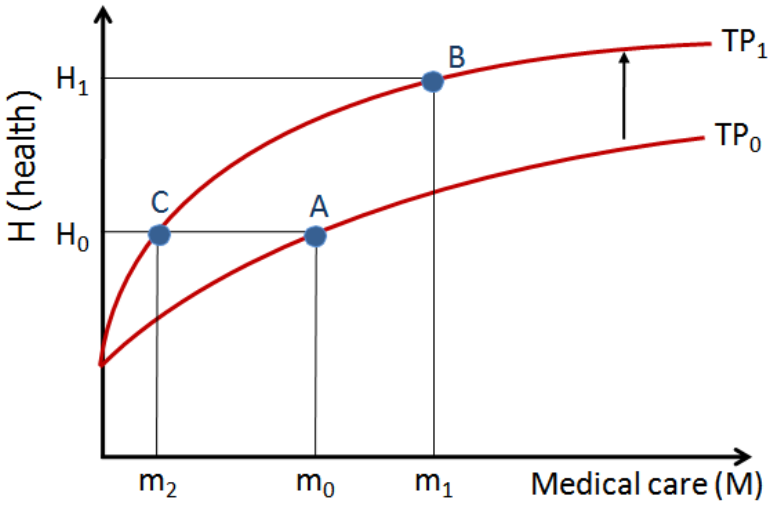
- Other factors that might shift the Total Product Curve
  - Genetics
  - Age
  - Lifestyle
  - Education
  - Income

Production of Health

Technological Change

- Technological change can affect the total product curve in various ways

- Treatment expansion – more patients treated by a new intervention
- Treatment substitution – new technology substitutes for or replaces older (could be more effective or less costly or both)
- The total product curve shifts upward with the development and application of new medical technology because of an increase in the marginal product of medical care
- A movement from point A to point B illustrates the case in which a new technology results in a simultaneous increase in the amount of medical care consumed and improvement in health



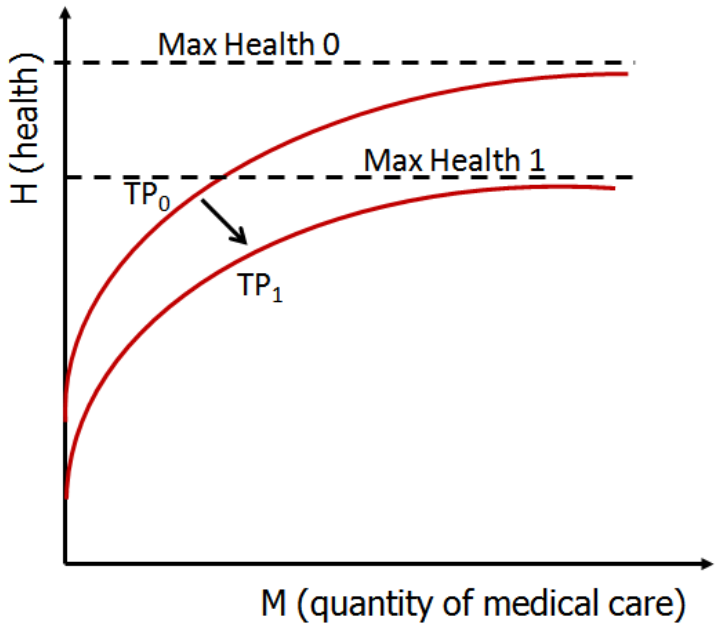
- A movement from point A to point C depicts the case in which the new medical technology has no impact on health but results in less consumption of medical care

Production of Health

Health Profile and Age

- If an individual has a heart attack, then overall health decreases, regardless of the amount of medical care consumed
  - The total product curve for medical care shifts down

- As a person ages, both health and the marginal product of medical care are likely to fall
- The total product curve shifts down and flattens out



Production of Health

Life Style

- Utah vs. Nevada (Fuchs, 1974)
  - Similar states, different lifestyles
  - Utah has a much better health

Excess Death Rate in Nevada Compared to Utah

Age Group	Males (%)	Females (%)
Less than 1	42	35
1–19	16	26
20–39	44	42
40–49	54	69
50–59	38	28
60–69	26	17
70–79	20	6

- Risky lifestyle behaviors - negative impact
  - Smoking, excessive alcohol consumption, lack of physical activity, and poor diet
  - Typical one-pack-a-day smoker 10.9 more sick days every six months
  - Consume two or more drinks a day 4.6 more sick days
  - Obesity - same impact on health as 20 years of aging
- Total product curve for medical care – shift downward and possibly flatten out
- Indirect evidence (Wolfe, 1986)
  - Controlling for lifestyle, medical care does matter for health

Production of Health

Education

- Correlation between health and education
  - more education $\Leftrightarrow$ better health
  - less education $\Leftrightarrow$ worse health
- Causal relation from education to income?
  - Individual with more education – more efficient producer of health independently of the amount of medical care consumed
  - Total product curve shifts upward
  - Total product curve steepens
    - Marginal product of medical care increases
    - Use each unit of medical care more effectively
- Reverse causality as well
  - Health influences education (among children)
  - Child with chronic asthma – more likely to miss school, learn less while attending school, and in the end acquire less education
- Other explanations?

Production of Health

Education

Two theories about the role of schooling

- Victor Fuchs (1982)
  - People place different value on returns in the future (i.e. they discount future at different rates)
    - Low discount rate – relatively high value for the future
    - High discount rate – relatively low value for the future
  - Suggested that people who seek out additional education tend to be those with lower discount rates
  - Individuals with relatively low discount rates will be more likely to invest in education and in health as well
- Michael Grossman's (1972a, 1972b)
  - A health capital model of demand for health that entails a central role for education
  - In Grossman's model, health is produced at home (with several inputs) and education works like technology that mixes various inputs to produce health
  - Grossman contends that better-educated persons tend to be economically more efficient producers of health status
  - We will see this model in more detail in a bit ...

Production of Health

Education

Two theories about the role of schooling

- Victor Fuchs (1982)
- Michael Grossman's (1972a, 1972b)
- Which theory?
  - Recent evidence supports the view that education makes one a more efficient producer of health (Lleras-Muney, 2002)
  - An additional year of schooling caused an improvement in the affected student's health (Oreopoulus, 2006; Auld and Sidhu, 2005)
  - 1 additional year of schooling $\Rightarrow$ prob of dying within 10 years reduced by 3.6%

Production of Health

Income and Inequality

- Correlation between health and income
  - high income $\Leftrightarrow$ better health
  - low income $\Leftrightarrow$ worse health
  - Causality? Direction?
  - Pritchett and Summers (1996) leave little doubt that extremely low incomes have a strong effect on peoples health
- Possible Mechanisms
  - Indirect effect on health (of increase in income)
    - Consume more medical care
    - More educated, healthier lifestyle, and live in a safer environment
    - Improved health
  - Direct effect on health (of increase in income)
    - Employed in a safer work environment – low risk of a work related accident
    - Employed in a more stressful occupation – adverse impact on health
  - Reverse effect
    - A health shock reduces the ability to work or be productive and hence lowers wealth/income

Production of Health

Income and Inequality

- Hypotheses about how income and inequality effects health
  - Income
    - Absolute income hypothesis – an individual's absolute income is positively related to health
  - Inequality
    - Relative income hypothesis – an individual's income relative to some social group average impacts overall health
    - Relative position hypothesis – social position in the income distribution impacts health
    - Income inequality hypothesis – the distribution of income itself directly impacts health
  - Evidence
    - Significant support for the absolute income hypothesis
    - Some support for the hypothesis that greater income inequality worsens health outcomes at the state level

The Grossman Model

- Model ingredients and setup
- Predictions

Grossman Model

Introduction

The Grossman model: How do age, education, health status and income influence the production of health through the demand for health capital?

- Special features of the model
  - People demand health because it is a durable good that provides them with utility
  - People they demand medical care inputs to **produce** health
  - Health is not passively purchased from markets – it is produced in combining time with purchased medical inputs
  - Health is a capital good – it does not depreciate instantly
  - Health can be treated both as a consumption and an investment good
    - consumption – health makes people feel better
    - investment – it increases the number of healthy days to work and to earn income
- Grossman's model of health capital
  - Helps understanding how individuals invest their time in health and in market activities
  - Provides explanations (and testable predictions) about relationships between health, education, income, aging, medical care etc.

- **Health Capital**
  - The stock of health capital provides the output of "healthy days"
  - Consumers apply a set of inputs to make investments in health capital
    - market inputs of health care
    - diet, exercise, time, ...
  - The health stock may grow, decline, or remain constant over time (depending on age, illness or injury)

- **Optimal Resource Allocation**
  - The model determines how much time and money people will invest in their health capital
  - Prices of health care, people's wages and their productivity in the production of health will determine how resources are to be allocated between health capital and other goods and services that people buy

Grossman Model

Ingredients and set up

- People do not necessarily care about consuming medical care (M) perse – they derive utility from being healthy and from consuming other goods

$$U = U(H, Z)$$

- Health is produced
  - Consumer does not purchase health (H) from the market
  - Produces it at home by spending time on it and by purchasing items from the market such as medical care (MC)
- Health (H) is a capital good
  - It lasts for more that one period but depreciates slowly

$$H_t = H_{t-1} + I - \delta$$

    where H is the stock of health, I is the investment in health and, δ is a depreciation rate
- Health is a investment good and a consumption good
  - Consumption good because it is valued by people (marginal utility of health is positive $\Delta U/\Delta H > 0$)
  - Also an investment good since it improves the ability to earn

Grossman Model

Ingredients and set up

- The consumer produces two goods
  - An investment in health – invests in activities that give a return on health
  - The consumer also produces the composite home good Z which represents the consumption of all other goods and activities
  - Each of these produced goods is given by their respective production functions

$$I = I(M, T_H; E)$$
$$Z = Z(X, T_Z; E)$$

where

- $I(\ )$ and $Z(\ )$ are production functions with outputs I and Z respectively
- T_H and T_Z are time spent producing health and home good
- M represents the health care inputs (hospital visits, medicine, checkups, etc.) purchased from the market
- X represents home good inputs purchased from the market (TV, fast red car, food etc.)
- E is the level of education – it in not an input into the production function but rather affects the shape of the function – captures the idea that more educated people will be more efficient at producing home or health good

- Time Constraint
  - Total time available is 365 days in a year

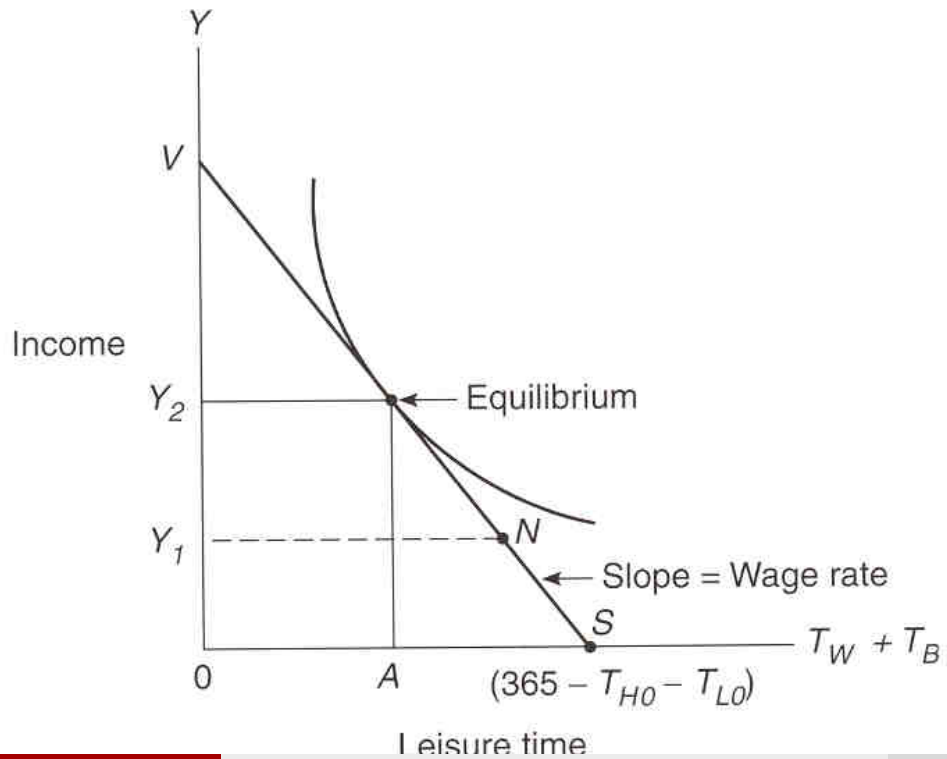
$$\Omega(=365) = T_H + T_Z + T_L + T_W$$

    where T_H and T_Z are time spent producing health and home good, T_L is the time spent in illness and T_W is the time spent working in the market place
  - Time spent in leisure is excluded for simplicity but can be easily accommodated in the model
  - To purchase M or X in the market place, income must be generated and hence time must be spent working – captured via T_W
- The consumer works at a wage rate w and earns wT_W
- Also let the market price of X and M be P_X and P_M

GROSSMAN MODEL

LABOR-LEISURE TRADE-OFF

- Call time spent in producing the home good T_Z leisure time
- Let time spent investing in health activities be fixed at T_{H0}
- Let time lost to illness be T_{L0}
  - Time spent on the home good is measured towards the right from origin
  - Time spent working is measured to the left from S
- Equilibrium pt. indicates how many hrs. person will choose to work

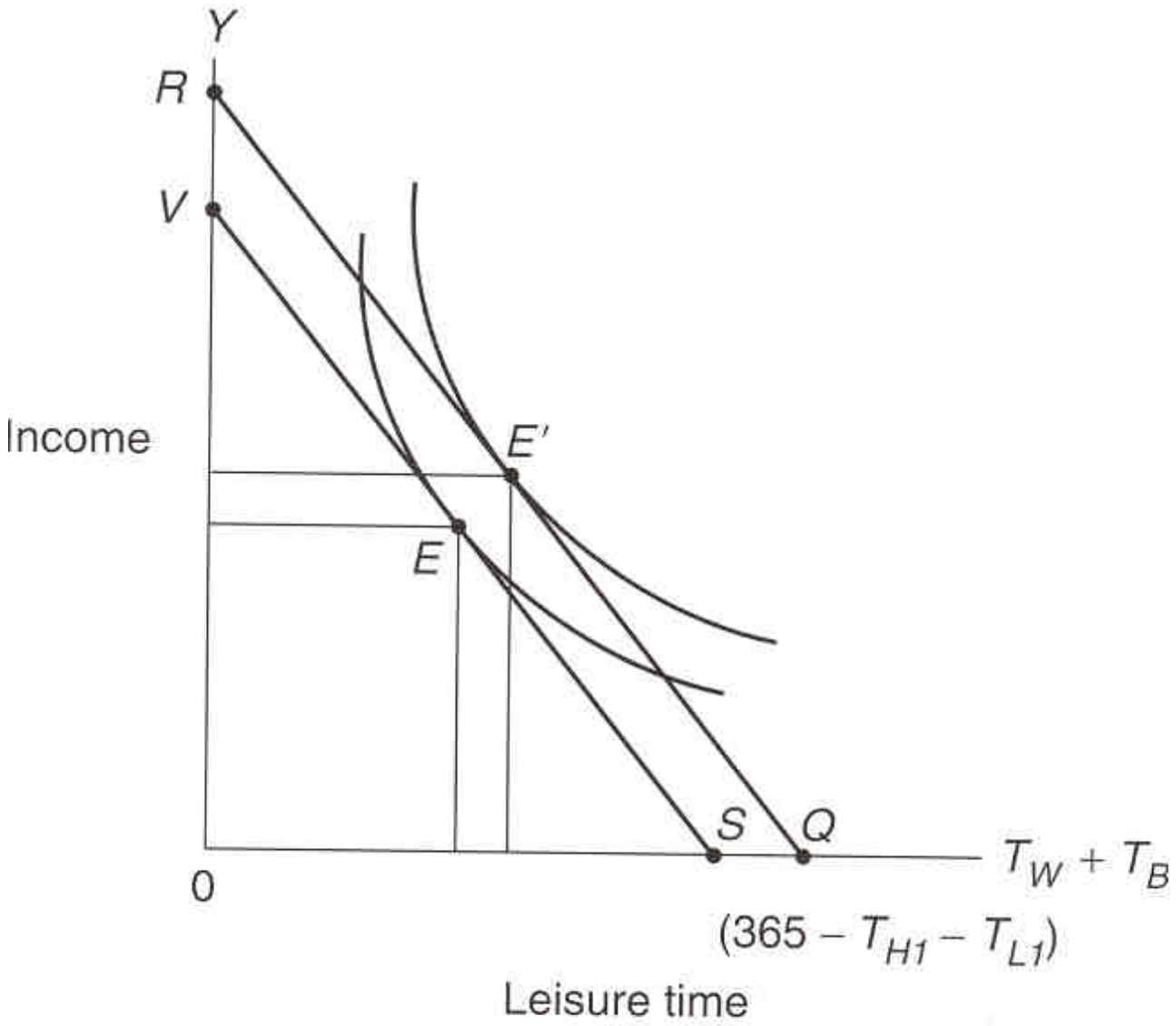


Now suppose T_H and T_L change

- T_H increases: $T_{H0} \rightarrow T_{H1}$; as a consequence
- T_L decreases: $T_{L0} \rightarrow T_{L1}$
- two effects: (1) less time available for other activities; (2) the increased health stock reduces time lost to illness
- If the net effect is positive: **the pure investment effect of health demand**
- Health investments add to potential leisure and
- increase potential income

Grossman Model

Labor-leisure trade-off



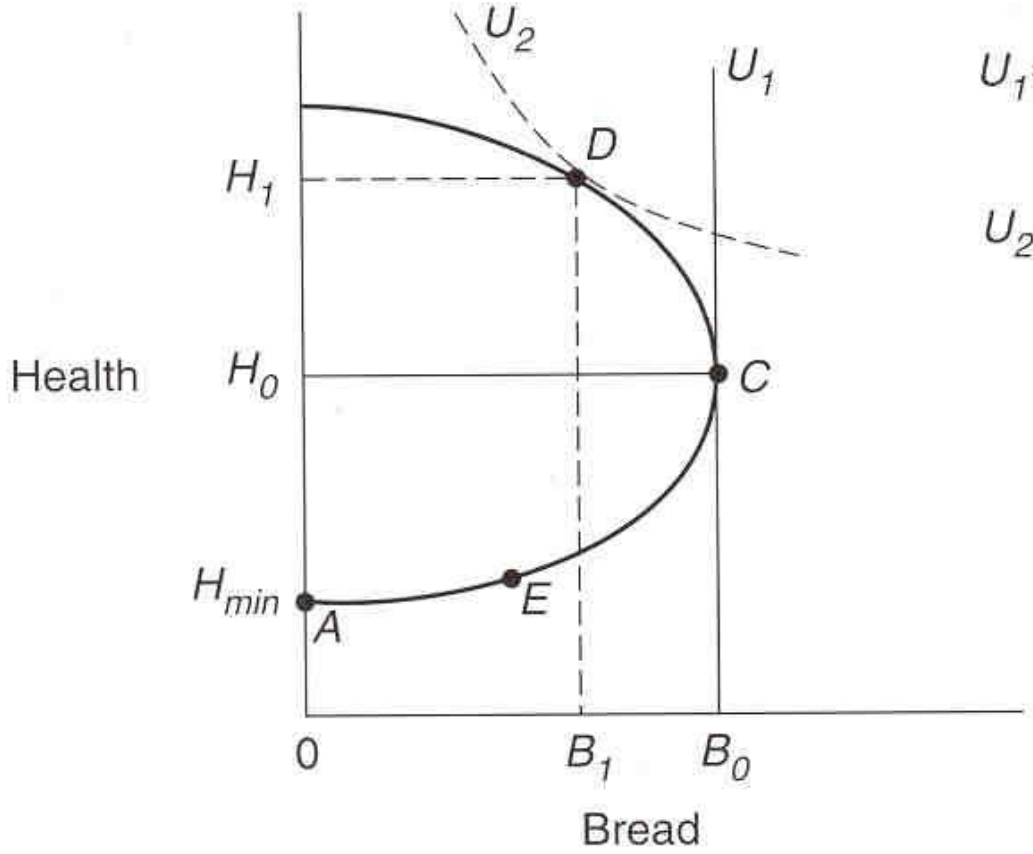
- The income-leisure line is shifted outward: VS $\rightarrow$ RQ
- Utility is increased ($E \rightarrow E'$)
  - more (future) income
  - more leisure (see figure)
  - and the individual is feeling better
- The improved health status might also increase a person's productivity at work (higher wages and a steeper income-leisure curve)

The investment aspect of health demand

An individual wishes to invest in her health even if the only value of health is its effect on earning future income.

Grossman Model

Investment & consumption aspects of health



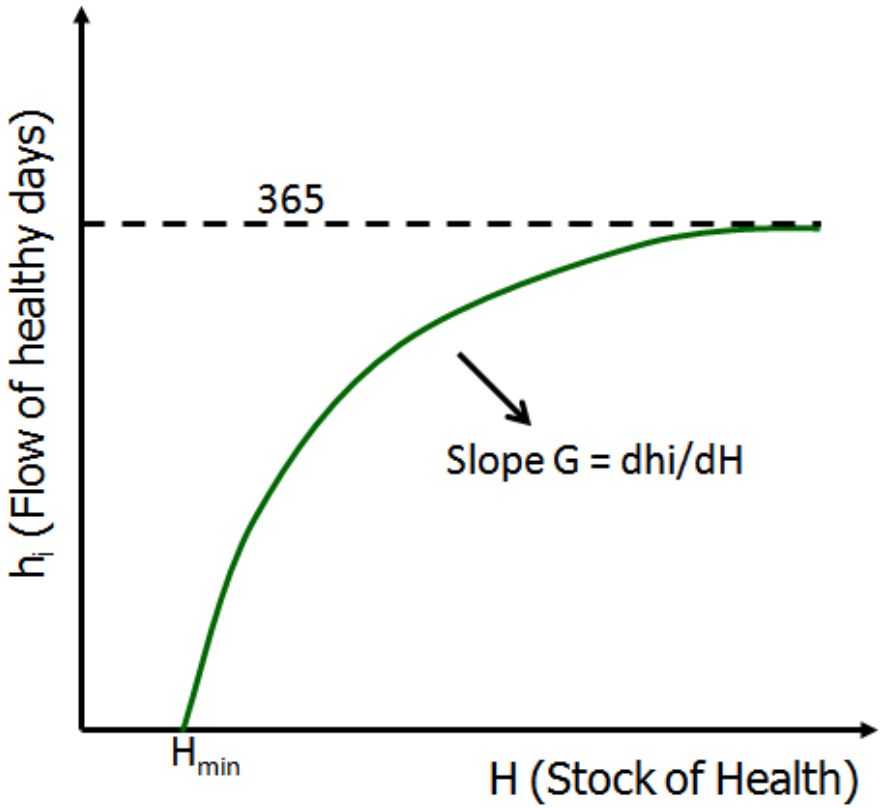
U_1=Ed derives utility from bread only

U_2=Ed derives utility from both health and bread

- The production possibility trade-off between H and B given the total amount of time available
  - $A \rightarrow C$: health improvements increase the amount of B
  - $H > H_{min}$: a minimum health capital stock is necessary to obtain income and leisure time necessary to produce B
  - $E \rightarrow C$: more time is made available for health $\rightarrow$ more leisure time and income for the production of the home good
- Suppose the utility from health is solely the ability to produce income and leisure time to produce the home good
  - vertical indifference curves
  - utility-maximizing choice in C
- If instead utility is not only derived from producing B but also directly from health itself (the consumption feature)
  - the more familiar indifference curve U_2
  - utility-maximizing choice in D
  - a higher health stock is chosen ($B_1 < B_0$)

Production of health days

- We view health as a productive good that produces single output, health days
- Health stock (H) on x-axis, health days (h) on y-axis
- Maximum 365 health days
- Bowed shaped – capturing the law of diminishing marginal returns – the slope G is is decreasing as H increases
- Minimum health stock need to live H_{min}



Health as a capital good

- **Cost** – what is the cost of a capita good?
  - Cost of holding capital good is the opportunity cost (what money could have earned else where, e.g. interest rate r) plus the rate at which capital depreciates (say δ)
  - Thus, $c = r + \delta$
- **Marginal Efficiency of Capital (MEC)** – (also called marginal efficiency (MEI)) is the rate of return on investment in capital
  - What is the rate of return on investment in health (i.e. of acquiring an additional unit of stock of health)?
    - Suppose the marginal product of health capital is G, i.e., an incremental addition to stock of health of ΔH would have resulted in change in healthy days Δh by $G \times \Delta H$
    - If health is purely an investment good, then the person could use the additional health days to work and gotten a return of $G \times w$ where is the wage rate
    - If the marginal cost of gross investment in health is π, then the marginal monetary return on investment in health is

$$\gamma = \frac{wG}{\pi}$$

Grossman Model

Consumers Problem

- The Grossman model specifies (and solves) essentially the following problem
  - $\max U(H_t, Z_t)$
  - such that
    - $H_t = H_{t-1} + I_t - \delta$
    - $I = I(M, T_H; E)$
    - $Z = Z(X, T_Z; E)$
    - $365 = T_H + T_Z + T_L + T_W$
- The problem is solved in a multi-period context and yields the equilibrium condition
  - $\gamma_t + a_t = r - \widetilde{\pi}_{t-1} + \delta_t$ where
  - $\gamma_t = w_t G / \pi_{t-1}$ is the marginal monetary return on investment in health (MEC)
  - $a_t = \frac{(Uh_t/\lambda)(1+r)^t G}{\pi_{t-1}}$ is the "psychic" rate of return on health
    - Uh_t is the marginal utility of health days
    - G is the marginal product of health capital (i.e., $G = \Delta h_i / \Delta H$)
    - π is the marginal cost of gross investment in health and $\widetilde{\pi}$ is the percentage rate of change of the marginal cost
    - w is the wage rate, r is the market interest rate
  - The solution states that an individual would demand that level of health stock where the total rate of return on health investment ($\gamma_t + a_t$) equals the cost of this capital ($r + \delta_t - \widetilde{\pi}$)

Grossman Model

Pure Investment and Pure Consumption Model

- The model allows us to think of health as a pure investment good or as a pure consumption good
  - Pure Investment Model
    - Psychic rate of return is zero, i.e., $a_i = 0$
    - This would happen if $Uh_i = 0$, i.e., marginal utility of healthy days is zero
  - Pure Consumption Model
    - Monetary rate of return is zero

Grossman Model

Pure Investment Model

- Pure Investment Model – psychic rate of return is zero, i.e., $a_i = 0$
- Then the equilibrium condition is

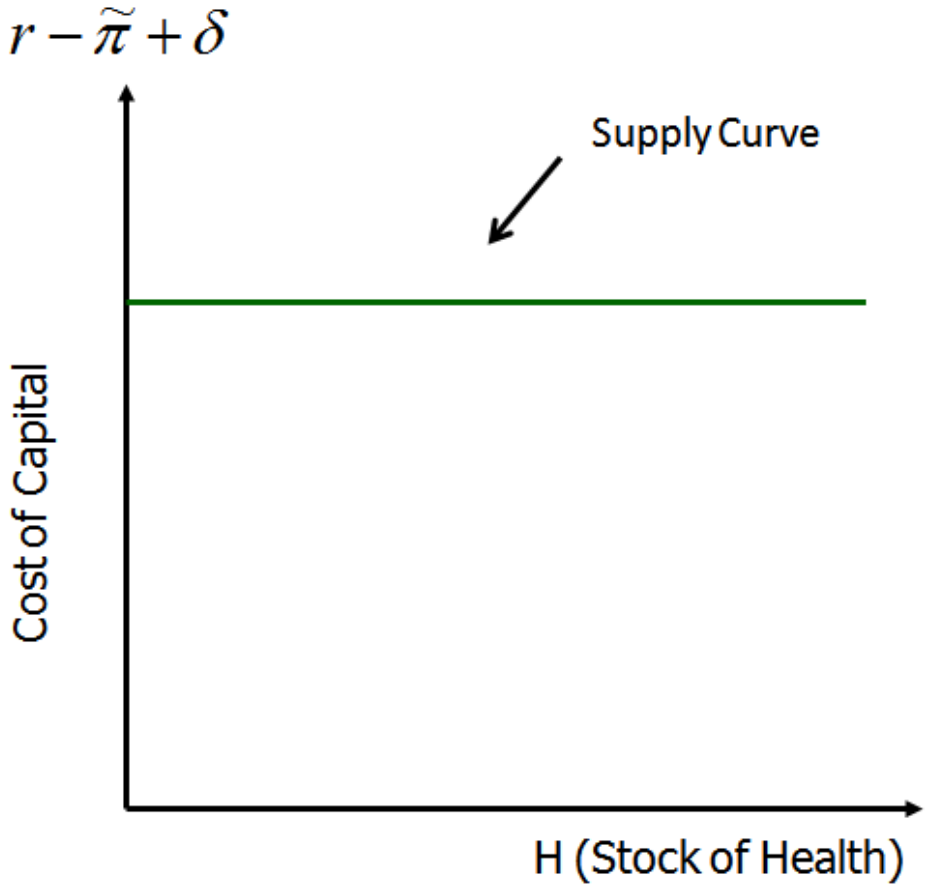
$$\gamma_t = \frac{wG}{\pi_{t-1}} = r - \widetilde{\pi}_{t-1} + \delta_t$$

- We can think of
  - $r - \widetilde{\pi}_{t-1}$ as the real own rate of interest
  - δ_t as the rate of depreciation of capital
  - The sum of these two quantities is the cost of capita – or the supply curve for health capital
  - Similarly $\gamma_t (= \frac{wG}{\pi_{t-1}})$, which is the MEC schedule can be thought of as demand for health capital – plotted against H, it shows how much extra expenditure is required for an additional unit of stock of health
- In equilibrium, the two must be equal to each other

Grossman Model

Pure Investment Model

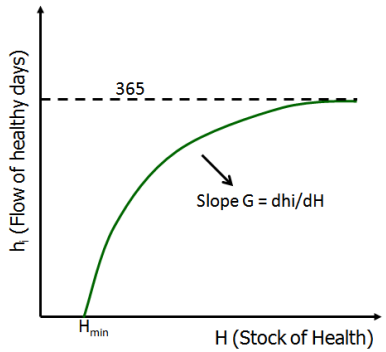
- Supply Curve
- Since $r - \widetilde{\pi}_{t-1}$ and δ_t are independent of stock of health, the supply curve is horizontal (and infinitely elastic)

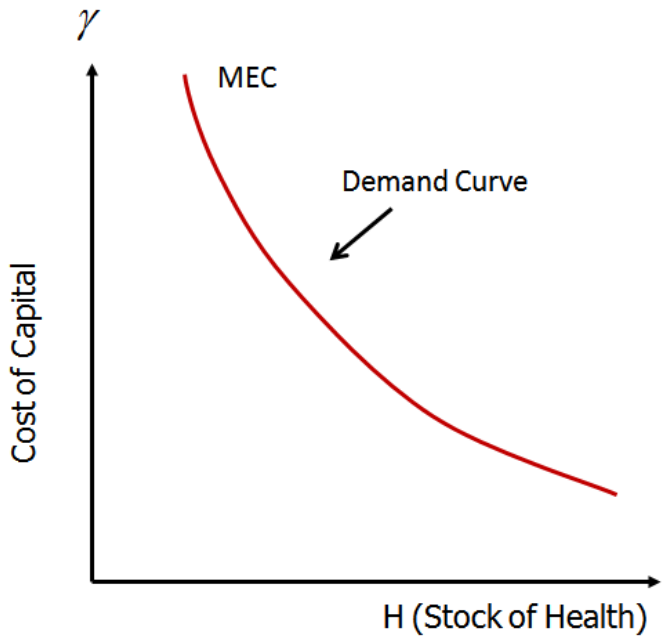


Grossman Model

Pure Investment Model

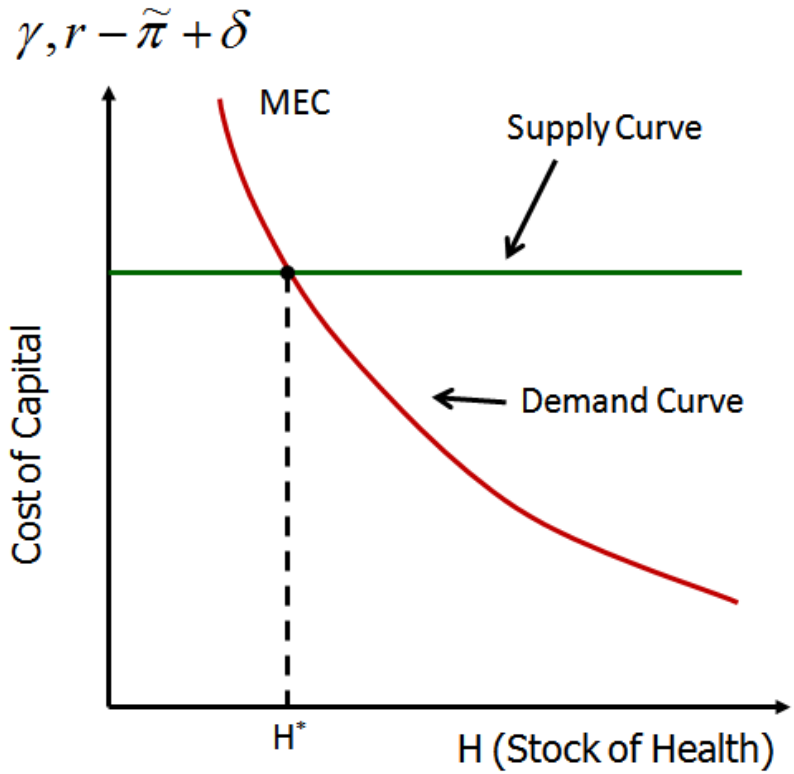
- Demand Curve
- Plot $\gamma_t (= \frac{wG}{\pi_{t-1}})$ against H
  - Note that it slopes downwards
  - Because G is the marginal product of health capital which is diminishing (it is the slope of curve of h against H and the slope is decreasing as H increases)
  - Thus, $\gamma_t = \frac{wG}{\pi_{t-1}}$ is decreasing as H increases





- Now put the demand and supply schedules together

- Equilibrium is where the two curves intersect (solution is at $\gamma_t = \frac{wG}{\pi_{t-1}} = r - \widetilde{\pi}_{t-1} + \delta_t$)
- The intersection point determines the stock of health an individual will have in equilibrium
- Note that the stock of health is *endogenous* in the model, i.e., determined by values of other parameters



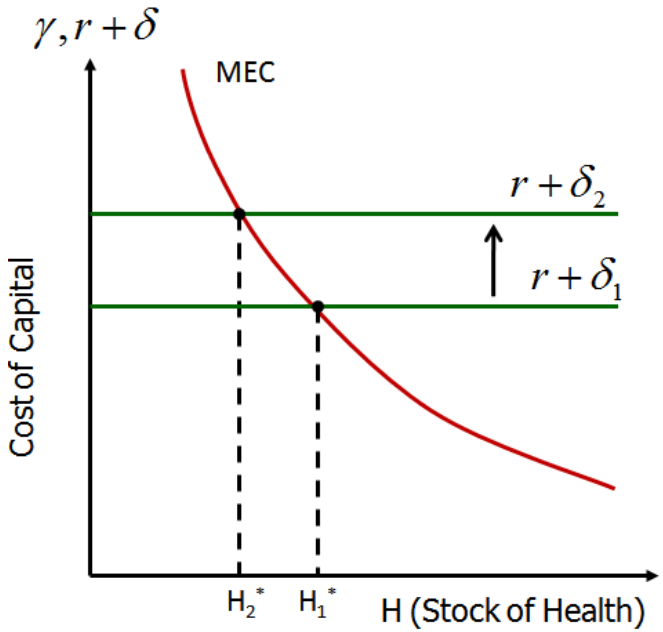
Grossman Model

Comparative Statics

- Comparative statics of the pure investment model
- Two types of statics explored
  - Evolutionary
    - Differences across time for the same person
    - Specifically, increase (change) in the rate of depreciation δ with age (or time)
  - Parametric
    - Differences across consumers of the same age
    - Specifically, across people of same age but with differences in δ, w, and E (depreciation rate, wage rate and education)

- Evolutionary (i.e., as a person ages)

- What happens as a person ages?
  - Plausible to assume that δ_t is positively correlated with age (i.e., with time t) at least after some point in life
  - So δ_t increase if t increases
  - Since the marginal cost of investment in health (π_{t-1}) does not depend on health, hence $\widetilde{\pi}_{t-1} = 0$
  - Thus, $\gamma_t = r + \delta_t$



- So as δ_t increases from δ_1 to δ_2 optimal health falls from H_1^* to H_2^* (elderly have a lower stock of health)
  - Investment in health does not necessarily follow the same path
  - It can be shown that if the elasticity of the MEC schedule is less than one, then I and δ are positively correlated (i.e. as a person ages, they invest more in health)

Grossman Model

Comparative Statics

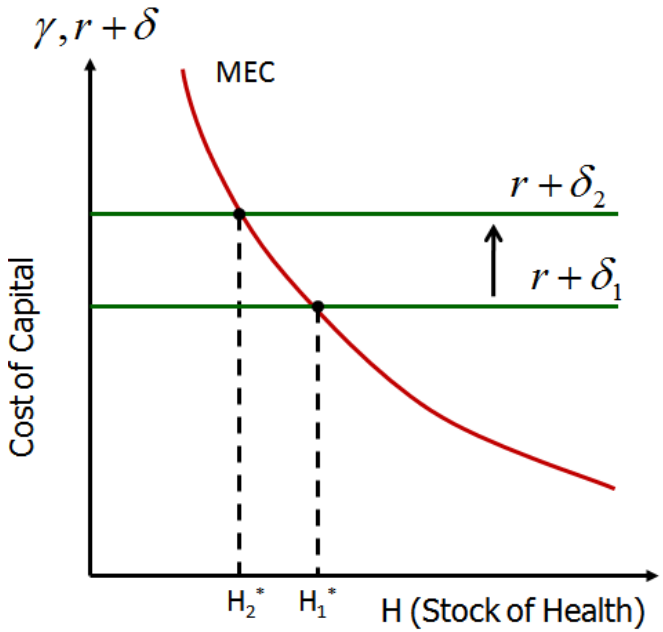
- Predictions (Health stock over life cycle)
  - The pure investment model predicts that health will decline with age
  - If health is also valued for consumption reasons – people increase their valuation of healthy days as they age – it implies a partial offset of the predicted health stock decline

Grossman Model

Comparative Statics

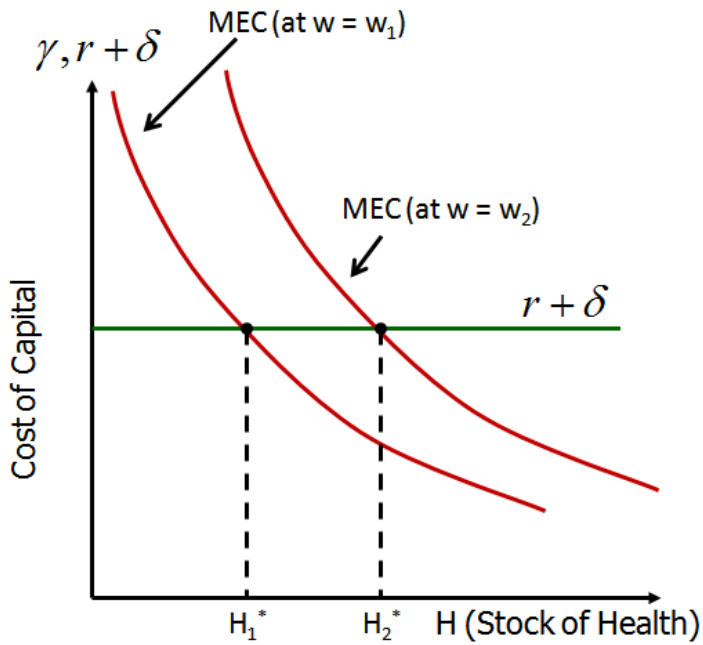
- Parametric shifts in δ – Differences in Depreciation Rate

- Suppose two different persons (or groups) have different values of δ such that $\delta_1 < \delta_2$
  - Same analysis as before ...
- Person with lower depreciation δ_1 chooses a higher value of stock of health H_1^* compared to the person with higher depreciation rate of δ_2 who chooses a lower stock of health H_2^*



- Parametric shifts in w – Wage Effects

- Suppose two people have different wage rates
  - Person 1 earns at wage rate w_1
  - Person 2 earns at wage rate w_2
  - Say $w_2 > w_1$
  - Recall that $\gamma_t = \frac{wG}{\pi_{t-1}}$
  - Thus, person with $w = w_2$ will have a MEC that is shifted out relative to the MEC for the person with $w = w_1$
- Thus, $w_2 > w_1 \Rightarrow H_2^* > H_1^*$
- Higher income, better health



Grossman Model

Comparative Statics

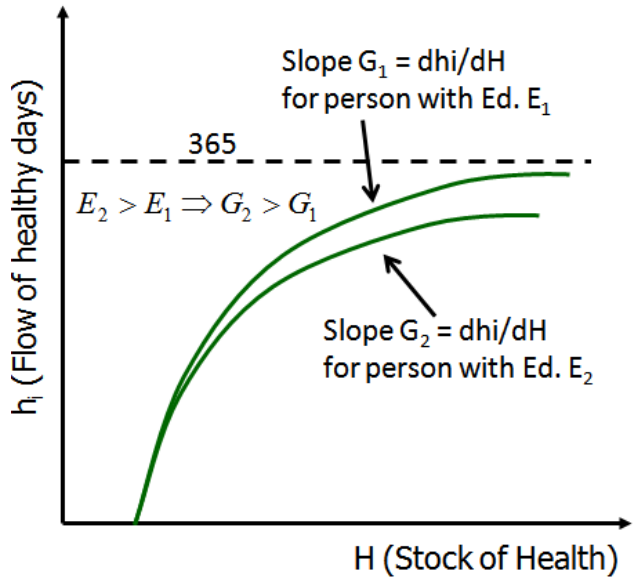
- Parametric shifts in w – Wage Effects (Continued)
- The result may be ambiguous
  - Increased opportunity cost of time in producing health investment
  - Implies a downward shift of the MEI curve is possible
- Retirement drops the wage to zero
  - No further investment in health under the pure investment version $\rightarrow$ health capital would depreciate until death
  - Under consumption effects: health stock would not necessarily drop to H_{min} directly upon retirement
  - Nonetheless, even if we include consumption effects: retirees would reduce their health stock since the investment motive has vanished

Grossman Model

Comparative Statics

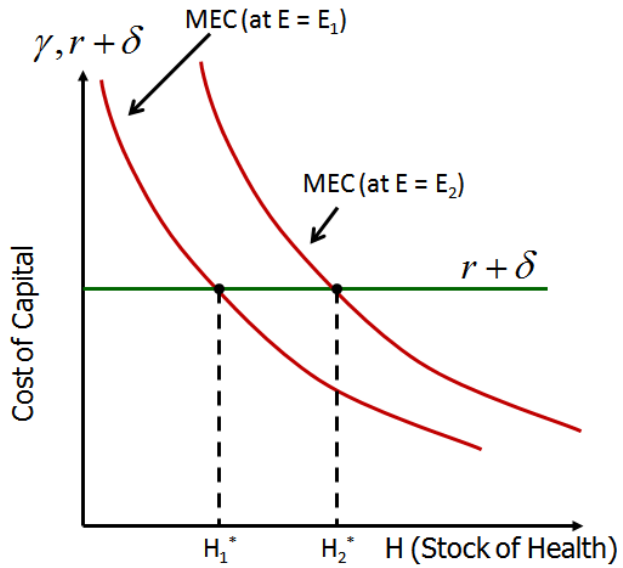
- Parametric shifts in E – Education Effect
  - Education is assumed to improve the efficiency to produce health investments (better knowledge of harmful effects of smoking; better ability to follow medical instructions, ...)
  - Education raises the marginal product of direct inputs $\Rightarrow$ given investments in health capital can be generated at less cost for educated people $\Rightarrow$ higher rates of return to a given health stock

- Suppose two people have different levels of education (say $E_2 > E_1$)
  - When $E_2 > E_1$ it implies at $G_2 > G_1$ (recall that G is the marginal product of health capital – slope of the curve of h against H)



- Parametric shifts in E – Education Effect (Continued)

- When $E_2 > E_1$ it i implies at $G_2 > G_1$ and hence MEC corresponding to E_2 is shifted out relative to MEC corresponding to E_1
- Thus, $E_2 > E_1 \Rightarrow H_2^* > H_1^*$
- More education, better health
- Can be shown that more educated demand less medical care as long as elasticity of MEC < 1



- Apart from this shift in MEC curve, additional effects may exist as well – difficult to disentangle
  - Individual likely to recognize the benefits of improved health
  - May enjoy feeling healthy (greater taste for health)

Grossman Model

Empirical Evidence

- Several studies provide empirical for the model ...
  - Leu & Doppmann (1986) and Leu & Gerfin (1992) confirm a decrease of health capital with age
  - Strauss et al. (1993) find that health based on activity limitation decreases with age and that higher education leads to improved health
  - Sickles & Yazbeck (1998) find that health care and leisure consumption tend to improve health
  - Gerdtham and Johannesson (1999) find that demand for health increases with income and education, and decreases with age, urbanization, being overweight, and being single
- Some studies, however, provide some unexpected results
  - Health – Wagstaff (1986) and Leu & Gerfin (1992) find a negative correlation between demand for medical services and health
  - Age – The prediction of an increase in the demand for medical services with age is rejected by the empirical literature (Duan et al. 1984, Newhouse & Phelps 1974, Zweifel 1985)
  - Education – Estimating a structural demand function for medical services Wagstaff (1986) finds a positive correlation between education and the demand for medical services

Grossman Model

Summary

- The Grossman model
  - The GM has yielded considerable insight into the determinants of health and into the allocation of time and money into health production
  - Empirical studies reveal, however, a negative correlation between health status and the demand for medical services
  - This challenges the perception that expenditure for medical services can be unequivocally derived from (health) demand

Demand for Medical Care

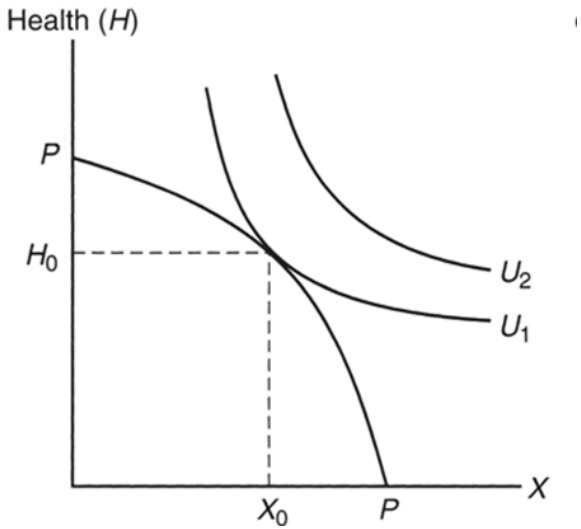
- Derived demand for medical care
- Factors that effect demand
- Empirical evidence

Demand for Medical Care

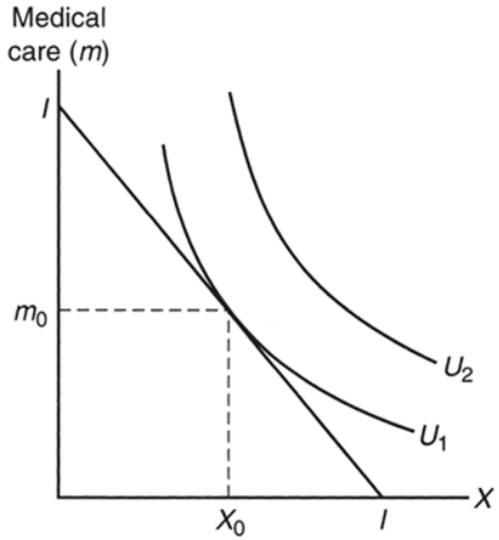
Derived Demand for Medical Care

- Consumer wants to maximize utility $U(H,X)$ subject to the constraints $H = g(M,O)$ and $p_x X + p_m m \leq I$

- Curve labeled PP is the *production possibility curve* – represents the feasible combinations of X and H the consumer can attain given budget and production function $H = g(M,O)$
- PP is downward sloping and concave because of diminishing marginal productivity of m in producing H
- Optimal combination of other goods and health – tangency point at (X_0, H_0)



- Straight line II is the budget line given by $p_x X + p_m m = I$
- I is consumers income, p_x and p_m are the prices of other goods and medical care
- Optimal combination of other goods and medical care – tangency point at (X_0, m_0)



Demand for Medical Care

Derived Demand for Medical Care

- Plot changes in price against optimal level of medical care at different prices to derive the demand curve for medical care
  - Say price for medical care changes from p_{m1} to p_{m2}
  - When price is p_{m1} consumer chooses m_1 level of medical care
  - When price falls to p_{m2} consumer chooses m_2 level of medical care
  - Left to right downward sloping demand curve for medical care