HUMAN

CAPITAL

INVESTMENT IN HUMAN CAPITAL

- Assumptions : - investment into onself one can increase own productivity
  - investment is also giving up of current earning

- CONTENT : simple examples → simple, signal, screening, >educat, estimation

CASE

$$-C_0 + \sum_{i=1}^{n} \alpha^i Y_i > 0$$

C_0 .... current investment cost

$Y_1 \dots Y_n$ .. generated income

$$\alpha_i = \frac{1}{1+r_i}$$

if $r_i = r$; $Y_i = Y$

$$-C_0 + Y \sum \alpha^i = -C_0 + \frac{Y}{r}(1-\alpha^n)$$

→ finite income stream
↳ see next page →

$$\boxed{\frac{Y}{r}(1-\alpha^n) > C_0}$$ criterium for investment

using IRR - internal Rate of Return approach

$$\frac{Y}{\rho}\left(1 - \frac{1}{(1+\rho)^n}\right) \stackrel{!}{=} C_0$$

↳ find ρ^* and see if $\rho > r$
→ advantageous investment

CASE

$Y_i = \overline{w} E_i \overline{H}$; $\Delta Y = Y_1 - Y_0$
$= \overline{w}\overline{H}\Delta E$

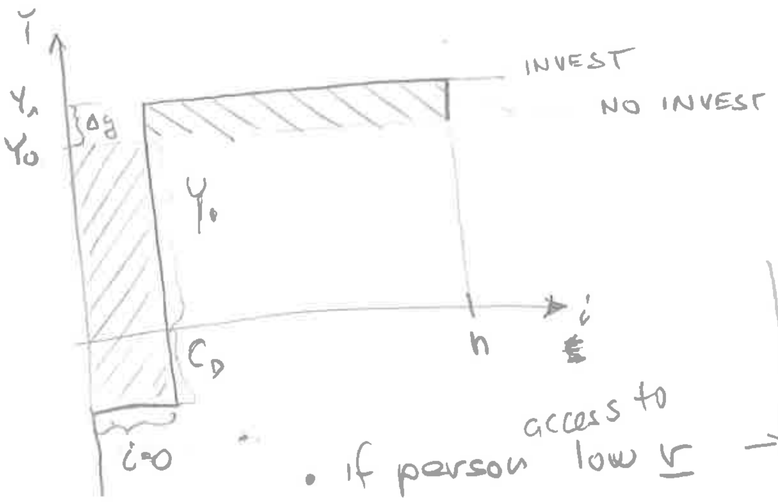
$C_0 = C_D + Y_0$

$H = \overline{H}$ ... hours worked

E – human capital

$w = \overline{w}$ rental value of k = wage

C_0 - cost < direct, forgone income



$$\boxed{\frac{\Delta Y}{r}(1-\alpha^n) > Y_0 + C_D}$$

- if person access to low $\underline{r}$ → $\frac{\Delta Y}{r}\uparrow$ → invest more
- the longer n → invest more
- invest early in carrier
- C_D - case of taxes
- returns to society from individual investment
- child labor

A note on geometric series #2

NOTE

$$S_n = 1 + q + \dots q^n$$

$$\left(S_{n+1} = 1 + q + \dots q^n + q^{n+1}\right)$$

$$qS_n = \underbrace{q + q^2 \dots q^n} + q^{n+1}$$

$$= S_n - 1 + q^{n+1}$$

$$S_n = \frac{1 - q^{n+1}}{1 - q}$$

$$q = \frac{1}{1+r} \qquad S_n = \frac{1 - \left(\frac{1}{1+r}\right)^{n+1}}{1 - \frac{1}{1+r}} = \frac{1 - (\quad)}{\frac{1+r-1}{1+r}} = \frac{1}{r}\left[(1+r) - \frac{1}{(1+r)^n}\right]$$

#1

$$S_n = q + q^2 \dots q^n = ? \qquad q = \frac{1}{1+r}$$

$$\left(S_{n+1} = \dots q^n + q^{n+1}\right)$$

$$qS_n = q^2 + \dots q^n + q^{n+1}$$

$$= S_n - q + q^{n+1}$$

$$S_n = \frac{q - q^{n+1}}{1 - q} = \left| q = \frac{1}{1+r} \right| = \frac{\frac{1}{1+r} - \left(\frac{1}{1+r}\right)^{n+1}}{\frac{r}{1+r}} = \frac{1}{r}\left[1 - \left(\frac{1}{1+r}\right)^n\right]$$

$$\equiv \frac{1}{r}\left[1 - q^n\right]$$

Or; using #1 & #2:

$$S_n = 1 + q + \dots q^n = \frac{1}{r}\left[(1+r) - \frac{1}{(1+r)^n}\right] \Rightarrow$$

$$\Rightarrow S_n - 1 = \frac{1}{r}\left[(1+r) - \frac{1}{(1+r)^n}\right] - 1 = \dots = \frac{1}{r}\left[1 - \left(\frac{1}{1+r}\right)^n\right]$$

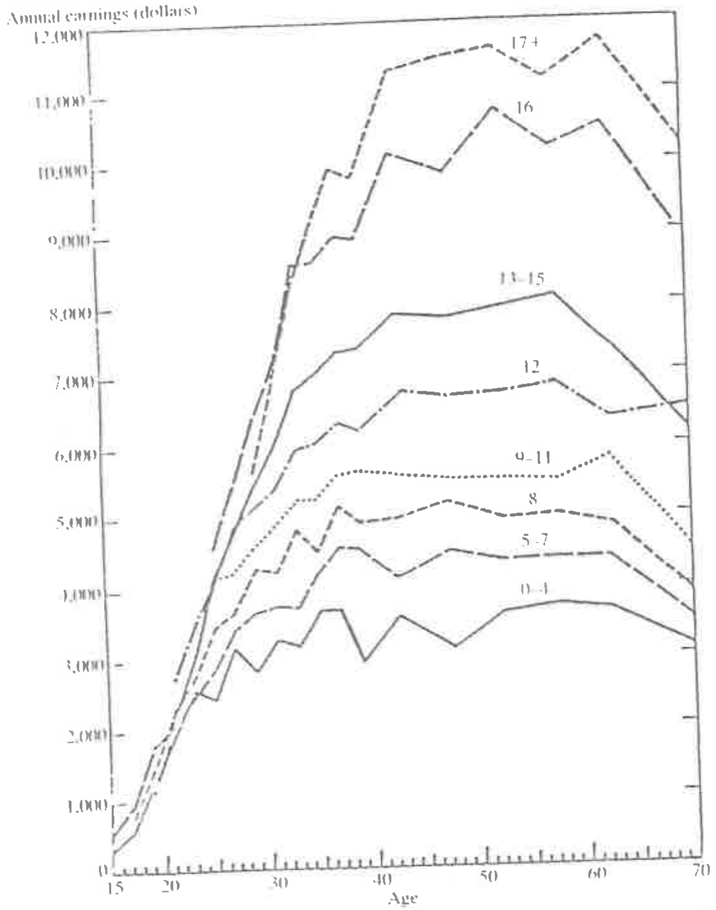


Figure 2.2 Age–earnings profiles of white non-farm men by schooling level, 1959. *Source:* Mincer, 1974, 66

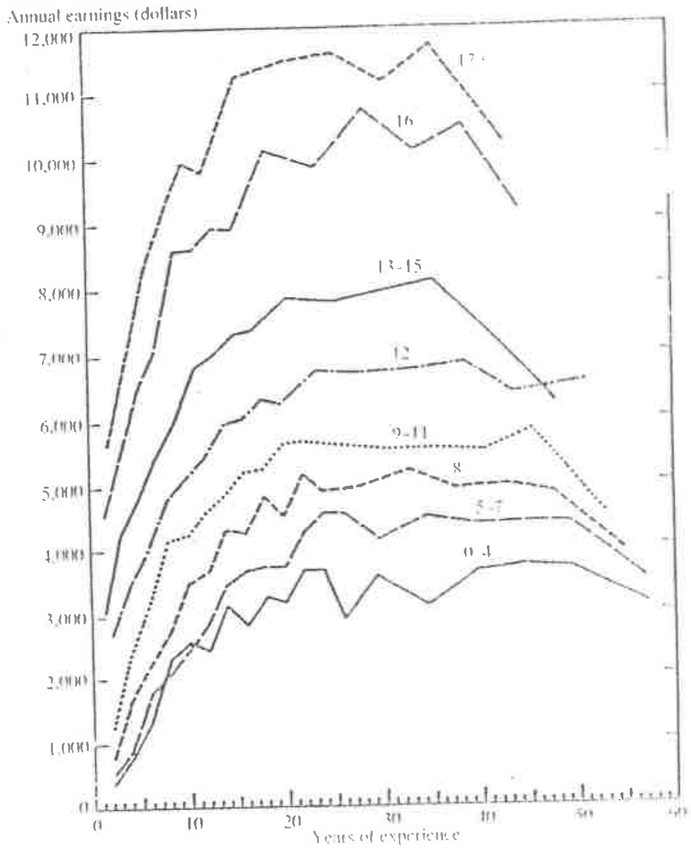


Figure 2.3 Experience–earnings profiles for white non-farm men by schooling level, 1959. *Source:* Mincer, 1974, 67

In figure 2.3 the two earnings patterns alluded to earlier are eminently clear: (1) earnings rise with age at a diminishing rate and (2) earnings profiles are

Original idea of HC model - Mincer

$\Downarrow E_t$

- At any period of Life, t, decission on how to alocaloaunit of timo (day, year)

$0<\Phi_t<1$; if $1-k_t$ ~ share devoted to work $\Rightarrow Y_t = \overset{*w=1}{E_t}(1-k_t)$

k_t ; —"— to studies.

forgone earnings (costs)

$C_t = k_t E_t$

increase in HC in the Future

$E_{t+1} = E_t + r C_t$

$r>0$ ~ return

$\Delta E_t = r C_t$

$\Delta E_t / C_t = r$

- Questions:
  - shape of Life-cycle profile of Y_t, E_t, C_t?
  - decissions driving k_t?
  - shape of profile during formal schooling?
  - decission driving optimal schooling?
  - testable predictions?

$$E_t \equiv Y_t + C_t$$

$$E_{t+1} = E_t + r C_t$$

$$C_t = \begin{cases} E_t & \sim \text{edu} \quad \#0 \\ c_0\left(1-\frac{t}{T}\right) & \sim \text{version\#1} \\ k_0\left(1-\frac{t}{T}\right)E_t & \sim \text{version\#2} \end{cases}$$

$$\frac{dE_t}{dt} = r C_t \Rightarrow dE_t = r C_t \, dt$$

#0 $$dE_t = r E_t \, dt$$

$$\frac{dE_t}{E_t} = r \, dt$$

$$\int \frac{dE_t}{E_t} \equiv \ln E_t = r*S + E_0$$

#2 $$dE_t = r k_0 \left(1-\frac{t}{T}\right) E_t$$

$$\frac{dE_t}{E_t} = r k_0 \left(1-\frac{t}{T}\right)$$

$$\int \frac{dE_t}{E_t} \equiv \ln E_t = r k_0 \underline{\underline{EXP}} - r k_0 \frac{t}{2T} \underline{\underline{EXP^2}} + E_s$$

$$Y_t = E_t - C_t = E_t\left[1 - k_0\left(1-\frac{t}{T}\right)\right]$$

$$\ln Y_t \cong \ln E_t - k_0\left(1-\frac{EXP}{T}\right)$$

$$\ln Y_t = \underline{const_1} + \beta * S + \gamma_1 EXP + \gamma_2 EXP^2$$

Sample of Mincer regression coefficients

	Coefficient on EXP	100*Coefficient on EXP2	Years of maximum returns from experience	Average years of schooling 1995	Coefficient on EDU	Period
Argentina	0.052	-0.07	37.1	0	0.11	1989
Austria	0.039	-0.067	29.1	11.9	0.04	1987
Bolivia	0.046	-0.06	38.3	0	0.07	1989
Brazil	0.073	-0.1	36.5	5.3	0.15	1989
Britain	0.091	-0.15	30.3	12.1	0.10	1972
Canada	0.025	-0.046	27.2	13.2	0.04	1981
Chile	0.048	-0.05	48.0	0	0.12	1989
China	0.019	0	n.a.	0	0.05	1985
Colombia	0.059	-0.06	49.2	0	0.15	1989
Czech R.	0.021	-0.04	26.3	12.5	0.03	Men, 1989
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Czech R.	0.028	-0.059	23.7	0	0.04	1988
Czech R.	0.032	-0.063	25.4	0	0.09	1996
Denmark	0.033	-0.057	28.9	12.4	0.05	1990
Ecuador	0.054	-0.08	33.8	0	0.10	1987
Greece	0.039	-0.088	22.2	10.9	0.03	1985
Guatemala	0.044	-0.06	36.7	0	0.14	1989
Hungary	0.034	-0.059	28.8	11.3	0.04	1987
India	0.041	-0.05	41.0	0	0.06	1981
Indonesia	0.094	-0.1	47.0	0	0.17	1981
Ireland	0.061	-0.1	30.5	10.8	0.08	1987
Israel	0.029	-0.046	31.5	0	0.06	1979
Italy	0.01	-0.027	18.5	10	0.03	1987
Kenya	0.044	-0.2	11.0	0	0.09	1980
South Korea	0.082	-0.14	29.3	0	0.11	1986
Malaysia	0.013	-0.004	162.5	0	0.09	1979
Mexico	0.084	-0.1	42.0	0	0.14	1984
Netherlands	0.035	-0.049	35.7	12.7	0.07	1983
Pakistan	0.106	-0.06	88.3	0	0.10	1979
Poland	0.021	-0.036	29.2	11.1	0.02	1986
Portugal	0.025	-0.04	31.3	10	0.09	1985
Singapore	0.062	-0.1	31.0	0	0.11	1974
Spain	0.049	-0.06	40.8	11.2	0.13	1990
Sweden	0.049	0	n.a.	12.1	0.03	1981
Switzerland	0.056	-0.069	40.6	12.6	0.07	1987
Thailand	0.071	-0.088	40.3	0	0.09	1971
USA	0.032	-0.048	33.3	13.5	0.09	1989
West Germany	0.045	-0.077	29.2	13.4	0.08	1988
AVERAGE	0.049	-0.069	42.9	11.6	0.09	-

Mark Bils and Peter J. Klenow, 1997, Does Schooling Cause Growth or the Other Way Around?, pp.36.