

# Simple Model of Human Capital Formation

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- $H(t)$  = Human capital
- $I(t)$  = Time investment
- Total time per period = 1
- Human production function:

$$(*) \quad H(t+1) - H(t) = F(H(t), I(t))$$

- $F_1, F_2 > 0, F_{11} < 0, F_{22} < 0$
- Ben Porath:

$$H(t+1) - H(t) = F(I(t)H(t))$$

- Maximize earnings (at time  $t$ ) over the rest of life ( $T - t$ ):

$$\max \sum_{j=0}^{T-t} \frac{H(t+j)(1 - I(t+j))W}{(1+r)^j}$$

subject to (\*)

- $WH$  is cost of time (wage)
- $W$  is payment per unit  $H$

## 2 Period Model ((1) and (2))

$$(*) \quad H(2) = H(1) \underbrace{(1 - \delta)}_{\text{depreciation}} + F(\underbrace{H(1)}_{\text{self-productivity}}, \underbrace{I(1)}_{\text{investment}})$$

- How much investment in period 2?
- None – can't take it with you. You cash out.

- Agent maximizes

$$\sum_{j=1}^2 \frac{WH(j)(1 - I(j))}{(1 + r)^{j-1}}$$

$$\max_{I(1)} \frac{WH(2)}{1 + r} + WH(1)(1 - I(1))$$

$$FOC : \frac{W}{1 + r} \overbrace{\frac{\partial F(H(1), I(1))}{\partial I(1)}}^{\text{marginal product}} - \overbrace{WH(1)}^{\text{marginal cost}} = 0$$

- Notice as  $H(1) \uparrow$ , marginal cost  $\uparrow$ , marginal productivity of  $I$  may or may not  $\uparrow$ .

- Neutrality (Ben Porath):

$$\begin{aligned}\frac{W}{1+r} H(1) F'(I(1)H(1)) \\ = WH(1)\end{aligned}$$

$$\text{Thus } \frac{1}{1+r} F'(I(1)H(1)) = W.$$

- Neutralizes effect of  $H$  on cost and productivity offsets it
- Otherwise productivity effect does not offset cost of time effect