Human Capital Accumulation, Private Information, and Insurance

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Introduction

Q: How does Human Capital (HC) accumulation interact with Insurance Markets?

Human Capital delivers stochastic returns (e.g., Carneiro-Cuhna-Hansen-Heckman-Navarro-...).

1. How incomplete insurance markets affect HC accumulation?

2. Is there scope for public intervention? If yes, how?

Focus on Insurance of HC risk (not on liquidity)

Review of a selected literature;

Discuss how answers depend on the nature of markets: exogenously vs endogenously incomplete markets.
Exogenous Markets and Linear Taxes

- Anderberg & Andersson (2003) and Jacobs et al. (2010), Pavoni & Gottardi (2012), Gottardi et al. (2012)

Endogenously Incomplete Markets and/or Optimal Taxation

- Kapicka (2006-2010-2012), Abraham et al. (2012)
The Working Model
Technology and Preferences

- Agents face idiosyncratic shocks (health/job/disability):
  \[ \tilde{\theta} \in \{\theta, 0\} \quad \text{where} \quad \theta > 0 \quad \text{with prob. } \pi. \]

- Agents live two periods;
- At \( t = 0 \) they invest in HC; in \( t = 1 \) they work
- Fixed inter-temporal transfer technology \( 1 \Rightarrow \frac{1}{q} \)
- Labor income is given by \( y = w(h_0)\tilde{l}_1 \), with \( w'(h_0) \geq 0 \).

- Preferences over consumption, HC and labor \((c_0, h_0, c_1, l_1)\):
  \[ u(c_0 - h_0) + \beta [u(c_1) - v(l_1)]. \]
  \( p = 1 \) price of HC; \( u \) concave, \( v \) convex (strictly), \( v(0) = 0 \).
Market Arrangements
Complete Markets (First Best)

Assume that all actions are public information

\[
\max_{c_0, h_0, c(\theta), c, l(\theta) \geq 0} u(c_0 - h_0) + \beta \pi [u(c(\theta)) - v(l(\theta))] + \beta (1 - \pi) u(c)
\]

subject to

\[
y_0 - c_0 + q \pi [w(h_0)\theta l(\theta) - c(\theta)] - q(1 - \pi) c \geq 0. \quad (\lambda)
\]

1. Full-Insurance: \( c(\theta) = c = c_1^* \)

2. Production efficiency: \( \theta w(h_0^*) u'(c_1^*) = v'(l^*(\theta)), \quad l(0) = 0 \)

3. Intertemporal efficiency: \( q u'(c_0^* - h_0^*) = \beta u'(c_1^*) = q \lambda \)

4. HC investment optimality:

\[
\frac{1}{q} = \pi w'(h_0^*)\theta l^*(\theta).
\]
Policy Concepts and Terminology

1. First-Best social returns can be compared to social returns in imperfect economies. Is it a useful concept?

2. First-Best social margins can be compared to social margins in imperfect economies; perhaps more useful.

3. For each economy, one can compare social margins vs private margins $\Rightarrow$ wedges.

4. In general, (linear) taxes differ from wedges.
   - They are the same only in concave economies
   - Wedges inform on ‘third-best’ linear taxes in non-concave economies (Ramsey)
Private Margins and Wedges

- Now we ask: **is the agent at his/her private optimum?**

- Private and social margins for savings coincide:
  \[ qu'(c_0^* - h_0^*) = \beta u'(c_1^*) \]

- As they do for labor supply:
  \[ \theta_w(h_0^*)u'(c_1^*) = v'(l^*(\theta)), \quad l(0) = 0. \]

- Private margin for HC investment is also aligned to social margin:
  \[ \frac{1}{q} = \pi w'(h_0^*)\theta l^*(\theta) \]

⇒ With complete insurance markets **all wedges are zero.**

In this talk say: 'there is no scope for policy intervention'.
The Bond Economy

- Assume that $y$, $\tilde{\theta}$, $l$ and period 1 consumption all unobservable
- Agents cannot be insured against shocks (self-insurance)

$$\max_{h_0, k_0, l} u(y_0 - h_0 - qk_0) + \beta \pi [u(y + k_0) - v(l)] + \beta (1 - \pi) u(k_0)$$

s.t. $y = w(h_0)\theta l$

- Optimal choice of $k_0$ (Euler Equation):

$$qu'(c_0 - h_0) = \beta \sum_{\theta} \pi_{\theta} u'(c(\theta))$$

- Labor supply:

$$\theta w(h_0)u'(c(\theta)) = v'(l(\theta)), \quad l(0) = 0.$$
Bond Economy II: Policy Predictions

- HC investment margin (HC is a ‘bad’ asset):

\[ \frac{u'(c_0 - h_0)}{\beta u'(c(\theta))} = \frac{\pi(h_0)w'(h_0)\theta l(\theta)}{q} > \frac{1}{q} \]

- Note: uncertainty reduces the level of HC investment \((h_0 < h^*_0)\) and tends to increase \(k_0\) (precautionary savings).
- A tax on \(k_0\) might increase \(h_0\) as it would a HC subsidy.
- In fact, there is again no scope for government intervention.
- All private and social margins coincide (constrained efficient): **Exogenously incomplete markets & no pecuniary externalities.**
Endogenous Insurance Markets
Observable HC

- $y_0$, $y$, $h_0$, savings, and consumption in period 1 are observable.
- $\tilde{\theta}$ and $l$ are not.

$$\max \quad u(c_0 - h_0) + \beta \pi [u(c(\theta)) - v(l(\theta))] + \beta (1 - \pi) u(c)$$
subject to
$$y_0 - c_0 + q\pi [w(h_0)\theta l(\theta) - c(\theta)] - q(1 - \pi)c \geq 0; \quad (\lambda)$$

$$u(c(\theta)) - v(l(\theta)) \geq u(c) \quad (\mu)$$

- First-Best rule for HC investment

$$\pi w'(h_0)\theta l(\theta) = \frac{1}{q}.$$
Intuition of the First-Best rule for HC

- The social cost of investment is not distorted by incentives:
  \[ u'(c_0 - h_0) = \lambda \]

- The direct returns of \( h_0 \) are fully internalized by the insurer which gives in exchange an allocation: \( q\lambda \pi w'(h_0)\theta l(\theta) \)

- Social margin is not distorted by incentives: \( h_0 \) is ‘neutral’ to the ex-post incentives for the insurer.
  In general, the multiplicative-separable form \( w(h_0)\theta \) matters.

Q: What does the first best rule mean for policy?
Private Margins

- Again, would a private agent be happy to remain with the stated allocation?
- Labor margin is alligned to social margin (no-distortion-at-the-top)
- Some private margins are distorted (Wedges)

1. **Savings are discouraged** (complement to shirking):
   \[ qu'(c_0 - h_0) < \beta \left[ \pi u'(c(\theta)) + (1 - \pi) u'(c) \right] \]

2. **Subsidize HC** (complement to working):
   - Expected Return:
     \[ \pi w'(h_0) \theta l(\theta) = \frac{1}{q} \]
   - Risk-adjusted private cost:
     \[ \frac{u'(c_0 - h_0)}{\beta u'(c(\theta))} > \frac{1}{q} \]
Unobservable HC

- $y_0$, $y$, savings, and consumption in period 1 are observable.
- $\tilde{\theta}$ and $h_0$, $l_1$ are not observable.

$$\max \quad u(c_0 - h_0) + \beta \pi \left[ u(c(\theta)) - v \left( \frac{y(\theta)}{w(h_0)\theta} \right) \right] + \beta(1 - \pi)u(c)$$

subject to

$$y_0 - c_0 + q\pi [y(\theta) - c(\theta)] - q(1 - \pi)c \geq 0; \quad (\lambda)$$

$$u(c_0 - h_0) + \beta \pi \left[ u(c(\theta)) - v \left( \frac{y(\theta)}{w(h_0)\theta} \right) \right] + \beta(1 - \pi)u(c) \quad (\mu)$$

$$\geq u(c_0) + \beta u(c) \quad \text{under-invest and lie: } \hat{h}_0 = 0 \text{ and } \hat{\theta} = 0.$$
Results and Intuitions

- It is optimal to have HC paying a positive premium (’second best’ $h_0$ is below first best rule)

$$\pi w'(h_0)\theta l(\theta) > \frac{1}{q}.$$ 

- In this problem, the cost of $h_0$ is affected by incentives:

$$u'(c_0 - h_0)(1 + \mu) = \lambda$$

- $h_0$ is now reduced - $u(c_0 - h_0)$ hence increases - to discourage the agent to deviate: under-invest and lie.

Q: What about Private Margins?

1. HC private and social margin coincide by construction;

2. Savings are again discouraged:

$$qu'(c_0 - h_0) < \beta \left[ \pi(h_0)u'(c(\theta)) + (1 - \pi(h_0))u'(c) \right]$$
Summary

- Economies with different informational frictions:
  1. Complete insurance markets (First-Best);
  2. The Bond economy (self-insurance);
  3. Imperfect insurance with observable HC;
  4. Imperfect insurance with hidden HC investment.

- We focused on social margins compared to F-B and wedges.

- In 2. social margins differ from that of 1. (F-B). But in both economies there is no case for policy intervention (wedges=0).

- In 3. & 4. savings are always discouraged while HC should be (weakly) subsidized (positive vs negative wedges).

- In 3. social returns follow a First-Best rule, while in 4. HC investment is below the First-Best rule (social margins are ’distorted’ away from First-Best rules as HC investment interacts with incentive constraints).
Discussion

1. Allowing for endogenous capital returns: \( k_0 \) always follows first best rule

\[
\frac{1}{q} = f'(k_0^*)
\]

2. This talk was not on whether we should change existing policies:
   - We do not know what are the existing markets (empirical question)
   - Policy reforms are quantitative questions.

3. Heterogeneous returns: If type is partially known in advance by the agent and \( h_0 \) is observable, we have ‘tagging’ on an endogenous variable.

4. What about income taxation and HC? (endogenous weights)

5. What about hidden assets? (regressive taxation)