Schooling, Experience, and Earnings

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- We learn much of what we know "on the job"

  - We punish you with problem sets, but on the job you'll eventually learn to teach, maybe even to write

- The Mincer framework puts experience and schooling on a continuum

  - Becker also asks: who pays for your OJT?

Lets Get Specific About General HK

- The distinction can be drawn in two periods

$$\pi(L) = pf_0(L) + \frac{pf_1(L)}{1+r} \quad (w_0 + c)L \quad \frac{w_1}{1+r}L$$

where c is training cost and w_0, w_1 are wages in periods 0 and 1

  - Assume $f_1'(L) > f_0'(L)$ by virtue of OJT paid for by c

- f.o.c.

$$pf_0'(L) + \frac{pf_1'(L)}{1+r} = (w_0 + c) + \frac{w_1}{1+r}$$

which we can write

$$MP_0 + \frac{MP_1}{1+r} = (w_0 + c) + \frac{w_1}{1+r}$$

- How will wages evolve?

  - If training raises my MP to MP_1 for all employers, my OJT is said to produce *general HK*

    * In general, you better pay me what I'm worth: $w_1 = MP_1$

  - This implies: $w_0 = MP_0 \quad c$, from which we conclude that *workers pay for general HK*

- – If training is specific, that is, when the employer that provides OJT benefits uniquely from the resulting productivity boost, the period 1 wage need only clear MP_1 *elsewhere* (this might be equal to MP_0), hence he may share the costs of my OJT, paying $w_0 > MP_0 - c$

- The notion that most HK is general (and therefore paid for by workers) can explain why wages increase with experience (not the only possible explanation for that, of course)

  - – Mincer gives us a functional form that captures this

- Note policy implications of general HK: min wage is double bad, yo!

- Acemoglu and Pischke (1998, 1999) and Autor (2001) question the Beckerian conclusion that workers pay for general skills training. As an empirical matter, many firms pay for what looks like general skills training. The explanation, as with many such puzzles, revolves around worker heterogeneity and market structure.

The Mincer Earnings Function

- Mincer (1974) asks

  - – How do schooling and OJT generate wages over a working life?

- Assumptions

  - – HK production technology is given

  - – The investment path is exogenous; Ben-Porath (1967) does the endogenous case, not empirically very tractable; but Mincer can be interpreted as choosing a specification suggested by the YBP analysis

- Details

  - – $k(t)$ = fraction of earnings capacity devoted to investment in HK, fraction $1 - k(t)$ can be consumed

  - – The rate of return on HK is fixed at ρ for all workers, a parameter determined by market forces (equalizing differences, perhaps)

  - – Earnings are given by $y(t) = (1 - k(t))E(t)$ where $E(t)$ is "earnings capacity", my marginal product, which determines my pay if I don't spend anything on OJT

  - – Assuming I reap the rewards to my OJT in continuous (is that real?) time, this implies

$$E'(t) = \rho k(t) \cdot E(t) = g(t) \cdot E(t)$$

where $g(t) = \rho k(t)$. Equivalently,

$$\frac{d \ln E(t)}{dt} = g(t)$$

Assuming $g(0) = k(0) = 0$, this simple differential equation has solution

$$E(t) = E(0)e^{\int_0^t g(\tau)d\tau} \tag{1}$$

- Schooling

  - For the first s years of life, set $k(t) = 1$, with $k(t) = 0$ for $t > s$
  - This implies

$$\begin{aligned} g(\tau) = \rho k(\tau) = \rho \qquad & 0 \le \tau \le s \\ = 0 \qquad & otherwise \end{aligned}$$

  so for $t > s$,

$$y(t) = E(s) \equiv E(0)e^{\rho s}$$

  and

$$\ln y(t) = \ln y(0) + \rho s$$

  as in the eq. diffs. story (What about $t < s$?)

- Experience

  - For $t > s$, let $x = t - s$ and set $\tilde{k}(x) = k_0(1 - \frac{x}{T})$ for $0 \le x \le T$ and 0 otherwise: investment declines linearly from k_0 to 0.
  - This comes from YBP-67 in the sense that he shows: (a) some post-schooling investment is optimal; (b) investment should decline with age because the payoff horizon shrinks
  - Break (1) up to write earnings as a function of schooling and time

$$E(s,t) = E(0)e^{\int_0^s g(\tau)d\tau + \int_s^t g(\tau)d\tau} = E(s)e^{\int_s^t \tilde{g}(\tau)d\tau} \tag{2}$$

  - next, change vars from t to $x \equiv t - s$:

$$E(s,x) = E(s)e^{\int_0^x g(\tau)d\tau} \tag{3}$$

  where $\tilde{g}(x) = \rho \tilde{k}(x)$ describes investment as a function of *potential experience*, $x = t - s$
  - Sub using $\tilde{k}(x) = k_0(1 - \frac{x}{T})$ to find

$$E(s,x) = E(s)e^{\int_0^x [\rho k_0 - \rho k_0 \frac{\tau}{T}]d\tau} \tag{4}$$

  Integrate and log to find

$$\begin{aligned} \ln E(s,x) &= \ln E(s) + \rho k_0 x - \frac{\rho k_0}{2T}x^2 \\ &= \ln E(0) + \rho s + \rho k_0 x - \frac{\rho k_0}{2T}x^2 \end{aligned}$$

- Finally, using $y(s,x) = [1 - k(x)]E[s,x]$ and the fact that $\ln(1 - k(x)) \cong - k(x) = - k_0(1 - \frac{x}{T})$, we get the *Mincer wage equation*

$$
\begin{aligned}
\ln y(s,x) &= \ln E(0) + \rho s + \rho k_0 x - \frac{\rho k_0}{2T}x^2 - k_0(1 - \frac{x}{T}) \\
&= [\ln E(0) - k_0] + \rho s + \left[\rho k_0 + \frac{k_0}{T}\right]x - \frac{\rho k_0}{2T}x^2
\end{aligned}
$$

  Heckman (1976) found that this does well against a more rigorously YBP-founded spec
- When do earnings peak? Solve for x^* in

$$
x^* = \frac{\rho k_0 + \frac{k_0}{T}}{\rho k_0/T} = T + 1/\rho
$$

  which equals 40 for $T = 30$ and $\rho = .1$

  * I'm not yet over the hill (in this model, earnings peak after investment stops - whew!)

- Mincer also computes the *over-taking age*: the age (or experience level) at which the earnings of someone with schooling $s + \Delta$ pass the earnings of someone with school s. Note that we need the quadratic term for this to happen in our lifetimes!

- Questions

  - Why is this a model of general HK?

  - In what sense does Mincer place schooling and experience on a continuum?

Wage 'Metrics

- Mincer functional forms put to the test in Murphy and Welch (1990)

- Experience vs seniority in Altonji and Shakotko (1987) and Topel (1991)

- Causality, as always, at issue

Angrist 1990: The price of service

- Draftees suffer a loss of earnings and, not coincidentally, perhaps, a loss of experience

- Other experience experiments: plant closure and layoffs

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