“Agency, Earnings Profiles, Productivity, and Hours Restrictions” by Edward P. Lazear

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Earnings Profiles

2007 ACS sample

Mean weekly wage full time employed males

Age

20 30 40 50 60 70

400 600 800 1000 1200 1400
Why do earnings increase with age?
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- Human Capital Story
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  - On-the-job training, skill acquisition
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  - In case of imperfect information it is optimal to pay workers less when young and more when old
Why do earnings increase with age?

- Human Capital Story
  - On-the-job training, skill acquisition

- This paper: Agency Approach
  - In case of imperfect information it is optimal to pay workers less when young and more when old
  - Even with human capital/productivity being constant over the life-cycle
Agency Approach

Given imperfect information:
- Worker=Agent
  - Incentive to supply less effort/to shirk.
  - If discovered shirking $\Rightarrow$ fired.
  - Incentive to shirk reduced by increasing wage profile; i.e. wage lower than productivity when young and higher when old.
- Firm=Principal
  - Holding out worker's payments gives incentive to terminate contract before end.
  - Flatter wage profile reduces incentives for dishonesty.
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    contract before end.
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$V(t) = \text{worker's productivity}; \ W(t) = \text{wage profile} \ \hat{W}_t = \text{reservation wage}\ T = \text{efficient date of retirement}; \ t = \text{firm would dismiss worker}$
Two Opposing Forces

- Worker=Agent
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- Worker=Agent
  - Steeper wage profile reduces incentives to shirk

- Firm=Principal
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⇒ Find the optimal wage profile
  - i.e. the one that maximizes workers' lifetime earnings s.t. zero profits of firms.
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Solving for the optimal wage profile

- Maximize workers’ life time wealth subject to
  - Zero-profits by firms; i.e. honest firms pay out wage stream equal to expected value of lifetime marginal product
  - Optimal retirement such that at T expected productivity equals alternative time use

- Assumptions:
  - Competitive firm
  - Workers have perfect information about firms; no dishonesty problem
  - Value of shirking (leisure value of less effort): $\theta$. 
Solving \textit{formally} for the optimal wage profile

\begin{itemize}
  \item Maximize Workers’ life time wealth:
  \[
  \max_{W(t)} \int_0^T \left\{ W(t) - e^{rt}(\tilde{f}(t) + \tilde{g}(t)) \times \int_t^T (W(\tau) - \tilde{W}(\tau))e^{-r\tau}d\tau + \tilde{f}(t)\theta_t(t) \right\} e^{-rt}dt
  \]
  \end{itemize}

where $\tilde{f}$ and $\tilde{g}$ are probabilities of default by workers or firm.
Solving formally for the optimal wage profile

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subject to zero-profits by firms

\[
\int_0^T \left\{ V(t) - e^{rt}\tilde{f}(t) \int_t^T V(\tau)e^{-r\tau}d\tau - \tilde{f}(t)C(t) \right\} e^{-rt}dt - \xi = \\
\int_0^T \left\{ W(t) - e^{rt}\tilde{f}(t) \int_t^T W(\tau)e^{-r\tau}d\tau \right\} e^{-rt}dt
\]

where \(\xi\) are hiring costs and \(C(t)\) is the loss of output suffered by firm if worker shirks.
Solving *formally* for the optimal wage profile continued

\[
\max_{W(t)} \int_0^T \{ W(t) - e^{rt} (\tilde{f}(t) + \tilde{g}(t)) \} \times \int_t^T (W(\tau) - \tilde{W}(\tau)) e^{-r\tau} d\tau + \tilde{f}(t) \theta_t(t) \} e^{-rt} dt
\]

\[
\text{s.t. } \int_0^T \{ V(t) - e^{rt} \tilde{f}(t) \int_t^T V(\tau) e^{-r\tau} d\tau - \tilde{f}(t) C(t) \} e^{-rt} dt - \xi = \int_0^T \{ W(t) - e^{rt} \tilde{f}(t) \int_t^T W(\tau) e^{-r\tau} d\tau \} e^{-rt} dt
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\[
\text{s.t. optimal retirement: } V(T) - \tilde{f}(T)[C(T) - \theta_T(T)] = \tilde{W}(T).
\]
Solving formally for the optimal wage profile continued

\[ \underset{W(t)}{\text{max}} \int_0^T \{ W(t) - e^{rt}(\tilde{f}(t) + \tilde{g}(t)) \times \int_t^T (W(\tau) - \tilde{W}(\tau)) e^{-r\tau} d\tau + \tilde{f}(t)\theta_t(t) \} e^{-rt} dt \]

\[ \text{s.t. } \int_0^T \{ V(t) - e^{rt}\tilde{f}(t) \int_t^T V(\tau)e^{-r\tau} d\tau - \tilde{f}(t)C(t) \} e^{-rt} dt - \xi = \int_0^T \{ W(t) - e^{rt}\tilde{f}(t) \int_t^T W(\tau)e^{-r\tau} d\tau \} e^{-rt} dt \]

\[ \text{s.t. optimal retirement: } V(T) - \tilde{f}(T)[C(T) - \theta_T(T)] = \tilde{W}(T). \]
The optimal wage profile-solution

- Any earnings path that assures that at any point $t$:
  - Zero shirking
  - Firms owe workers more than $\theta$.

- In equilibrium: $\tilde{f}(t) = \tilde{g}(t) = 0$.

- Solution is not unique.
Optimal Wage Paths

\[ \hat{W}, W, V \]

\[ V(t) + \theta \]

\[ \hat{W}(t) \]

\[ W(t) \]

\[ V(t) \]

\[ t \quad t \quad T \]

\[ \theta: \text{value of shirking/leisure value of exerting less effort} \]
Optimal Wage Profile-Features

- Upward sloping even in absence of on-the-job training or rising productivity
- Spot wage does not equal productivity

Possible characteristics:
- Large lump sum upon retirement
- Receiving pension for $t > T$
Certain additional assumptions allow deriving a unique upward sloping earnings profile

- Imperfect information of workers about firm ⇒ Dishonest firms
- Borrowing constraints
- Progressive Income Taxes
Unique Optimal Wage Profile

- Dishonest firms
  - Wage profiles less end-weighted to reduce $\tilde{g}(t)$.
  - Shorter length of contract to reduce $\tilde{f}(t)$.

- Borrowing constraints
  - Steeper wage profile implies less favored consumption profile (given time separable and concave utility)
  - Workers willing to trade wealth for less steep profile
  - Positive worker shirking ($\tilde{f}(t) > 0$) even if firms are honest
  - Shorter contracts

- Effect of Progressive Income Taxes
  - Flatter profile
  - Positive shirking
Additional Results

- Under Uncertainty
- Concerning Piece-Rates
- Hours Restrictions
- Comparison Human Capital Story
Worker receives unanticipated wage offer \( \hat{W}(t^*) \).

\[ \hat{W}, W, \nu \]

\[ W(t^*) \]

\[ \hat{W}(t^*) \]

\[ W(t) \]

\[ V(t) \]

\[ t \]

\[ t^* \]

\[ T \]

\[ A \]

\[ B \]

\[ \Rightarrow \text{Solution: Old firm pays present value of ABCD and worker leaves; i.e. severance pay to restore efficiency} \]
Assume output $V(t) = E(t) + u(t)$ where $u(t) =$’luck’

Piece rates found in occupations where output can be measured easily and there is a large luck component of output (e.g. salesmen)

Piece Rate workers, self-employed workers, and salesmen will have flatter and more variable wage rates over the lifetime than time-rate workers (even though acquisition of human capital should be similar)
Life-cycle earnings: Wage Workers vs Self-employed

2007 ACS sample for Sales Occupations

Mean weekly wage/income full time male (self) employed

Age

Self-Employed  Wage Workers
Additional Results on Hours Restrictions

- Workers would choose to work few hours when young and more when old
  - mandatory retirement necessary
  - Young workers complaining about too many, old workers complaining about too few hours
  - Old workers more likely to accept overtime hours than young workers
  - Young workers are the first to be laid off in low seasons (reservation wage closer to wage)

- Efficient contract needs to constrain number of hours at each point in working
Comparison Human Capital Story

- Lower starting wages and steeper earning profiles
  - Here: Reduce incentives to shirk
  - HC: Trade off earnings today to purchase human capital increasing later productivity

- Fewer worker-firm separations for old workers
  - Here: Imperfect Severance payments
  - HC: Specific human capital acquired over work life

- Job switch $\Rightarrow$ Initial Drop in Wages $\Rightarrow$ Increase in Wage Growth
  - Here: Worker putting up collateral
  - HC: Reinvestment period
Agency Approach: Alternative story to why earnings increase with age

Imperfect information makes it optimal to pay workers less when young and more when old

Incentives to shirk are reduced with steeper earnings profiles

Dishonest firms may take advantage of steep earning profiles

Optimal contract can be determined

Many testable implications for life-cycle earnings