Comments on “Wage Dynamics and Returns to Unobserved Skills”

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BAS [Name of Conference Here]

June 4, 2018
Introduction: Background

❖ Rising Residual Wage Inequality in the U.S.

❖ Current Theory:
  ▪ Rising Price of Unobserved Skills
  ▪ Evidence if Human Capital is fixed upon labor market entry, changes in wage dispersion needs to be related to prices of skills.
  ▪ Argument is often SBTC is causing price of skills to rise.
This Paper: Innovation

- Recognizes that skills may evolve in labor market.
- Clouds interpretation of residual wage dispersion linked to rising price of skills.
- Rising wage dispersion is the product of changing skill prices and changing skill amounts.
- Importantly, growing unobserved skills would cause wage dispersion without changes in skill prices; even more interesting skill prices could fall and rising skills could cause rising wage dispersion.
- A strong model is needed to separate the dynamics of skill acquisition from the dynamics of skill prices and they provide one.
This Paper: Model

- Identification of dynamics of skill prices - Two Key Assumptions:
  - Wages are levels of human capital times the price of human capital plus an Idiosyncratic component that dies out over time. Specifically:
    \[ w_{i,t} = \mu_t \theta_{i,t} + \varepsilon_{i,t} \]
  - Human Capital Accumulation process is additive and linear. Specifically (in the most stripped down form):
    \[ \theta_{i,t} = \theta_{i,t-1} + \delta \]
  - From this they show:
    \[ Cov(w_i,,t, w_{i,t'}) = \mu_t \mu_{t-1} Cov(\theta_{i,,t}, \theta_{i,t'}) = \mu_t \mu_{t-1} Var(\theta_{i,t'}) \]
This Paper: Model

- Intuition of a central formula:

\[ \text{Cov}(w_{i,t}, w_{i,t'}) = \mu_t \mu_{t-1} \text{Cov}(\theta_{i,t}, \theta_{i,t'}) = \mu_t \mu_t \text{Var}(\theta_{i,t'}) \]

- The last equality holds because:
  - t and t’ are sufficiently far apart that \( \varepsilon_{i,t} \) and \( \varepsilon_{i,t-1} \) are uncorrelated.
  - \( \theta_{i,t} \) is just \( \theta_{i,t'} \) plus a scale factor making the covariance equal to the variance of \( \theta_{i,t'} \).

- To see the last point considered the stripped down HC process. Then:

\[ \theta_{i,t} = \theta_{i,t'} + \delta(t - t') \]

\[ \text{Cov}(\theta_{i,t}, \theta_{i,t'}) = \text{Cov}(\theta_{i,t'} + \delta(t - t'), \theta_{i,t'}) = \text{Var}(\theta_{i,t'}) \]
This Paper: Model

Since:
\[
\frac{\text{Cov}(w_{i,t}, w_{i,t'})}{\text{Cov}(w_{i,t-1}, w_{i,t'})} = \frac{\mu_t \mu_t, \text{Var}(\theta_{i,t'})}{\mu_{t-1} \mu_t, \text{Var}(\theta_{i,t'})} = \frac{\mu_t}{\mu_{t-1}}
\]

That is the ratio of the covariance of two sufficiently spaced wages will be a function only of relative prices!

Once you can trace out the dynamic path of prices you can back out the dynamic path of human capital as well.

Notice you can let $\delta$ have an “i” subscript $\delta_i$, and as long as $\delta_i$ and $\theta_{i,t'}$ are uncorrelated everything goes through.

Now human capital can fan out over time and wage dispersion can increase without changes in prices or even in the face of declining prices!
This Paper: Delivers Evolution of Human Capital Prices
Comments

- Strong assumptions are needed to separate the dynamics of prices and human capital.

Benefits:
- You can make progress and get answers.
- You need very little data other than wage series of individuals.
- This means the method can be applied to a wide variety of datasets including large administrative datasets.

Costs:
- Results could be sensitive to modeling assumptions.
- Are results sensitive to the human capital process modeled?
- Is the assumption of limited idiosyncratic wage shock persistence reasonable (especially for the historical time period of the data)?
Some things you might try that require no more data than you are currently using.
- Alternative modeling assumptions that help establish robustness.

Some things you might try that require more data than you are currently using.
- Alternative data-driven modeling assumptions.

Some things you might try that require less data than you are currently using.
- Alternative modeling assumptions that could be applied to other less detailed datasets.
Comments

Some ideas that use the same amount of data
Comments: Human Capital Process

Human Capital Production Process:

What if Human Capital Process is not linear and additive but is like Cunha, Heckman & Schennach (again in its simplest form):

\[ \theta_{i,t} - \theta_{i,t-1} = \delta_i \theta_{i,t-1} \]

This implies that:

\[ \frac{\text{Cov}(w_{i,t}, w_{i,t})}{\text{Cov}(w_{i,t-1}, w_{i,t})} = \frac{\mu_t \mu_t \text{Cov}(\theta_{i,t}, \theta_{i,t})}{\mu_{t-1} \mu_t \text{Cov}(\theta_{i,t-1}, \theta_{i,t})} = (1 + \delta_i) \frac{\mu_t}{\mu_{t-1}} \]

Separating \( \delta_i \) and \( \frac{\mu_t}{\mu_{t-1}} \) is now not possible without additional assumptions.
Comments: Human Capital Process

- Human Capital Production Process:
  - Human Capital Process that has a classic depreciation form:
    \[ \theta_{i,t} = \gamma \theta_{i,t-1} + \delta_i \]
  - Implies a similar condition:
    \[
    \frac{\text{Cov}(w_{i,t}, w_{i,\tau})}{\text{Cov}(w_{i,t-1}, w_{i,\tau})} = \frac{\mu_t \mu_{\tau} \text{Var}(\theta_{i,\tau})}{\mu_{t-1} \mu_{\tau} \text{Var}(\theta_{i,\tau})} = \gamma \frac{\mu_t}{\mu_{t-1}}
    \]
- Again not identified.
Comments: Human Capital Process

- Much progress is made by assuming growth rate in human capital is uncorrelated with initial human capital if growth rate is measured when workers are old enough. But:
  - This is not consistent with a linear additive model of Human Capital.
  - May not be consistent with a model of Human Capital that includes depreciation.

- Might be worth replacing this assumption with a different assumption such as explicit modeling the \( \text{Cov} (\delta_i, \theta_{i,0}) \).

- Might allow identifying more human capital models.

- Are the implied price paths the same with varying human capital models?
Comments

Some ideas that require more data:
Exploiting more data elements of the PSID
Comments: Do Idiosyncratic Wage Shocks Die out Quickly Enough

Key assumption is $Cov(\varepsilon_{i,t}, \varepsilon_{i,t'}) = 0$ if $t - t' > k$.

- Is this true for all regions in the U.S. during this historical time period?

Concentration of employment:

- In Michigan 9 industries comprise 50% of employment; Three industries comprise 35% -
  - automobile manufacturing, construction and machinery manufacturing.

- In Massachusetts 18 industries comprise 50% of employment; Nine industries comprise 35% of employment –
  - construction, electrical machinery manufacturing, other machinery manufacturing, justice/police/safety, elementary and secondary teaching, national security, grocery stores, metal products, eating and drinking establishments
Comments: Do Idiosyncratic Wage Shocks Die out Quickly Enough

- Key assumption is $\text{Cov}(\varepsilon_{i,t}, \varepsilon_{i,t'}) = 0$ if $t - t' > k$.
  - Both the historical diversity of the local economy and the concentration in especially declining industries is very different regionally.
  - Concern is a rapid decline in manufacturing in the 1980s in the Rust Belt and a rapid rise in technology industry in the 1990s on the Coasts.
  - $k$ may be very large, even a full generation, in places like Michigan!
  - How sensitive is the model to allowing $k$ to be a function of region (or the parameters of the ARMA process a function of region).
- Again are the implied price paths the same allowing the die out of wage shocks rate to vary by region?
Comments: More data-driven human capital processes

- Key assumption is Human Capital accumulation not a function of job tenure or industry tenure.
  - Typically one thinks that Human Capital accumulation might be more rapid when jobs are new and slow down with job tenure.
  - Might the Human Capital process be made a function of job tenure?
  - Typically one thinks that there is a loss of industry specific human capital when changing industries
  - Might the Human Capital process be made a function of industry tenure?

- Again are the implied price paths the same with this more data-driven human capital model?
Some ideas that use less data:
Would allow model to be applied more generally
Comments: Finding heterogeneity without data elements

- Paper usefully divides analysis by education group. Patterns are different in some time periods by education group.
- PSID has education but many datasets, especially administrative datasets do not.
- Might use PSID but not use education. Instead model the wage process as a mixture of two groups as in a latent class model.
- Does the model replicate the price paths found conditioning on education?
- Do posterior probabilities of group assignment accord with the actual education of respondents.
Other Comments

- Most people are concerned with growing wage inequality in repeated cross-sections.
- PSID has the advantage of being a panel, but the disadvantage of not replicating the cross section.
- It would be good to establish that overall wage inequality in the PSID mimics repeated cross-sections.
Other Comments

- Very nice paper.
- Generalizes more restrictive models of wage dispersion.
- Needs to make strong assumptions, does so, and delivers results.
- Outstanding question is robustness of price dynamics to model specification.
- As a general strategy it might be good to use more data to reject model specifications and then see if statistical methods can mimic those specifications in the absence of such data.
- Of course application to new contexts may not extend but at least you have some faith in model from a known context.