Understanding Earnings Dynamics: Identifying and Estimating the Changing Role of Unobserved ability, Permanent and Transitory Shocks
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Outline

- The paper in context and quick summary
- On identification in theory and in practice
- Some final comments
Summary

- Large increase in residual (after controlling for observables) inequality in the US since late 1970s. Two approaches

  - Cross sectional based (SDI) analysis which invokes the price of unobserved skills (i.e. flexibility, quality of education) as drivers (Katz and Murphy, 1992 and ...)

  - Panel based analysis which invokes changing volatility of permanent (persistent) and transitory shocks (Gottshalk and Moffit, 1994 and ...)

- Paper argues for panel based approach that can identify both changing volatility of shocks and changing prices of unobserved skills (methodological)

- Finds that role of changing prices of unobserved skills significant in the early 1980s but small post 1990s (substantive)
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The PSID-based literature explores the relative importance of permanent and transitory shocks; however, it typically ignores variation in the pricing of unobserved skills (i.e. assumes $\mu_t(\theta) = \mu(\theta)$). Figure 6 shows that this is not innocuous, even if one is only interested in the relative importance of permanent and transitory components. This figure decomposes the total variance into ‘permanent’ and ‘transitory’ components based on a model that assumes $\mu_t(\theta) = \mu(\theta)$ is time invariant. Here, the ‘permanent’ component is given by the variance of $\mu_t(\theta) + \kappa_t$. These estimates suggest more modest increases in the permanent component and stronger increases in the transitory component over the early 1980s relative to estimates from our more general model that allows for variation in unobserved skill prices (Figure 5).

In Appendix B, we explore the robustness of our main variance decomposition results (Figure 5) to a few alternative specifications. First, we show that different assumptions about the transitory component yield very similar results. Specifically, the dynamics and relative importance of all three variance components are quite similar to those shown in Figure 5 if $\nu_t$ follows an $MA(1)$, $MA(5)$, or $ARMA(1,1)$ process. Second, we consider the possibility that the variance of transitory shocks is not constant over time, but rather varies with other variables. We consider this specification below.

There are a few notable exceptions in the literature (e.g. Haider 2001, Moffitt and Gottschalk 2012); however, these studies abstract from other important features of the problem. Haider (2001) abstracts from permanent shocks, $\eta_t$. Moffitt and Gottschalk (2012) assume that the variance of permanent shocks remains constant over time, but they multiply both $\theta$ and $\kappa_t$ by the same time-varying ‘price’. We consider this specification below.
Identification: the panel data approach in a simple case

\[ y_{it} = z_{it} + \varepsilon_{it} \]
\[ z_{it} = z_{it-1} + \eta_{it} \]
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Take first differences

\[ \Delta y_{it} = \eta_{it} + \varepsilon_{it} - \varepsilon_{it-1} \]
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compute covariances

\[
cov(\Delta y_{it+1}, \Delta y_{it}) = E(\eta_{it+1} + \varepsilon_{it+1} - \varepsilon_{it})(\eta_{it} + \varepsilon_{it} - \varepsilon_{it-1}) = -\text{var}(\varepsilon_{it})
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Idea: permanent shocks at \( t \) only affect \( \Delta y_{it} \) (as over time do not decay): any covariation in growth between \( t \) and \( t + 1 \) due to temporary shocks.
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Idea: permanent shocks at t only affect \( \Delta y_{it} \) (as over time do not decay): any covariation in growth between \( t \) and \( t+1 \) due to temporary shocks. Once temp. shocks identified, perm. shocks are identified residually

\[
\text{var}(\eta_{it}) = \text{var}(\Delta y_{it}) - 2\text{var}(\varepsilon_{it})
\]
Identification: shocks and skills

\[ y_{it} = p_t \theta_i + z_{it} + \varepsilon_{it} \]
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\[ y_{it} = p_t \theta_i + z_{it} + \varepsilon_{it} \]

\[ \Delta y_{it} = \theta_i \Delta p_t + \eta_{it} + \varepsilon_{it} - \varepsilon_{it-1} \]

How to identify \( p_t \theta_i \)?

Taking growth rates far apart in time

\[
\text{cov}(\Delta y_{it+2}, \Delta y_{it}) = E(\theta_i \Delta p_{t+2} + \eta_{it+2} + \varepsilon_{it+2} - \varepsilon_{it+1})(\theta_i \Delta p_t + \eta_{it} + \varepsilon_{it} - \varepsilon_{it-1}) = E\theta_i^2 \Delta p_{t+2} \Delta p_t
\]

- General idea: shocks (temporary or permanent) do not generate co-variation in growth rates far apart, while unobserved skills (which are fixed characteristics associated with common prices) do, hence observed covariation in far apart growth rates can be attributed to changing prices of observed skills
Identification in practice

- Covariance of growth rates of different individuals at two years far in time should be informative about role of unobserved skills
- How has this covariance evolved in PSID?
- Data set from Heathcote, Perri, Violante (2001) (PSID, annual data 1967-1996), compute log male earnings residuals and then $Cov(\Delta y_{i,t}, \Delta y_{i,t+4})$
Covariance of earnings growth at t and t+4
Reinterpreting the main result

- Increase in inequality in early 1980s associated to changes in growth rates correlated in time, as individuals experience growth in earnings, expect growth to persist.
- Inequality in early 2000 mostly explained by standard permanent shocks plus transitory shocks.
Final comments and suggestions

• Great paper, uncovers an important change in the nature of inequality

• Should provide more direct evidence on what feature of the data identifies this change.

• How has the household risk changed from 80s to 2000s?

• If households know the path of prices of skills, then risk has increased (as now more earnings risk comes from shocks)

• If households face uncertainty on price of skills, then risk has declined (as now earning risk is less "long run")

• Paper could connect more to panel estimation literature. Literature focused on simple two shocks model as finds autocovariance of earnings die off quickly. Using same data the paper suggests this is not the case?

• Small literature suggesting the simple permanent and transitory shock mis-specified as it yields very different estimates if moments in level vs. growth rates are used. I suspect that specification used in this paper might help to solve this puzzle.
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