A dynamic analysis of the relationship between employment transitions and mental health among British men

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Unemployment and mental health

Previous studies find current/previous employment status and employment transitions are strongly associated with mental health.

- Poorer mental health while individuals are unemployed and economically inactive (Wiggins et al. 2004)
- Previous exposure to unemployment associated with higher risk of onset of depression (Montgomery et al. 1999) and suicide (Lundin et al. 2010)
- Transitions out of (into) employment associated with higher (lower) risk of psychological distress (Thomas et al., 2005, 2007)
Explanations: causation and/or selection?

- **Causation**
  - Stress of unemployment is damaging to mental health

- **Selection**
  - People in poor health may be at higher risk of unemployment (*direct selection/reverse causality*)
  - Unmeasured factors affecting the risks of both unemployment and poor mental health (*indirect selection*)
Previous approaches to handle selection

Direct
- Adjust for prior health
- Model effect of health on unemployment
  - Poor health in childhood increases risk of unemployment (Montgomery et al. 1996)
  - Poor perceived health associated with lower chance of being employed and higher chance of unemployment (Schuring et al. 2007)

Indirect
- Adjust for measured confounders, e.g. childhood social circumstances
Our approach to the selection problem

- Model effect of employment transitions between $t - 1$ and $t$ on health at $t$, adjusting for health at $t - 1$

- Simultaneously model effect of health at $t - 1$ on employment transitions between $t - 1$ and $t$

- Allow for unmeasured time-invariant confounders via residual correlation between health and employment transitions
Model of health and employment transitions

\[ H_t \quad \text{Health at } t \]
\[ \Delta E_{t-1} \quad \text{Change in employment } t-1 \text{ to } t \]
\[ u^H, u^E \quad \text{Unmeasured time-invariant influences} \]
Dynamic model for effect of employment transitions on mental health

Random effects model for health at $t | t - 1$

$$H_{ti} = \beta_0 + \beta_1 H_{t-1i} + \beta_2 \Delta E_{t-1i} + u_i^{(H)} + e_{ti}$$

- $H_{ti}$: mental health of individual $i$ at time $t$
- $\Delta E_{t-1i}$: change in employment status between $t - 1$ and $t$
- $u_i^{(H)}$: individual random effect
- $e_{ti}$: time-varying residual

$\beta_2$ are the effects of employment transitions between $t - 1$ and $t$ on mental health at $t$, adjusted for mental health at $t - 1$. 
Dynamic model for effect of health on employment transitions

\( E_{ti} \) is employment status at \( t \) (1=employed, 2=economically inactive, 3=unemployed)

\[
\pi_{ti}^{(k)} = \Pr(E_{ti} = k).
\]

Random effects multinomial logit model for status at \( t \mid t - 1 \)

\[
\log \left( \frac{\pi_{ti}^{(k)}}{\pi_{ti}^{(1)}} \right) = \alpha_0^{(k)} + \alpha_1^{(k)} E_{t-1i} + \alpha_2^{(k)} H_{t-1i} \\
+ \alpha_3^{(k)} E_{t-1i} \times H_{t-1i} + u_i^{(Ek)}, \quad k = 2, 3
\]

Interactions allow effect of health to vary across employment transitions.
Joint model for health and employment transitions

Equations for $H_{ti}$ and $E_{ti}$ are linked by allowing for correlation between the individual random effects.

**Residual correlations**

\[
\text{Corr}(u_{i}^{(H)}, u_{i}^{(E2)}) \quad \text{health and moves into economically inactive}
\]

\[
\text{Corr}(u_{i}^{(H)}, u_{i}^{(E3)}) \quad \text{health and moves into unemployment}
\]

Expect positive correlations if individuals with tendency towards poorer-than-average health ($u_{i}^{(H)} > 0$) also have higher risk of moving into unemployment or economic inactivity ($u_{i}^{(Ek)} > 0$).
Impact of selection on effect of becoming unemployed

- **H_t ↑** by men with \( u^H > 0 \) and \( u^E > 0 \)
- **H_t ↓** by men with \( u^H < 0 \) and \( u^E < 0 \)

**Note:** Higher \( H_t \) indicates poorer mental health
Initial Conditions

A problem when start of measurement does not coincide with start of process under study. Denote by $y_t$ either outcome (health or employment) at $t$.

- Unmeasured time-invariant factors influencing $y_t$ at $t > 1$ also likely to influence $y_1$, leading to correlation between $y_1$ and individual random effects.

- Can show that in a 1st order autoregressive model, the dependence of $y_t$ on previous $y$ operates entirely through $y_1$.

- A solution is to specify a model for $y_1$ and estimate jointly with model for $y_2, \ldots, y_T$. 

Data and measures

- British household panel survey, waves 1-18 (1991-2009)
- Men of working age (16-64), after first leaving full-time education
- 12,662 men observed for 79,022 person years

- **Mental health:** GHQ-12 anxiety and depression scale (0-36)
- **Employment status:** employed, economically inactive, unemployed
- **Covariates:** age, partnership status, presence and age of children, household occupation class, LAD employment rate
## Transition probabilities given employment state at $t - 1$

<table>
<thead>
<tr>
<th>Transition</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed at $t - 1$ $(n = 52,372)$</td>
<td></td>
</tr>
<tr>
<td>E $\rightarrow$ E</td>
<td>95.3</td>
</tr>
<tr>
<td>E $\rightarrow$ EI</td>
<td>2.4</td>
</tr>
<tr>
<td>E $\rightarrow$ UE</td>
<td>2.4</td>
</tr>
<tr>
<td>Economically inactive at $t - 1$ $(n = 10,879)$</td>
<td></td>
</tr>
<tr>
<td>EI $\rightarrow$ E</td>
<td>14.5</td>
</tr>
<tr>
<td>EI $\rightarrow$ EI</td>
<td>79.0</td>
</tr>
<tr>
<td>EI $\rightarrow$ UE</td>
<td>6.5</td>
</tr>
<tr>
<td>Unemployed at $t - 1$ $(n = 3,867)$</td>
<td></td>
</tr>
<tr>
<td>UE $\rightarrow$ E</td>
<td>36.5</td>
</tr>
<tr>
<td>UE $\rightarrow$ EI</td>
<td>17.5</td>
</tr>
<tr>
<td>UE $\rightarrow$ UE</td>
<td>46.0</td>
</tr>
</tbody>
</table>

**E** Employed, **EI** Economically Inactive, **UE** Unemployed
Estimated residual correlation matrix from joint model

All correlations significant at < 1 % level.

<table>
<thead>
<tr>
<th></th>
<th>GHQ</th>
<th>EI vs E</th>
<th>UE vs E</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHQ</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EI vs E</td>
<td>0.293</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>UE vs E</td>
<td>0.289</td>
<td>0.564</td>
<td>1</td>
</tr>
</tbody>
</table>

E = employed, EI = economically inactive, UE = unemployed

- Men with tendency towards depression (high GHQ) tend to have higher chances of economic inactivity and unemployment
- Positive residual correlation between risks of economic inactivity and unemployment
## Estimated effects of employment transitions on GHQ

<table>
<thead>
<tr>
<th>Transition ( t - 1 ) to ( t )</th>
<th>Unadjusted</th>
<th>Adjusted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \text{Ccorr}(u_i^{(H)}, u_i^{(E_k)}) = 0 )</td>
<td>( \text{Ccorr}(u_i^{(H)}, u_i^{(E_k)}) \neq 0 )</td>
</tr>
<tr>
<td>( E \rightarrow E )</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>( E \rightarrow EI )</td>
<td>0.86**</td>
<td>0.65**</td>
</tr>
<tr>
<td>( E \rightarrow UE )</td>
<td>2.51**</td>
<td>2.26**</td>
</tr>
<tr>
<td>( EI \rightarrow E )</td>
<td>(-0.64**)</td>
<td>(-0.82**)</td>
</tr>
<tr>
<td>( EI \rightarrow EI )</td>
<td>0.54**</td>
<td>0.14*</td>
</tr>
<tr>
<td>( EI \rightarrow UE )</td>
<td>1.18**</td>
<td>0.68**</td>
</tr>
<tr>
<td>( UE \rightarrow E )</td>
<td>(-1.14**)</td>
<td>(-1.37**)</td>
</tr>
<tr>
<td>( UE \rightarrow EI )</td>
<td>1.34**</td>
<td>0.82**</td>
</tr>
<tr>
<td>( UE \rightarrow UE )</td>
<td>0.88**</td>
<td>0.35**</td>
</tr>
</tbody>
</table>

** \( E \) Employed, ** \( EI \) Economically Inactive, ** \( UE \) Unemployed

** \( p < 0.01 \), * \( p < 0.05 \)
Effects of GHQ on probability of transitions from employment
Effects of GHQ on probability of transitions from unemployment
Conclusions

- Weak evidence of direct selection (GHQ $\rightarrow$ employment transitions)

- Stronger evidence of indirect selection (on time-invariant unmeasured characteristics)

- But there remains a strong effect of employment transitions on subsequent GHQ (adjusting for prior GHQ)
  - Although cannot rule out selection on time-varying unmeasured factors influencing GHQ and employment
Further work

- Mediating effect of financial circumstances (Thomas et al. 2007)
- Interaction between employment transitions and socio-economic position (e.g. Wiggins et al. 2004)
- Effects of repeated transitions (e.g. Booker and Sacker 2011)
References


