Multilevel Multiprocess Models for Partnership and Childbearing Event Histories

Fiona Steele, Constantinos Kallis, Harvey Goldstein and Heather Joshi

Institute of Education, University of London
Aims of Research

• Develop methodology for the analysis of correlated event histories

• Apply in an analysis of the link between partnership stability and childbearing
  – Examine effect of presence of children on separation and move from cohabitation to marriage, adjusting for correlation between partnership transitions and fertility
Methodology: Overview I

• Consider all partnerships for ages 16-42 using multilevel modelling

• Estimate simultaneously models for 3 types of partnership transition:
  – Marriage → Separation
  – Cohabitation → Separation; Cohabitation → Marriage

• Estimate these transitions jointly with model for fertility to allow for potential endogeneity of fertility outcomes
Methodology: Overview II

- Use multilevel multistate discrete time event history model (Steele et al. 2004) for partnership transitions
  - ‘States’ are marriage and cohabitation
  - Competing risks from cohabiting state

- Estimate jointly with model for conceptions within partnerships using simultaneous equation (multiprocess) model (extending Lillard (1993) who considers only marriage)

- Multilevel data structure: repeated partnerships and births (level 1) within individuals (level 2)

- Estimation using MCMC in MLwiN v.2
Endogeneity of Prior Fertility Outcomes

• Interested in effect of presence of children on partnership transitions

• But children are prior outcomes of a potentially correlated process (fertility)

• There may be factors (some unobserved) which influence decisions about partnership transitions and childbearing

• If ignored, effects of interest will be biased
Multiprocess Model of Partnership Transitions and Fertility

\[ h_P(t): \text{Hazard of partnership transition at time } t \]

\[ F(t): \text{Children born before } t \]

\[ h_F(t): \text{Hazard of conception at time } t \]
Model for Partnership Transitions: Marital Separation

\[
\text{logit } h_{PM}^M(t) = \alpha_0^M D_{PM}^M(t) + \alpha_1^M F(t) + \alpha_2^M X_{PM}^M(t) + u_{PM}^M
\]

- \( h_{PM}^M(t) \): Hazard of marital separation
- \( D_{PM}^M(t) \): Partnership duration
- \( F(t) \): Prior fertility outcomes
- \( X_{PM}^M(t) \): Covariates affecting marital separation
- \( u_{PM}^M \): Woman-specific random effect $\sim$ Normal
Model for Partnership Transitions: Cohabitation to Separation (r=1) or Marriage (r=2)

Multilevel discrete-time competing risks model:

$$\log \left[ \frac{h^{PC(r)}(t)}{h^{PC(0)}(t)} \right] = \alpha_0^{C(r)} D^{PC(r)}(t) + \alpha_1^{C(r)} F(t)$$

$$+ \alpha_2^{C(r)} X^{PC(r)}(t) + u^{PC(r)}$$

$h^{PC(0)}(t)$ is hazard of “no transition”, i.e. stay cohabiting

Estimate jointly with model for marital separation
Model for Fertility

Marriage

\[ \text{logit} h^{FM}_M (t) = \beta_0^M D^{FM}_M (t) + \beta_1^M F(t) + \beta_2^M X^{FM}_M (t) + u^{FM} \]

Cohabitation

\[ \text{logit} h^{FC}_C (t) = \beta_0^C D^{FC}_C (t) + \beta_1^C F(t) + \beta_2^C X^{FC}_C (t) + u^{FC} \]
Data

- 1958 British birth cohort (National Child Development Study)
  - Partnership (living together for >1 month) and birth histories collected retrospectively at ages 33 and 42. Linked to form history for age 16-42.
  - Covariates from childhood and adulthood.

- Analysis sample: n=5142 women with ≥1 partner by age 42; n=7032 partnerships and n=9137 “partnership episodes”
Selected Random Effect (Residual)
Correlations Across Processes

• Separation from marriage and marital conception
  \( r = -0.28^* \) (*sig. at 5% level)

• Separation from cohabitation and cohabiting conception
  \( r = 0.19 \)

• Cohabitation to marriage and cohabiting conception
  \( r = 0.59^* \)
## Effects of Fertility Variables on Log-odds of Marital Separation

<table>
<thead>
<tr>
<th>Age/Father&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Single Process</th>
<th>Multiprocess</th>
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<td>Preschool/Curr&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
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<tr>
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<tr>
<td>Corr(u&lt;sup&gt;uFM&lt;/sup&gt;,u&lt;sup&gt;uPM&lt;/sup&gt;)</td>
<td>-</td>
<td>-0.28*</td>
</tr>
</tbody>
</table>

<sup>a</sup>Father is current or previous partner.
<sup>b</sup>Reference category for all vars is 0 children.

*95% interval estimate does not contain zero
## Effects of Fertility Variables on Log-odds of Marrying vs. Staying Cohabiting

<table>
<thead>
<tr>
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<th>Single Process</th>
<th>Multiprocess</th>
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<td>Corr(u&lt;sub&gt;PC(2)&lt;/sub&gt;,u&lt;sub&gt;FC&lt;/sub&gt;)</td>
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<td>0.59*</td>
</tr>
</tbody>
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<sup>a</sup>Father is current or previous partner.

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Conclusions

• Allowing for endogeneity of children conceived within marriage/cohabitation affects substantive conclusions regarding effects of children on move from cohabitation to marriage, but not on partnership dissolution.

• Multiprocess approach also allows:
  – Estimation of correlation between unobservables within and across processes
  – Comparison of effects of covariates within and across processes