The Effect of Parental Rural-to-Urban Migration on Children’s Cognitive Skill Formation

Bolun Li
Capital One Financial Corporation

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Background

• Large-scale internal migration is prevalent in developing countries
  ▶ economic growth has lead rural workers to migrate to urban areas
  ▶ 10 million migrant workers in Indonesia
  ▶ 130 million migrant workers in China

• Parental rural-to-urban migration $\implies$ left-behind children
  ▶ left-behind children $\equiv$ rural-origin children w/ at least 1 migrant parent
  ▶ 5 million in Indonesia, 8% of all Indonesian children
  ▶ 30 million in China, 11% of all Chinese children

• Limited parent-child interactions pose developmental challenges
  ▶ Heckman & Mosso (2014)
Motivation

- Early cognitive skills are important in predicting later life outcomes
  - 1 st. dev. increase in math scores at the end of developmental stage translates into 4% higher employment rate (Currie & Thomas, 2001)
  - schooling (Heckman, Stixrud & Urzua, 2006)
  - income (Chetty, Friedman & Rockoff, 2014)

- Left-behind children have received wide attention from policy-makers
    “reinforcing and promoting children’s rights, with a focus on the protection and well-being of children left behind.”
    “Transforming our world: the 2030 Agenda for Sustainable Development.”
    “Left-behind children are the orphans of China’s economic miracle.”
Research Question

I. How does parental rural-to-urban migration affect children’s cognitive skill formation?

II. What would happen to the cognitive skill development of left-behind children if their parents had not left?

III. What types of migration policies are effective in promoting children’s human capital development?
Preview of Findings

• Estimate a dynamic model of children’s skill formation within household migration using panel survey data from Indonesia

• Children’s cognitive skill formation is sensitive to the duration and type of parental migration
  ▸ leaving children behind one year reduces cognitive skill by 0.02 st. dev.

• Cognitive skills of left-behind children would have improved substantially at age 14 if their families had remained together
  ▸ equivalent to 7% ↑ high school graduation rates (national average 53%)

• Migration policies of encouraging family moving with their children promote cognitive skill formation
  ▸ annual subsidy of $150 ⇒ 3% ↑ high school graduation rates
Outline

• Literature review

• A dynamic model of skill formation w/in household migration

• Data from the Indonesia Family Life Survey

• Identification and Simulated Maximum Likelihood estimation

• Counterfactual policy experiments
Selected Literature Review

- **Children’s skill formation**
  - **contribution: understand skills formation in developing countries**

- **Labor migration**
  - **contribution: study welfare impacts of migration policies on children**

- **Impact of migration on children**
  - **contribution: model skill dynamics & include a full sample of rural-origin children**
Outline

- Literature review and contribution
- A dynamic model of skill formation within household migration
- Data from the Indonesia Family Life Survey
- Identification and Simulated Maximum Likelihood estimation
- Counterfactual experiments & policy analysis
Economic Model

• Setup
  ▶ a dynamic discrete choice model of rural household migration
  ▶ a married coupled w/ oldest child born in a rural location
  ▶ exogenous but stochastic fertility

• Decision
  ▶ sequential annual migration decision $j_t$ from birth till age 14
    $j_t = \begin{cases} 
    1, & \text{if both parents stay with the child in a rural location} \\
    2, & \text{if at least one parent migrates and child is left behind in a rural location} \\
    3, & \text{if both parents move with the child to an urban location} 
  \end{cases}$

• Household Utility
  $U_t = U(C_t, Q_t, j_t, j_{t-1}, S_t^O, S_t^U, \varepsilon_t; \alpha)$
  ▶ parents face a trade-off consumption $C_t$ and child’s skill $Q_t$
  ▶ $S_t^O = \text{observed characteristics}$
  ▶ $S_t^U = \text{unobserved household types}$
  ▶ $\varepsilon_t = \text{preference shock } \sim \text{TIEV distribution}$
**Economic Model**

- **Budget Constraint**

  \[ C_t = \mathbb{1}_{\{j_t = j\}} Y_{jt} - (\Delta_1 \mathbb{1}_{\{j_t = 2, 3\}} D + \Delta_2 \mathbb{1}_{\{j_t = 2\}} N_t + \Delta_3 \mathbb{1}_{\{j_t = 3\}} N_t), \quad j \in J_t \]

  - \( Y_j \) = income
  - \( D \) = distance between home village & provincial capital
  - \( N_t \) = number of children

- **Parental Income**

  \[ \ln Y_{jt} = \beta_{j1} educ_f + \beta_{j2} educ_m + \sum_{k \in K} \delta_{jk} \mathbb{1}_{\text{type} = k} + \eta_{jt} \]

  - location-dependent stochastic process
  - \( k \) = unobserved type
  - \( \eta_{jt} \) = income shock \( \sim \) Normal distribution
Economic Model

- **Cognitive skill production function**

\[
Q_t = \delta_1 \text{age} + \delta_2 \text{age}^2 + \delta_3 \text{gender} + \delta_4 \text{educ}_f + \delta_5 \text{educ}_m + \delta_6 N_t \\
+ \delta_7 H_{2t} + \delta_8 H_{3t} + \delta_9 H_{2t}^2 + \delta_{10} H_{3t}^2 + \sum_{k \in \mathcal{K}} \delta_k \mathbb{1}\{\text{type} = k\} + \omega_t
\]

- \(N_t\) = number of children
- \(H_{jt} \equiv \sum_{\tau=1}^{t-1} \mathbb{1}\{j_{\tau} = j\}\) = migration experience
- \(k\) = unobserved household type
- \(\omega_t\) = stochastic production component \(\sim\) Normal distribution

- **Features & restrictions**

1. migration experience serve as proxy for parental investments
2. cumulative migration history matter instead of its timing
3. stock of children captures resource allocation among children
4. unobserved heterogeneity has a constant effect over time
**Economic Model**

- **Cognitive skill production function**

  \[ Q_t = \delta_1 \text{age} + \delta_2 \text{age}^2 + \delta_3 \text{gender} + \delta_4 \text{educ}_f + \delta_5 \text{educ}_m + \delta_6 N_t \]
  
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  - \( N_t \) = number of children
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  - \( k = \text{unobserved household type} \)
  - \( \omega_t = \text{stochastic production component} \sim \text{Normal distribution} \)

- **Features & restrictions**

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Economic Model

• Cognitive skill production function

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• Features & restrictions

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Economic Model

- Cognitive skill production function

\[ Q_t = \delta_1 age + \delta_2 age^2 + \delta_3 gender + \delta_4 educ_f + \delta_5 educ_m + \delta_6 N_t + \delta_7 H_{2t} + \delta_8 H_{3t} + \delta_9 H_{2t}^2 + \delta_{10} H_{3t}^2 + \sum_{k \in K} \delta_k 1\{type = k\} + \omega_t \]

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- Features & restrictions

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Economic Model

- **Household Problem**

  \[
  \max_{\{j_t \in J\}_{t=0}^T} E \left[ \sum_{t=0}^{T} \rho^t U_{jt} \mid \Omega_t \right]
  \]

  ▶ parents choose sequentially optimal migration alternatives to maximize discounted expected lifetime utility
  ▶ \( \rho \) = discount factor
  ▶ \( \Omega_t \) = state space

- **Bellman equation**

  \[
  V(\Omega_t) = \max_{j \in J} \left\{ U_{jt}(\Omega_t) + \rho E[V(S_{t+1}) \mid \Omega_t, j_t] \right\}
  \]

  for \( t < T \),

  \[
  = \max_{j \in J} \left\{ U_{jT}(\Omega_T) + \alpha_{jqT} \ln Q_{T+1} \right\}
  \]

  for \( t = T \)

  ▶ with period timing: 1st fertility, 2nd shocks, 3rd decision
  ▶ solution: backward recursion due to finite horizon
Outline

- Literature review and contribution
- A dynamic model of skill formation within household migration
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Data: Indonesia Family Life Survey

- **Main feature**
  - retrospective & longitudinal information on migration & household income
  - established cognitive measures using Raven’s Colored Progressive Matrices test & math test (Raven, 2000; Unsworth et al., 2014)
  - transform raw score using Item Response Theory

- **Migration patterns**
  - majority (70%) of rural households stay in rural over a long period (11 yrs)
  - migration (64%) is concentrated internally w/in each major island
Data: Internal Migration in Indonesia

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Identification & Estimation

- **Identification**
  - **problem**: skills are endogenously formed through migration experience
  - **instrument 1**: distance from home village to provincial capital in budget constraint (Card, 1995, 2001; Meng & Yamauchi, 2017)
  - **instrument 2**: ratio of number of schools divided by population in one’s home village to its counterpart in provincial capital cities in utility function
  - instruments validity

- **Estimation**

\[ L_i(\theta) = \sum_{k \in K} \mu_k \prod_{t=1}^{15} \left[ \sum_{j \in J} d_{jt} \Pr(d_{jt} = 1, Y_{jt}, Q_t | \Omega_t, k; \theta) \right] \]

- iterative process of solving the dynamic model and maximizing the likelihood
- simulation deals with missing income
- stochastic production component is assumed to be a measurement error
Identification & Estimation

- **Identification**
  - **problem**: skills are endogenously formed through migration experience
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  \]

  - iterative process of solving the dynamic model and maximizing the likelihood
  - simulation deals with missing income
  - stochastic production component is assumed to be a measurement error
Model Fit

- The estimated dynamic model replicates the data reasonably well.

- **Both parents stay w/ child rural ($j = 1$)**

- **At least one parent moves w/o child ($j = 2$)**

- **Both parents move w/ child urban ($j = 3$)**
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Counterfactual: Are Left-behind Children Worse Off?

**Figure:** Counterfactual Skill Distribution of **Left-behind Children**

- 0.3 st. dev. ↑ skills if parents of left-behind children had never left them
- skill improvement ≈ 6.8% ↑ graduation rates (national average 53%)
Counterfactual: Decomposition of Cognitive Skills

- Decomposition by counterfactual migration choices
  - of all parents who leave their children behind in the baseline (factual world)
  - 94% now stay in rural areas → 0.2 st. dev. ↑ in skills
  - 6% now migrate w/ child to urban locations → 0.6 st. dev. ↑ in skills
  - policy suggestion: encouraging family migration together w/ children
Policy Experiments: Migration Subsidy

- Subsidize families if parents migrate w/ their children to urban locations
### Policy Experiments: Migration Subsidy

**Table:** Effects of Cash Transfer Programs on Migration Rates

<table>
<thead>
<tr>
<th>Subsidy</th>
<th>$j = 1$ nonmigrant</th>
<th>$j = 2$ left-behind</th>
<th>$j = 3$ migrant</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0$</td>
<td>84.02%</td>
<td>11.55%</td>
<td>4.44%</td>
</tr>
<tr>
<td>$25$</td>
<td>83.56%</td>
<td>11.49%</td>
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</tr>
<tr>
<td>$50$</td>
<td>82.81%</td>
<td>11.37%</td>
<td>5.82%</td>
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<tr>
<td>$75$</td>
<td>81.89%</td>
<td>11.22%</td>
<td>6.89%</td>
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<tr>
<td>$100$</td>
<td>80.81%</td>
<td>11.08%</td>
<td>8.11%</td>
</tr>
<tr>
<td>$125$</td>
<td>79.49%</td>
<td>10.90%</td>
<td>9.61%</td>
</tr>
<tr>
<td>$150$</td>
<td>78.11%</td>
<td>10.71%</td>
<td>11.18%</td>
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<tr>
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<td>34.15%</td>
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*a* $j = 1$ if both parents stay w/ child rural  
   $j = 2$ if at least one parent migrates w/o child  
   $j = 3$ if both parents migrate w/ child to urban
**Policy Experiments: Migration Subsidy**

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*a $j = 1$ if both parents stay w/ child rural
   $j = 2$ if at least one parent migrates w/o child
   $j = 3$ if both parents migrate w/ child to urban*
Policy Experiments: Migration Tax

- Tax parents if they leave their children behind
Policy Experiments: Migration Tax

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</tr>
<tr>
<td>$25$</td>
<td>85.21%</td>
<td>10.28%</td>
<td>4.51%</td>
</tr>
<tr>
<td>$50$</td>
<td>86.31%</td>
<td>9.31%</td>
<td>4.55%</td>
</tr>
<tr>
<td>$75$</td>
<td>86.98%</td>
<td>8.4%</td>
<td>4.62%</td>
</tr>
<tr>
<td>$100$</td>
<td>87.68%</td>
<td>7.63%</td>
<td>4.69%</td>
</tr>
<tr>
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$^a j = 1$ if both parents stay w/ child rural
$^a j = 2$ if at least one parent migrates w/o child
$^a j = 3$ if both parents migrate w/ child to urban
Policy Experiments: Relaxing Constraints

- Recent debate whether to relax household registration system (National Development and Reform Commission of China, 2019)

- Reduce migration cost by 25% if parents move together w/ their child
  - Estimated cost of family migration with children is $3,255

- Children’s cognitive skill ↑ by 0.28 st. dev., accompanied by 14% inflow of rural families to urban destinations
Conclusion

• Estimate a dynamic household migration model embedding a child’s cognitive skill formation

• Left-behind children’s cognitive skills would have improved if their families had remained together

• Encouraging rural-to-urban family migration advances children’s cognitive development

• Next steps
  ▶ model material inputs (income) in the cognitive production
  ▶ allow differentials impacts of parental investments by age
Thank you!

Any comments and suggestions are appreciated!

bolun.allen.li@gmail.com
Utility function

\[ U_t = C_t + \alpha_{2c} \mathbb{1}\{j_t = 2\} C_t + \alpha_{3c} \mathbb{1}\{j_t = 3\} C_t \] = consumption

\[ + Q_t + \alpha_{2q} \mathbb{1}\{j_t = 2\} Q_t + \alpha_{3q} \mathbb{1}\{j_t = 3\} Q_t + \alpha_{cq} C_t Q_t \] = child’s cognitive skill

\[ + \alpha_{21} \mathbb{1}\{j_t = 2\} \mathbb{1}\{j_{t-1} \neq 2\} \] = transition cost

\[ + \alpha_{31} \mathbb{1}\{j_t = 3\} \mathbb{1}\{j_{t-1} \neq 3\} \]

\[ + \mathbb{1}\{j_t = 2\} (\alpha_{22} \text{age} + \alpha_{23} \text{age}^2 + \alpha_{24} \text{relative} + \alpha_{25} \text{school ratio}) \] = characteristics

\[ + \mathbb{1}\{j_t = 3\} (\alpha_{32} \text{age} + \alpha_{33} \text{age}^2 + \alpha_{34} \text{relative} + \alpha_{35} \text{school ratio}) \]

\[ + \mathbb{1}\{j_t = 2\} \sum_{k \in K} \alpha_{2k} \mathbb{1}\{\text{type} = k\} \] = unobserved heterogeneity

\[ + \mathbb{1}\{j_t = 3\} \sum_{k \in K} \alpha_{3k} \mathbb{1}\{\text{type} = k\} \]

\[ + \mathbb{1}\{j_t = 1\} \varepsilon_{1t} + \mathbb{1}\{j_t = 2\} \varepsilon_{2t} + \mathbb{1}\{j_t = 3\} \varepsilon_{3t} \] = preference shocks
**Figure:** Raven’s Colored Progressive Matrices Example
## Descriptive Statistics

<table>
<thead>
<tr>
<th>Household characteristics</th>
<th>Mean</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household income ($)</td>
<td>1069.82</td>
<td>235.29</td>
</tr>
<tr>
<td>Distance (miles)</td>
<td>60.35</td>
<td>46.23</td>
</tr>
<tr>
<td>Relative</td>
<td>0.44</td>
<td>0.50</td>
</tr>
<tr>
<td>Father education</td>
<td>2.62</td>
<td>1.04</td>
</tr>
<tr>
<td>Mother education</td>
<td>2.46</td>
<td>0.95</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Choice fraction</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Never move</td>
<td>56.60%</td>
<td>-</td>
</tr>
<tr>
<td>Leave child behind at least once</td>
<td>35.34%</td>
<td>-</td>
</tr>
<tr>
<td>Move at least once w/ child</td>
<td>12.33%</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cumulative decision periods (yrs)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay w/ child</td>
<td>12.84</td>
<td>3.52</td>
</tr>
<tr>
<td>Leave child behind conditional on moving</td>
<td>4.49</td>
<td>3.69</td>
</tr>
<tr>
<td>Move w/ child conditional on moving</td>
<td>4.66</td>
<td>3.56</td>
</tr>
</tbody>
</table>
Raw Score Distribution

Mean = 9.15
St. Dev. = 3.66
Num. Obs. = 116

Mean = 9.41
St. Dev. = 3.35
Num. Obs. = 49

Mean = 8.95
St. Dev. = 3.34
Num. Obs. = 75

Mean = 10.68
St. Dev. = 3.52
Num. Obs. = 131

Mean = 11.53
St. Dev. = 3.10
Num. Obs. = 139

Mean = 11.67
St. Dev. = 3.42
Num. Obs. = 156

Mean = 12.33
St. Dev. = 3.36
Num. Obs. = 128

Mean = 12.59
St. Dev. = 3.02
Num. Obs. = 116
Item Response Theory

- model the probability of correctly answering a question from a test as a function of test characteristics and a test takers latent skills
- test characteristics include difficulty level $\lambda_i$ and discrimination level $\kappa_i$
- latent skill $\zeta_j$ is assumed to follow a standard Normal distribution
- estimate parameters of test characteristics using maximum likelihood

$$\Pr(Y_{ij} = 1 \mid \Gamma, \zeta_j) = \frac{\exp\{\kappa_i(\zeta_j - \lambda_i)\}}{1 + \exp\{\kappa_i(\zeta_j - \lambda_i)\}}$$

- recover latent skill using empirical Bayesian updating

Latent Cognitive Skill Distribution
**Figure:** Item Characteristics Curve
Figure: Item Characteristics Curve
Figure: Variation in Instruments

Panel A: Distance

Panel B: School Ratio
Table: Instrumental Variable Test & Evidence

Panel A: Tests for Weak Instruments

*Under Identification Test*
Kleibergen-Paap rank LM statistic (p-value) 31.53 (0.00)

*Weak Instrument Test*
Cragg-Donald Wald F statistic 11.39
Kleibergen-Paap Wald F statistic 10.57

Stock-Yogo Critical values
10% & 15% maximal relative biases 13.43 & 8.18

Panel B: Suggestive Evidence

<table>
<thead>
<tr>
<th>Distance</th>
<th>Correlation</th>
<th>St. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity availability</td>
<td>−0.025</td>
<td>0.016</td>
</tr>
<tr>
<td>Agricultural wage</td>
<td>−0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>Housing price</td>
<td>−0.248</td>
<td>0.335</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of School</th>
<th>Correlation</th>
<th>St. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subjective measure of school quality</td>
<td>−0.031</td>
<td>0.023</td>
</tr>
</tbody>
</table>

Identification
Table: $\chi^2$ Goodness-of-Fit Tests of the Within-Sample Choice Distribution

<table>
<thead>
<tr>
<th>Age</th>
<th>$j = 1$</th>
<th>$j = 2$</th>
<th>$j = 3$</th>
<th>Row</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.13</td>
<td>1.11</td>
<td>0.32</td>
<td>1.56</td>
</tr>
<tr>
<td>1</td>
<td>0.20</td>
<td>8.72*</td>
<td>1.72</td>
<td>10.64*</td>
</tr>
<tr>
<td>2</td>
<td>0.31</td>
<td>1.76</td>
<td>2.17</td>
<td>4.25</td>
</tr>
<tr>
<td>3</td>
<td>0.00</td>
<td>0.17</td>
<td>0.08</td>
<td>0.25</td>
</tr>
<tr>
<td>4</td>
<td>0.00</td>
<td>0.28</td>
<td>0.11</td>
<td>0.39</td>
</tr>
<tr>
<td>5</td>
<td>0.00</td>
<td>0.11</td>
<td>0.05</td>
<td>0.16</td>
</tr>
<tr>
<td>6</td>
<td>0.10</td>
<td>0.26</td>
<td>2.04</td>
<td>2.40</td>
</tr>
<tr>
<td>7</td>
<td>0.39</td>
<td>1.01</td>
<td>2.01</td>
<td>3.40</td>
</tr>
<tr>
<td>8</td>
<td>0.10</td>
<td>0.12</td>
<td>2.15</td>
<td>2.37</td>
</tr>
<tr>
<td>9</td>
<td>0.04</td>
<td>0.39</td>
<td>1.79</td>
<td>2.22</td>
</tr>
<tr>
<td>10</td>
<td>0.02</td>
<td>0.22</td>
<td>0.00</td>
<td>0.24</td>
</tr>
<tr>
<td>11</td>
<td>0.01</td>
<td>0.00</td>
<td>0.13</td>
<td>0.14</td>
</tr>
<tr>
<td>12</td>
<td>0.13</td>
<td>0.01</td>
<td>1.06</td>
<td>1.20</td>
</tr>
<tr>
<td>13</td>
<td>0.17</td>
<td>0.02</td>
<td>1.04</td>
<td>1.22</td>
</tr>
<tr>
<td>14</td>
<td>0.17</td>
<td>0.01</td>
<td>1.38</td>
<td>1.56</td>
</tr>
</tbody>
</table>
# Model Fit: Migration Choice Transition Matrix

## Table: $\chi^2$ Goodness-of-Fit Tests of the Migration Transition Matrix

<table>
<thead>
<tr>
<th>Choice $(t-1)$</th>
<th>$j = 1$</th>
<th>$j = 2$</th>
<th>$j = 3$</th>
<th>Row</th>
</tr>
</thead>
<tbody>
<tr>
<td>$j = 1$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td>95.88%</td>
<td>0.91%</td>
<td>3.21%</td>
<td>-</td>
</tr>
<tr>
<td>Model</td>
<td>95.51%</td>
<td>0.99%</td>
<td>4.51%</td>
<td>-</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>0.14</td>
<td>0.66</td>
<td>38.24*</td>
<td>39.04*</td>
</tr>
<tr>
<td>$j = 2$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td>19.51%</td>
<td>79.78%</td>
<td>0.71%</td>
<td>-</td>
</tr>
<tr>
<td>Model</td>
<td>28.42%</td>
<td>71.26%</td>
<td>0.32%</td>
<td>-</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>35.22*</td>
<td>12.85*</td>
<td>5.99*</td>
<td>54.06*</td>
</tr>
<tr>
<td>$j = 3$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td>4.60%</td>
<td>1.31%</td>
<td>94.09%</td>
<td>-</td>
</tr>
<tr>
<td>Model</td>
<td>6.49%</td>
<td>0.17%</td>
<td>93.34%</td>
<td>-</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>2.51</td>
<td>34.94*</td>
<td>0.03</td>
<td>37.48*</td>
</tr>
</tbody>
</table>
Model Fit: Skill Distribution by Migration Experience

- For both parents staying with the child in rural areas (\(j = 1\)), the data and model show a similar trend in mean skills across different cumulative migration duration intervals (\([0, 5]), [6, 10], [11, 15]\)).

- For at least one parent moving without the child in urban areas (\(j = 2\)), the data and model also show comparable mean skills across the same intervals.

- For both parents moving with the child in urban areas (\(j = 3\)), the data and model align similarly in mean skills across the intervals.

A graphical representation illustrates the comparisons between data and model for each scenario, with the x-axis representing cumulative migration duration in years and the y-axis showing mean and standard deviation of skills.
Figure: Model Fit to Income Distribution by Migration Status
Figure: Model Fit to Income Distribution by Parental Education

- Father education = 1, Mother education = 1
- Father education = 1, Mother education = 2
- Father education = 1, Mother education = 3
- Father education = 2, Mother education = 1
- Father education = 2, Mother education = 2
- Father education = 2, Mother education = 3
- Father education = 3, Mother education = 1
- Father education = 3, Mother education = 2
- Father education = 3, Mother education = 3