The Impact of Parental Income and Parental Education on the Schooling of Children

Colm Harmon (UCD Geary, CEPR, and IZA)
Ian Walker (LUMS, UCD Geary Institute, and IZA)
Arnaud Chevalier (Royal Holloway and IZA)
Vincent O’Sullivan (Warwick)
Motivation

• Long history of research on intergenerational mobility in social science
  – Earnings elasticity of father and son’s earnings:
    • 0.40 - 0.50 in US (Solon, 1999), 0.60 in UK (Dearden et al., 1997)
  – International Comparisons:
    • Bratsberg, Roed, Raaum, Naylor,….. and Osterbacka (2007)
  – Elasticity of educational mobility:
    • 0.25 to 0.40 in UK (Dearden et al., 1997)

• Mechanism?
  – Is it causal?
  – Is it parental education or income or both that matters?

• UK policy context
  – Raising min SLA to 18, abolish child poverty
Wider context

• Private returns to education widely studied
  – High returns suggest possible underinvestment
  – So encouraging more human capital formation might be welfare improving

• Growing literature on social returns:
  – Health and education.
    • Currie and Moretti (2002) – Mother’s education and child birth weight in developing world and US.
  – “Social Capital” and Education.

• Children’s human capital
  – An externality of sorts
    • Survey of correlation studies by Haverman and Wolfe (JEL 1995)
    • Suggest strong associations
Intergenerational Transfer: Nurture, Nature, or what?

• Better educated are better at parenting
  – Higher home productivity as well as in the paid marketplace
• Better educated make better investments
  – Including investing in the human capital of their children
• Better educated are better peers
  – Cultural transmission
• Better educated have better genes
  – Unobserved characteristics of the parents may be genetically transmitted to the children.
Literature Review
Children of identical twins

• Eliminates (half of) the nature effects?
  – As genetically alike as siblings
  – but cousins – so (slightly) different nurture

• Behrman and Rosenzweig (AER 2002, 2005) and Antonovics and Golberger (AER 2005)
  – Differences between the children of US MZ twins
    • Small effect of father’s education, no effect of mother’s
  – But terrible data

• Bingley and Jensen (ESPE, 2008)
  – Much better data
    • Conventional effects of DZ mother’s education
    • no effect of MZ mothers
Literature Review
Adoptees

• Eliminates the nurture effect?
  – But selective adoption? Differential treatment?

• Mostly small samples
    • Small effect of adoptive father’s educ on adopted sons
    • About the same as on natural sons

• Two bigger datasets control for selection
  – Sacerdote (2007)
    • Korean adoptees randomly assigned to US parents
    • Some impact of adopted mother’s education
      – But very small when father’s education included
  – Bjorklund et al (QJE 2006)
    • Swedish data registers
      – Use pre-adoption info to control for selection
      – Finds post-adoption mother’s education matters (a little)
Literature Review

Instrumental Variables

• Identifies causal (nurture) effect?
  – Most studies focus on RoSLA as an IV (Harmon & Walker, AER, 1995)

• Black, Devereux and Salvanes (AER, 2005)
  – Cross sectional variation in SLA in Norway
    • Uses completed schooling
  – OLS supports evidence of impact, IV does not
    • but (weak) evidence of mother/son influences
    • Effect of 0.12 years for low education sample

• Oreopoulos, Page and Stevens, (JoLE 2006)
  – Cross sectional variation in Min SLA in USA:
    • Outcome is grade repetition:
      – OLS and IV
        • Significant effects for sum of parent’s educations
          – Insignificant when entered separately

• Other studies
  – Grade repetition in HE
    • Carneiro et al (2007)
    • Maurin and McNally (2008)
      – Suggestive of an effect that parental HE has an effect, but weak IVs
Does money matter?

- Shea (2000): union status as IV
  - big effects of income on child’s subsequent wages (for low educated fathers)
- Carneiro/Heckman (2002): Credit constraints
  - long term factors (parental education) matter for college attendance
    - not current parental income
- Jenkins and Schluter (2002): school type
  - Correlation
    - later income matters more than early income
  - but small effect compared to parental education
  - Matched group evidence
    - Payment increases participation by about 6%
This paper

• Effects of parental education and income on the probability dropping out (at age 16)
  – Intermediate outcome, but an important one in the UK
    • Empirical work- QLFS
    • OLS – education and income have usual effects
• Endogeneity – causal effects of education and income
• Aim of study: disentangle the effects!
• IV estimates
  – Maternal education matters for daughters
  – Paternal earnings matters for sons (and maybe daughters)
Endogeneity and IV

- Parental schooling and the error term are correlated
  - RoSLA provides RD – no x-section variation but
    • control for smooth cohort effects in parental yob
    • narrow the window around reform
  - LATE
    • Parental education affect only identified for those constrained to leave early or with lower taste for schooling
    • but still useful for policy

- Also use parental months of birth as IVs
  - Youngest in school cohort suffer penalty
Endogeneity and IV

- Parental income is endogenous.
  - Labour market productivity may be correlated with parenting ability?
- Need to instrument (again).
  - Use union membership, occupation and interactions
- Assumes union membership etc is uncorrelated with child’s outcome
  - Union wage premium due to bargaining strength etc.
  - Not to unobservables
- Difficult to incorporate maternal income separately because of zeroes
  - Assume HH income is pooled and estimate HH income effect from paternal income alone
Empirical model

• Mother’s SLA:
  \[ S_M = \varphi_0 + \varphi_1 IV_M + g(\text{DoB}_M) + \varepsilon_{MS} \]
  where \( IV_M = \text{mob}_M \) and \( \text{RoSLA}_M \)

• Father’s SLA:
  \[ S_F = \pi_0 + \pi_1 IV_F + h(\text{DoB}_F) + \varepsilon_{FS} \]
  where \( IV_F = \text{mob}_F \) and \( \text{RoSLA}_F \)

• Father’s Log Earnings:
  \[ \ln Y_F = \delta_0 + \delta_1 \text{Age}_F + \delta_2 \text{Age}^2_F + f(IV_Y) + e(X_H) + \varepsilon_{FY} \]
  where \( X_H = \text{regs,month,yr,Union}_F,SEG_F, IV_Y=\text{Union}_F*SEG_F \)

• Child outcome
  \[ \text{Prob}(S_c > 15) = \alpha_0 + \alpha_1 S_M + \alpha_2 S_F + \alpha_3 \ln Y_F + \varepsilon_C \]
UK Quarterly LFS: 1992-2007

• Rotating panel. Address remains in for 5 qtrs
  – Earnings data asked in Q5 (and in Q1 from 97)
  – Union information asked Q3 each year.
• 16*, 17 & 18 year olds
  – 96% live with at least one parent
    * include 16’s when interviewed after choice
  – 4% live away from parents, 3% with father only, 20% with mother only, 73% with both.
• Characteristics of parents mapped to child in HH
• Select if
  – Both parents present, father employee, not a migrant, not Scot, no missing/mis-coded data (mostly missing wage)
Data – outcome variables

• Probability of attending post compulsory schooling
  – Define as
    • in education at present
    • based on currently in education question
    OR
    • in education between 16-18 even if now left school
    • based on age left full time education question

• Probability of 5+ GCSEs at grade A*-C
  – Similar story emerges.

• Can probably also estimate effects of parental background on A-level and university entrant
  – Exploit wave 5 information for those present in wave 1 at age 18
## Descriptive statistics

<table>
<thead>
<tr>
<th>Age distribution %:</th>
<th>Living Away</th>
<th>Living with one</th>
<th>Living with both</th>
<th>Final sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>2</td>
<td>11</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>17</td>
<td>34</td>
<td>49</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>18</td>
<td>64</td>
<td>41</td>
<td>43</td>
<td>43</td>
</tr>
<tr>
<td>Stayed on at 16</td>
<td>23</td>
<td>71</td>
<td>76</td>
<td>78</td>
</tr>
<tr>
<td>5+ GCSE A*-C</td>
<td>39</td>
<td>67</td>
<td>77</td>
<td>78</td>
</tr>
<tr>
<td>observations:</td>
<td>754</td>
<td>9181</td>
<td>31474</td>
<td>8596</td>
</tr>
</tbody>
</table>
## Descriptive statistics

<table>
<thead>
<tr>
<th></th>
<th>Log $Y_F$</th>
<th>$S_F$</th>
<th>$S_M$</th>
<th>Age$_F$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Girls: N=4142</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not stay in</td>
<td>6.05</td>
<td>15.93</td>
<td>15.93</td>
<td>45.41</td>
</tr>
<tr>
<td>full time education 18%</td>
<td>(0.42)</td>
<td>(1.46)</td>
<td>(1.23)</td>
<td>(5.51)</td>
</tr>
<tr>
<td>Did stay in</td>
<td>6.28</td>
<td>17.19</td>
<td>17.17</td>
<td>47.09</td>
</tr>
<tr>
<td>full time education 82%</td>
<td>(0.46)</td>
<td>(2.53)</td>
<td>(2.19)</td>
<td>(5.08)</td>
</tr>
<tr>
<td>Whole sample</td>
<td>6.24</td>
<td>16.96</td>
<td>16.92</td>
<td>46.8</td>
</tr>
<tr>
<td></td>
<td>(0.46)</td>
<td>(2.5)</td>
<td>(2.11)</td>
<td>(5.19)</td>
</tr>
</tbody>
</table>
# Descriptive statistics

**Boys: N=4454**

<table>
<thead>
<tr>
<th></th>
<th>Log $Y_F$</th>
<th>$S_F$</th>
<th>$S_M$</th>
<th>Age$_F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not stay in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>full time education 18%</td>
<td>6.04</td>
<td>15.97</td>
<td>16</td>
<td>45.41</td>
</tr>
<tr>
<td></td>
<td>(0.43)</td>
<td>(1.48)</td>
<td>(1.25)</td>
<td>(5.51)</td>
</tr>
<tr>
<td>Did stay in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>full time education 82%</td>
<td>6.29</td>
<td>17.41</td>
<td>17.32</td>
<td>47.09</td>
</tr>
<tr>
<td></td>
<td>(0.5)</td>
<td>(2.68)</td>
<td>(2.23)</td>
<td>(5.08)</td>
</tr>
<tr>
<td>Whole sample</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.22</td>
<td>17.04</td>
<td>16.95</td>
<td>46.8</td>
</tr>
<tr>
<td></td>
<td>(0.46)</td>
<td>(2.5)</td>
<td>(2.15)</td>
<td>(5.19)</td>
</tr>
</tbody>
</table>
Proportion of children by $S_F$
**OLS:**

Dependent Variable $S_C > 15$

<table>
<thead>
<tr>
<th></th>
<th>boys</th>
<th>girls</th>
<th>boys</th>
<th>girls</th>
<th>boys</th>
<th>girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_M$</td>
<td>0.034</td>
<td>0.025</td>
<td>0.032</td>
<td>0.023</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.004</td>
<td>0.003</td>
<td>0.004</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$S_F$</td>
<td>0.024</td>
<td>0.016</td>
<td>0.017</td>
<td>0.011</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td>0.003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\log Y_F$</td>
<td></td>
<td>0.193</td>
<td>0.139</td>
<td>0.12</td>
<td>0.093</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.014</td>
<td>0.013</td>
<td>0.015</td>
<td>0.014</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.12</td>
<td>0.08</td>
<td>0.09</td>
<td>0.07</td>
<td>0.13</td>
<td>0.09</td>
</tr>
</tbody>
</table>
The Instruments
Raising of School Leaving Age - Fathers
The Instruments
Raising of School Leaving Age - Fathers

0% 25% 50% 75% 100%


Age 15 Age 16 Age 17 Age 18 Age 19+
The Instruments
School entry policy in England and Wales

• Summer born penalised
  – Academic year starts in September
• Traditional policy – 1950’s, 1960’s
  – entry at start of term child turns 5.
• Flexibility - late 60’s +
  – 3 points of entry Sept, Jan & April/May
  – e.g. August born starts in April/May
    • is youngest in class
    • Has two fewer terms in primary school than class mates
  – e.g. September born starts in September
    • Is oldest in class
The Instruments
Average SLA by year of birth - England & Wales

September Born
July Born
## The Instruments

Are unionized fathers better parents?

<table>
<thead>
<tr>
<th></th>
<th>Union</th>
<th>Non Union</th>
</tr>
</thead>
<tbody>
<tr>
<td>% disagree with statement</td>
<td>23%</td>
<td>18%</td>
</tr>
<tr>
<td>“Needs of children more important than own”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If school report poor, parent would very likely or likely to:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact teacher</td>
<td>89%</td>
<td>81%</td>
</tr>
<tr>
<td>keep closer eye on child</td>
<td>87%</td>
<td>91%</td>
</tr>
<tr>
<td>talk with child</td>
<td>94%</td>
<td>97%</td>
</tr>
<tr>
<td>give more help with schoolwork</td>
<td>93%</td>
<td>93%</td>
</tr>
</tbody>
</table>

**Source:** NCDS
## The Instruments

**Are unionized fathers better parents?**

<table>
<thead>
<tr>
<th></th>
<th>Union</th>
<th>Non-union</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hours spent watching TV ....</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>on typical weekday</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>(% with zero hours)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>on typical weekend day</td>
<td>60</td>
<td>62</td>
</tr>
<tr>
<td>(% with 2 or less hours per day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time spent with child – how often.....</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>child eats meal with mother and father?</td>
<td>71</td>
<td>58</td>
</tr>
<tr>
<td>talks to child while busy?</td>
<td>57</td>
<td>52</td>
</tr>
<tr>
<td>reads stories to child?</td>
<td>83</td>
<td>88</td>
</tr>
</tbody>
</table>

*Source: NCDS*
<table>
<thead>
<tr>
<th></th>
<th>boys</th>
<th></th>
<th></th>
<th>girls</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_M$</td>
<td>0.082</td>
<td>0.14</td>
<td>0.076</td>
<td>0.141</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.068</td>
<td>0.057</td>
<td></td>
<td>0.067</td>
<td>0.056</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$S_F$</td>
<td>0.066</td>
<td>0.041</td>
<td>0.003</td>
<td>-0.011</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.06</td>
<td>0.05</td>
<td></td>
<td>0.06</td>
<td>0.052</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\ln Y_F$</td>
<td></td>
<td>0.425</td>
<td>0.31</td>
<td>0.458</td>
<td>0.337</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.026</td>
<td>0.024</td>
<td>0.03</td>
<td>0.026</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>4451</td>
<td>4146</td>
<td>4451</td>
<td>4146</td>
<td>4451</td>
<td>4146</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RoSLA effects about +0.4 years
MoB effect about -0.015 years per month
RoSLA$_M$ and RoSLA$_F$ $F = 52$
MoB$_F$ and MoB$_M$ $F = 25$
Joint MoB and RoSLA $F = 99$
Union*SEG $F = 73$
Robustness checks

- Money matters for sons
- $S_M$ matters for daughters

- These conclusions robust to
  - Narrowing the window
  - Dropping MoB as IVs
  - Using Union as an IV
  - Using only 16 years olds or only 17 year olds
  - Dropping $S_F$

- No significant differences across time
  - New Labour vs Old Tory periods
Interpretation

- $\frac{\partial \text{Prob}(\text{dropout})}{\partial S_M} = -0.14$
  - 1 extra $S_M$ reduces dropout prob by 0.14
  - Dropouts have about 2 yrs less $S_c$
    - Increases $S_c$ on average by about 0.3
    - Return to $S$ about 0.1
  - So extra $S_M$ raises wages of children by 0.03
    - PV of £15k compared to cost of £6k
- $\frac{\partial \text{Prob}(\text{dropout})}{\partial \ln Y_F} = -0.46$
  - Extra 1 yr of $S_F$ raises $\ln Y_F$ by 0.1
    - reduces sons (daughters) dropout prob by 0.05 (0.03)
    - PV of £6.5k compared to cost of £6k
      - And there will be other benefits too?
- But problem is - how to target the at-risk children?
Conclusion

- Examines effects of parental education and income on the probability of dropping out
- Education and income have usual effects in OLS
- Endogeneity – IV
  - Maternal education matters for daughters
  - Paternal earnings matter for sons (and daughters)
  - Stronger effects than for OLS
    - Suggesting LATE
- Symmetric results for probability of getting 5+ GCSE passes
- Policy implications
  - Child poverty addresses low achievement of boys
  - Raise min SLA to 18 addresses low achievement of girls