The influence of mother’s and father’s education on educational attainment

Maarten L. Buis

Department of Social Research Methodology
Vrije Universiteit Amsterdam
http://home.fsw.vu.nl/m.buis/
Questions

1. Is educational attainment influenced by the education of:
   ▶ the father and/or the mother,
Questions

1. Is educational attainment influenced by the education of:
   ▶ the father and/or the mother,
   ▶ the highest and/or lowest educated parent,
Questions

1. Is educational attainment influenced by the education of:
   - the father and/or the mother,
   - the highest and/or lowest educated parent,
   - the same-sex and/or different sex parent, or
Questions

1. Is educational attainment influenced by the education of:
   - the father and/or the mother,
   - the highest and/or lowest educated parent,
   - the same-sex and/or different sex parent, or
   - any combination of the three?
Questions

1. Is educational attainment influenced by the education of:
   - the father and/or the mother,
   - the highest and/or lowest educated parent,
   - the same-sex and/or different sex parent, or
   - any combination of the three?

2. Are the roles of the father’s and mother’s education constant or have they changed over time?
Questions

1. Is educational attainment influenced by the education of:
   - the father and/or the mother,
   - the highest and/or lowest educated parent,
   - the same-sex and/or different sex parent, or
   - any combination of the three?

2. Are the roles of the father’s and mother’s education constant or have they changed over time?

3. Is there a difference between men and women in the effect of parental education?
Questions

1. Is educational attainment influenced by the education of:
   - the father and/or the mother,
   - the highest and/or lowest educated parent,
   - the same-sex and/or different sex parent, or
   - any combination of the three?

2. Are the roles of the father’s and mother’s education constant or have they changed over time?

3. Is there a difference between men and women in the effect of parental education?

4. Is there a (non-linear) trend in the effect of parental education?
Main results

- Educational attainment is influenced by:
  - the highest and lowest educated parent, and
  - the same-sex and different sex parent.
Main results

- Educational attainment is influenced by:
  - the highest and lowest educated parent, and
  - the same-sex and different sex parent.
- These roles have *not* changed.
Main results

- Educational attainment is influenced by:
  - the highest and lowest educated parent, and
  - the same-sex and different sex parent.
- These roles have *not* changed.
- There is *no* difference between men and women in the effect of parental education.
Main results

- Educational attainment is influenced by:
  - the highest and lowest educated parent, and
  - the same-sex and different sex parent.
- These roles have *not* changed.
- There is *no* difference between men and women in the effect of parental education.
- The effect of parental education has decreased, but this decrease has slowed down.
Data

- International Stratification and Mobility File (ISMF) on the Netherlands.
- 40,000 respondents aged between 24 and 65 have complete information on child’s, father’s and mother’s education and father’s occupation.
- Number of cases are unequally distributed over cohorts.
The model

\[ed = coh * fem + coh * fem * fisei + coh * fem * par_{ed}\]

\[par_{ed} = fed + med +
fed * hi_{fed} + med * hi_{med} +
fed * male + med * female\]
Full model

\[ par_{ed} = fed + med + \]
\[ fed \times hi_{fed} + med \times hi_{med} + \]
\[ fed \times male + med \times female \]

<table>
<thead>
<tr>
<th></th>
<th>estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>father</td>
<td></td>
</tr>
<tr>
<td>same sex</td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>fed + fed<em>hi_{fed} + fed</em>male</td>
</tr>
<tr>
<td>lowest</td>
<td>fed + fed*male</td>
</tr>
<tr>
<td>different sex</td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>fed + fed*hi_{fed}</td>
</tr>
<tr>
<td>lowest</td>
<td>fed</td>
</tr>
<tr>
<td>mother</td>
<td></td>
</tr>
<tr>
<td>same sex</td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>med + med<em>hi_{med} + med</em>female</td>
</tr>
<tr>
<td>lowest</td>
<td>med + med*female</td>
</tr>
<tr>
<td>different sex</td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>med + med*hi_{med}</td>
</tr>
<tr>
<td>lowest</td>
<td>med</td>
</tr>
</tbody>
</table>
Constraints on the roles of father and mother

\[ \text{effect father} = \text{effect mother} \]

\[ \text{par}_{\text{ed}} = \text{fed} + \text{med} + \]
\[ \text{fed} \times \text{hi}_{\text{fed}} + \text{med} \times \text{hi}_{\text{med}} + \]
\[ \text{fed} \times \text{male} + \text{med} \times \text{female} \]

\[ \chi^2(3) = 7.20, p = 0.06 \]
Constraints on the roles of father and mother

effect father = effect mother
no effect highest and lowest educated parent

\[ par_{ed} = \underbrace{fed + med} + \]
\[ \underbrace{fed \ast hi_{fed} + med \ast hi_{med}} + \]
\[ \underbrace{fed \ast male + med \ast female} = 0 \]

\[ \chi^2(4) = 107.86, \ p = 0.00 \]
Constraints on the roles of father and mother

effect father = effect mother
no effect same-sex and different-sex parent

\[ \text{par}_\text{ed} = \text{fed} + \text{med} + \]
\[ \text{fed} \times \text{hi\_fed} + \text{med} \times \text{hi\_med} + \]
\[ \text{fed} \times \text{male} + \text{med} \times \text{female} \]
\[ = 0 \]

\[ \chi^2(4) = 14.39, p = 0.01 \]
Constraints on the roles of father and mother

effect father = effect mother
no effect lowest educated and different sex parent

\[
\text{par}_{\text{ed}} = \underbrace{\text{fed} + \text{med} +}_{=0} \underbrace{\text{fed} \times \text{hi}_\text{fed} + \text{med} \times \text{hi}_\text{med}} + \underbrace{\text{fed} \times \text{male} + \text{med} \times \text{female}}
\]

\[\chi^2(4) = 320.96, \ p = 0.00\]
Constraint on changes in the roles of fathers and mothers

if changing roles

$$ed = \cdots + \gamma_1 \text{tg}_\text{joined}_\text{ed} + \gamma_2 \text{tg}_\text{hi}_\text{ed} + \gamma_3 \text{tg}_\text{ssex}_\text{ed}$$

if constant roles

$$ed = \cdots + \lambda_\text{tg}(\gamma_1 \text{tg}_\text{joined}_\text{ed} + \gamma_2 \text{tg}_\text{hi}_\text{ed} + \gamma_3 \text{tg}_\text{ssex}_\text{ed})
= \cdots + \lambda_\text{tg}_\text{par}_\text{ed}$$

This is a proportionality constraint.

$$\chi^2(115) = 126.86, \ p = 0.21$$
Constraint on changes in the roles of fathers and mothers

if changing roles

\[ ed = \cdots + \gamma_1 \text{tg}_\text{joined}_\text{ed} + \gamma_2 \text{tg}_\text{hi}_\text{ed} + \gamma_3 \text{tg}_\text{ssex}_\text{ed} \]

if constant roles

\[ ed = \cdots + \lambda \text{tg} (\gamma_1 \text{tg}_\text{joined}_\text{ed} + \gamma_2 \text{tg}_\text{hi}_\text{ed} + \gamma_3 \text{tg}_\text{ssex}_\text{ed}) \]

\[ = \cdots + \lambda \text{tg}_\text{par}_\text{ed} \]

This is a proportionality constraint.
\[ \chi^2(115) = 126.86, p = 0.21 \]
Constraint on changes in the roles of fathers and mothers

if changing roles

\[ ed = \cdots + \gamma_1 \text{tg}\_\text{joined}\_\text{ed} + \gamma_2 \text{tg}\_\text{hi}\_\text{ed} + \gamma_3 \text{tg}\_\text{ssex}\_\text{ed} \]

if constant roles

\[ ed = \cdots + \lambda \text{tg}(\gamma_1 \text{tg}\_\text{joined}\_\text{ed} + \gamma_2 \text{tg}\_\text{hi}\_\text{ed} + \gamma_3 \text{tg}\_\text{ssex}\_\text{ed}) = \cdots + \lambda \text{tg}\_\text{par}\_\text{ed} \]

This is a proportionality constraint.

\[ \chi^2(115) = 126.86, \ p = 0.21 \]
Relative importance of roles

<table>
<thead>
<tr>
<th></th>
<th>relative importance</th>
<th>confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>same sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>lowest</td>
<td>.88</td>
<td>.85 – .90</td>
</tr>
<tr>
<td><strong>different sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>.88</td>
<td>.79 – .96</td>
</tr>
<tr>
<td>lowest</td>
<td>.76</td>
<td>.67 – .84</td>
</tr>
</tbody>
</table>
Constraint on the effect of parental education

The role of fathers and mothers
The effect of parental education

Educational attainment and parental education

Maarten L. Buis
Constraint on the effect of parental education
Constraint on the effect of parental education

\[ \chi^2(59) = 77.21, \ p = 0.06 \]
Loess curve in 1949

(a) Observations Within the Window
span = 0.6
year in which respondent is 12
effect of parental education
1930 1950 ... ●
●
●
●
●
●
●●
●
●
●
●
●
●
●
●
●
●
●
●
●●
●
●
●
●
●
●
●
●
●
●
●

(b) Tricube Weights
year in which respondent is 12
Tricube Kernel Weight
1930 1950 1970 1990
0 1 2

(c) Tricube (+), Precision (x), and Joint (o) Weights
year in which respondent is 12
weights
1930 1950 1970 1990
0 1 2

(d) Weighted 3rd degree polynomial
year in which respondent is 12
effect of parental education
1930 1950 1970 1990
0.2 0.3 0.4

Maarten L. Buis
Educational attainment and parental education
Non-linear trend

(b) Lowess Smooth and 90% Confidence Envelope

c) Trend and 90% Confidence Envelope

(d) Change in Trend and 90% Confidence Envelope

The role of fathers and mothers
The effect of parental education

Maarten L. Buis

Educational attainment and parental education
Summary trend

The role of fathers and mothers
The effect of parental education

Maarten L. Buis
Educational attainment and parental education
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother,
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother, No
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother, No
   ▶ the highest and lowest educated parent, and/or
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother, No
   ▶ the highest and lowest educated parent, and/or Yes
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother, No
   ▶ the highest and lowest educated parent, and/or Yes
   ▶ the same-sex and different sex parent
Conclusions

1. Is educational attainment influenced by the education of:
   - the father and the mother, **No**
   - the highest and lowest educated parent, and/or **Yes**
   - the same-sex and different sex parent **Yes**
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother, No
   ▶ the highest and lowest educated parent, and/or Yes
   ▶ the same-sex and different sex parent Yes

2. Are the roles of the father’s and mother’s education constant or have they changed over time?
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother, No
   ▶ the highest and lowest educated parent, and/or Yes
   ▶ the same-sex and different sex parent Yes

2. Are the roles of the father’s and mother’s education constant or have they changed over time? Constant
Conclusions

1. Is educational attainment influenced by the education of:
   - the father and the mother, No
   - the highest and lowest educated parent, and/or Yes
   - the same-sex and different sex parent Yes

2. Are the roles of the father’s and mother’s education constant or have they changed over time? Constant

3. Is there a difference between men and women in the effect of parental education?
Conclusions

1. Is educational attainment influenced by the education of:
   - the father and the mother, No
   - the highest and lowest educated parent, and/or Yes
   - the same-sex and different sex parent Yes

2. Are the roles of the father’s and mother’s education constant or have they changed over time? Constant

3. Is there a difference between men and women in the effect of parental education? No difference
Conclusions

1. Is educational attainment influenced by the education of:
   - the father and the mother, No
   - the highest and lowest educated parent, and/or Yes
   - the same-sex and different sex parent Yes

2. Are the roles of the father’s and mother’s education constant or have they changed over time? Constant

3. Is there a difference between men and women in the effect of parental education? No difference

4. Is there a (non-linear) trend in the effect of parental education?
   Mostly declining, but the trend slowed down around 1950, speeded up around 1960 and slowed down again around 1970, and the effect of parental education has not changed since 1972.
Conclusions

1. Is educational attainment influenced by the education of:
   - the father and the mother, \textbf{No}
   - the highest and lowest educated parent, and/or \textbf{Yes}
   - the same-sex and different sex parent \textbf{Yes}

2. Are the roles of the father’s and mother’s education constant or have they changed over time? \textbf{Constant}

3. Is there a difference between men and women in the effect of parental education? \textbf{No difference}

4. Is there a (non-linear) trend in the effect of parental education? \textbf{Mostly declining,}
Conclusions

1. Is educational attainment influenced by the education of:
   ▶ the father and the mother, No
   ▶ the highest and lowest educated parent, and/or Yes
   ▶ the same-sex and different sex parent Yes

2. Are the roles of the father’s and mother’s education constant or have they changed over time? Constant

3. Is there a difference between men and women in the effect of parental education? No difference

4. Is there a (non-linear) trend in the effect of parental education? Mostly declining, but the trend slowed down around 1950, speeded up around 1960 and slowed down again around 1970, and
Conclusions

1. Is educational attainment influenced by the education of:
   - the father and the mother, No
   - the highest and lowest educated parent, and/or Yes
   - the same-sex and different sex parent Yes

2. Are the roles of the father’s and mother’s education constant or have they changed over time? Constant

3. Is there a difference between men and women in the effect of parental education? No difference

4. Is there a (non-linear) trend in the effect of parental education? Mostly declining, but the trend slowed down around 1950, speeded up around 1960 and slowed down again around 1970, and the effect of parental education has not changed since 1972.