Changes in Study Subject and the Evolving Gender Wage Gap

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Background and Motivation

In lots of countries, many more women go to university now than in the past; what women study at university has also changed and specialisation into ‘men’s and women’s degrees’ has fallen.

At the same time women’s relative position in the labour market has been improving over time as gender wage gaps have tended to fall.

In this paper we ask: how important is changing subject of study in accounting for changes in gender wage differentials amongst graduates?
Background and Motivation

This paper focuses on human capital investment prior to labour market entry amongst graduates in several countries.

We investigate the relationships between

- Changes in subject of degree (field of major)
- Shifts in the graduate gender wage gap
- Cross-country differences in institutions of higher education (universities vs. polytechnics, grande écoles versus universities)

Background and Motivation

Why is this of interest?

Despite there being a large body of work on gender wage differentials, not much of it looks at the role of subject of degree and this issue has hardly been explored in the literature on changes over time (exceptions: Daymont and Andrisani, 1984 JHR; Gerhart, 1990 ILRR; Brown and Corcoran, 1997 JOLE on gap; Loury, 1997 ILLR on changes 1978-1986)

There are potentially important policy implications, both at HE level and earlier in the education sequence. If sorting into different degree subjects acts to equalise gender related differences in wages then earlier decisions on what to study may act as important determinants of success or failure in the labour market
Structure of Talk

1. Patterns of Change in Subject Specialisation Amongst Male and Female Graduates
2. Changes in Gender Wage Differentials
3. Subject of Degree and Wages
4. The Role of Changing Degree Subject in Accounting for Changes in Wage Differentials
5. Possible Interpretations: Differences in Institutions
6. Conclusions

1. Data

- Graduate Cohort Survey (1985 and 1990 cohorts observed in 1991 and 1996)
- Administrative data on the number of graduates by subject of degree, gender, institution and year for all three countries
- Issue: harmonisation of codes (across years in the survey and across countries).
### 1. Shares of Subject of Degree by Gender and Country

**Year: 2000**

<table>
<thead>
<tr>
<th>Subject</th>
<th>GLFS men [%]</th>
<th>GLFS women [%]</th>
<th>FLFS men [%]</th>
<th>FLFS women [%]</th>
<th>BLFS men [%]</th>
<th>BLFS women [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Medical &amp; Related</td>
<td>7.3</td>
<td>10.1</td>
<td>5.0</td>
<td>6.1</td>
<td>5.7</td>
<td>11.3</td>
</tr>
<tr>
<td>2 Agricultural &amp; Related</td>
<td>2.8</td>
<td>3.1</td>
<td>6.8</td>
<td>2.4</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td>3 Natural Sciences</td>
<td>6.9</td>
<td>4.7</td>
<td>12.6</td>
<td>11.5</td>
<td>14.5</td>
<td>9.1</td>
</tr>
<tr>
<td>4 Mathematical &amp; Computing</td>
<td>5.7</td>
<td>3.2</td>
<td>8.5</td>
<td>4.7</td>
<td>10.2</td>
<td>4.9</td>
</tr>
<tr>
<td>5 Engineering &amp; Technology</td>
<td>32.6</td>
<td>7.3</td>
<td>18.0</td>
<td>2.9</td>
<td>17.6</td>
<td>1.6</td>
</tr>
<tr>
<td>6 Architecture &amp; Related</td>
<td>3.3</td>
<td>2.0</td>
<td>1.1</td>
<td>0.7</td>
<td>3.9</td>
<td>1.4</td>
</tr>
<tr>
<td>7 Social Sciences</td>
<td>13.1</td>
<td>15.1</td>
<td>14.4</td>
<td>20.6</td>
<td>11.6</td>
<td>17.1</td>
</tr>
<tr>
<td>8 Business &amp; Financial</td>
<td>11.3</td>
<td>9.8</td>
<td>16.1</td>
<td>13.7</td>
<td>16.3</td>
<td>12.0</td>
</tr>
<tr>
<td>9 Librarianship &amp; Information</td>
<td>0.4</td>
<td>1.2</td>
<td>3.1</td>
<td>3.5</td>
<td>0.5</td>
<td>1.4</td>
</tr>
<tr>
<td>10 Languages</td>
<td>1.6</td>
<td>5.3</td>
<td>4.7</td>
<td>20.2</td>
<td>3.9</td>
<td>10.7</td>
</tr>
<tr>
<td>11 Humanities</td>
<td>2.3</td>
<td>2.1</td>
<td>4.0</td>
<td>6.0</td>
<td>4.9</td>
<td>6.1</td>
</tr>
<tr>
<td>12 Arts</td>
<td>2.1</td>
<td>3.3</td>
<td>1.7</td>
<td>2.7</td>
<td>3.5</td>
<td>6.7</td>
</tr>
<tr>
<td>13 Education</td>
<td>10.7</td>
<td>32.8</td>
<td>4.1</td>
<td>5.0</td>
<td>6.6</td>
<td>17.3</td>
</tr>
</tbody>
</table>

### 1. Difference in Female-Male Subject of Degree

**Shares by Cohort (Britain, BLFS 2000)**

[Graph showing the difference in female-male subject of degree shares by cohort (Britain, BLFS 2000)]
1. Difference in Female-Male Subject of Degree Shares by Cohort (France, FLFS 2000)

1. Difference in Female-Male Subject of Degree Shares by Cohort (Western Germany, MZ 2000)
1. **Difference in Female-Male Subject of Degree Shares by Cohort (Germany, Admin Data)**

![Graph showing dissimilarity indices for different countries and years.]

1. **Dissimilarity Indices**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Britain</td>
<td>32</td>
<td>29</td>
<td>22</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>France</td>
<td>30</td>
<td>33</td>
<td>29</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Germany</td>
<td>31</td>
<td>33</td>
<td>31</td>
<td>34</td>
<td></td>
</tr>
</tbody>
</table>
Structure of Talk

1. Patterns of Change in Subject Specialisation Amongst Male and Female Graduates
2. Changes in Gender Wage Differentials
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5. Possible Interpretations: Differences in Institutions
6. Conclusions

2. Gender Wage/Earnings/Income Gap

![Graph showing gender wage/earnings/income gap over time]

- Gap GB(GHS)
- Gap F(FQP)
- Gap D(VZ/MZ) II
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3. Male Wage Coefficients for Selected Degree Subjects (Western Germany, VZ/MZ)

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4. **Methodology**


\[ \Delta \equiv \ln w_m - \ln w_f = (x_m - x_f)\beta_m + (\beta_m - \beta_f)x_f \]

- The question is which \( X \) variables to control for:
  - Human capital model: *education, experience (age), subject of degree*
  - ‘Full model’ with additional variables: *industry, region, part-time, public sector, (occupation)*

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4. **Extended Wage Regressions and Subject of Degree without Occupation (Year 2000)**

<table>
<thead>
<tr>
<th>GLFS gap=0.25</th>
<th>FLFS gap=0.17</th>
<th>BLFS gap=0.24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Subject of Degree</td>
<td>With Less Detailed SoD</td>
<td>With Less Detailed SoD</td>
</tr>
<tr>
<td>(bm - bf)Xf</td>
<td>0.23</td>
<td>0.22</td>
</tr>
<tr>
<td>(s.e.)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>(Xm – Xf)bm</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>(s.e.)</td>
<td>(0.01)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Percentage of Gap Expl.</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>Abs. Incr. in GE by SoD</td>
<td>0.000</td>
<td>0.007</td>
</tr>
<tr>
<td>(s.e.)</td>
<td>(0.000)</td>
<td>(0.004)</td>
</tr>
</tbody>
</table>
4. **Methodology**

- Decomposition of the change in the gap (Wellington, 1993 JHR; Lee and Miller, 2004 Austr. EP):

\[
\Delta_1 - \Delta_o = \beta_{m1} [\Delta x_1 - \Delta x_o] + [\beta_{m1} - \beta_{m0}] \Delta x_0
\]

\[
+ [\Delta \beta_1 - \Delta \beta_0] x_{f0} + \Delta \beta_1 [x_{f1} - x_{f0}]
\]

- The first two terms on the right-hand side correspond to the decomposition used by Blau and Kahn (1997 JOLE) and Juhn, Murphy and Pierce (1991 CV)

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4. **Decomposition of the Change in the Gender Wage Gap Across Time (Specification 2)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without SoD With SoD Difference</td>
<td>Without SoD With SoD Difference</td>
<td>Without SoD With SoD Difference</td>
</tr>
<tr>
<td>( \beta_{m1} [\Delta x_1 - \Delta x_o] )</td>
<td>2 1 -1</td>
<td>-6 -9 -3</td>
<td>-1 0 1</td>
</tr>
<tr>
<td>([\beta_{m1} - \beta_{m0}] \Delta x_0 )</td>
<td>-2 -2 0</td>
<td>-4 -4 0</td>
<td>6 9 3</td>
</tr>
<tr>
<td>([\Delta \beta_1 - \Delta \beta_0] x_{f0} )</td>
<td>-5 -6 0</td>
<td>-10 -9 1</td>
<td>-6 -10 -4</td>
</tr>
<tr>
<td>( \Delta \beta_1 [x_{f1} - x_{f0}] )</td>
<td>1 3 2</td>
<td>4 6 2</td>
<td>3 3 0</td>
</tr>
</tbody>
</table>

---
4. Decomposition of the Change in the Gender Wage Gap Across Cohorts (Specification 2)

<table>
<thead>
<tr>
<th></th>
<th>Britain (BLFS)</th>
<th>France (FLFS)</th>
<th>Germany (GLFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Change in Gap</td>
<td>Change in Gap</td>
<td>Change in Gap</td>
</tr>
<tr>
<td>Without SoD</td>
<td>0 percent</td>
<td>4 percent</td>
<td>16 percent</td>
</tr>
<tr>
<td>Difference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\beta_{m1} \left[ \Delta x_i - \Delta x_o \right]$</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>$[\beta_{m1} - \beta_{m0}] \Delta x_o$</td>
<td>2</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>$[\Delta \beta_i - \Delta \beta_0] x_{i0}$</td>
<td>-1</td>
<td>-3</td>
<td>6</td>
</tr>
<tr>
<td>$\Delta \beta_i \left[ x_{i1} - x_{i0} \right]$</td>
<td>32</td>
<td>32</td>
<td>-28</td>
</tr>
<tr>
<td>Difference</td>
<td>0</td>
<td>-6</td>
<td>-4</td>
</tr>
</tbody>
</table>

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6. Conclusions
6. Conclusions

- There are differences between countries in how women catch up with men in terms of the distributions of subject of degree

- British and French women made more progress in terms of studying degrees with a higher pay-off than women in Germany.

- This can explain part of the differences across countries in changes in the graduate wage gap over time
6. Conclusions

- Women moved up the institutional ladder in Britain and France, but not in Germany.

- Within institutions, women tended to move to more lucrative subjects of degree in Britain and France; this is not true in Germany.

- Plausible reasons can be found in the long periods of study, in the child-care and school systems (part-time schools and choices made earlier in children’s education sequences) and possibly societal attitudes towards the role of the woman.

Selection Issue: Participation and Higher Education

\[
Pr(F|P,H) = \frac{Pr(P|F,H) \times Pr(F|H)}{Pr(P|H)}
\]