Existing Technology-Industry Concordances

- **MERIT**: All 625 subclasses of the International Patent Classification (IPC) are linked to about 22 industrial sectors (2-digit level of ISIC).
- **USPTO**: USPC subclasses are linked to 41 industrial sectors of the USSIC.
- **Yale and subsequently OECD**: Based on Canadian examiners allocation of each patent to and Industry of Manufacture and of Use.

*None of these use information on the product group of the company applying for the patent.*
Suggested Technology-Industry Concordance

- Approach based on defining 44 matched Technical and Industrial Fields.
- First Step is to allocate 625 IPC subclasses to the 44 Fields (done by technical experts within ISI).
- Second step analyse patents by technology for 3400 large ‘patenting’ firms classified according to 44 industrial sectors (from Dunn & Bradstreet database).
- Final Result: a square transformation matrix from technologies to industries.

Decisions in Generating the Concordance Matrix

- Only large patentees included (although we have some information on ‘small’ patentees).
- Only Manufacturing firms considered (although services are an important locus of innovation).
- Only ‘principal’ product group of a firm considered (although some large firms are multi-product).
- Only first IPC class considered.
Format of the Concordance

<table>
<thead>
<tr>
<th>Technology</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sectors</td>
<td>D1</td>
<td>N11</td>
<td>N12</td>
<td>N13</td>
<td>N14</td>
<td>N15</td>
<td>N16</td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td>N21</td>
<td>N22</td>
<td>N23</td>
<td>N24</td>
<td>N25</td>
<td>N26</td>
</tr>
<tr>
<td></td>
<td>D3</td>
<td>N31</td>
<td>N32</td>
<td>N33</td>
<td>N34</td>
<td>N35</td>
<td>N36</td>
</tr>
<tr>
<td></td>
<td>D4</td>
<td>N41</td>
<td>N42</td>
<td>N43</td>
<td>N44</td>
<td>N45</td>
<td>N46</td>
</tr>
<tr>
<td></td>
<td>D5</td>
<td>N51</td>
<td>N52</td>
<td>N53</td>
<td>N54</td>
<td>N55</td>
<td>N56</td>
</tr>
<tr>
<td></td>
<td>D6</td>
<td>N61</td>
<td>N62</td>
<td>N63</td>
<td>N64</td>
<td>N65</td>
<td>N66</td>
</tr>
<tr>
<td></td>
<td>D7</td>
<td>N71</td>
<td>N72</td>
<td>N73</td>
<td>N74</td>
<td>N75</td>
<td>N76</td>
</tr>
</tbody>
</table>

An Example of the Transformation Matrix:
One column.

Distribution of Telecommunications Technologies

<table>
<thead>
<tr>
<th>Industry</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telecommunications</td>
<td>52.4</td>
</tr>
<tr>
<td>Computers</td>
<td>21.3</td>
</tr>
<tr>
<td>Electronic components</td>
<td>7.5</td>
</tr>
<tr>
<td>Television</td>
<td>4.9</td>
</tr>
<tr>
<td>Motor Vehicles</td>
<td>4.0</td>
</tr>
<tr>
<td>Measuring instruments</td>
<td>1.7</td>
</tr>
<tr>
<td>Other transport</td>
<td>1.3</td>
</tr>
<tr>
<td>Lighting</td>
<td>1.1</td>
</tr>
</tbody>
</table>
Statistical Verification of concordance

- Differences between concordance matrices tested for
  - different countries (US / JP / UK / FR / DE)
  - different points in time (early / late 1990s)

Types of checks (1)

- Similarities in the distribution of a given technology across industries
  - Distributions by country somewhat similar: 67% of all possible correlations are significant. However only 15% are greater than 0.9
  - Distributions over time highly similar: All correlations are significant, and more than 70% greater than 0.9
Types of checks (2)

- Similarities of the distribution of technologies within a given industry

  - Distributions by country somewhat similar: 78% of all possible correlations are significant. However only 23% are greater than 0.9
  - Distributions over time highly similar: All correlations are significant, and more than 70% greater than 0.9

First Use: Relationship between Technology Performance and Economic Performance

- To what extent is higher economic performance of a country (measured as shares of value-added or exports) within a sector associated with higher technological performance (measured as share of patenting)?

- To what extent is sectoral specialisation in trade and value-added within a country associated with sectoral specialisation in technology?
Data Used from the OECD STAN Database

- Value-added and Exports
- 21 Industries
- 13 OECD countries
- Time Period: 1993-2000

Analysis based on Simple Correlations

Main Results

- Within Sector Analysis
  - In general, the more ‘high-tech’ the sector, the closer the relationship between patenting and value-added. Highest correlations are in Electronics (Computers, Telecomms, Instruments), Chemicals and Pharmaceuticals.
  - Relationship between export shares & patent shares is weaker in general. But a strong positive association in Electronics, Machinery and Transport Equipment. This doesn’t apply to Pharmaceuticals.
Relative Specialisation

- Finland, Italy, Sweden, Denmark, and Germany have high correlations between technology specialisation and both trade and output (value-added) specialisation.
- For US, UK and Spain the patterns of specialisation in technology are very different from those in output or trade.

No straightforward explanations of these results.

Conclusions

A pioneering attempt at using information on companies patenting to link technology to industrial classes.

- Can be used to examine importance of technologies across sectors
- Can be applied easily
- Can be used for international comparisons

Main problem is that the matrix works well for High-tech sectors but not for other sectors. More research needed to examine why?