Linking Technology Areas to Industrial Sectors

Ulrich Schmoch, Francoise Laville, Pari Patel

Fraunhofer ISI, Karlsruhe, Germany
Observatoire des Sciences et des Techniques (OST), Paris, France
SPRU, University of Sussex, Brighton, UK

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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.

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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.

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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.

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Format of the Concordance

Technology

Sectors

Industrial sectors	Technological field						
	1	2	3	4	5	6	7
1	**D1**	N11	N12	N13	N14	N15	N16
2	N21	**D2**	N22	N23	N24	N25	N26
3	N31	N32	**D3**	N33	N34	N35	N36
4	N41	N42	N43	**D4**	N44	N45	N46
5	N51	N52	N53	N54	**D5**	N55	N56
6	N61	N62	N63	N64	N65	**D6**	N66
7	N71	N72	N73	N74	N75	N76	**D7**

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An Example of the Transformation Matrix: One column.

Distribution of Telecommunications Technologies	
	%
Telecommunications	52.4
Computers	21.3
Electronic components	7.5
Television	4.9
Motor Vehicles	4.0
Measuring instruments	1.7
Other transport	1.3
Lighting	1.1

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Statistical Verification of concordance

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

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Types of checks (1)

- ¬ **Similarities in the distribution of a given technology <u>across</u> 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**

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Types of checks (2)

- **Similarities of the distribution of technologies <u>within</u> 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**

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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*?**

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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

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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.**

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¬ **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.

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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?

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