An OECD Perspective on Industry-Science Relations in the Digital Age

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Outline

- Channels and policies for knowledge transfer and exchange
- Where does Germany stand among OECD countries?
- Recent policy trends in knowledge transfer and co-creation
- Some ideas and suggestions for the future
**Introduction:** Business innovation relies on private and public research
Main channels of knowledge transfer between public research and the private sector

<table>
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<th>Direct channels of interaction</th>
<th>Indirect channels of interaction</th>
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<td>▪ Flow of graduates to industry</td>
<td>▪ Publication of research results in scientific journals</td>
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<td>▪ Academic consultancy,</td>
<td>▪ Presentations in conferences, expositions, specialised media</td>
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<td>▪ Contract research</td>
<td>▪ Courses &amp; continuing education provided to industry</td>
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<td>▪ Collaborative research/public-private partnerships</td>
<td>▪ Idea and business exchanges around innovation clusters</td>
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<td>▪ Intellectual property (IP) (patents, licenses, databases)</td>
<td>▪ Domestic and international mobility of high skilled people</td>
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<td>▪ Academic start-ups</td>
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6 key policy domains to support knowledge transfer

1. **Rules**: Legal frameworks for intellectual property in both private and public sectors, employment rules that encourage university staff to work with industry.

2. **Private Money**: Bank finance, crowdfunding, equity finance, venture capital funds, corporate funds, corporate venture funds,

3. **Public Money**: Direct and indirect funding to encourage SMEs to collaborate with universities/public research.

4. **People**: Incentives for researcher mobility, academic entrepreneurship, industrial PhD-programs, etc.

5. **Hard and soft infrastructure**: Technology transfer offices, intermediaries, platforms, networks and clusters.

6. **Digital capacity**: Research data management, skills and computing power.
German strengths: leading in industrial patents, 2003-2013

- Inventions from University & Public research Institute
- Inventions from industry

( ) Growth ratio as percentage of 2013 to 2003

Source: OECD Patent Database, 21 February 2019
Germany ranks high in terms of the share of business R&D spending that goes to higher education.

Source: OECD Main Science and Technology Indicators, 2018
Higher education facilitates innovation through student start-ups

18% of German start-ups are by students
Founders of academic start-ups are less often researchers.

Fig. A Start-ups founded by students and Phds

Fig. B Start-ups founded by researchers

Source: OECD based on Breschi et al. (forthcoming); www.crunchbase.com
Germany strong in product innovation. But room for improvement as regards new-to-the market innovations

Most German innovations are mostly new “to the firm”, less “to the market” (Fig. A)
Share of German product innovation fell somewhat between 2010-2014 (Fig. B)

Sales of product innovations as a percentage of total sales

Source: Eurostat, CIS 2014
German firms, and particularly SMEs, tend to use ICT innovations such as digital cloud services less often

Enterprises using cloud computing services, by size, 2016 and as a percentage of enterprises in each employment size class

Entrepreneurial education in schools Germany lags behind

Average expert scores, [1 = highly insufficient; 9 = highly sufficient], 2017

Source: Global Entrepreneurship Monitor (2018), ENTREPRENEURIAL BEHAVIOUR AND ATTITUDES
https://www.gemconsortium.org/report
Proficiency levels in PISA 2015 in basic maths was above average but proficiency at higher levels has declined by 5 percentage points between 2009-2015.

Source: PISA 2015 Results (OECD)
Some recent international trends

1. Greater emphasis on **knowledge co-creation rather than one-way transfer**
   a) Public-private partnership, e.g. Catapult centres in the UK
   b) Joint research laboratories, e.g. Portugal’s CoLABs, France’s LabCom programme support’s the establishment of joint labs between universities/PRIs and SMEs

2. Looking beyond university patents and start-ups: **promoting domestic and international mobility of the highly skilled.**
3. **Adapting knowledge transfer policies to national (+ regional) strengths**:

   - The Netherlands takes a place-based approach
   - France focuses on networks of technology transfer offices
   - Canada’s Technology Access Centers focus on transferring talent, expertise and technology from technical universities or colleges to SMEs

4. **Adapting knowledge transfer policies to the digital age**

   - Research Funders promote open access and open data (e.g. NIH in the USA, Horizon 2020)
   - Guidelines on research data management and creating research data centres at universities and public labs
How can Germany leverage its already strong position in knowledge transfer?

- Take advantage of the **Digital** transformation to improve the quality and speed of knowledge transfer activities
- Promote **open research data** as source of innovation for SMEs!

- **Improve evaluation** of policy initiatives
- Keep a focus on **STEM skills** in primary school education
- Improve **youth awareness and interest** in innovation and entrepreneurship
- Improve **researcher involvement** in start-ups
- Promote **international partnering** for knowledge diffusion
Thank you!

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- For further information on STI policies and knowledge transfer activities:
  - [oe.cd/tip](http://oe.cd/tip)