

BISS Bochum

GeoInno: Political support for innovation activities

Tom Broekel

Course Outline

- 🌐 Knowledge & externalities
- 🌐 Knowledge transfer
- 🌐 Proximities
- 🌐 Agglomeration & scaling
- 🌐 Spin-offs & life cycle
- 🌐 Evolutionary economics
- 🌐 Relatedness & knowledge space & complexity
- 🌐 Knowledge networks
- 🌐 Political support for innovation, collaboration, networks

Session Outline

Political support for innovation activities

-  Patents: Why and how

-  Public research capacities

-  Subsidisation of R&D

Support for knowledge transfer and collaboration

-  Subsidies for joint projects by German Federal Ministry of Education and Research

-  Subsidies for joint projects by the EU - EU framework programs

Patents






- Commercial use of innovation (e.g., selling of new product) frequently implies revealing / publishing the embedded knowledge (e.g., see reverse-engineering)
 - Knowledge shared for free when selling products (excludability / appropriability not complete)
 - Publishing of knowledge eases copying & reengineering by competitors (e.g., generics of pain killer)
 - Competitors save own research & development efforts
- Publishing of knowledge reduces incentives to generate new knowledge
- **Behaviour individually rationally but socially suboptimal**

Patents

- To reach socially optimal level of knowledge generation / innovation - **increasing of economic incentives of knowledge utilisation**
- Patent (& trade marks) laws define commercialisation & utilisation rights of intellectual properties
- Inventors apply for patent protection of their product at, e.g., German patent office (*Deutschen Patent- und Markenamt*) or *European Patent Office*
- Patent office enforces patent laws **within its jurisdiction**

Patents

Patent




-  Intellectual property right for commercialisation of invention
-  Patent holder may grant others the rights of usage or demand non-usage
-  Patent protection granted for specific time period (sometimes with possibility of renewal)
 -  Germany: § 16 patent law (PatG) max 20 years
-  Patent grants temporary monopoly position

Patents


- § 1 paragraph 1 patent law defines three requirements for inventions eligible for patent protection
 - Degree of novelty
 - Based on inventive activity
 - Commercial potential
- Checked and assessed by patent lawyers and patent office
- In cases of granted patent protection: patent holder may sue others violating the granted right

Patents

Historically

-  Prominent case of Wright brothers (inventors of first airplane)
-  Patented aerial navigation method - patent challenged by competitors
-  Case put entire airplane development on hold for multiple years

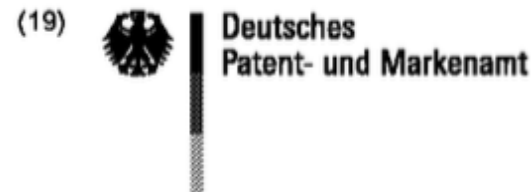
Contemporary “patent wars”

-  Yahoo, Barnes & Noble, ZTE, AOL, Ericsson, Apple Inc., EMC, Foxconn, HTC, Facebook, InterDigital, IBM, Microsoft, LG Corp, Kodak, Halliburton, Nokia, Motorola, Nortel, Oracle, Samsung, Pantech, Gemalto, Openwave, VIA Technologies and Research In Motion

Patents

- Applicant bears costs of patent application
- Content of granted patents becomes public
 - Patent includes “re-engineerable“ documentation of invention
 - Patent database open to everyone: <https://depatisnet.dpma.de/DepatisNet/depatisnet?action=einsteiger>

Patents



(10) **DE 20 2012 007 103 U1** 2013.06.20

(12) **Gebrauchsmusterschrift**

(21) Aktenzeichen: **20 2012 007 103.3**
(22) Anmeldetag: **24.07.2012**
(47) Eintragungstag: **30.04.2013**
(45) Bekanntmachungstag im Patentblatt: **20.06.2013**

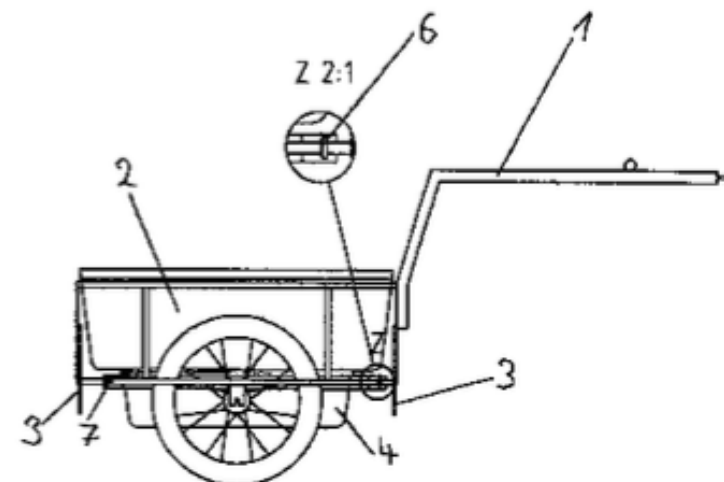
(51) Int Cl.: **B62D 63/06** (2012.01)
B62K 27/00 (2012.01)
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(73) Name und Wohnsitz des Inhabers:
**Gdynia, David, 74564, Crailsheim, DE; Gdynia,
Jonathan, 74564, Crailsheim, DE**

Die folgenden Angaben sind den vom Anmelder eingereichten Unterlagen entnommen

(54) Bezeichnung: **Anhänger mit Grillfunktion für Fahrrad und leicht motorisierte Fahrzeuge wie Elektro-Fahrrad, Mofa, Roller, Quadt und dergleichen.**

(57) Hauptanspruch: Ein Anhänger (1) mit Transportkiste (2) der an Fahrräder und leicht Motorisierte Fahrzeuge angehängt werden kann wie E-Bike, Mofa, Roller/Scooter, Quadt und dergleichen, der mit wenigen Handbewegungen auf- und zusammengeklappt werden kann und eine sichere Feuerstelle in der Grillkohleschale/-behälter (4) ermöglicht für Holz, Holzkohle oder ähnliche Energieträger, um dann auf dem Grillrost (5) zu grillen oder auch einfach nur etwas zu erwärmen ob Nahrungsmittel oder nicht, wie zum Beispiel Wasser zum abkochen oder dergleichen. Wobei die Vorrichtung einen normalen Fahrrad Anhänger (1) zum Beispiel einen TC2025 betrifft der mit einer Zusatzfunktion zum Grillen ausgestattet wird, die sich in einer Grillkohleschale (4) mit Grillrost (5) und einem Höhenverstellbaren Kreuz (9), einer Schwenkfunktion (11) für den Grillrost (5) und einer Schwenkfunktion zur Grillkohleentsorgung (11) auszeichnet.



Patents

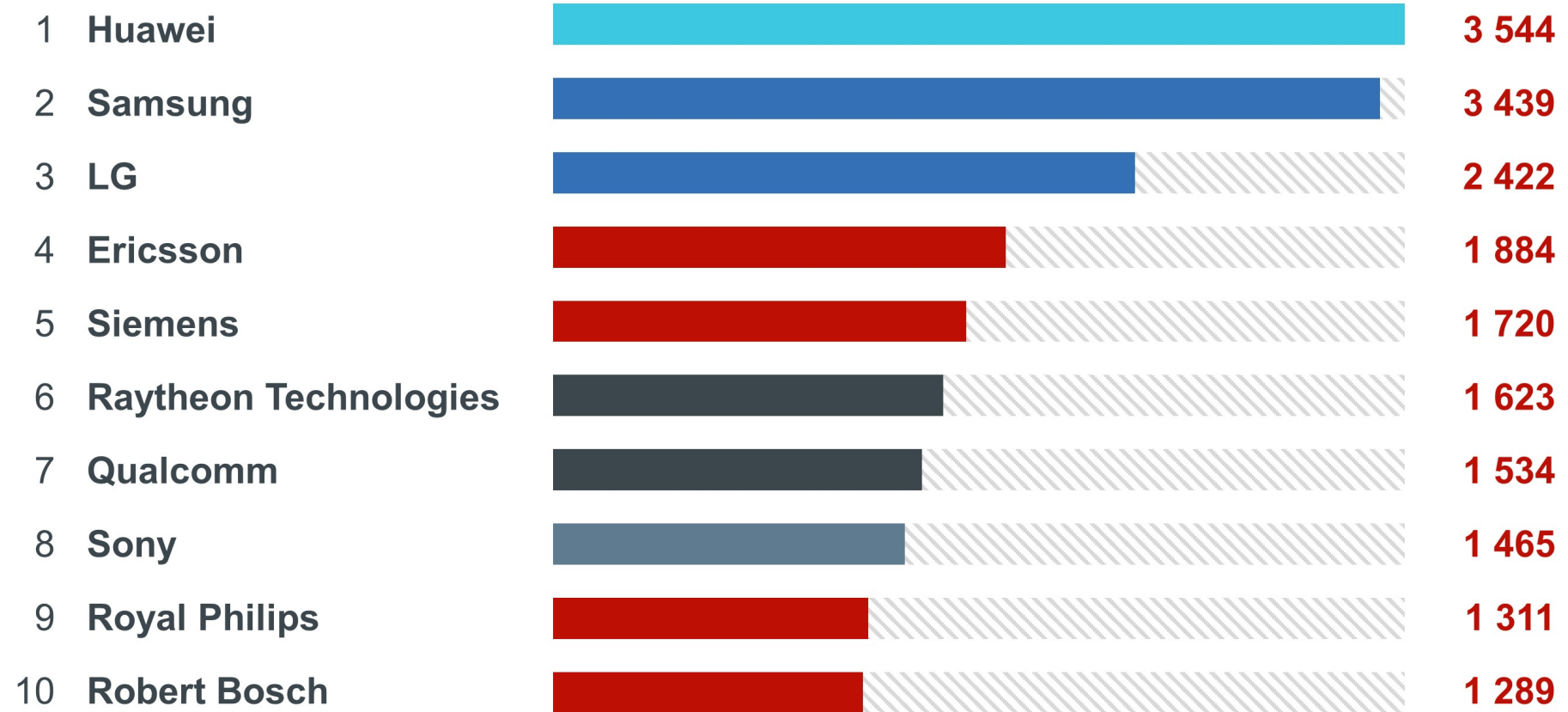
- ① Actual costs of patent protection is publishing of underlying knowledge
- ① Alternative strategies to patent protection
 - ① Secrecy
 - ① No commercialisation of relevant knowledge
 - ① Prevention of re-engineering through aggressive pricing (making product unattractive for potential competitors)

Patents

Top ten applicants 2021

TOP 10

Number of patent applications at the EPO in 2021



● EPO states ● United States ● R. Korea ● P.R. China ● Japan

European Patent Office 2022

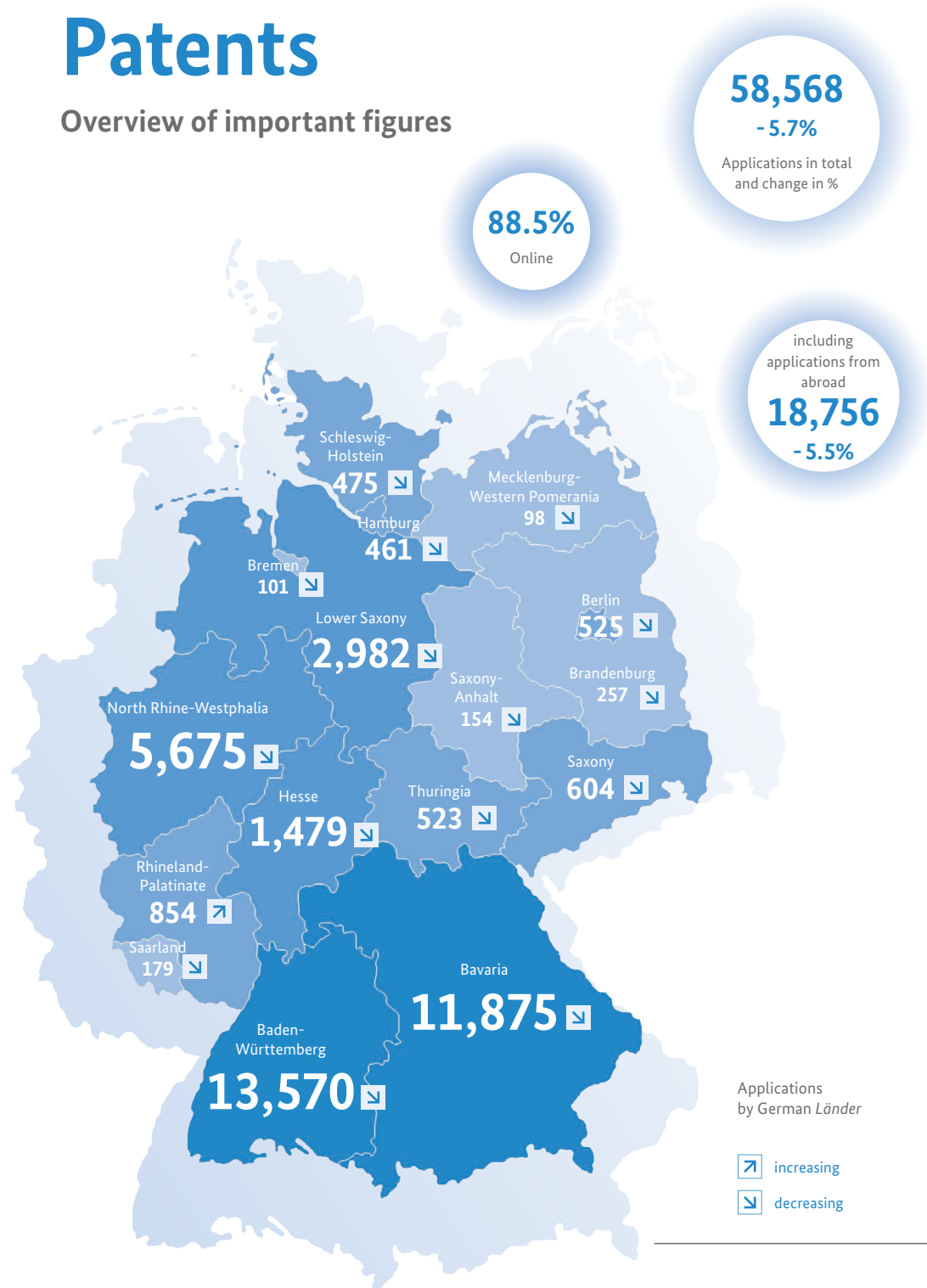
Patents

Patents 2021

German Patent and Trade Mark Office

Patents

Overview of important figures



https://www.dpma.de/docs/presse/dpma_infografik_patent_engl_2021.pdf

Patents

TOP 5 Fields of technology ^[1]

Field of technology (area)	Applications in 2020	Applications in 2021	Changes in %
32 - Transport (mechanical engineering)	10,781	10,482	-2.8
1 - Electrical machinery, apparatus, energy (electrical engineering)	7,025	7,168	+2.0
10 - Measurement (instruments)	4,581	4,490	-2.0
31 - Mechanical elements (mechanical engineering)	4,434	4,080	-8.0
6 - Computer technology (electrical engineering)	3,143	2,891	-8.0

[1] According to the [WIPO IPC-Technology Concordance Table](#).

https://www.dpma.de/english/our_office/publications/statistics/patents/index.html

Outline

🌐 Political support for innovation activities

- 🌐 Patents: Why and how

- 🌐 Public research capacities

- 🌐 Subsidisation of R&D






🌐 Support for knowledge transfer and collaboration

- 🌐 Subsidies for joint projects by German Federal Ministry of Education and Research

- 🌐 Subsidies for joint projects by the EU - EU framework programs

Public research capacities

Innovation risky

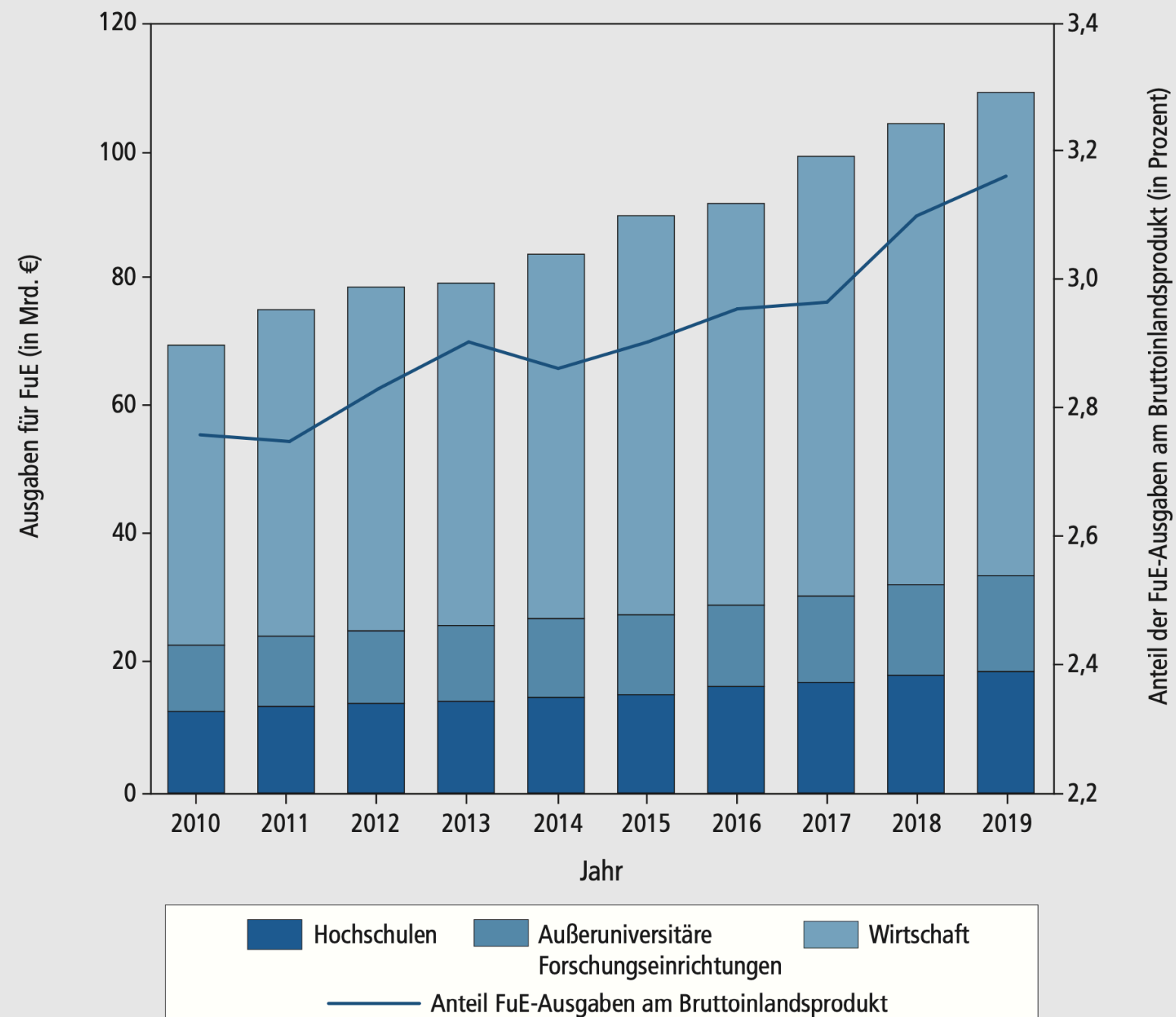
-  Profits not always fully appropriable (incomplete excludability)
 -  Success of innovations not guaranteed
 -  Basic research frequently lacks commercialisation potential
-  Economic actors with tendency of too low R&D investments
-  To reach socially optimal level: **Reduction of costs of knowledge generation and invention**

Public research capacities

- Possibilities of public hand to reduce costs of R&D activities
 - Supply of public R&D capacities
 - Partly or complete financing of research organisations (e.g., universities & extramural research institutes)
 - Usually focus on basic research
 - Subsidisation of R&D activities (more on this later)
 - Support for marketisation and commercialisation of (radical) inventions -> public agencies (Germany: SprinD, Agency for cybersecurity)
 - Provision of public venture capital

Public research capacities

Abbildung 2-2:
Entwicklung der FuE-Ausgaben von Deutschland 2010 bis 2019 nach Art der Einrichtung



Public research capacities

Tabelle 2-2:
Grundmittel und Drittmittel ausgewählter außeruniversitärer Forschungseinrichtungen 2019

Art der Einrichtung	Gesamt	davon			
		Laufende Grundmittel		Drittmittel	
	Mio. €	Mio. €	% von gesamt	Mio. €	% von gesamt
Fraunhofer-Gesellschaft (FhG)	2.464	820	33,3	1.644	66,7
Helmholtz-Gemeinschaft (HGF)	4.866	3.483	71,6	1.383	28,4
Leibniz-Gemeinschaft (WGL)	1.722	1.244	72,2	478	27,8
Max-Planck-Gesellschaft (MPG)	2.009	1.785	88,9	224	11,1
Insgesamt	11.061	7.332	66,3	3.729	33,7

Datenbasis und Quelle:

Gemeinsame Wissenschaftskonferenz (GWK): Pakt für Forschung und Innovation. Monitoring-Bericht 2020.
Berechnungen der DFG.

Public research capacities

Tabelle 3-1:

Beteiligung¹⁾ an Förderprogrammen für Forschungsvorhaben von DFG, Bund und EU nach Art der Einrichtung




Art der Einrichtung	DFG-Bewilligungen		Direkte FuE-Projektförderung des Bundes		Förderung im Programm IGF über die AiF		Förderung in Horizon 2020 ²⁾	
	Mio. €	%	Mio. €	%	Mio. €	%	Mio. €	%
Hochschulen	8.428,5	88,9	4.711,9	40,6	284,8	53,5	1.404,8	35,0
Außeruniversitäre Einrichtungen	1.055,2	11,1	3.770,3	32,5	246,5	46,3	1.513,7	37,7
Fraunhofer-Gesellschaft (FhG)	22,0	0,2	1.313,9	11,3	66,7	12,5	277,9	6,9
Helmholtz-Gemeinschaft (HGF)	217,3	2,3	551,2	4,7	1,3	0,2	392,4	9,8
Leibniz-Gemeinschaft (WGL)	269,2	2,8	336,3	2,9	16,7	3,1	103,3	2,6
Max-Planck-Gesellschaft (MPG)	257,9	2,7	131,3	1,1	0,5	0,1	311,4	7,8
Bundesforschungseinrichtungen	58,3	0,6	123,8	1,1	4,4	0,8	50,8	1,3
Weitere Einrichtungen	230,5	2,4	1.313,7	11,3	156,9	29,5	377,9	9,4
Industrie und Wirtschaft			3.123,7	26,9	0,6	0,1	1.093,6	27,3
Insgesamt	9.483,7	100,0	11.605,9	100,0	532,0	100,0	4.012,1	100,0

¹⁾ Nur Fördermittel für deutsche und institutionelle Mittelempfänger.

²⁾ Die hier ausgewiesenen Fördersummen zu Horizon 2020 sind zu Vergleichszwecken auf einen Drei-Jahres-Zeitraum entsprechend den Betrachtungsjahren der Fördersummen von DFG und Bund umgerechnet. Insgesamt haben die hier betrachteten Institutionen bisher 8.024,2 Millionen Euro in Horizon 2020 erhalten. Weitere methodische Ausführungen sind dem Methodenglossar im Anhang zu entnehmen.

Public research capacities: universities

Universities

-  Production of human capital: “free” input into firms’ R&D activities
-  Production of codified knowledge: “free” input into firms’ R&D activities
-  Diffusion of own and others’ knowledge (in particular, international knowledge (Universities as (regional) gatekeeper)



Public research capacities: universities

- ⊙ Differences between universities of applied sciences (UAS) and universities (Uni) (Germany only)
 - ⊙ Universities with larger research capacity (lower teacher obligations)
 - ⊙ *“Polytechnics (Fachhochschulen) have a special role in Germany. Often, they are specialised in the same technical fields as local businesses and are supposed to support small- and medium-sized firms through consultancy and the supply of graduates.”*
(Beise & Stahl, 1999, p. 400)
 - ⊙ Universities of applied sciences stronger oriented towards SMEs, universities more relevant for large firms (Beise & Stahl, 1999)
 - ⊙ > 50 % of firms collaborating with UAS less than 25 km away
 - ⊙ > 50 % of firms collaborating with universities less than 50 km away

Public research capacities: extramural institutes

Extramural research organisations

Nicolay & Wimmers (2000)

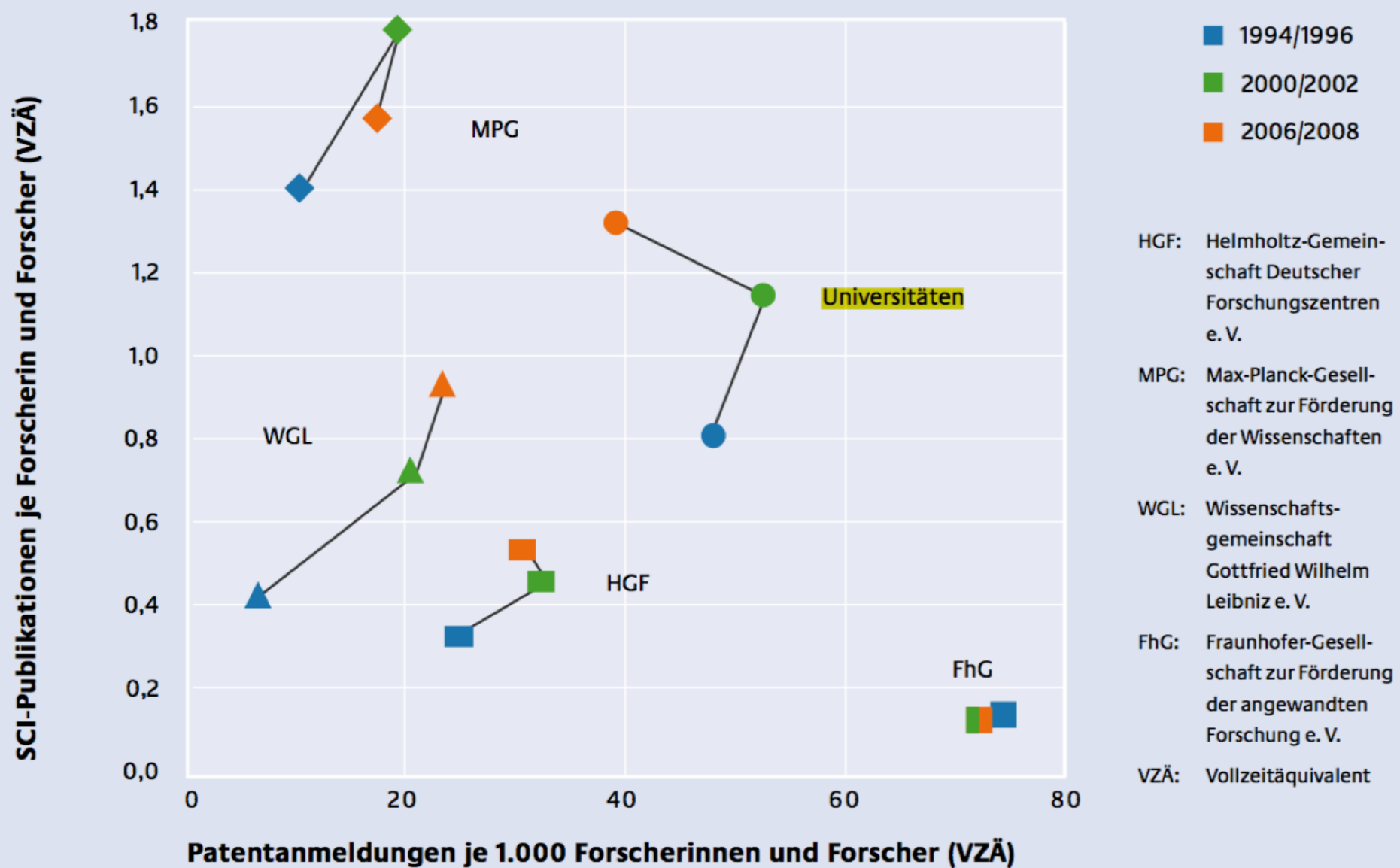
-  50 % of all firms in contact with extramural (regional) research organisations
-  Primary firms with high R&D intensities

Public research capacities: extramural institutes

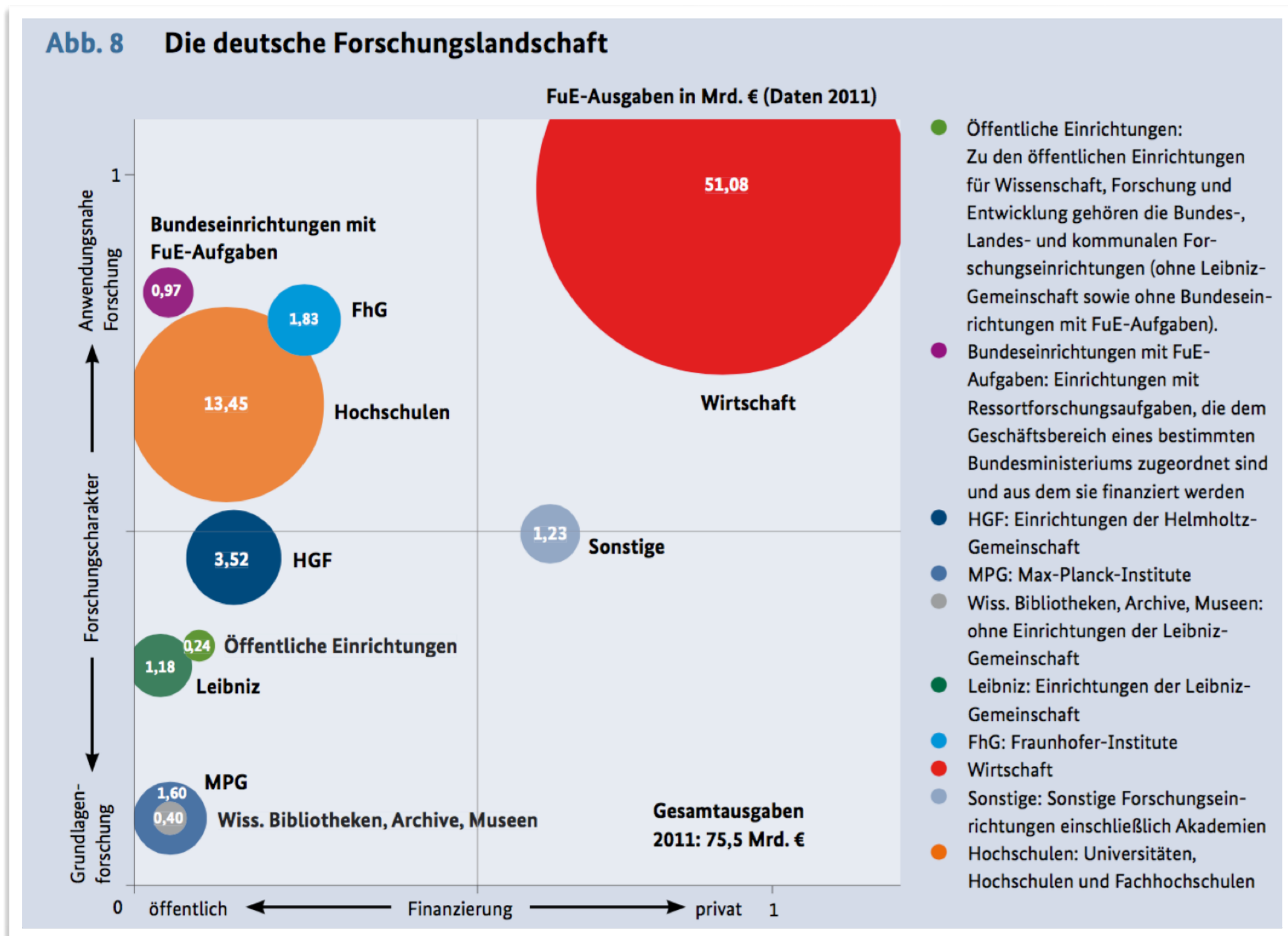
- Extramural research organisations in Germany
 - Hermann von Helmholtz-Gemeinschaft Deutscher Forschungszentren (HGF, Helmholtz-Association): >22,000 researchers
 - Max-Planck-Gesellschaft (MPG, Max-Planck Assoziation): >11,000 researchers
 - Fraunhofer-Gesellschaft (FHG, Fraunhofer-Society): >6,000 researchers
 - Wissensgemeinschaft Gottfried Wilhelm Leibniz (WGL, Leibniz Association): >12,000 researchers

Public research capacities: extramural institutes

Abb. 20 Publikations- und Patentintensität der Hochschulen und außeruniversitären Forschungseinrichtungen 1994–2008 in den Natur-, Ingenieur-, Medizin- und Agrarwissenschaften



Public research capacities: extramural institutes



Outline

Political support for innovation activities

-  Patents: Why and how

-  Public research capacities

-  Subsidisation of R&D

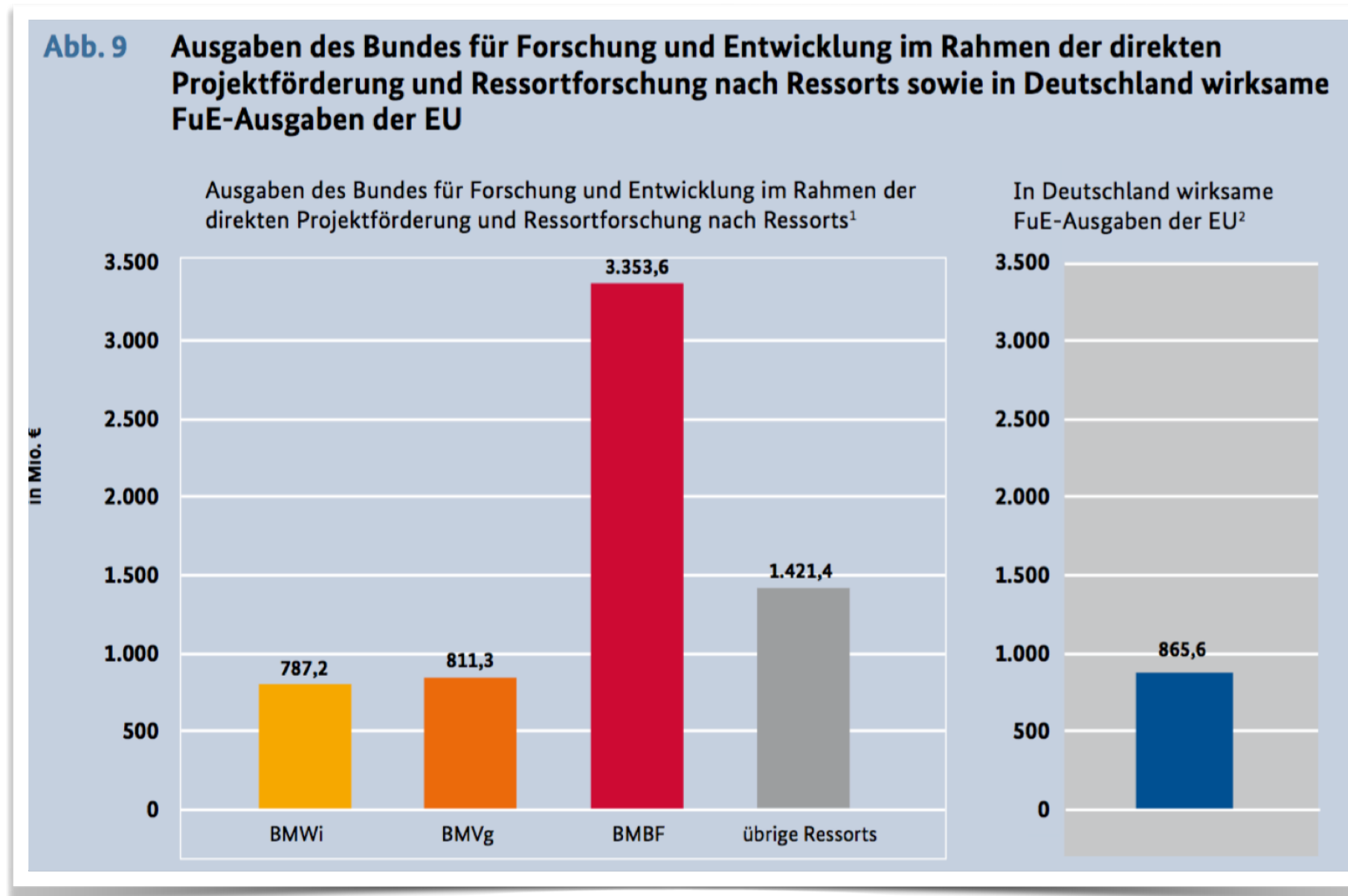
Support for knowledge transfer and collaboration

-  Subsidies for joint projects by German Federal Ministry of Education and Research

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Subsidisation of R&D

Substantial subsidisation of R&D projects



Provision of R&D grants by Federal ministry (2013)

Subsidisation of R&D

- Important providers of R&D grants in Germany
 - **BMBF / BMWi (Federal Ministry of Education and Research & Federal Ministry of Economic Affairs)**
 - DFG “National Science Foundation” (only institutes of higher education & extramural research organisations)
 - EU (Framework programs)
 - Federal states

Subsidisation of R&D

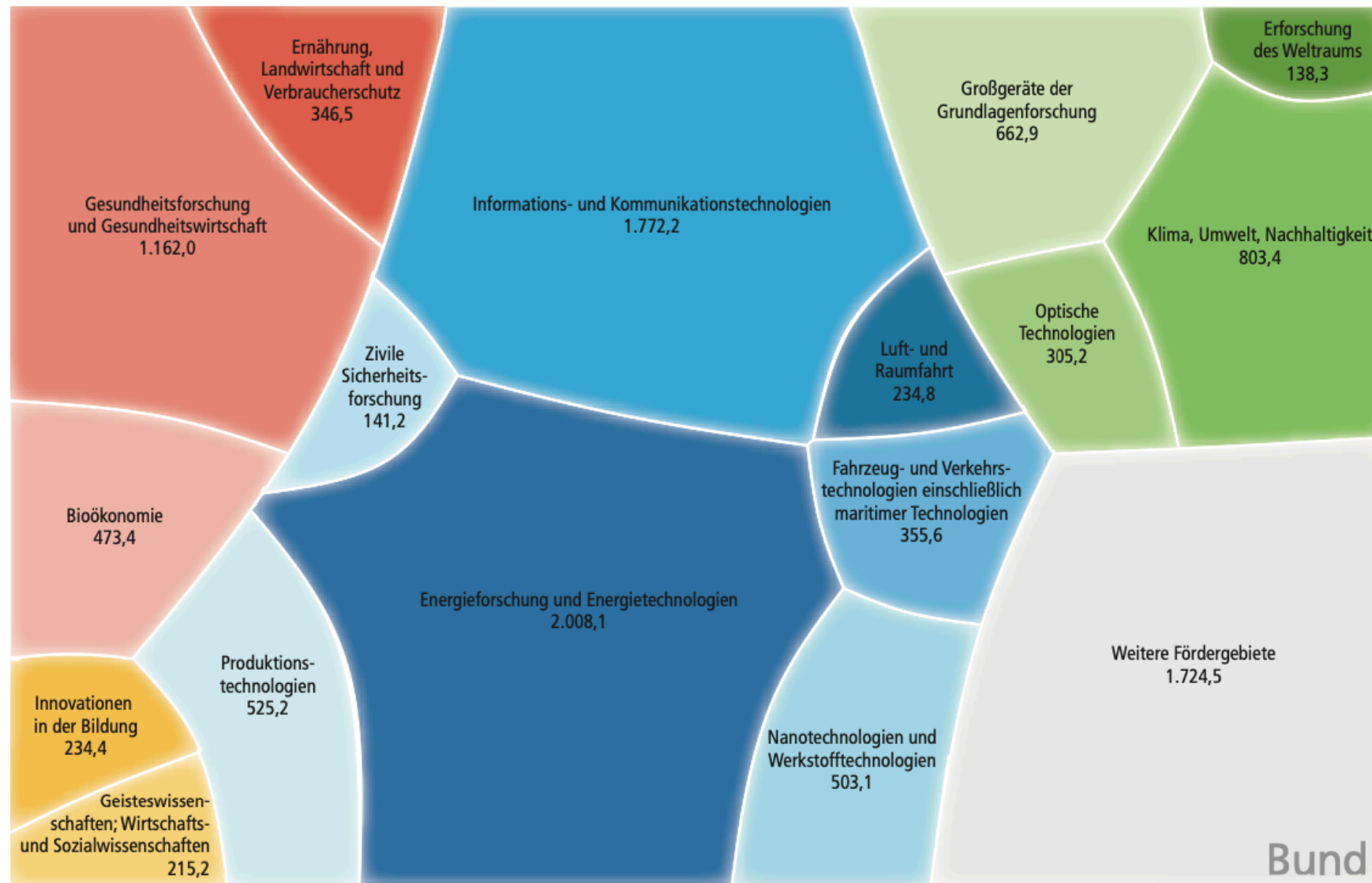
- Usual procedure of grant-based project subsidisation
 - Creation and publishing of call for grant applications -> based on political and expert commissions' assessment of "relevant" research areas
 - Organisation apply for temporal, project-specific, monetary support within the framework of the call
 - Evaluation of applications by experts (competition approach)
 - Thematic fields and "relevant" research areas vary over time

Subsidisation of R&D

- Allocation of subsidies for individual R&D projects
 - Likelihood of support increases with (e.g., Blanes & Busom 2004)
 - Experience with subsidised projects
 - Size of organisations
 - Intensity of research and human capital

Subsidisation of R&D

Abbildung 4-2:
FuE-Projektförderung des Bundes 2017 bis 2019 nach Fördergebieten



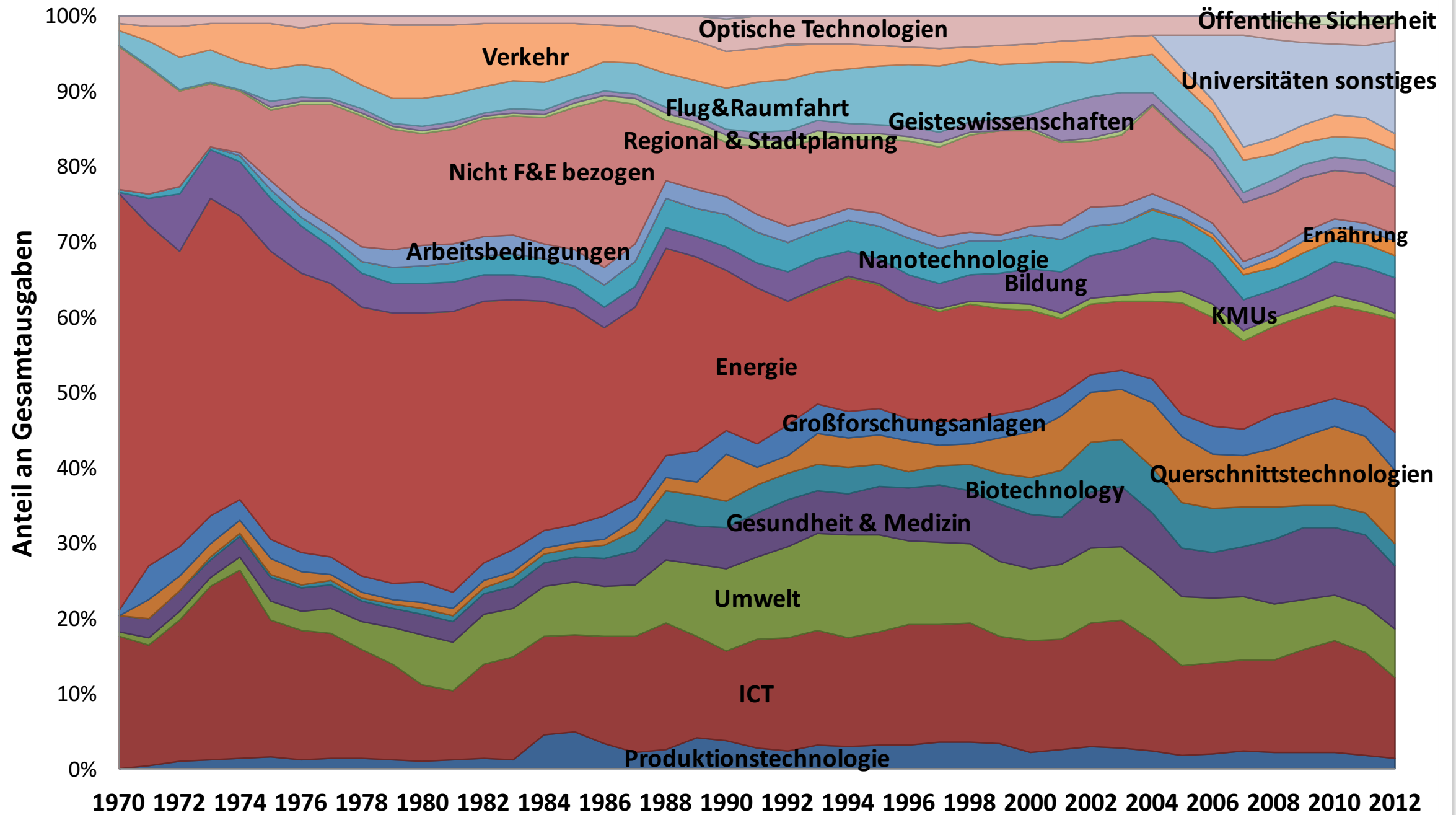
Flächenproportionale Darstellung. Angaben in Millionen Euro.

Datenbasis und Quellen:

Bundesministerium für Bildung und Forschung (BMBF): Direkte FuE-Projektförderung des Bundes 2017 bis 2019 (Projektdatenbank PROFIL).
Bundesministerium für Wirtschaft und Energie (BMWi): Förderung im Zentralen Innovationsprogramm Mittelstand (ZIM) 2017 bis 2019.
Berechnungen der DFG.

Subsidisation of R&D

Verteilung der F&E Subventionen (Projektförderung) in Deutschland 1970-2012



Subsidisation of R&D

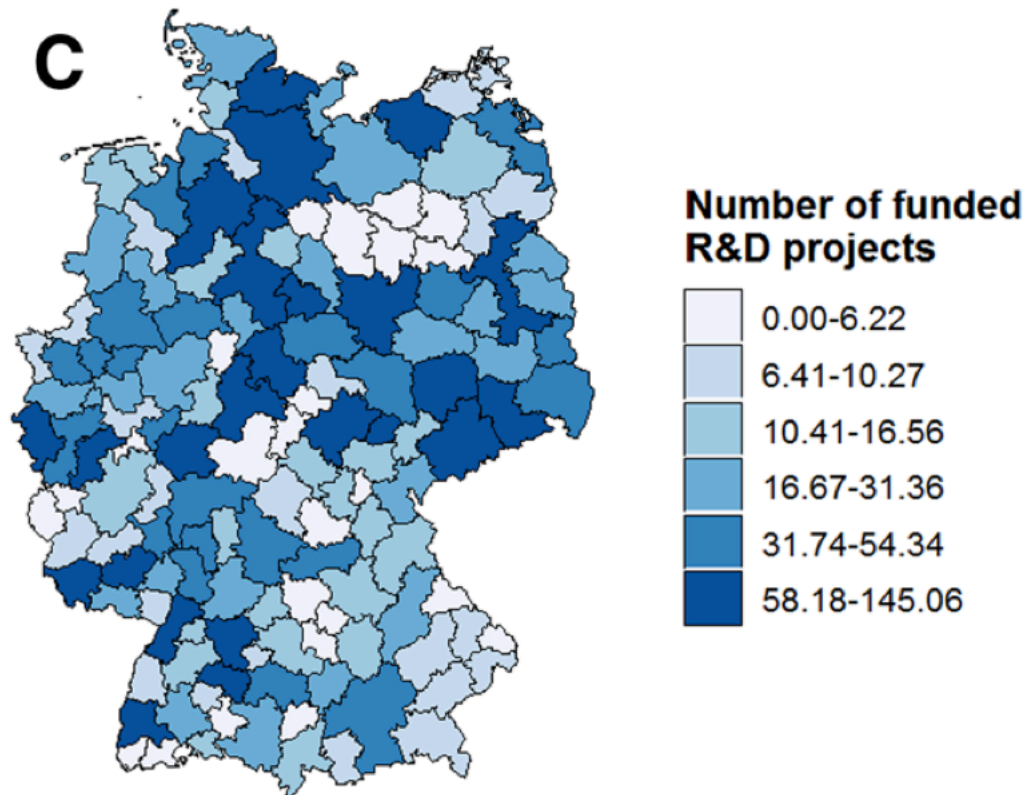
- BMBF grant-based project subsidisation
 - Primarily individual grants: individual organisation conducts project
 - Increasingly joint-projects: multiple organisations collaboratively conduct projects (more on this later)
 - Magnitude of subsidisation (public subsidies account only for parts of total project costs) conditional on type of organisation (University, firm, ...) and project
 - No full coverage of project costs to reduce moral hazard

Subsidisation of R&D

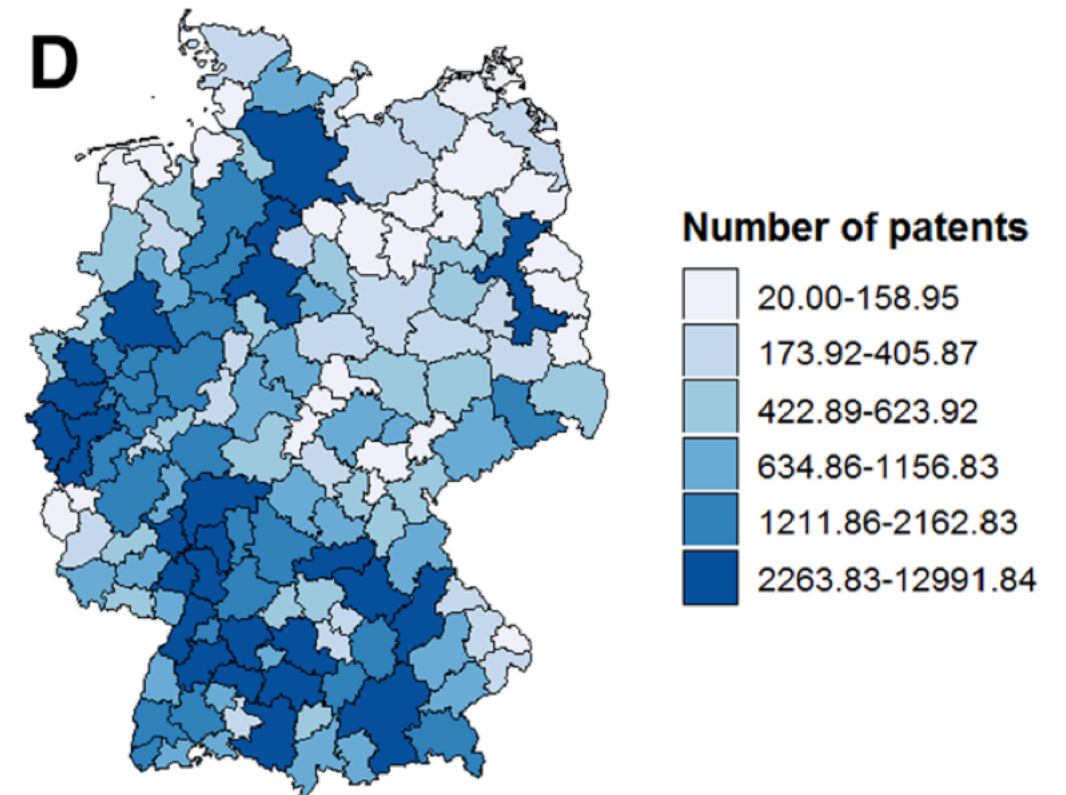
- Although subsidisation usually without explicit spatial dimension or targets, it is not “space neutral”
- Significant variations in geographic distribution of subsidies
 - Differences in industrial structures (Broekel et al. 2015)
 - Subsidies frequently focused on young and research-intensive industries
 - Differences in the motivation to apply for funding
 - Access to information on subsidisation, e.g.: organisations in clusters with better information access

Subsidisation of R&D

Number of funded project
between 2006-2010



Number of granted patents
between 2006-2010



Source: Mewes & Broekel 2020, p. 238

Subsidisation of R&D

● Reduction of R&D-costs due to subsidisation

● Effects:

● **Additionality - hypothesis**

● Additional private investments into R&D (Convergence towards social optimum)

● **Substitution-hypothesis**

● Subsidised projects would have been realised without subsidies as well

● Positive effects of subsidisation cannibalised through windfall gains

● Substitution of private with public funds

Subsidisation of R&D

🌐 Impact of project subsidisation at the **firm level**

🌐 **Many studies:** Czarnitzki & Hussinger (2004); Ebersberger & Lehtoranta (2008); Görg & Strobl (2007); Koski (2008); Cunningham (2012)

🌐 Positive effects on patents, innovation efficiency, employment growth

🌐 **Literature review** (Zúñiga-Vicente et al. 2014)

🌐 More evidence in favour of additionality: R&D - investments increase due to subsidisation

🌐 However, more recent studies find lower or no effects

Subsidisation of R&D

- Impact of project subsidisation at the **regional level**
 - Influence on the system level (local spillover, collaboration, entry & exit, ...)
 - Short-term effects on regional innovation efficiency? (Broekel 2015a)
 - No or even slightly negative effects of individual grant-based subsidisation
 - Long-term effects on regional innovation efficiency (Broekel et al. 2015)
 - No effect of individual grant-based subsidisation
 - Long-term effects on regional industrial diversification (Mewes & Broekel 2020)
 - Positive effects of individual grant-based subsidisation

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