

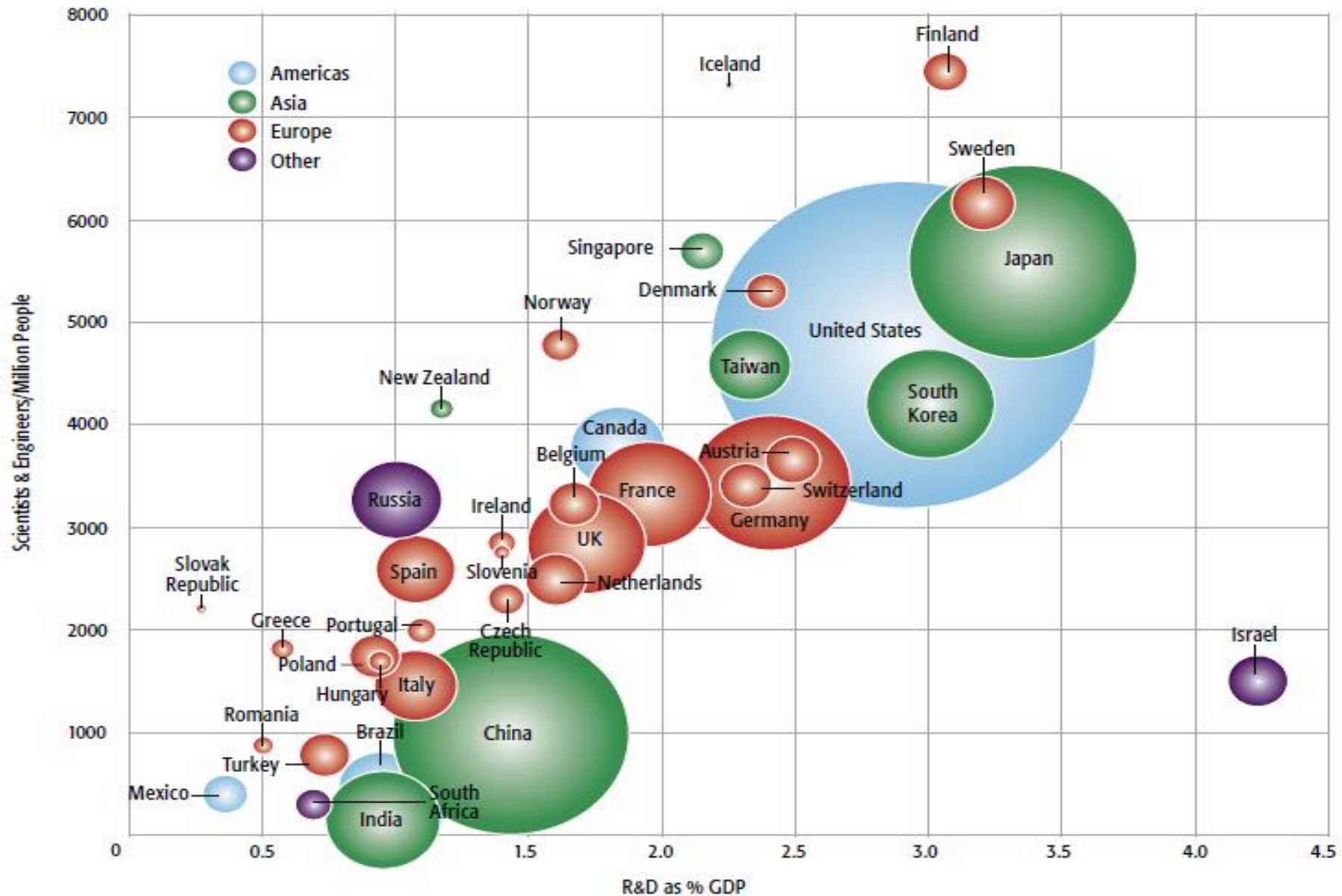


Transfer of Technology and Innovation from Universities to Firms: The Case of China

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World of R&D 2010

Size of circle reflects the relative amount of annual R&D spending by the country noted.



Multifaceted role of university

Educating People

- Training skilled undergraduates, graduates & postdocs

Increasing stock of 'codified' useful knowledge

- Publications
- Patents
- Prototypes

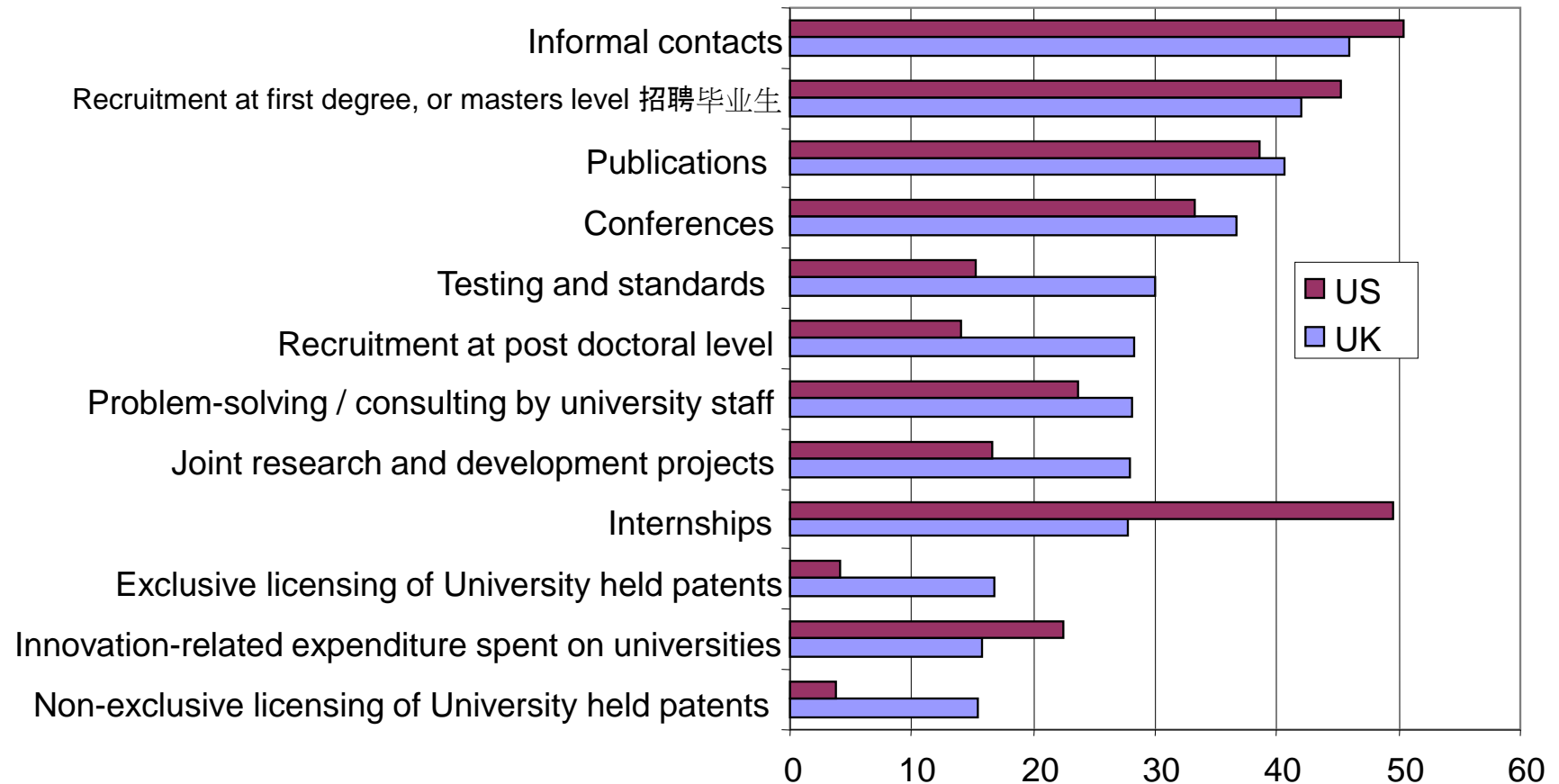
Providing public space

- Forming/accessing networks and stimulating social interaction
- Influencing the direction of search processes among users and suppliers of technology and fundamental researchers
 - Meetings and conferences
 - Hosting standard-setting forums
 - Entrepreneurship centers
 - Alumni networks
 - Personnel exchanges (internships, faculty exchanges, etc.)
 - Visiting committees
 - Curriculum development committees

Problem-solving

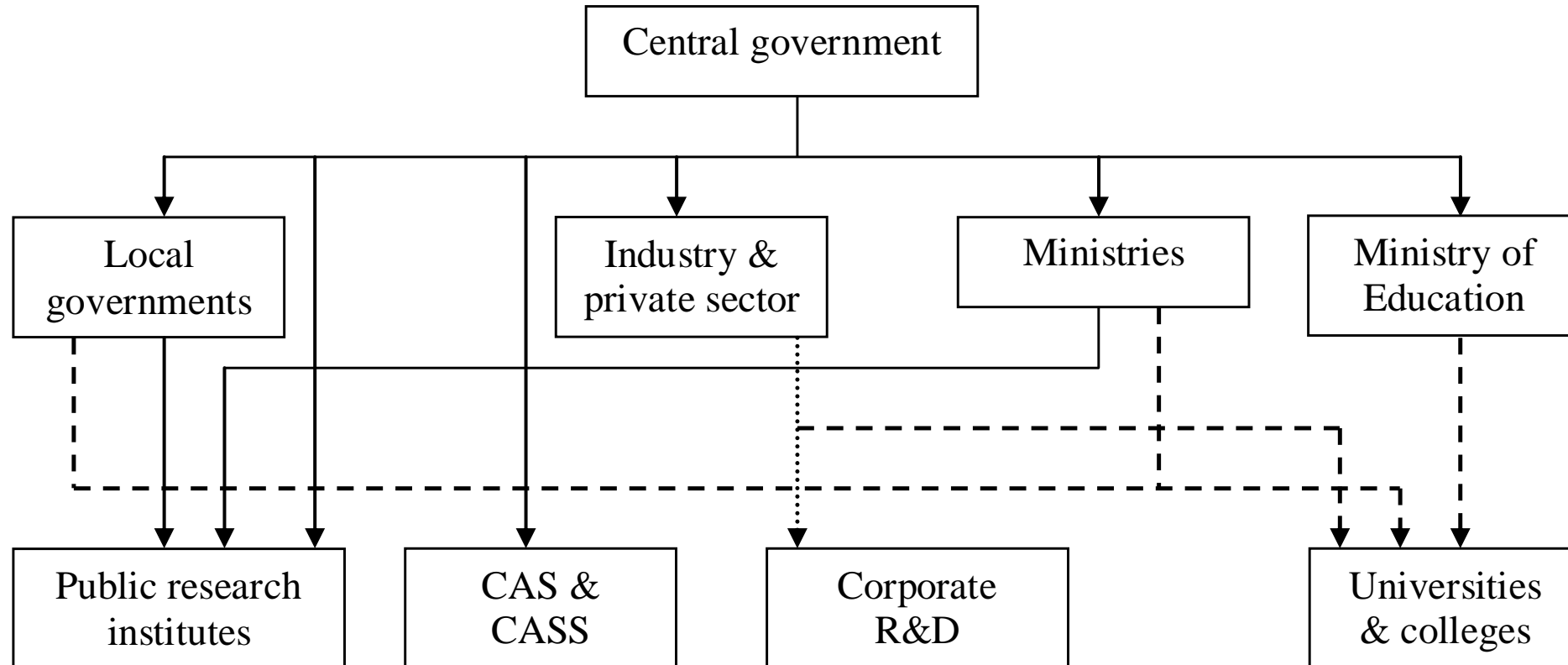
- Contract research
- Cooperative research with industry
- Technology licensing
- Faculty consulting
- Providing access to specialized instrumentation and equipment
- Incubation services

Multifaceted university-industry linkage



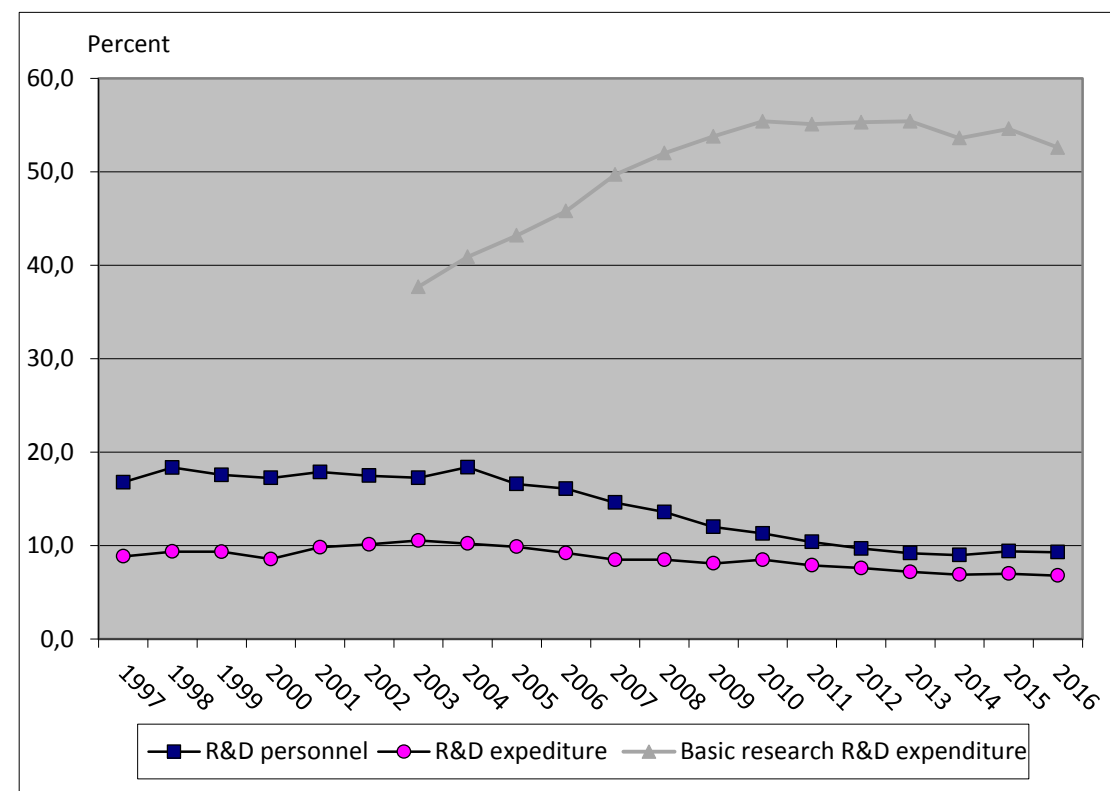
Source: A. Cosh, A. Hughes and R. Lester *UK PLC Just How Innovative Are We?* Cambridge MIT Institute 2005.

China's national innovation system

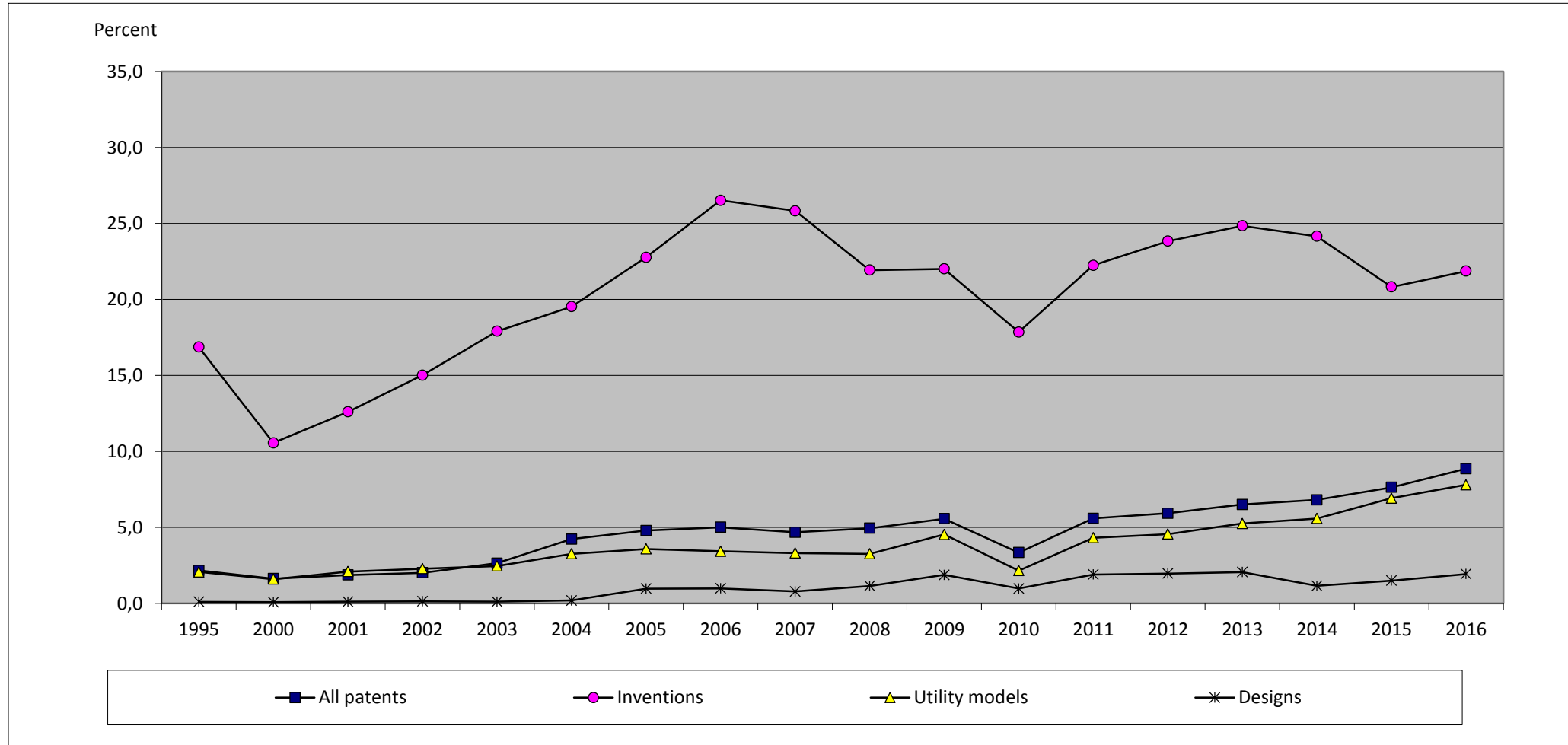


University sector's share in national R&D

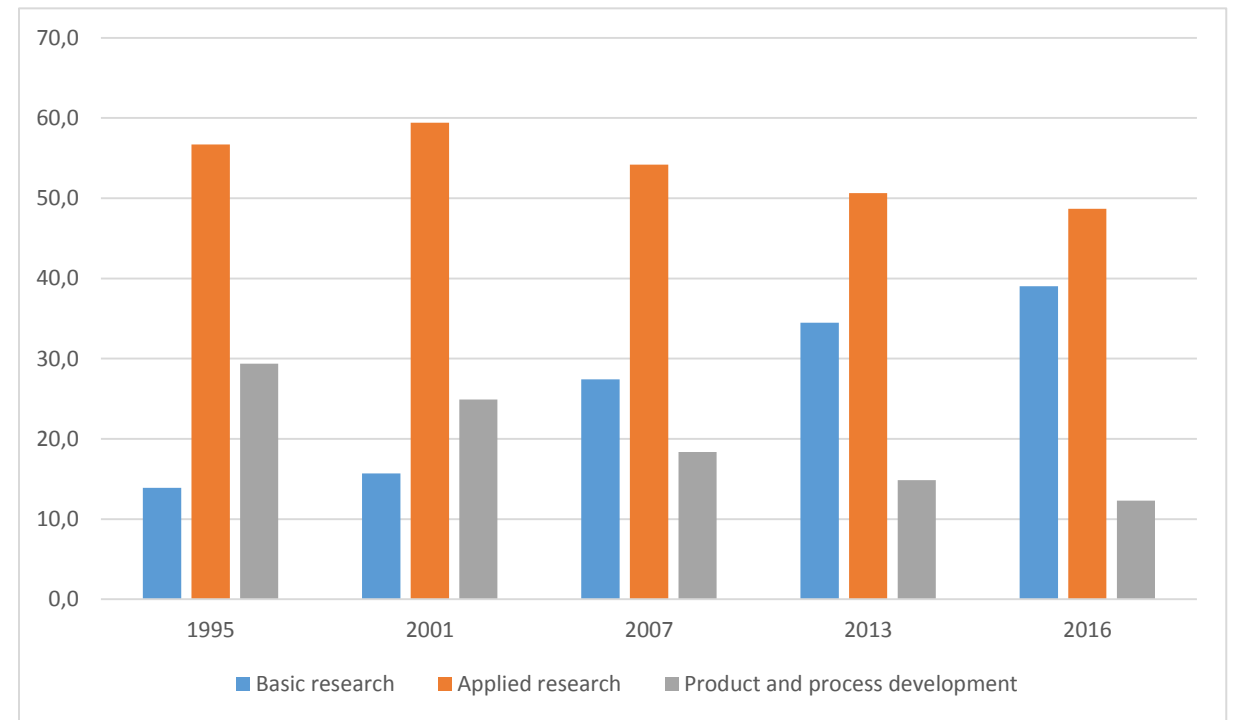
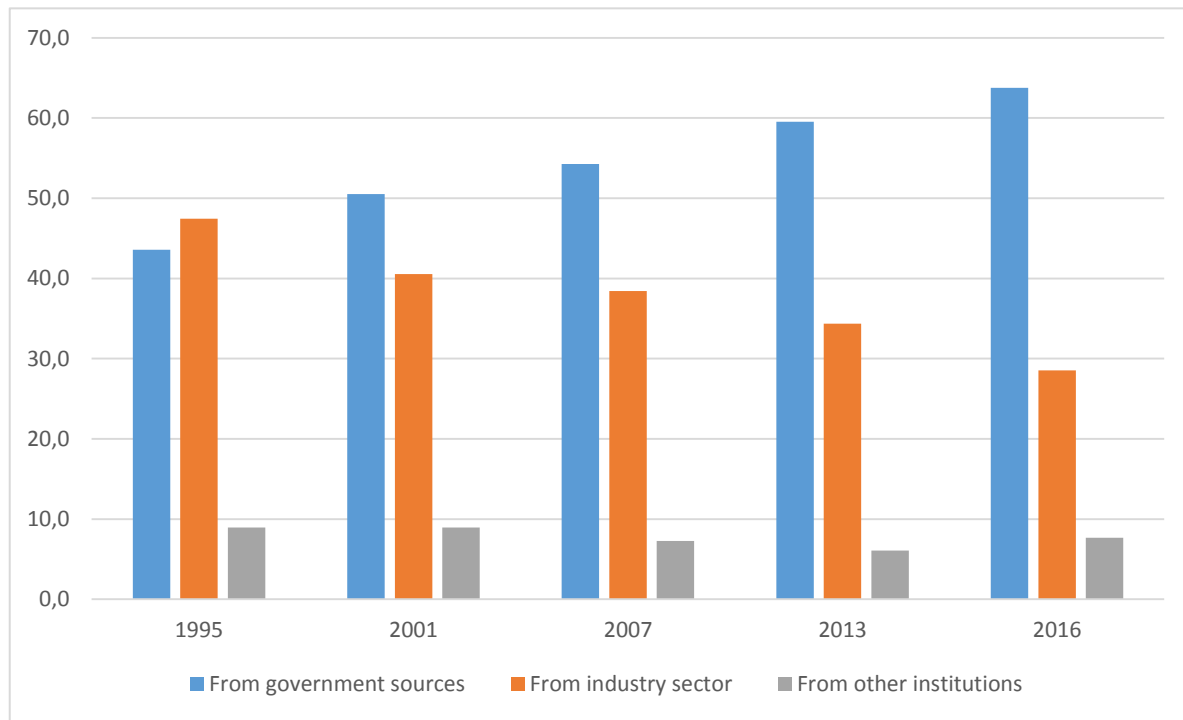
	China	Brazil	Mexico	Russia	S. Korea	Japan	U.S.
<i>Gross domestic expenditure on R&D (GERD), 2016</i>							
GERD PPP (US\$, billions)	410	37	10	37	76	149	464
As % of GDP PPP	2.1	1.2	0.5	1.1	4.2	3.1	2.7
<i>R&D expenditure by performing sector, 2016 (%)</i>							
Business	77.5	-	30.6	58.7	77.7	78.8	71.2
Higher education	6.8	-	26.8	9.1	9.1	12.3	13.2
Government	15.7	-	36.5	32	11.5	7.5	11.5
Private nonprofit	0	-	6.23	0.21	1.6	1.38	4.07
<i>Expenditure in higher education, 2015*</i>							
Annual expenditure per student (US\$, PPP)	4,550	14,261	8,170	8,369	10,109	19,289	30,003
As % of GDP per capita	76.0	92.1	45.0	32.8	26.4	44.0	50.4



University sector's share in domestic patents



Academic research revenues & expenditures



Types of university-industry linkage

- Conventional technology transfer (resembling the West)
 - patent licensing or sales
 - consulting
 - joint or contract R&D
 - technical services
- University-affiliated enterprises (almost uniquely Chinese)
 - wholly university-owned and operated
 - controlling equity position by university
 - participating equity position by university

Academic technology transfer

		2000	2003	2006	2009	2012	2016
Technology transfer contracts							
	Number	4,946	7,809	6,878	8,770	10,275	9,592
	Value (million RMB)	1,788	2,374	1,964	3,120	3,876	5,025
	As % of university R&D revenues	22.0	15.4	7.6	6.6	5.0	5.3
Patent licensing							
	Number of patents licensed and sold	299	611	701	1,571	2,357	4,803
	As % of granted patents	19.3	15.5	6.3	5.6	3.4	3.3
	Value of patent licensing and sales (million RMB)	185	360	287	762	821	2,270
	As % of university R&D revenues	2.3	2.3	1.1	1.6	1.1	2.4
Share of technology transfer contract value (percent)							
	State enterprises	53.6	33.7	49.0	34.2	34.4	32.6
	Private enterprises	18.8	34.7	33.7	47.7	49.9	47.9
	Foreing-invested enterprises	10.0	3.1	4.5	5.4	4.6	10.4
	Others	17.6	28.5	12.8	12.7	11.2	9.1

Key implications

- Overall development of UIs suggests flawed calibration of university mission and enterprises needs
- Problems have become acute as sources of technology diversified
- Indigenous companies are cultivating their own internal technological capacity
- Slow pace of reform at university level in autonomy, governance, and incentive structure
- Universities and industry remain out of sync