

# **The Myth of the Ivory Tower: The Role of Academics in the Innovation Ecosystem**

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# Structure

- Preamble
- Context: the innovation process
- University-business links in the UK
- Research methods
- Some results
- Policy Implications
- Future work

# Acknowledgements

- Centre for Business Research (CBR) Project (ESRC-HEFCE HEFCW SFC and DEL funded) on University Industry Knowledge Exchange
  - Principal Investigators: Alan Hughes and Michael Kitson
  - Research Fellows: Maria Abreu and Vadim Grinevich
  - CBR Survey and Database Team Anna Bullock, Isobel Milner
- Qualitative case study work with Philip Ternouth of CIHE on successful university-industry links published as Abreu et al 2008 “Universities, Business and Knowledge Exchange” ([www.cbr.cam.ac.uk/pdf/University\\_Business\\_Knowledge\\_Exchange\\_v7.pdf](http://www.cbr.cam.ac.uk/pdf/University_Business_Knowledge_Exchange_v7.pdf)).
- CBR UK-wide surveys of enterprises and academics to characterise university-industry links:
  - Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.
  - Cambridge Centre For Business Research Survey Of Knowledge Exchange Activity By United Kingdom Businesses, 2005-2009 (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6464.

# Innovation: the Narrow View

- Focus on R&D
- High Technology Manufacturing
- The Role of Universities:
  - Focus on Technology Transfer
  - Mechanisms: Patents, Licenses, Spin-outs

# Innovation: the Wider View

- Innovation beyond R&D
  - Products, Processes and Business Practices
- Beyond High-technology Manufacturing
  - Traditional sectors
  - Services
  - Public Sector
  - ‘Third’ Sector
- University Technology Transfer
  - Potential financial returns were frequently over-estimated
  - Metrics distorting behaviour (Goodhart’s Law: any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes)
  - Model is incomplete

# The evolution of university-business links in the UK

- Mode 1: the 'laissez faire' model
  - Importance of chance, luck and serendipity
- Mode 2: technology transfer - the entrepreneurial university
  - Focus on a narrow range of technology **transfer** mechanisms
- Mode 3: knowledge exchange - the connected university
  - Focus on a wide range of interactions
  - **Exchange** rather than transfer

# Mode 1: the laissez faire model

- Universities focussed on two missions – research and education
- Example: the ‘Cambridge Phenomenon’ initially developed when the University took little active interest in business engagement. In the past:
  - University largely ignored IP issue
  - Adopted a liberal attitude to what academics did
  - Industrial liaison merely acted as ‘window’ on what the university did – little exchange or dialogue

# Mode 2: technology transfer - the entrepreneurial university

- Focus on Technology Transfer
- Mechanisms: Patents, Licenses, Spin-outs



# Limitations of the entrepreneurial university

- Significant economic and social returns but financial and private returns were frequently over-estimated
- Metrics distorting behaviour (Goodhart's Law: any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes)
- Model is incomplete

# Stanford Office of Technology Licensing

- 65% of licensing earnings came from just 3 of the 8000 inventions which have passed through the doors of the OTL at Stanford
  - Google's improved hypertext searching: \$337 million
  - DNA cloning: \$255 million
  - Functional antibodies: \$229 million
- Stanford struggled to put a value on Google and opted for 2% of equity, and immediately cashed out post-IPO

(Source: Katherine Ku, Director of Stanford University's Office of Technology Licensing )

# Mode 3: knowledge exchange - the connected university

- Multiple knowledge exchange mechanisms
- Role of many disciplines (not just STEM)
- Interactions with public and third sectors as well as with business
- Public space functions (**Universities do not move!**)
  - Relatively neglected, but distinctive
  - Includes networking, social interaction, meetings, conferences etc
- Focus on ‘exchange’ not simply ‘transfer’

# Project on University-Business Knowledge Exchange

- Multi-methodology approach
- In a first stage, scoping case studies of businesses and academics to help in the development of two survey instruments
- In the second stage, two large-scale surveys of businesses and academics, with matched questions
- Finally, a number of in-depth case studies to follow up on findings from the surveys

# Survey of Academics

- Online survey sent to individual e-mail addresses
- Results based on 22,170 observations
- Total population surveyed: 125,900
- Response rate: 17.6%
- Survey sent twice to individual email addresses (one reminder)
- Software: Qualtrics
- Each response use a unique URL to prevent multiple responses

# Conduct of the Survey

- Two complaints
- One anonymous post on a website accusing us of 'unsolicited bulk email'
- One complaint from a departmental webmaster.....
- The University of Cambridge Engineering Department
- Threats to close down the entire Business School website

# Consequence

- Considerable project delay
- Protracted email dialogue with University of Cambridge Computing Services
- Meeting after 3 months delay
- Where the Computing Service concluded that the survey was.....
- Best Practice!

# What is 'best practice'?

- Check with relevant legal authorities
- Manual collection of email addresses (VITAL!)
- Description of purpose use and funders
- Opt-out option (no reminders)
- Contact email for any queries (and complaints)
- Respond quickly to any queries
- FAQ available on Departmental website



# Analysis of the survey: A Representative Sample?

- Questionnaire design – stressed that the survey was for all academics
- Response by discipline and position consistent with population
- Comparison of responses between those that did and those that did not need a prompt.

# Survey of businesses

- Postal Survey
  - Main survey plus two prompts
- Results based on 2,537 responses
- Total sample surveyed: 21,000
  - Sample structured by sector, size and region
- Responses rate: 11.1%

# Analysis of the survey: A Representative Sample?

- Comparison with D&B database: representative by size, sector and region
- Comparisons by response waves: no bias apparent
- Comparison with UK Community Innovation Survey 4: innovative firms may be over-represented

Survey of  
22,000  
Academics

Survey of  
2,500  
Businesses

# Research Activities

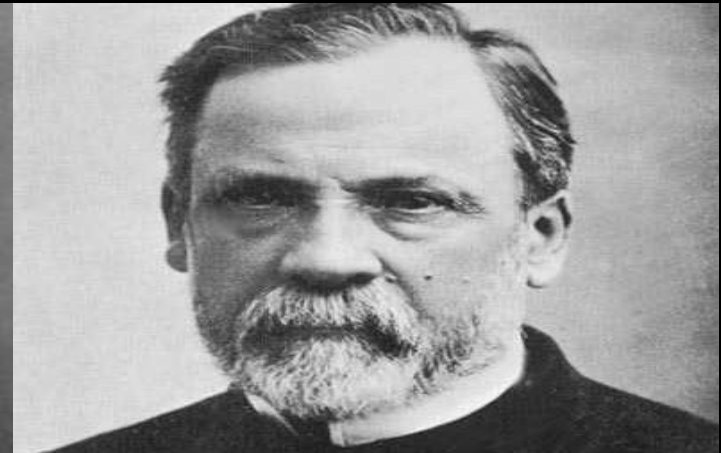
Considerations of use?

NO

YES

Quest for fundamental understanding?

YES



NO



Source: Adapted from D. Stokes (1997) Pasteur's Quadrant Washington Brookings Institution

# Research Activities

Considerations of use?

NO

YES

Quest for fundamental understanding?

YES

*The Republic of Science*

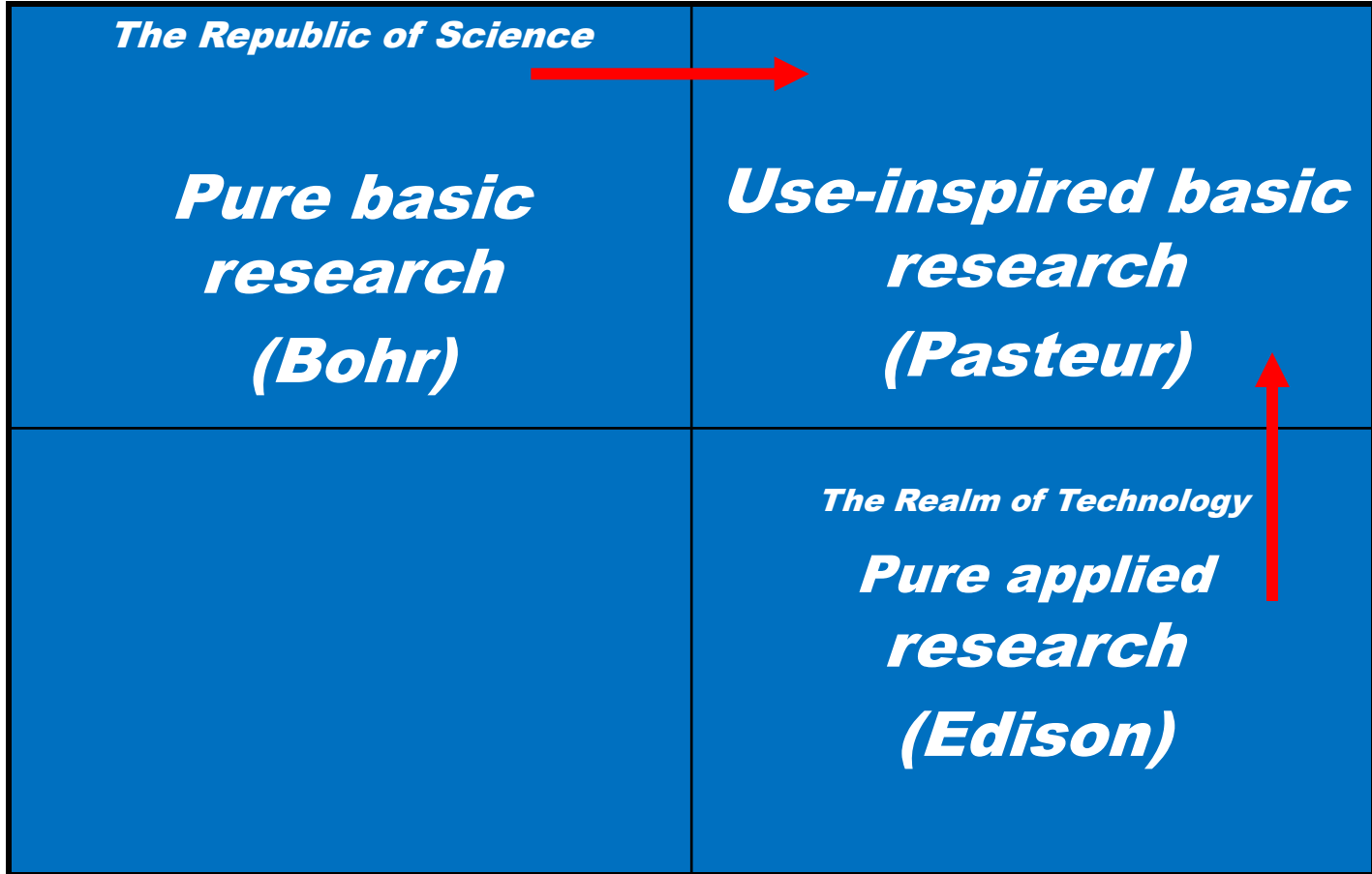
***Pure basic  
research  
(Bohr)***

***Use-inspired basic  
research  
(Pasteur)***

NO

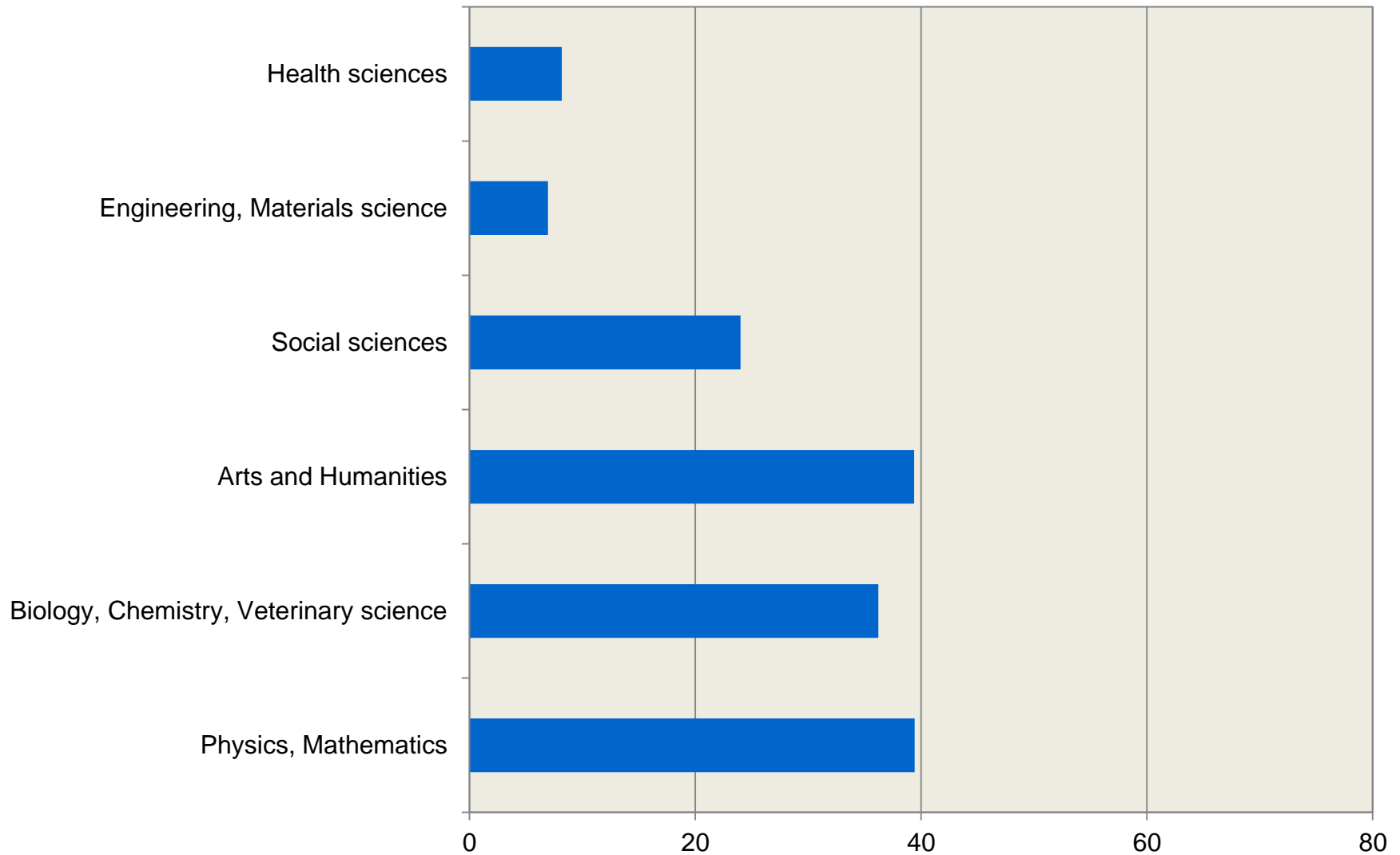
*The Realm of Technology*

***Pure applied  
research  
(Edison)***



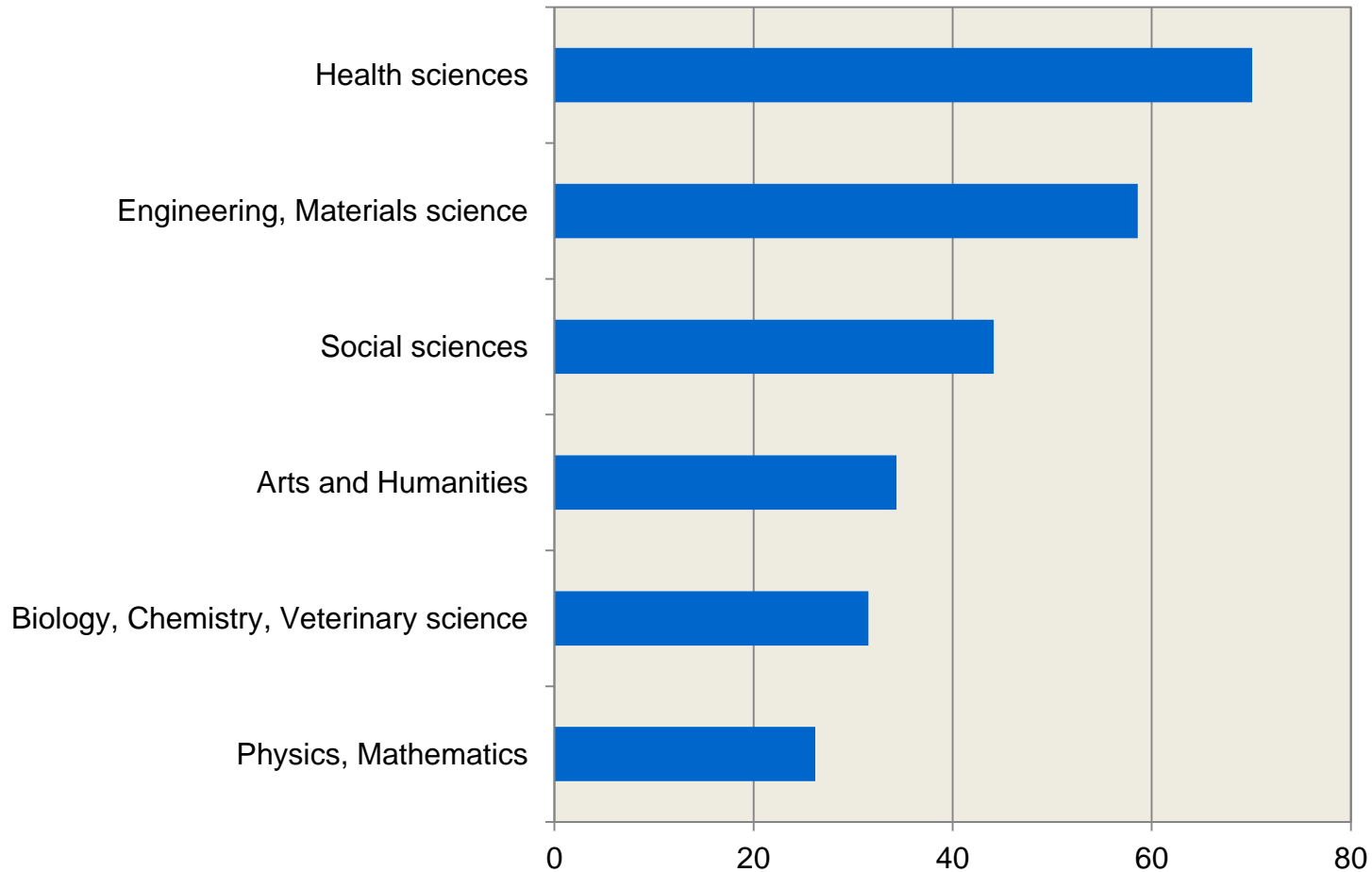
Source: Adapted from D. Stokes (1997) Pasteur's Quadrant Washington Brookings Institution

# Basic Research (% of respondents)



Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.

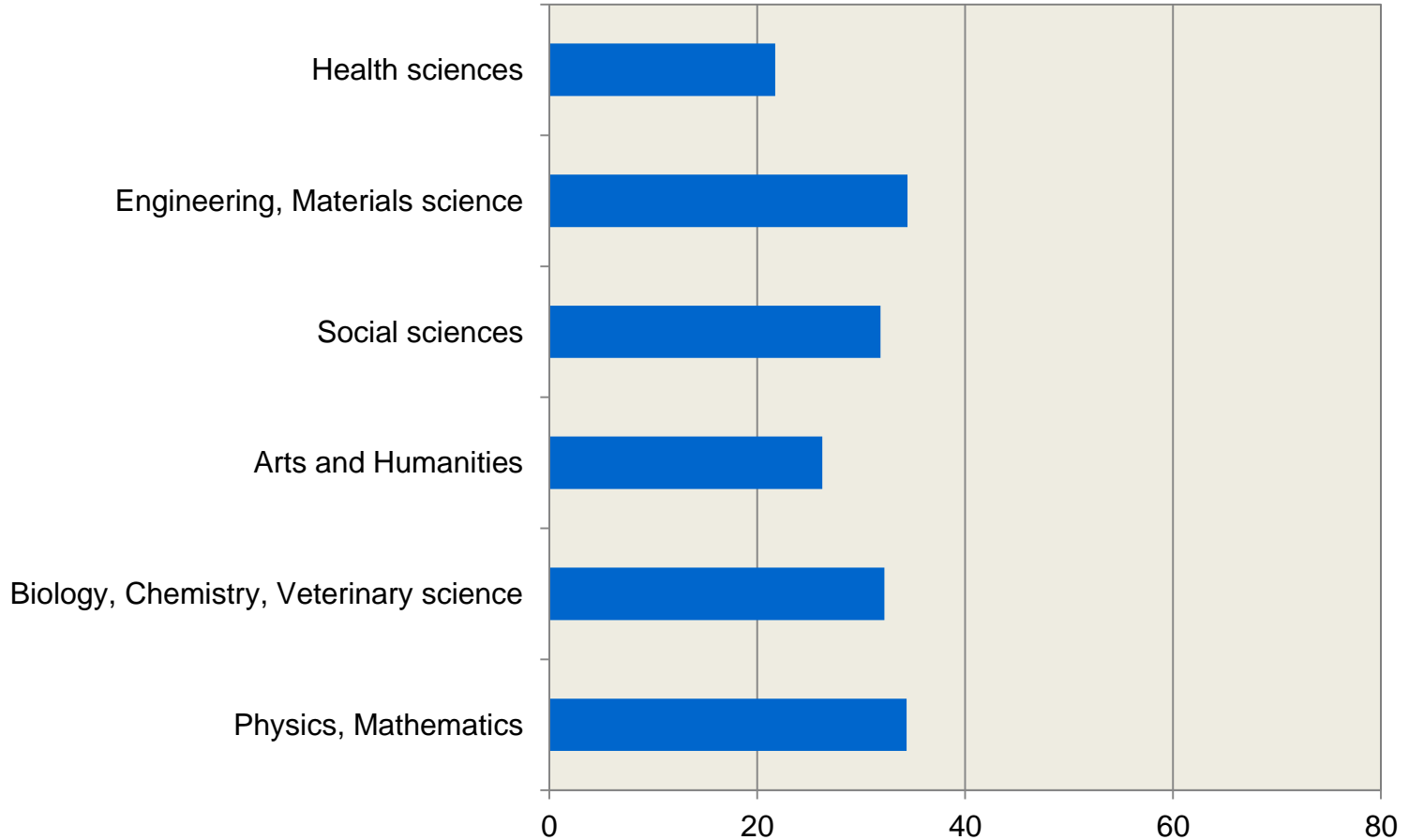
# Applied research (% of respondents)



Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.



# User-inspired basic research (% of respondents)



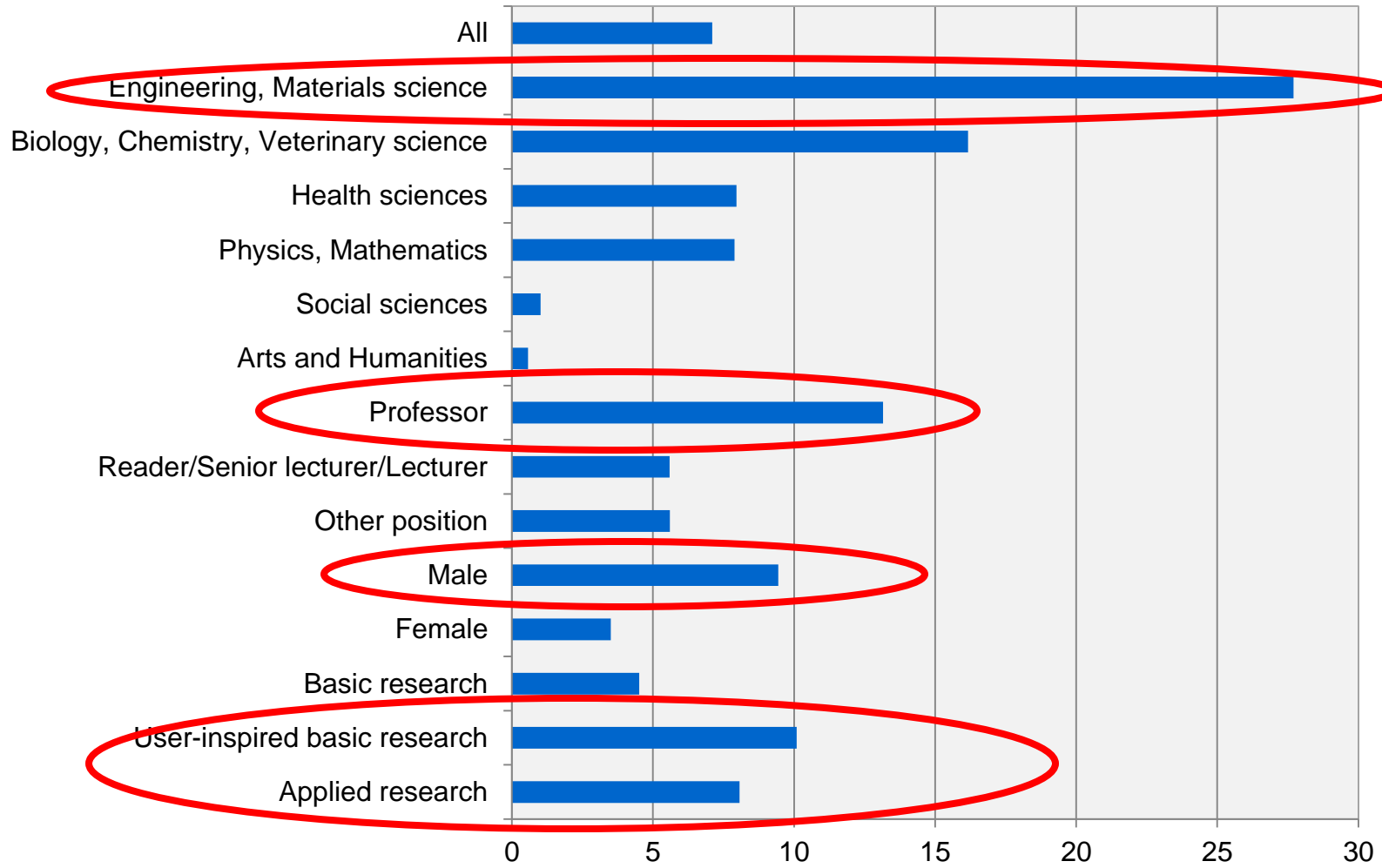
Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data

Archive Study Number 6462.

# Commercialisation Activities

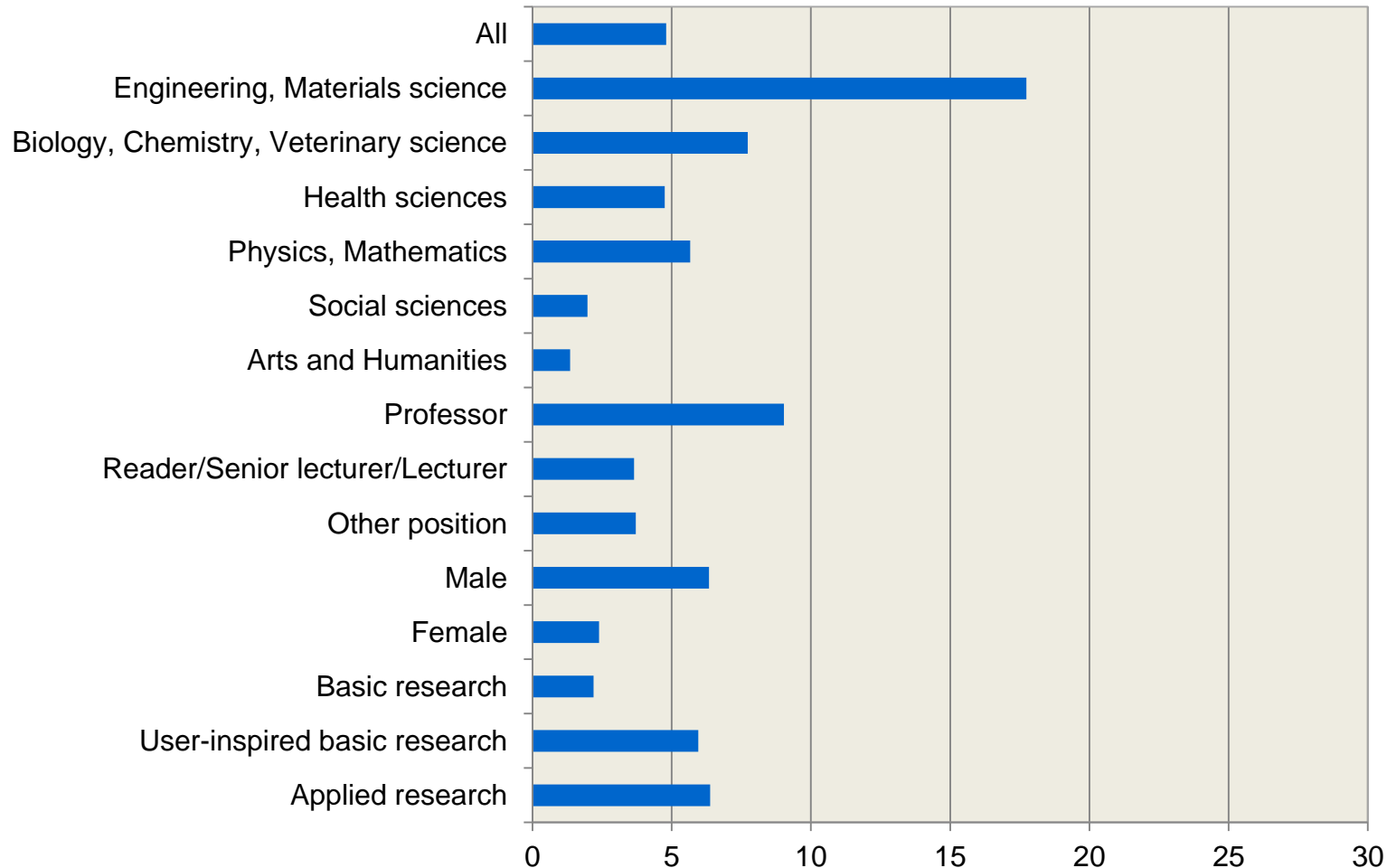
- Patents (7% of academics)
- Licenses (5% of academics)
- Spin- outs (4% of academics)

# Taken out a patent in the last 3 years (% of respondents)



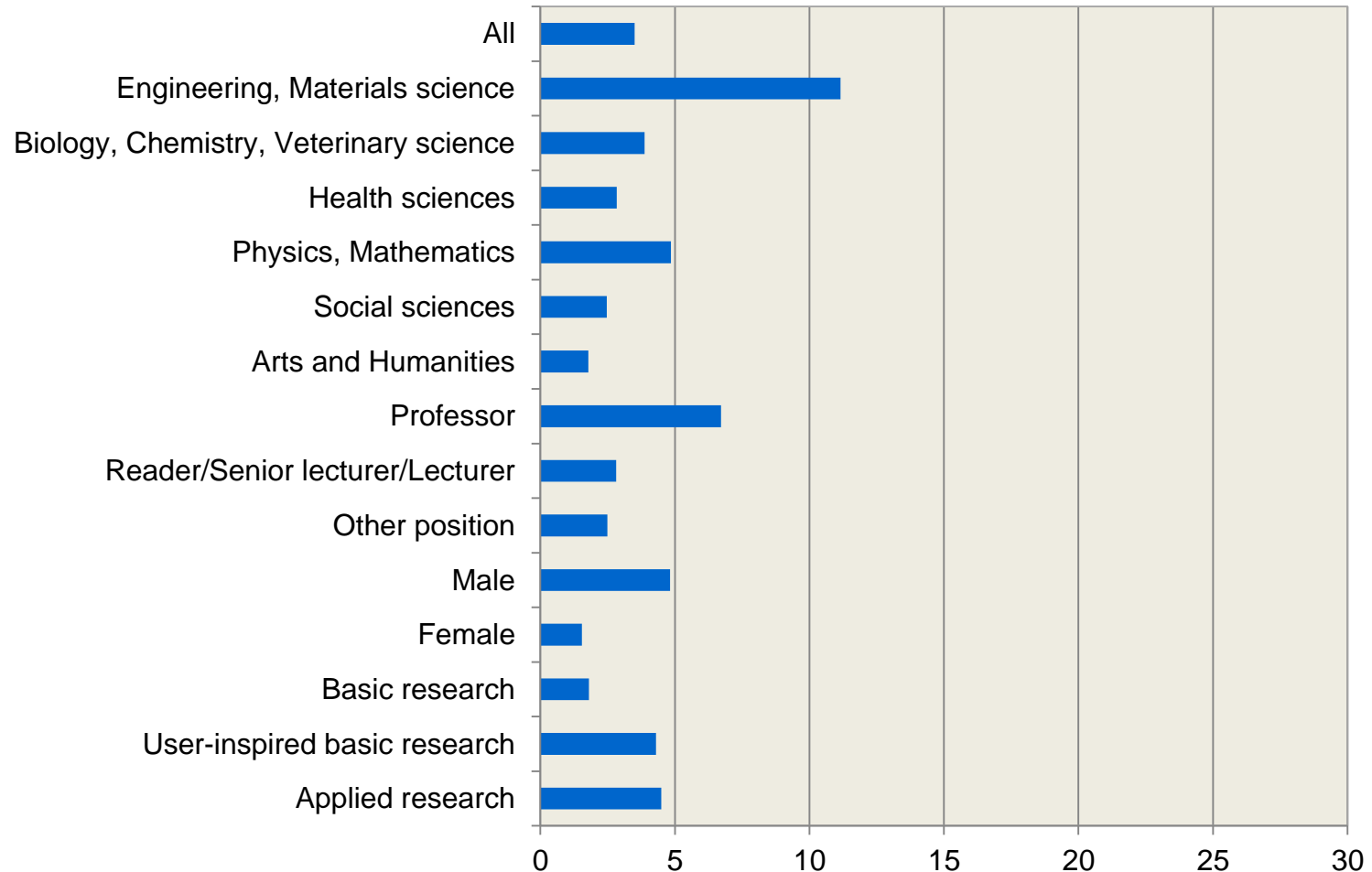
Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.

# Licensed research outputs to a company in the last 3 years (% of respondents)



Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.

# Formed a spin out company in the last 3 years (% of respondents)



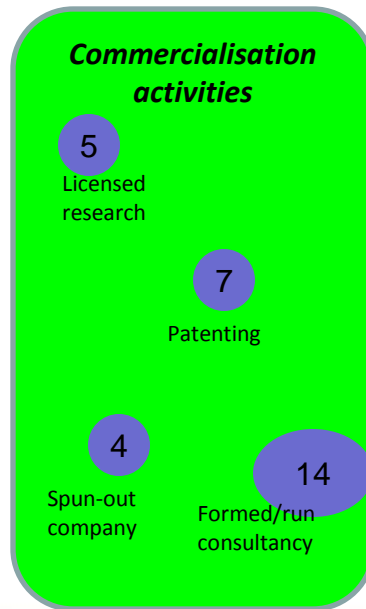
Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics

(Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.

# Other types of Interactions

- People based activities
  - Training, networks, conferences etc
- Problem-solving activities
  - Contract research, joint publications, informal advice etc
- Community based activities
  - Lectures for the community, exhibitions, school projects

# Academic Interactions with External Organisations

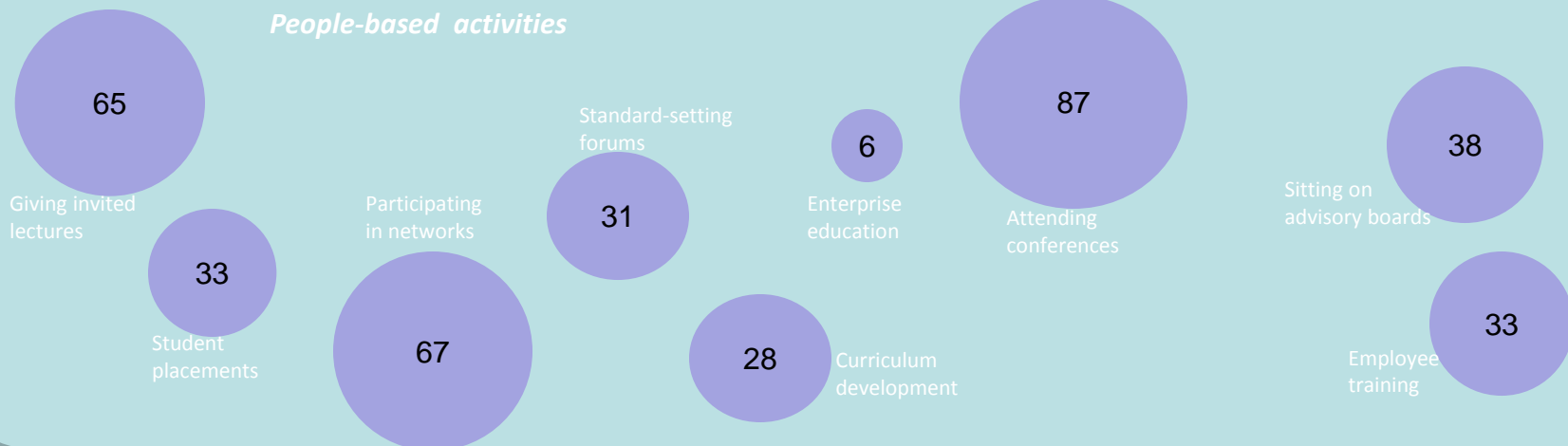


Format adapted from Ulrichsen (2009)

Source: Abreu, M., Grinevich, V., Hughes, A. and Kitson, M. (2009), *Knowledge Exchange between Academics and the Business, Public and Third Sectors*, Centre for Business Research, University of Cambridge, Cambridge.

# Academic Interactions with External Organisations

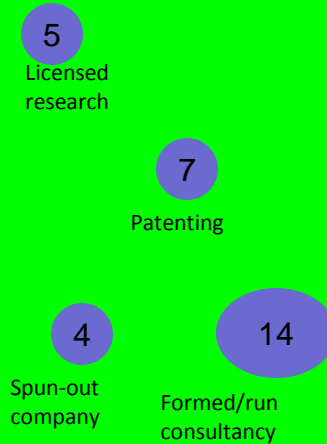
## People-based activities



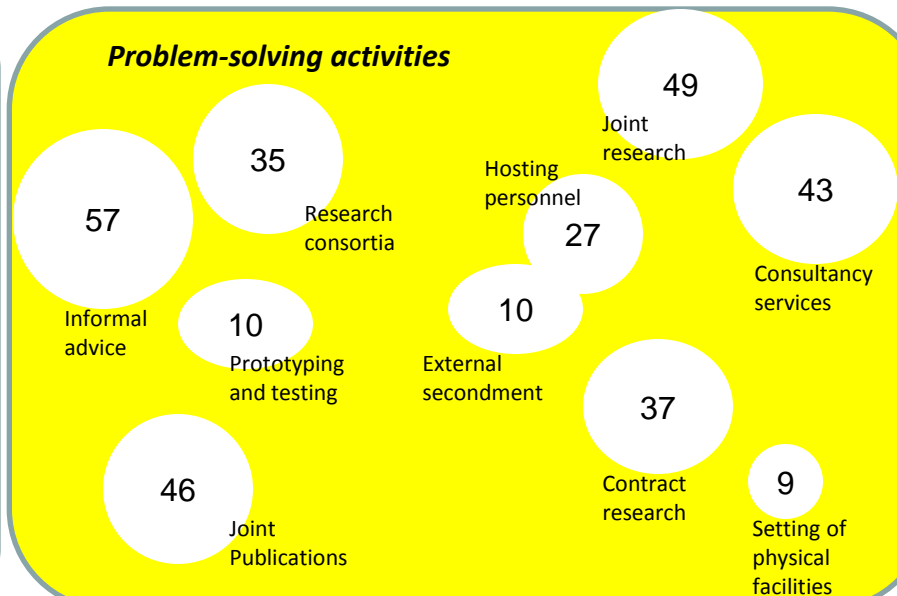
## Community-based activities



## Commercialisation activities



## Problem-solving activities



Format adapted from Ulrichsen (2009)

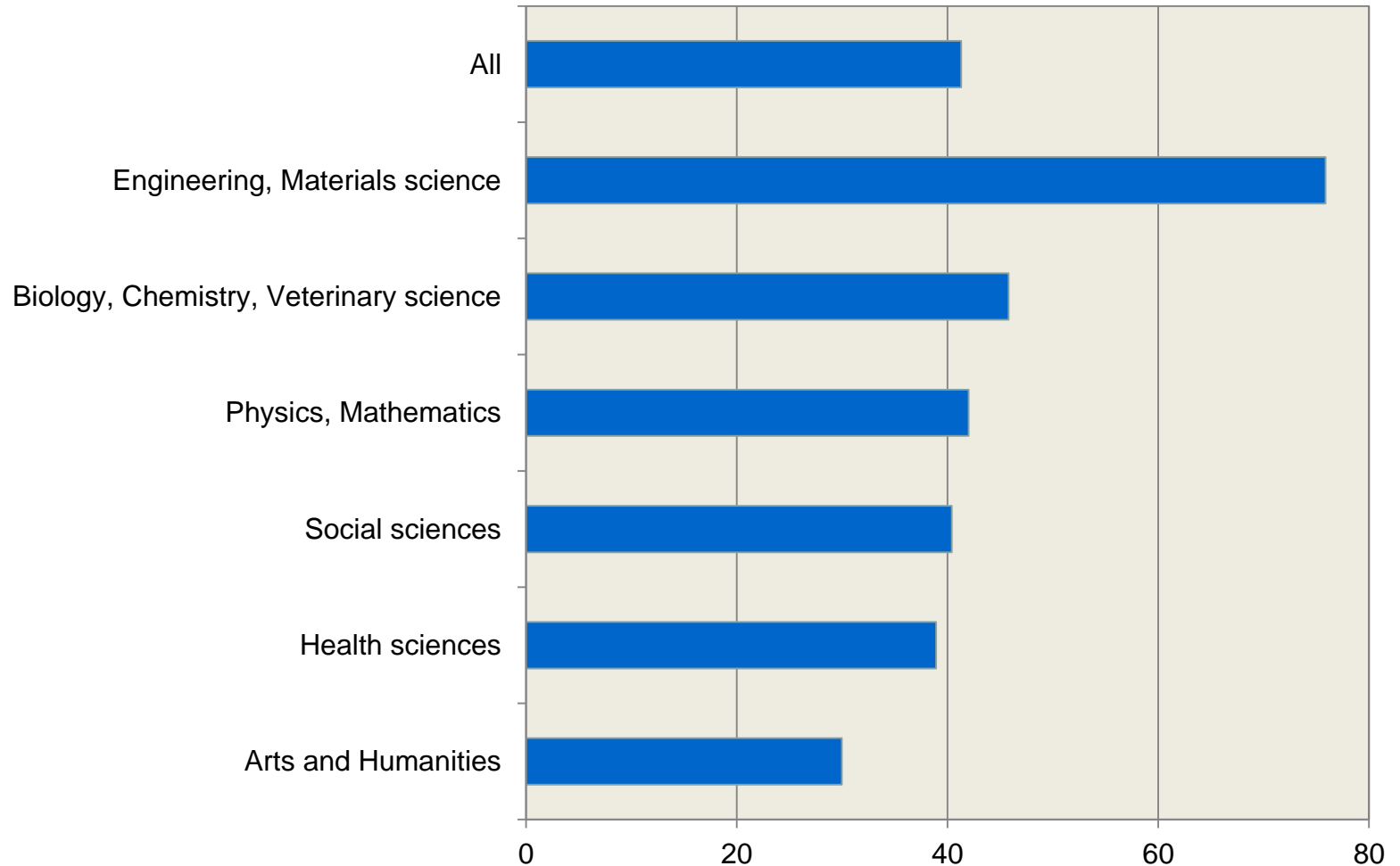
Source: Abreu, M., Grinevich, V., Hughes, A. and Kitson, M. (2009), *Knowledge Exchange between Academics and the Business, Public and Third Sectors*, Centre for Business Research, University of Cambridge, Cambridge.



# Partners

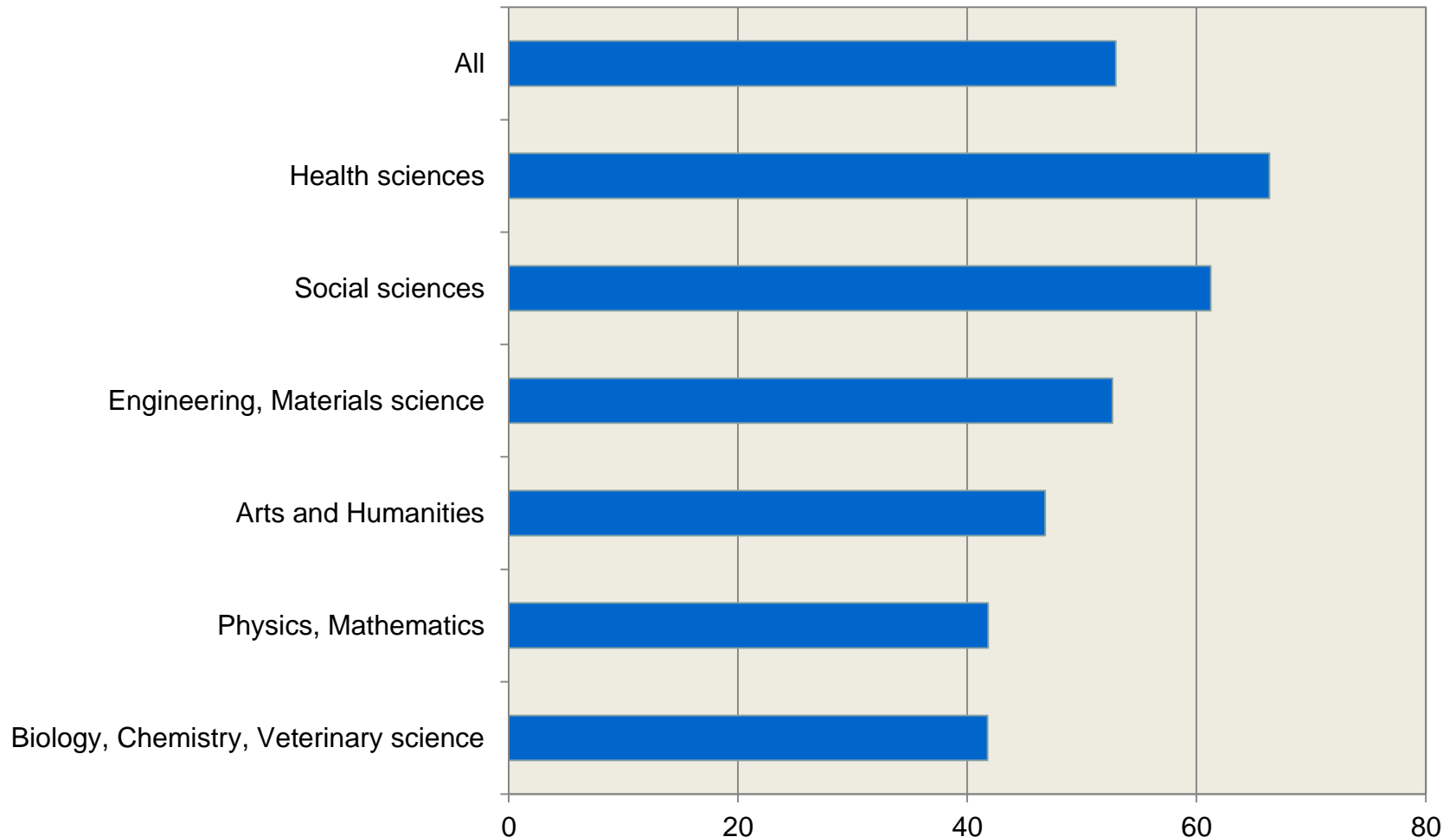
- Private sector companies across a range of sectors (40% of academics)
- Public sector - UK and abroad (53% of academics)
- Third sector – including charities, non-profit organisations and social enterprises (44% of academics)

# Interactions with private sector companies (% of respondents)



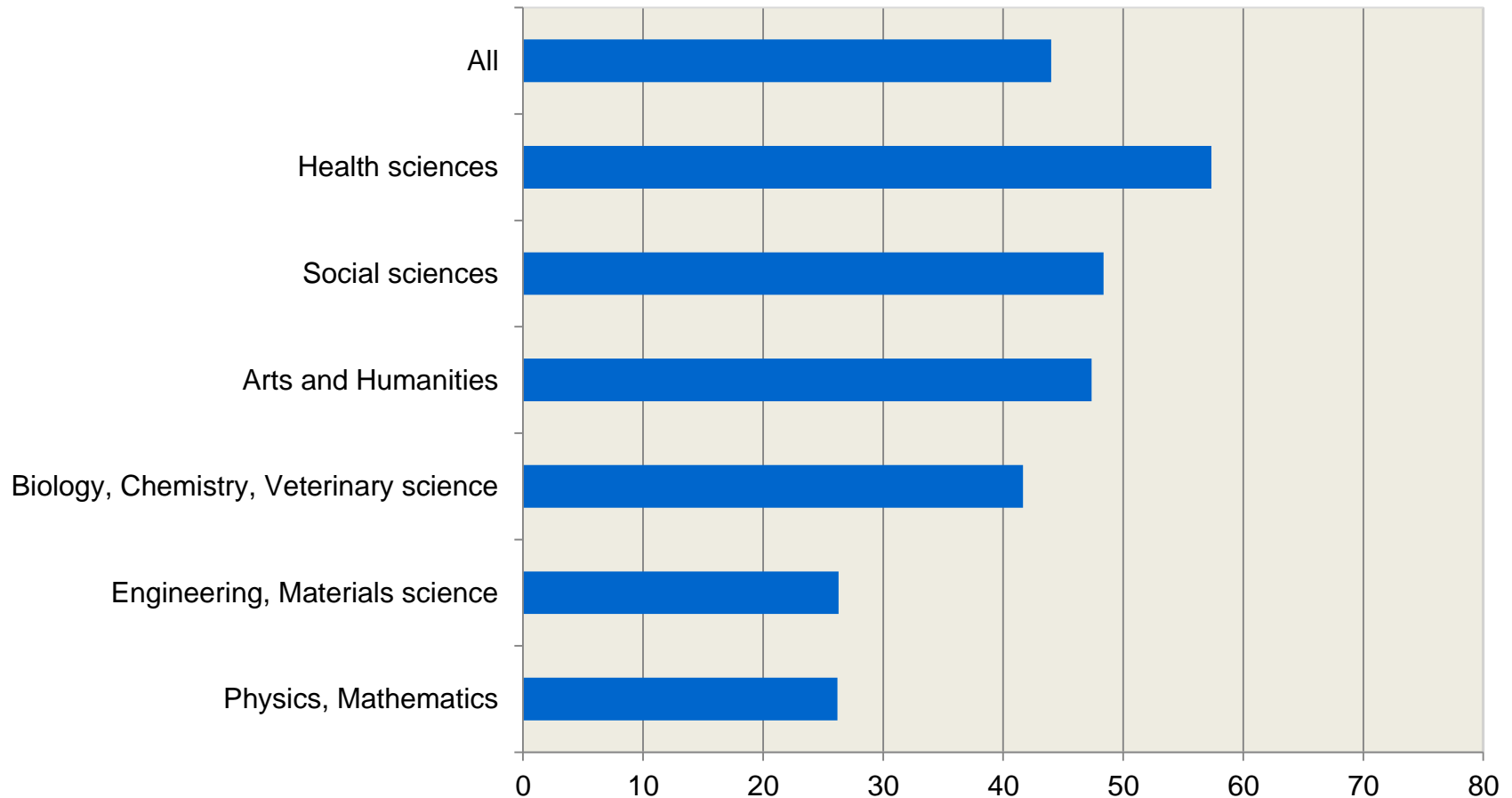
Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.

# Interactions with public sector organisations (% of respondents)



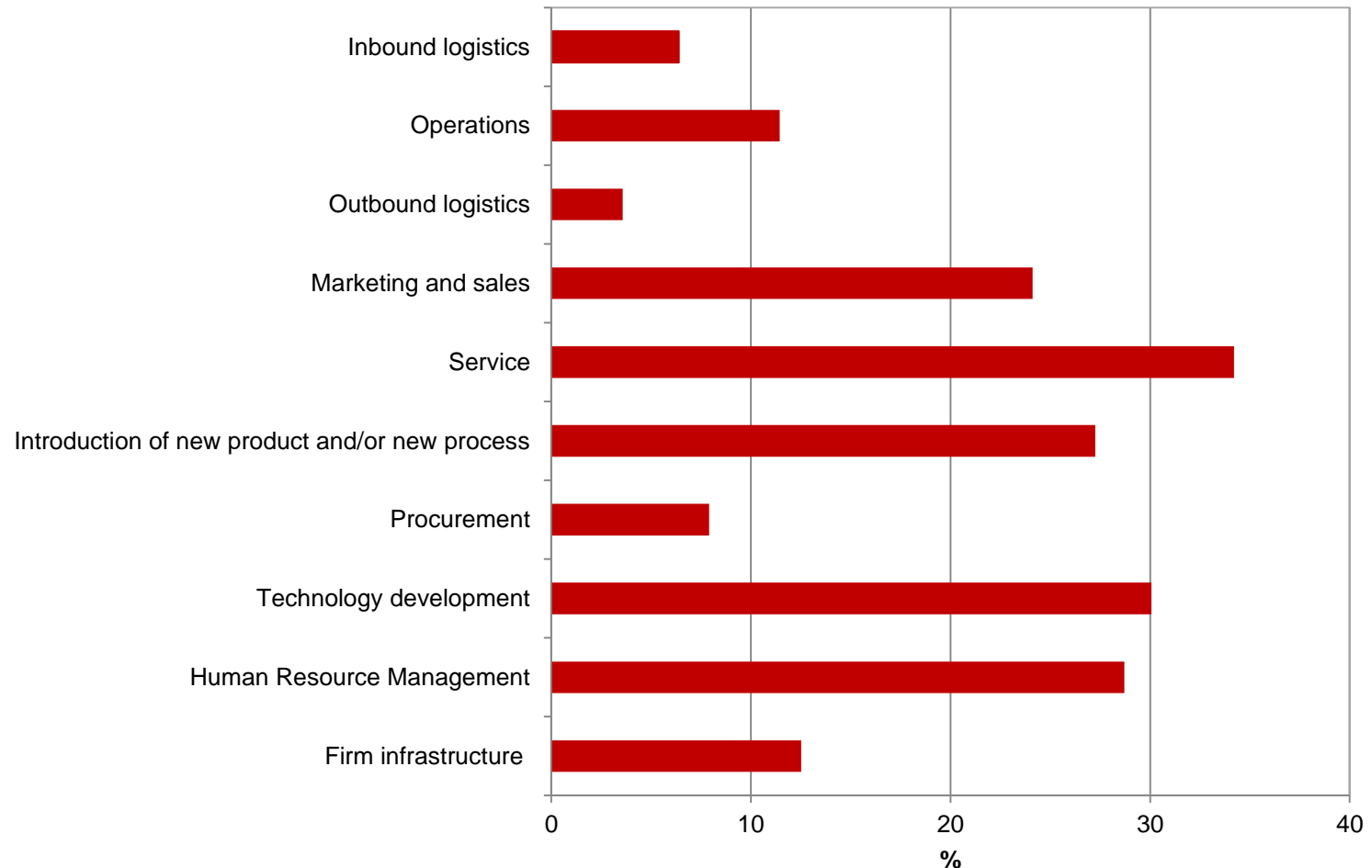
Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.

# Interactions with the third sector organisations (% of respondents)



Source: Cambridge Centre for Business Research Survey of Knowledge Exchange Activity by UK Academics (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6462.

# Why businesses interact with universities?



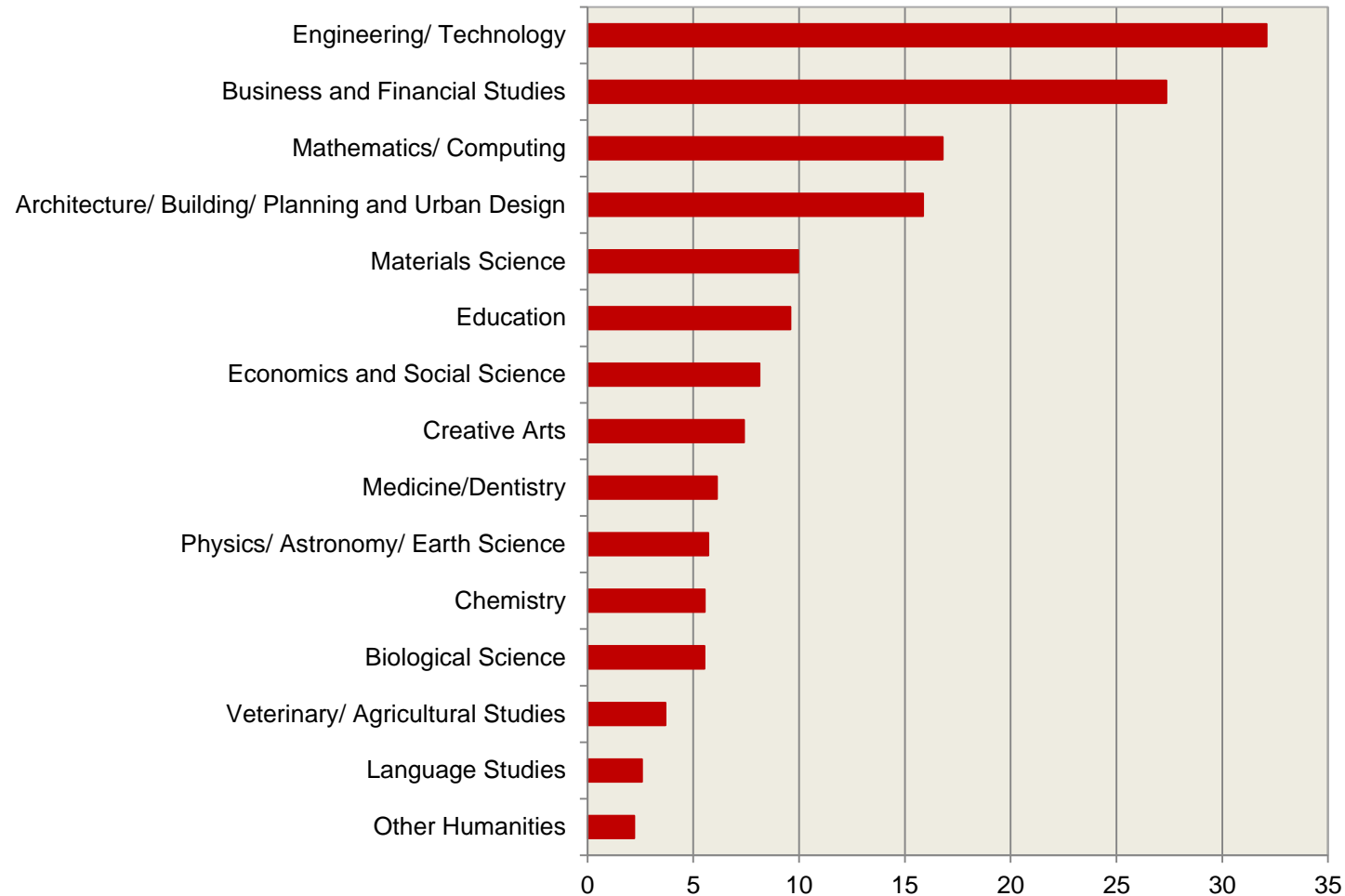
Source: Cambridge Centre For Business Research Survey Of Knowledge Exchange Activity By United Kingdom Businesses, 2005-2009 (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6464.

# Why businesses interact with Universities (all collaborating interacting firms)

	Logistics, procurement and operations	Innovation activities	Marketing, sales and support services	Human resource management
All firms with interactions	24	43	49	38
STEM interaction only	18	64	36	19
Social sciences interaction only	34	17	50	50
Interaction with STEM and any other	26	47	59	45
Any interaction except with STEM	27	24	53	50
	**	**	**	**

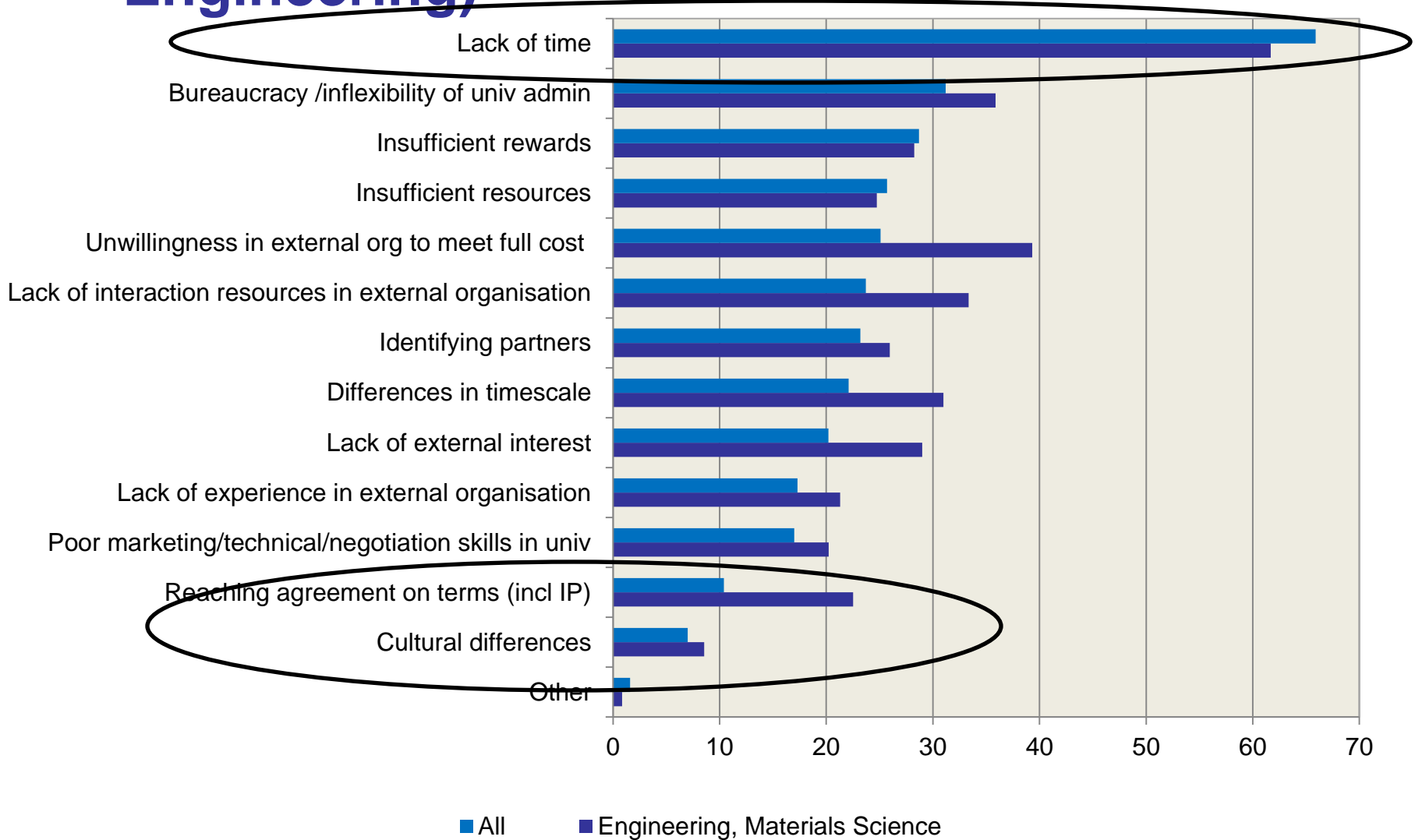
*Source:* Hughes and Kitson (2012)

# Who do businesses interact with?



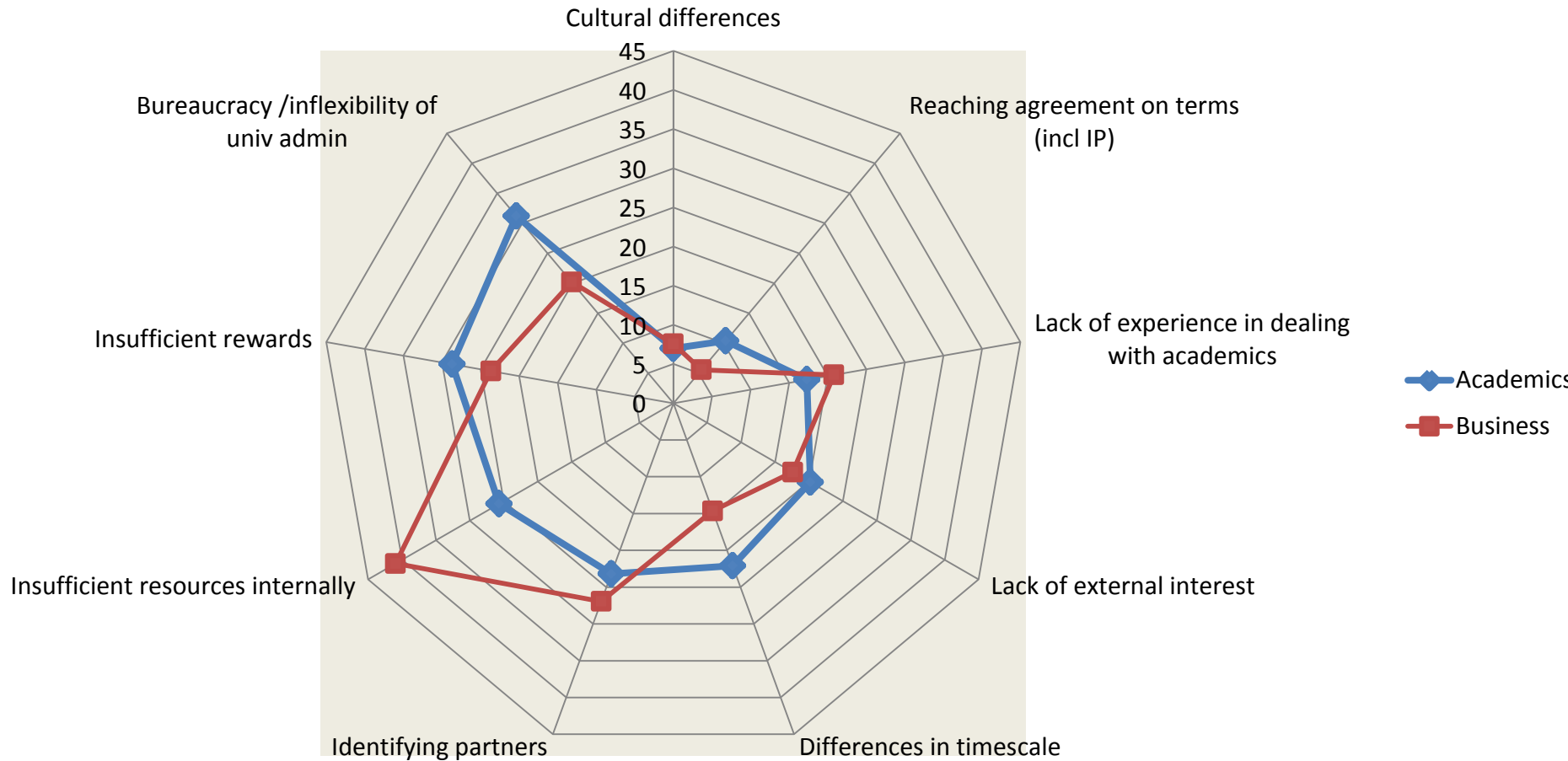
Source: Cambridge Centre For Business Research Survey Of Knowledge Exchange Activity By United Kingdom Businesses, 2005-2009 (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6464.

# Constraints on interactions with external organisations (% of respondents – All and Engineering)



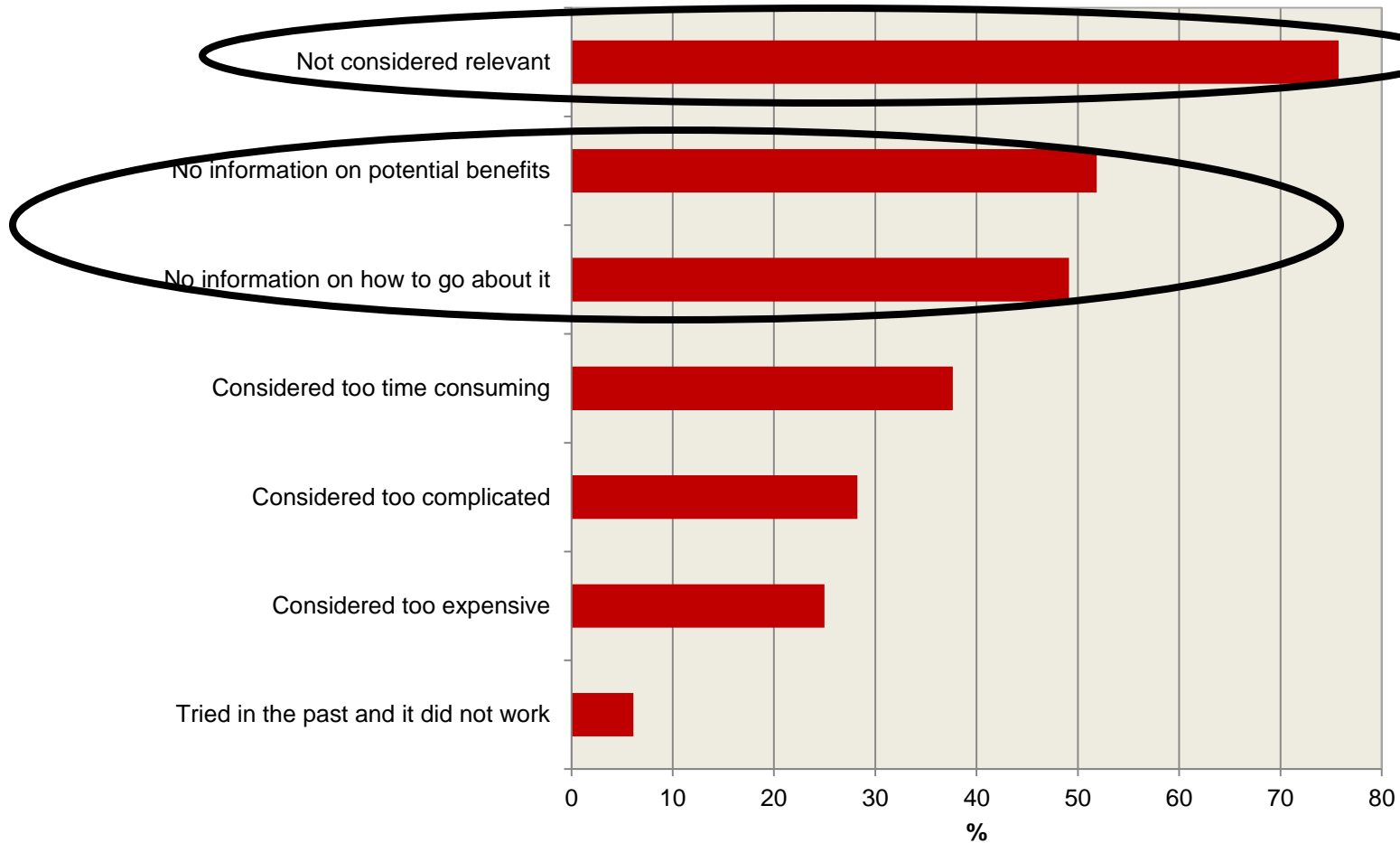


# Academic and business perceptions of constraints on interactions



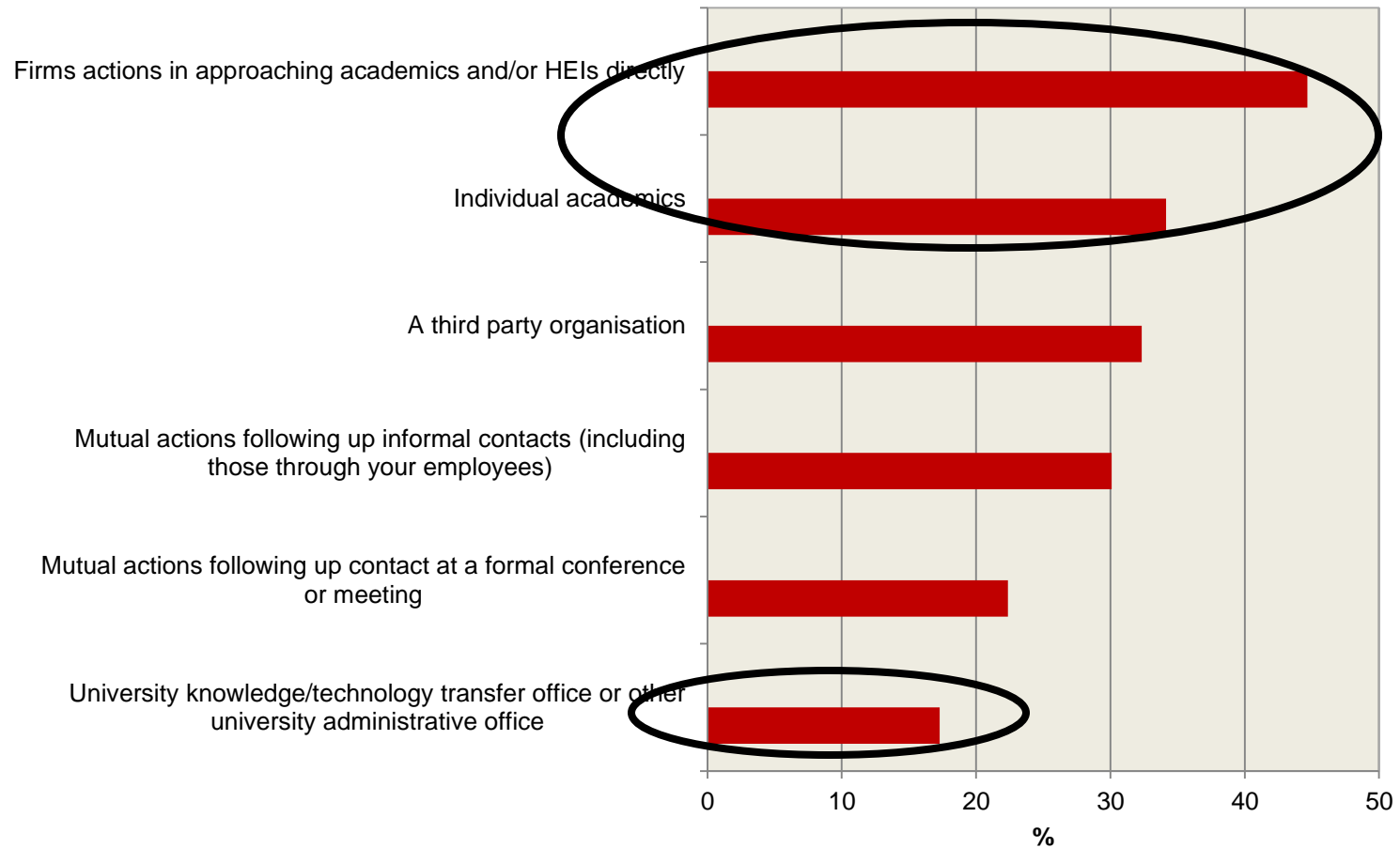
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# Reasons for not interacting (% of non collaborating firms)



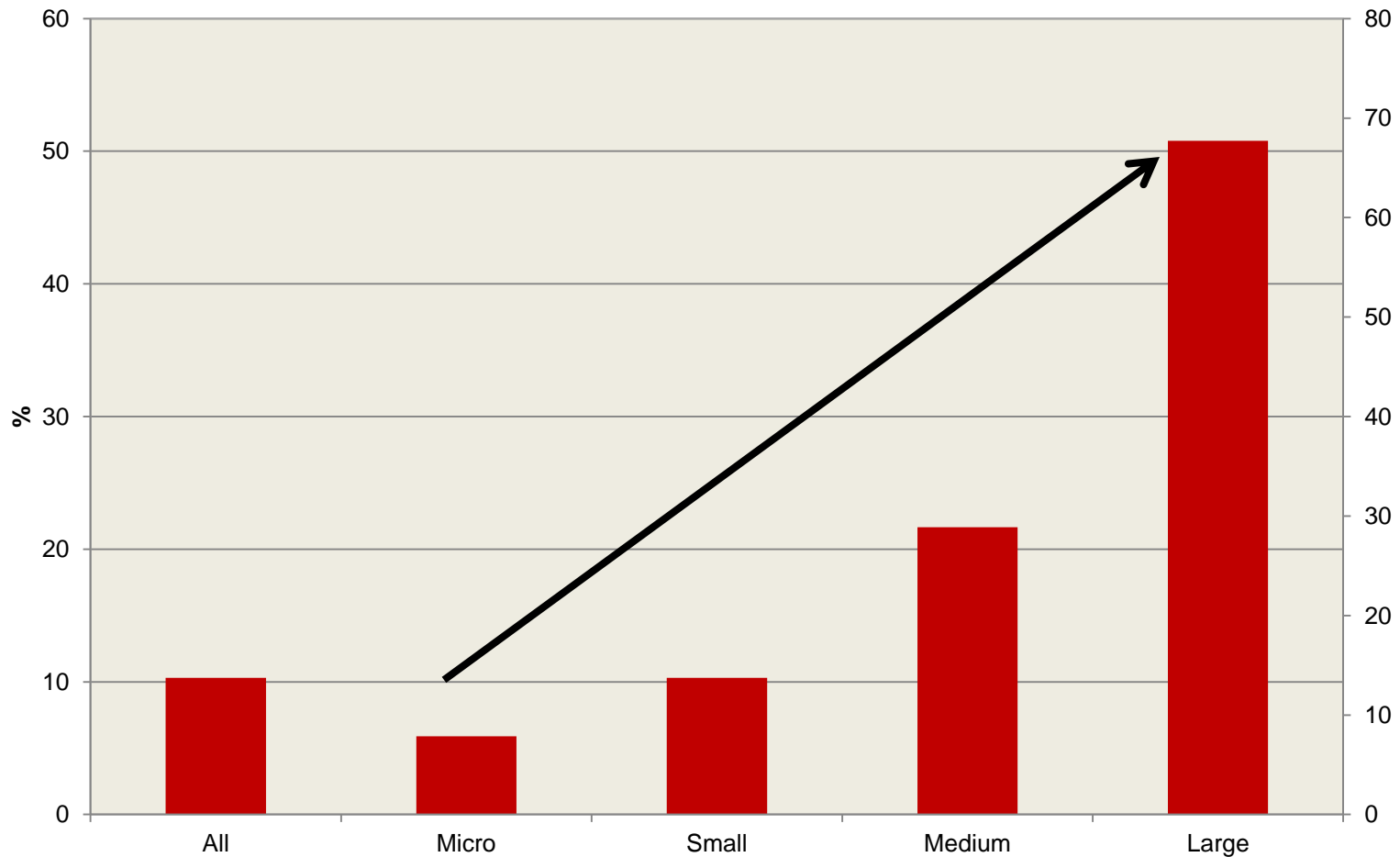
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# How are interactions with universities initiated?



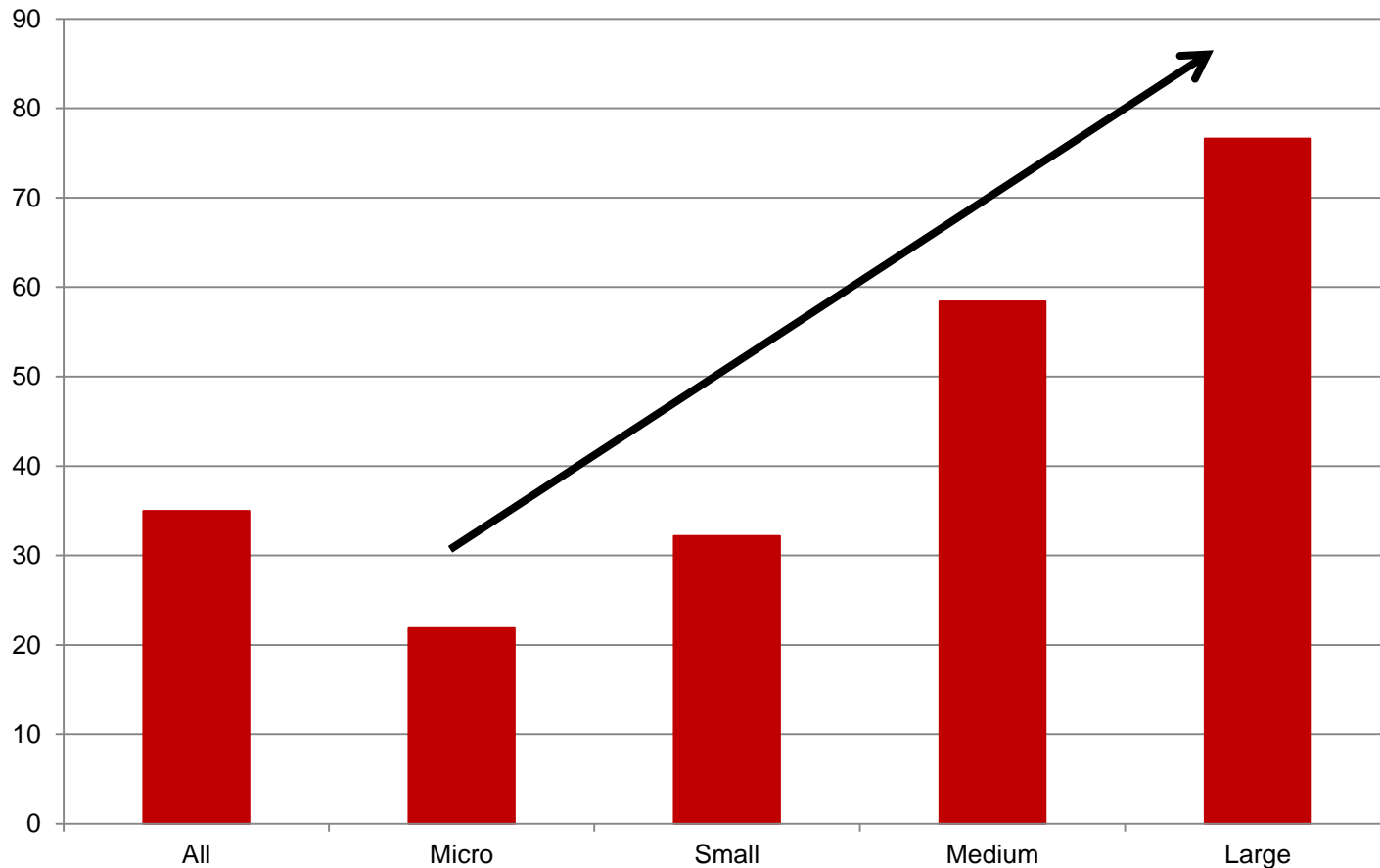
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# Businesses (%) employing someone to liaise with universities



Source: Cambridge Centre For Business Research Survey Of Knowledge Exchange Activity By United Kingdom Businesses, 2005-2009 (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6464.

# Businesses (%) interacting with universities



Source: Cambridge Centre For Business Research Survey Of Knowledge Exchange Activity By United Kingdom Businesses, 2005-2009 (Hughes, A., Kitson, M., Abreu, M., Grinevich, V., Bullock, A. and Milner, I.) UK Data Archive Study Number 6464.

# The connectivity of universities: a wider perspective

- Research: the importance of applied research with an economic impact
- **Basic and Applied – a simplistic distinction**
- **Impact is complex and uncertain: unknown unknowns**

# The connectivity of universities: a wider perspective

- The importance of technology transfer
- **Only part of the knowledge exchange picture ignores many people-based, problem-solving and community interactions**

# The connectivity of universities: a wider perspective

- Focus on university-business links
- **Ignores the many and varied interactions with the public and third sectors**



# The connectivity of universities: a wider perspective

- Businesses connect with academia for technical innovation
- **Businesses connect with academia for many reasons, many of which are NOT concerned with technical innovation**

# The connectivity of universities: a wider perspective

- Major constraints include cultural difference and disputes over IP
- **Such constraints only apply to small range of interactions**
- **Significant constraints/problems include a lack of resources (time and people) and a lack of information**

# Implications for policy

- Academia is important source of knowledge for wider innovation
- Importance of demand-side limitations
  - Lack of competences and relevant skills in business
- The size problem
  - Difficult for SMEs to connect with universities
  - The aggregation problem for KE projects
- The information problem – lack of knowledge about what academia can offer and how to access it
- The reality problem – there are 120,000 academics in the UK and 4.8 million businesses
- The short-termism problem – focus on research with an ‘economic impact’

# Implications for policy

- The need for ‘boundary spanners’ to initiate and manage interactions
- May require the development of new institutions
  - In or outside the university?
  - eg Fraunhofers in Germany, ‘Catapults’ in the UK (technology and innovation centres)
- Need to develop new skills

# Next steps

- Continued analysis of the data
  - Project funded by the Arts and Humanities Research Council on the role of arts and the development of creative places
- Link to other datasets
  - Patents, funding and research assessment data
  - The anti-intellectual black hole of ‘Common Method Bias’
- Future surveys (to create a panel)
- Cross-country surveys

# THE ACADEMIC IVORY TOWER IS A MYTH

# References

Abreu, M., Grinevich, V., Hughes, A. and Kitson, M. (2009), Knowledge Exchange between Academics and the Business, Public and Third Sectors, Centre for Business Research, University of Cambridge , Cambridge.

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