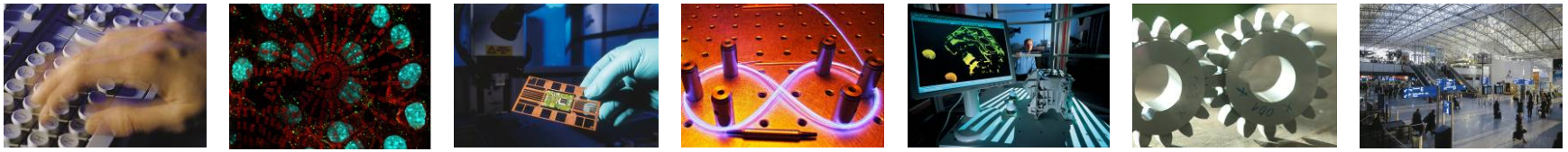


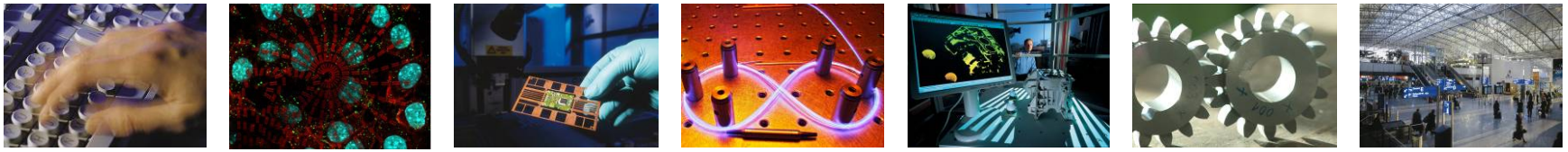
# Innovating together –
## Collaborations between multi-national companies and academia in China

VCW Conference Internationalization of R&D and Innovation

Essen, November 26, 2015

Dr. Ulrike Tagscherer

# The Profile of Fraunhofer



- 67 institutes and independent research units
- more than 23,000 staff
- annual research volume of €2 billion

7 Groups:

- Information and Communication Technology
- Life Sciences
- Microelectronics
- Light & Surfaces
- Production
- Materials and Components – MATERIALS
- Defense and Security

Fraunhofer ISI

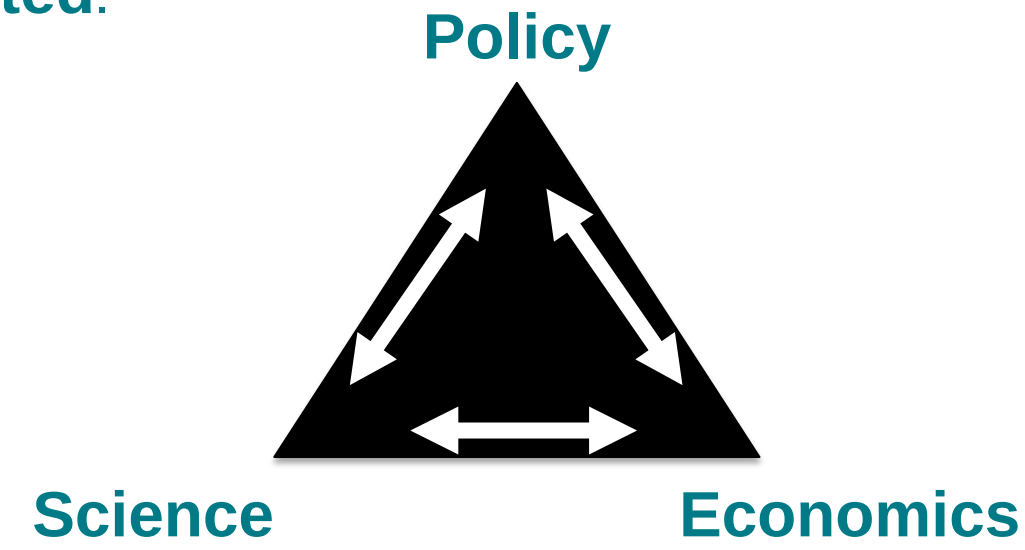
# Fraunhofer Locations in Germany

Mission: to conduct applied research of direct utility to private and public enterprises for of wide benefit to society


Fraunhofer ISI

# The Fraunhofer Institute for Systems and Innovation Research ISI…

…studies how innovations **originate**,
which **stakeholders** are to be integrated,
who **benefits** from them and
how they can be **promoted**.

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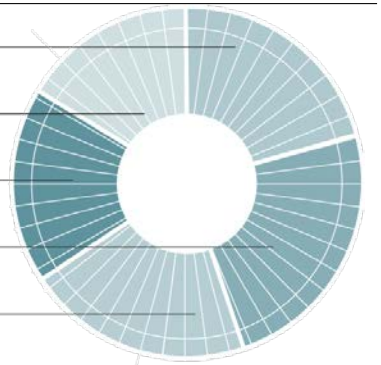
# Facts and Figures

## Disciplinary background of scientific staff

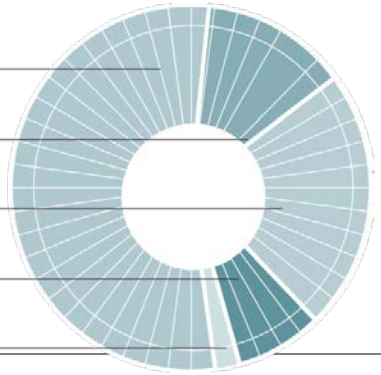
in % of all scientific employees (~170; total ~230)



- 21% Economists
- 16% Industrial engineers
- 18% Engineers
- 24% Social scientists
- 21% Natural/life scientists


## Our clients

share on overall budget (~ 21 million Euro)



- 54% Public sector national
- 13% European Union
- 23% Industry
- 8% Other R&D
- 2% Research promotion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# Competence Centers of Fraunhofer ISI

## Fraunhofer ISI

### Industrial and Service Innovations

BUSINESS UNIT

- Industrial Innovation Strategies and Systems
- Innovative Production Systems and Value Chains
- Industrial Services

### Policy and Regions

BUSINESS UNIT

- Policy and Evaluation
- Regions and Clusters
- Innovation Indicators

### Energy Technology and Energy Systems

BUSINESS UNIT

- Energy Efficiency
- Energy Economy
- Demand Analysis and Projections

### Energy Policy and Energy Markets

BUSINESS UNIT

- Renewable Energies
- Energy and Climate Policy
- Electricity Markets and Infrastructures

### Sustainability and Infrastructure Systems

BUSINESS UNIT

- Water Resources Management
- Transportation Systems
- Systemic Risks
- Sustainability Innovations and Policy

### Innovation and Technology Management and Foresight

BUSINESS UNIT

- Futures Research and Foresight
- Management of Innovations and Technologies
- Strategies for Material Technologies

### Emerging Technologies

BUSINESS UNIT

- Biotechnology and Life Sciences
- Innovations in the Health System
- Information and Communication Technologies

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# Fraunhofer ISI - China Focus

- Participation in the OECD Report about the Chinese innovation system .
- Memorandum of Understanding with the Institute for Policy and Management (IPM) of the Chinese Academy of Sciences in 2008 for a strategic collaboration.
- One senior scientist from ISI permantently based at IPM as staff since 2008.
- Joint Summer Schools in 2008, 2009, 2010.
- 1-4 Ph.D. students per year from IPM at ISI since 2008.
- Bi-annual Sino-German Joint Research Conferences funded by the Sino-German Center in Beijing (DFG & NSFC) together with University Bayreuth, University Kassel, TU Berlin, University Erlangen-Nürnberg in 2008, 2010, and 2011.
- Support of the Fraunhofer President for his consultancy of the Governor of Guangdong province.

# Selected Projects

- Bibliometric analysis of the Chinese science system
- Monitoring of the Chinese innovation system (2009 environmental technologies, 2010 life sciences)
- Innovation study for 6 selected countries (US, JP, FR, KR, CN, IN) + DE
- Research and Technology Competence for a Sustainable Development in the BRICS countries
- Integration of sustainablility innovations in catching-up-processes
- European Manufacturing Survey, Pilotstudie China in 2009
- Regional innovation system analysis of Bohai Bay, Yangtze River and Pearl River Delta
- Comparison of technology transfer mechanisms of SME in China and Germany
- Analysis of methodological differences in roadmapping as a tool for technology foresight




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# Joint Center for Innovation Research

- Close collaboration between the partners since 2006 in OECD innovation study
- MoU  in 2008, resulting in long-term staff exchange
- Signing of Memorandum of Cooperation in May 2013 to establish a
- **Joint Center for Innovation Research** between the Institute of Policy and Management (CAS IPM) and the Fraunhofer Institute for System and Innovation Research (ISI)

Fraunhofer ISI

# Major Goals of the Joint Center

To intensify and institutionalize the existing cooperation in order to further develop our joint expertise in the fields of

- **science & technology policy**
- **management science and engineering**
- **socio-sustainable development**
- **S & T management and evaluation and**
- **innovation and entrepreneurship policy**

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# Our Services

- Consulting projects in the field of energy efficiency and renewable energies,
- Consulting projects in the field of water infrastructure,
- Consulting projects in the field of urban development and transport infrastructure,
- Consulting for public stakeholders with a view to technology transfer, intellectual property rights and science-industry co-operation,
- Consulting for multinational firms with respect to the overall techno-economic development of markets and novel trends,
- Joint projects in the field of technology foresight and road-mapping,
- Joint questionnaire and interview based surveys, to contribute to international comparative studies procured by diverse clients.




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# Project Ideas for China

- Regional and sectoral competition analysis for science and technology (e.g. technology field benchmarks)
- Trainings in foresight methodologies
- Foresight processes for specific customers (e.g. industry, agencies etc.)
- Trainings in innovation theory and practices to deepen the understanding for innovation strategies (e.g. for managers, administrators, government officials….)
- Regional policy comparisons (regional, national, international, sectoral)
- Development of innovative concepts for sustainable development, e.g. urban infrastructure systems, energy systems, transportation, systemic risks, resource efficiency
- Program evalutation or impact evaluation, e.g. government programs, innovation policies, etc.

# Table of Contents

# MOTIVATION, METHODOLOGY, AND SAMPLE

# Technology Upgrading – A Key Challenge for all Economies

- The **international competitiveness** of leading economies is based on innovation and technology rather than on price and volume
- Enterprises that want to compete based on their technological leadership need to **technologically upgrade continuously**
- **Upgrading involves learning** – most firms need to co-operate and interact with partners, from both the private enterprise and the public research sector
- Few technology firms have the resources to perform all the work necessary to achieve major breakthroughs on their own
- Working in isolation is less efficient and **open innovation** is becoming more important
- More and more importance is given to **industry-science collaborations** for technology upgrading




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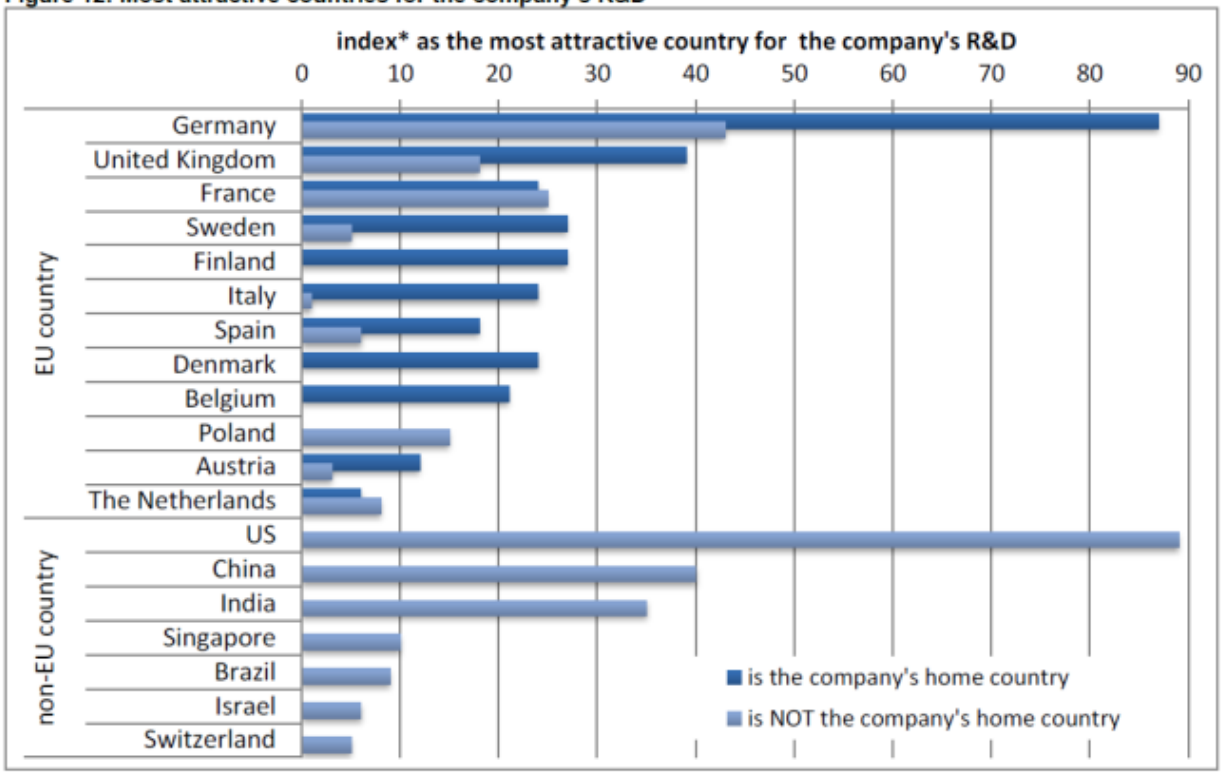
# Most attractive countries for companies R&D

**Figure 12: Most attractive countries for the company's R&D**




Note: * Based on an attractiveness index for 143 responses out of the 172 companies in the sample: countries ranked as most attractive with 3 points, as 2nd most attractive with 2 points, and as 3rd most attractive with 1 point. Only for countries mentioned at least five times.

Source: European Commission JRC-IPTS (2013)



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# Research Focus

Main goal of the study:

Give recommendations to the Chinese government on how to strengthen and support industry-science-collaborations between MNC and Chinese academia

Research questions:

- How do the current cooperations look like and what trends can be observed?
- What are the key drivers for collaborations?
- What are the key success factors?
- What role does IP play for collaborations?
- What impact do Chinese innovation policies play?




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# Methodology

- Two surveys among MNCs in China, 2011/12 and autumn 2014
- Personal Interviews with 30 multinational companies in Beijing and Shanghai in 2011/12, in 2014 including Shenzhen and Wuhan
- 80% of the interviews were face-to-face interviews, 20% telephone interviews in both surveys
- Guided questionnaire with open and closed questions
- In 2011/12 additionally 4 case studies, for which the universities or research institutes co-operating with the MNC were interviewed as well

# Sample Description

**2011/12**

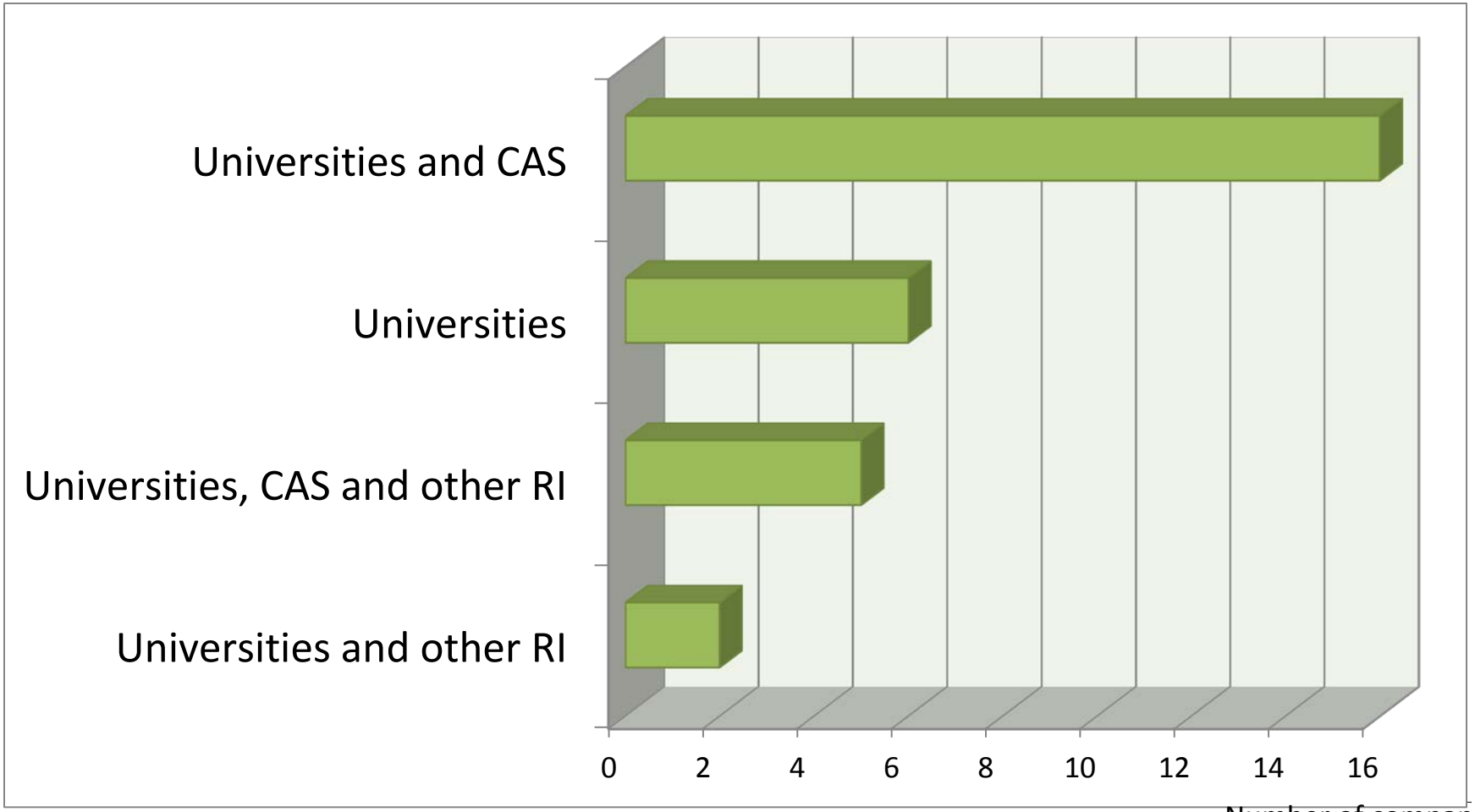
- 21 MNC have a global R&D center in China
- Sector distribution: chemicals 23%, pharmaceuticals 20%, computer/electronics 13%, mixed 10%, transportation 7%, IT 7%
- Country of origin: Germany 34%, France 20%, US 17%, Denmark 13%, Netherlands 13%, Sweden 3%.

**2014**

- 26 MNC have a global R&D center in China
- Sector distribution: chemicals 40%, pharmaceuticals 14%, computer/electronics 10%, mixed 17%, transportation 13%, IT 3%, food 3%
- Country of origin: Germany 50%, France 23%, US 10%, Denmark 7%, Netherlands 7%, Sweden 3%.
- 20 companies of 2014 survey identical with 2011/12 companies

# COLLABORATION MODES AND DRIVERS

# Collaboration partners in academia

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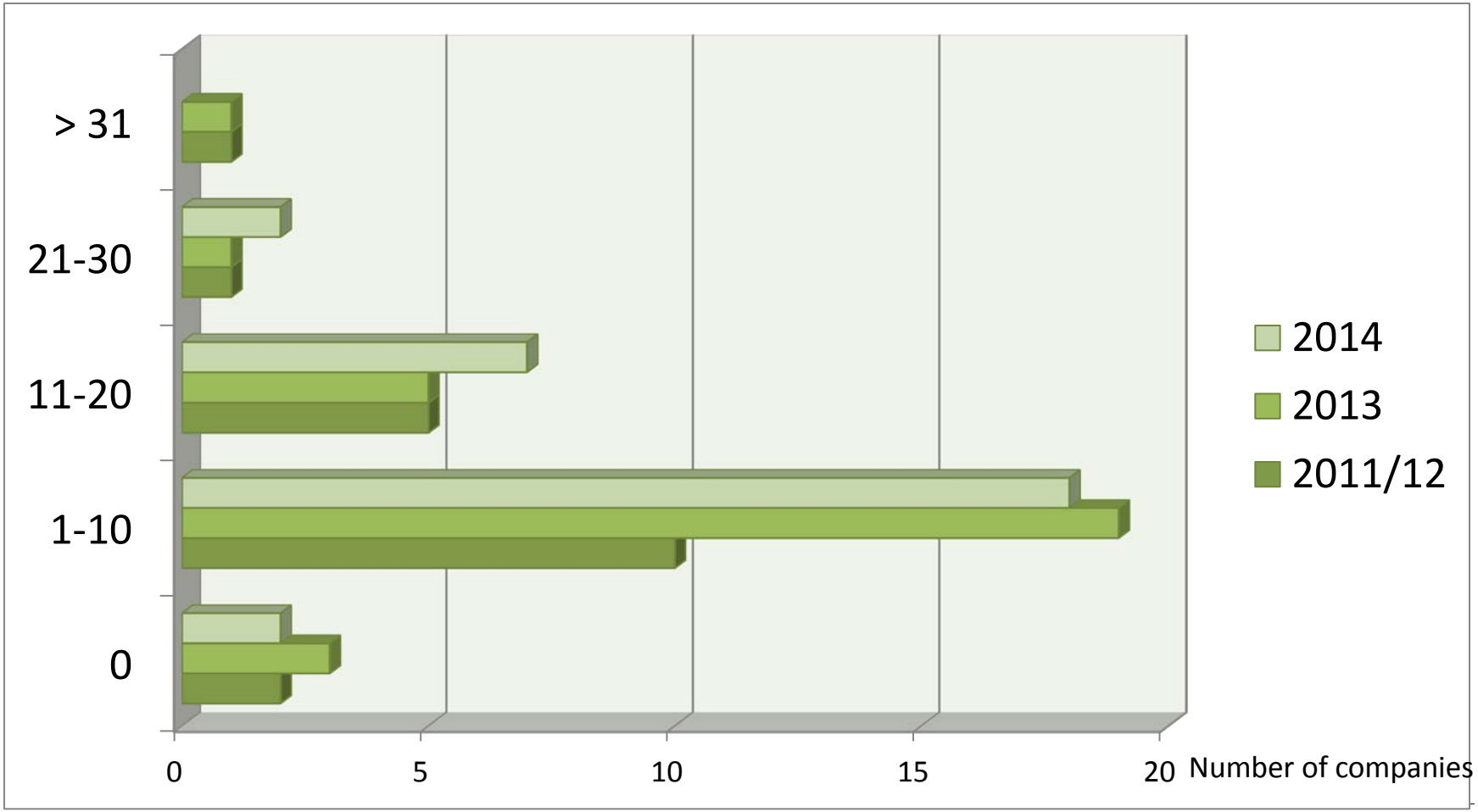
# Differences between universities and CAS

| Are there any differences? | No. of companies |
|---|---|
| Yes | 8 |
| No | 13 |
| Not applicable | 9 |

| What kind of differences? | No. of companies |
|---|---|
| CAS has more resources | 4 |
| CAS is better in applied research | 5 |
| Universities are more flexible than CAS | 3 |

# Number of research projects

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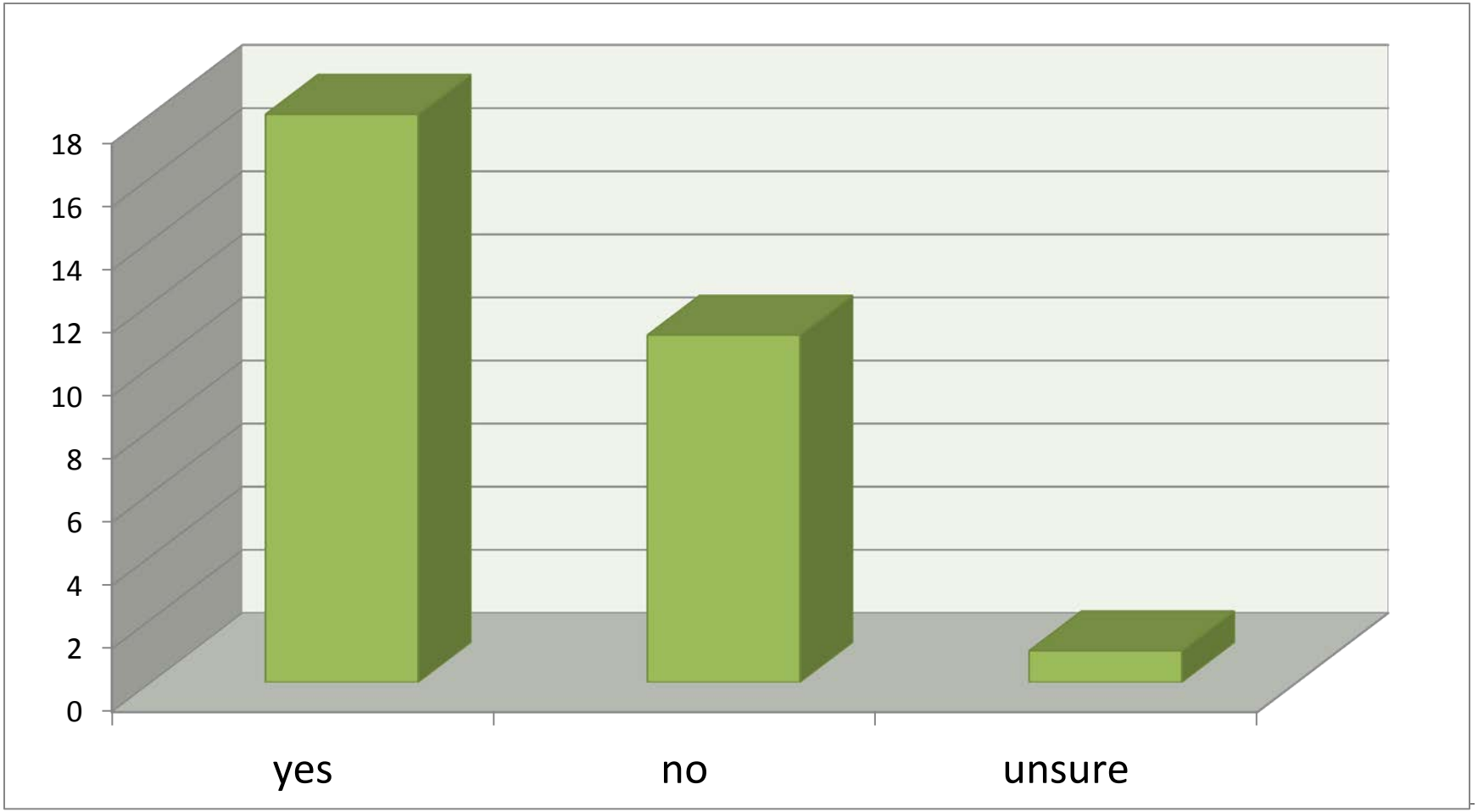
# Plan to increase collaboration projects

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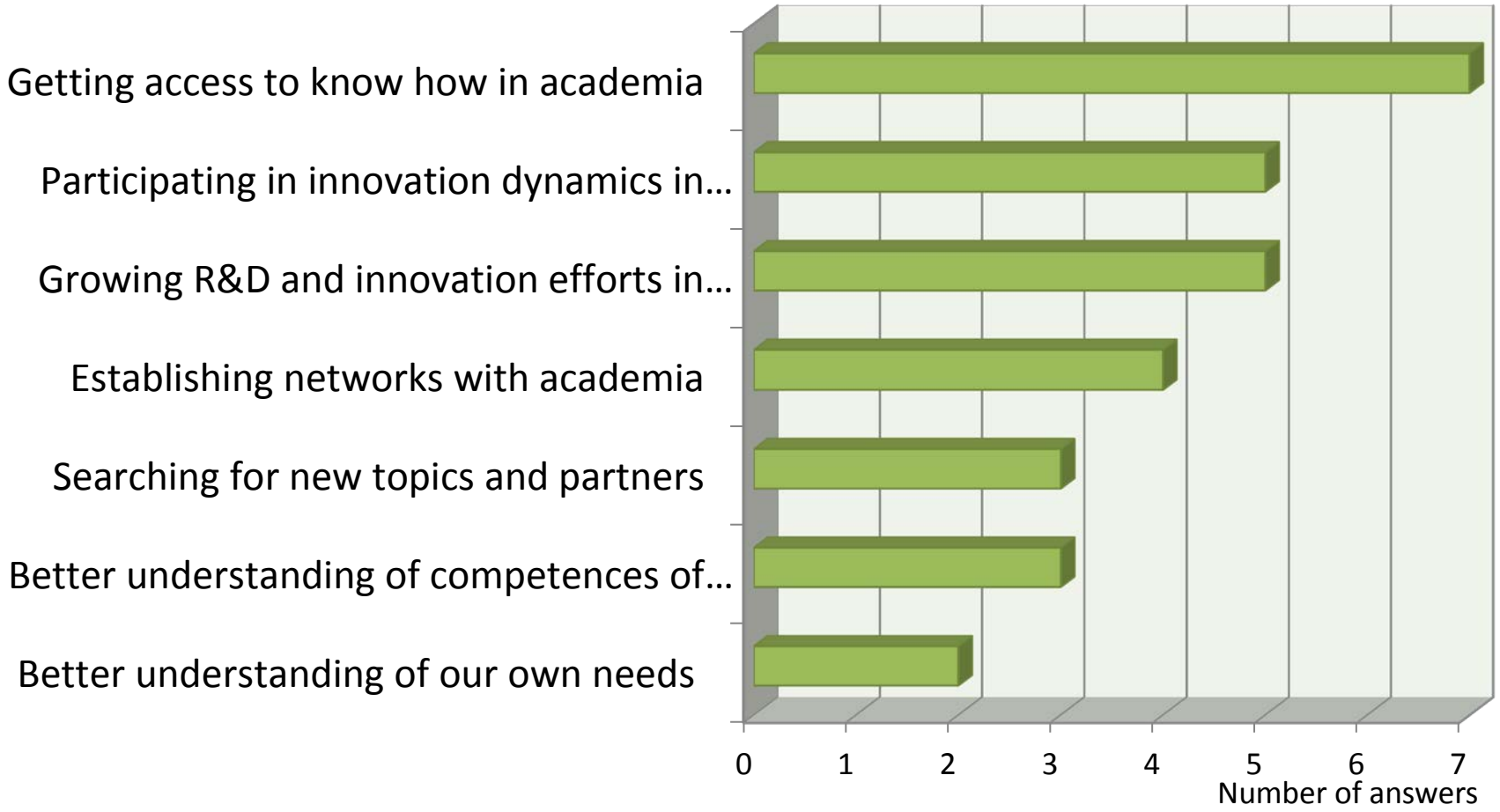
# Main motivation for increase of collaborations

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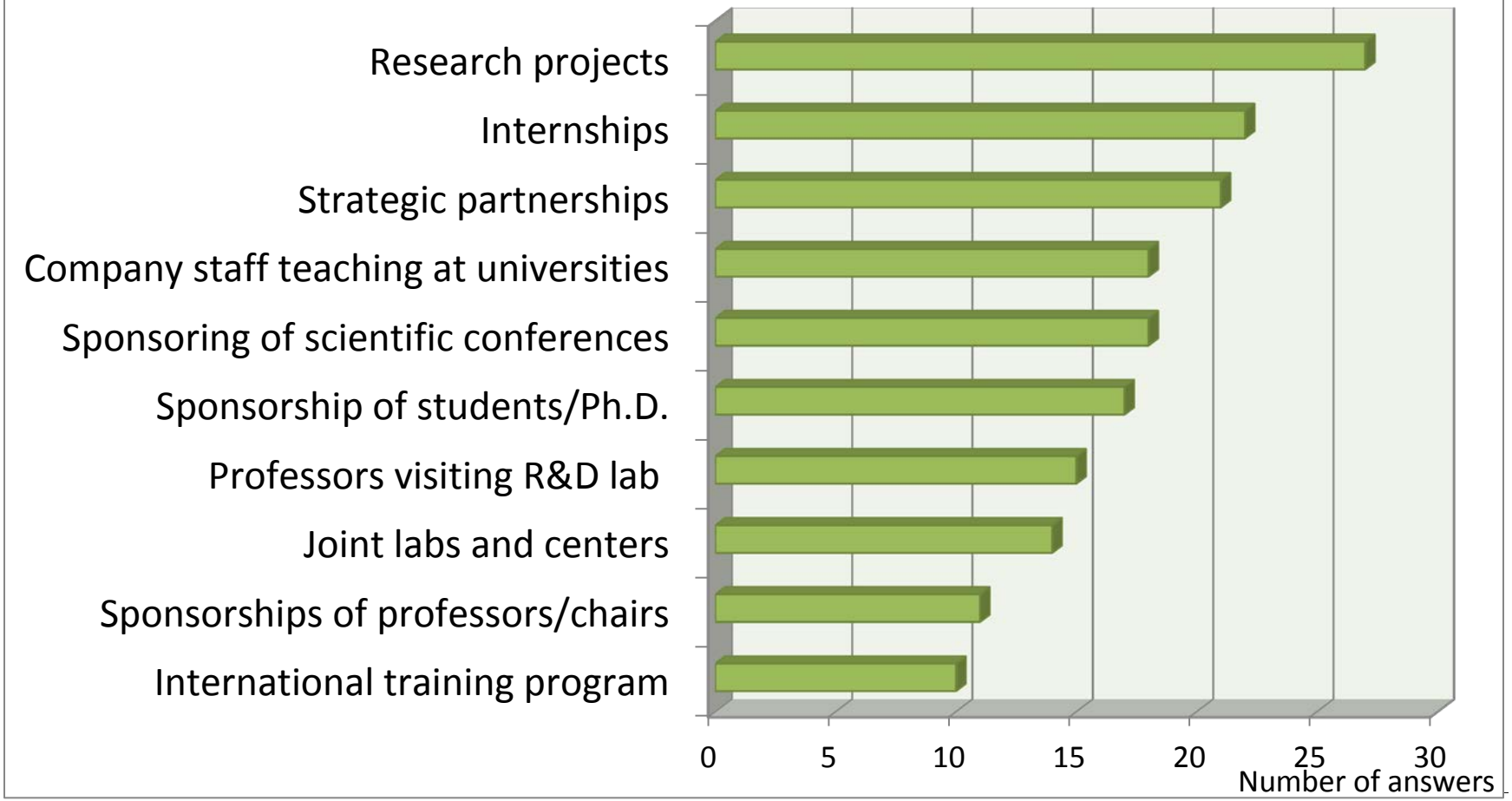
# Modes of collaboration

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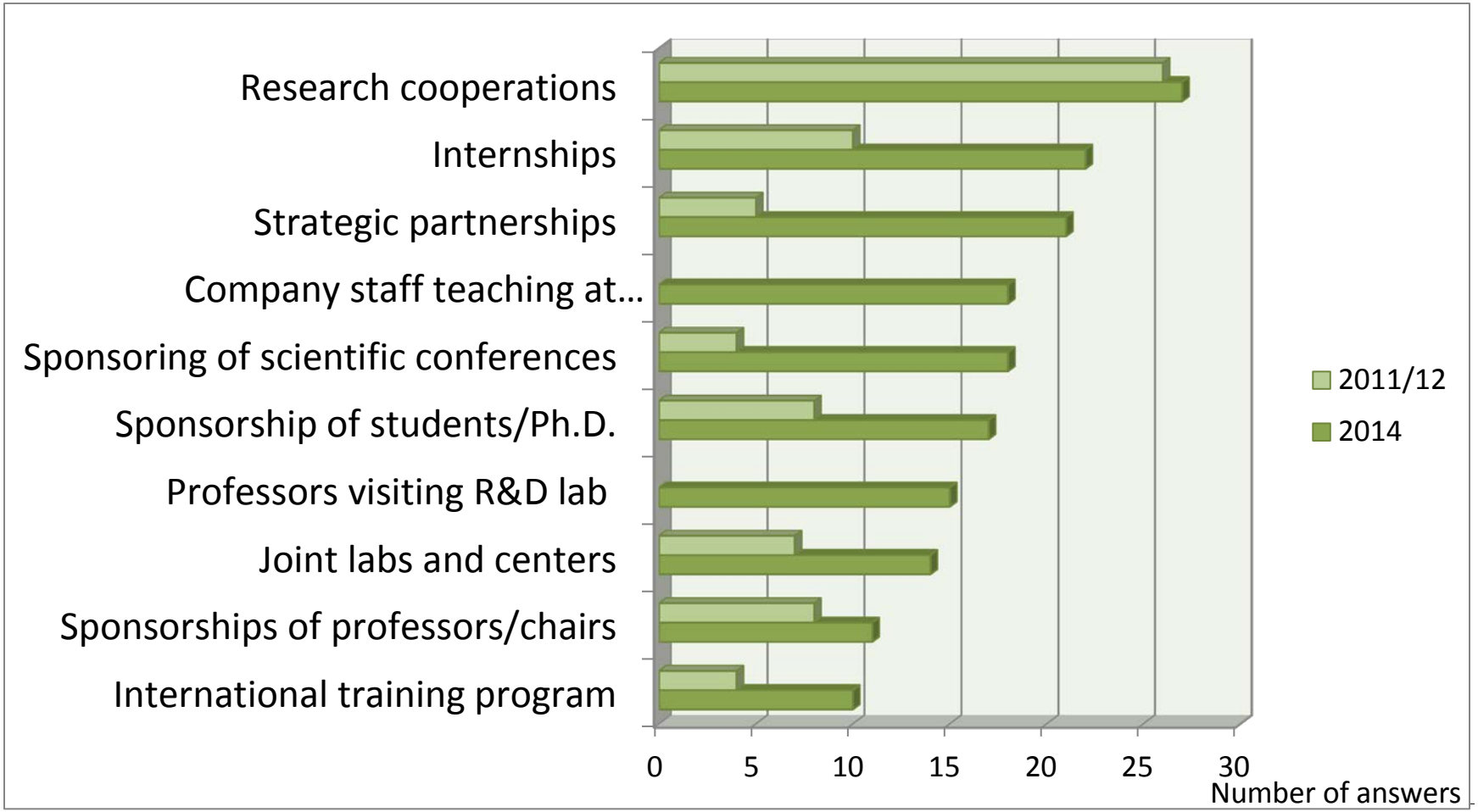
# Comparison of collaboration modes

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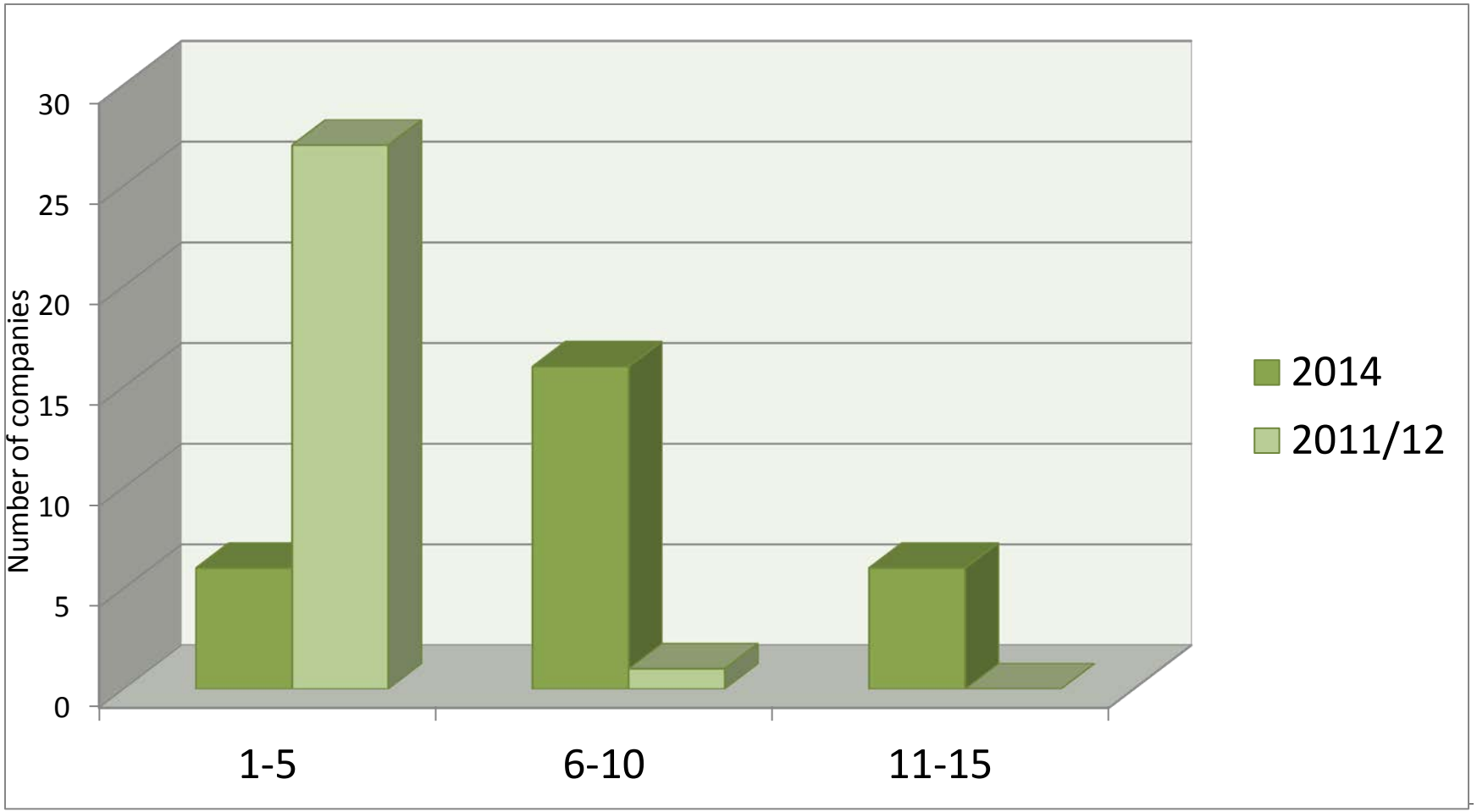
# Number of collaboration types used in parallel

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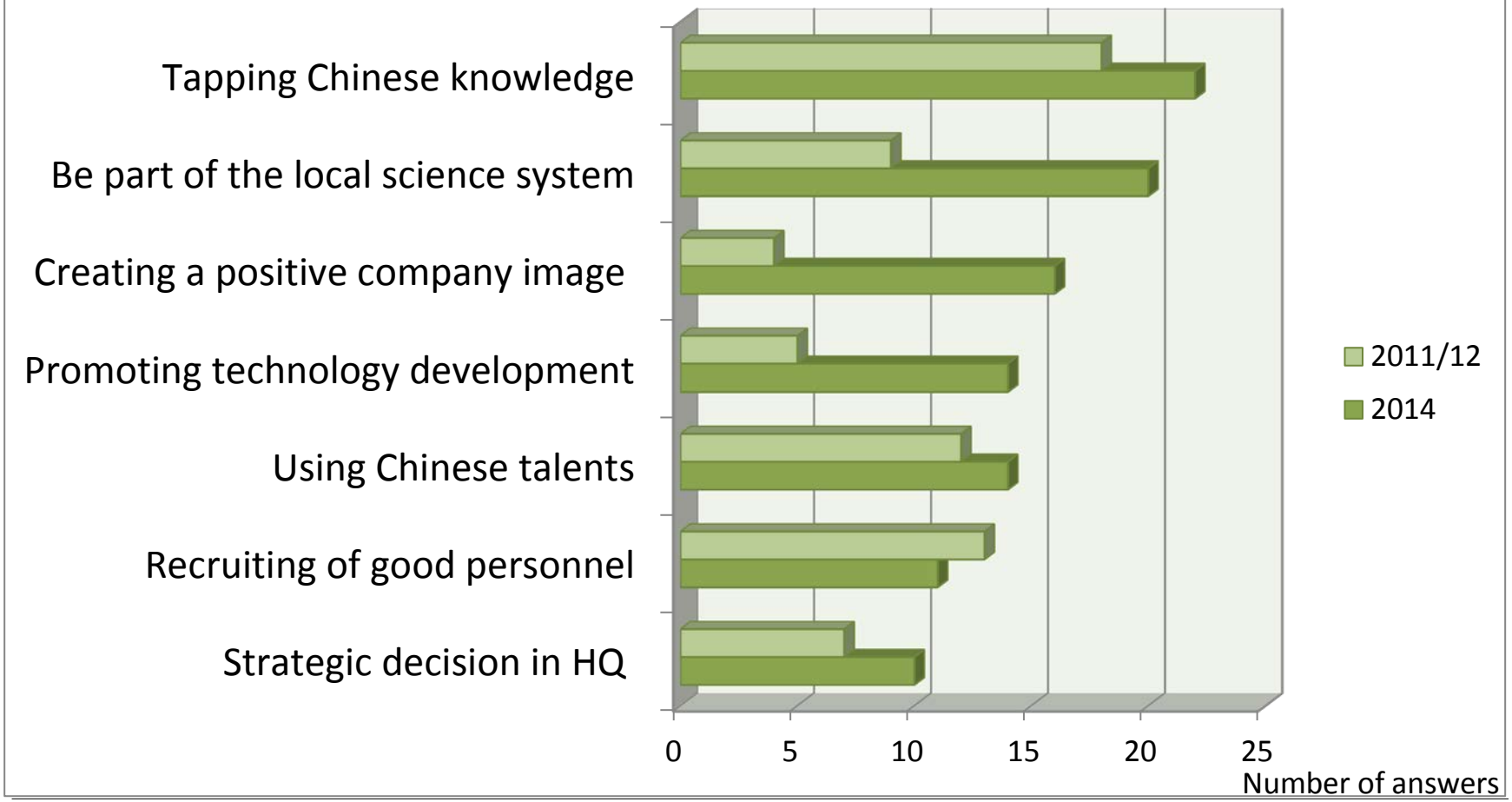
# Lessons learned with regard to collaboration types

- ‘Joint labs are important, if filled with life’ (4)
- ‘Research projects work the best, that’s where we get the most out of the collaborations’ (4)
- Strategic partnerships are important, mostly because it makes research cooperations easier, but also because of the visibility we and our partners get (5)
- Most companies will continue to use multiple types, as each form of collaboration can fulfill a different task

# Key drivers for collaboration

(> 10 times mentioned in 2014)

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# Key drivers of academic partners


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# Changes of motivation of academia

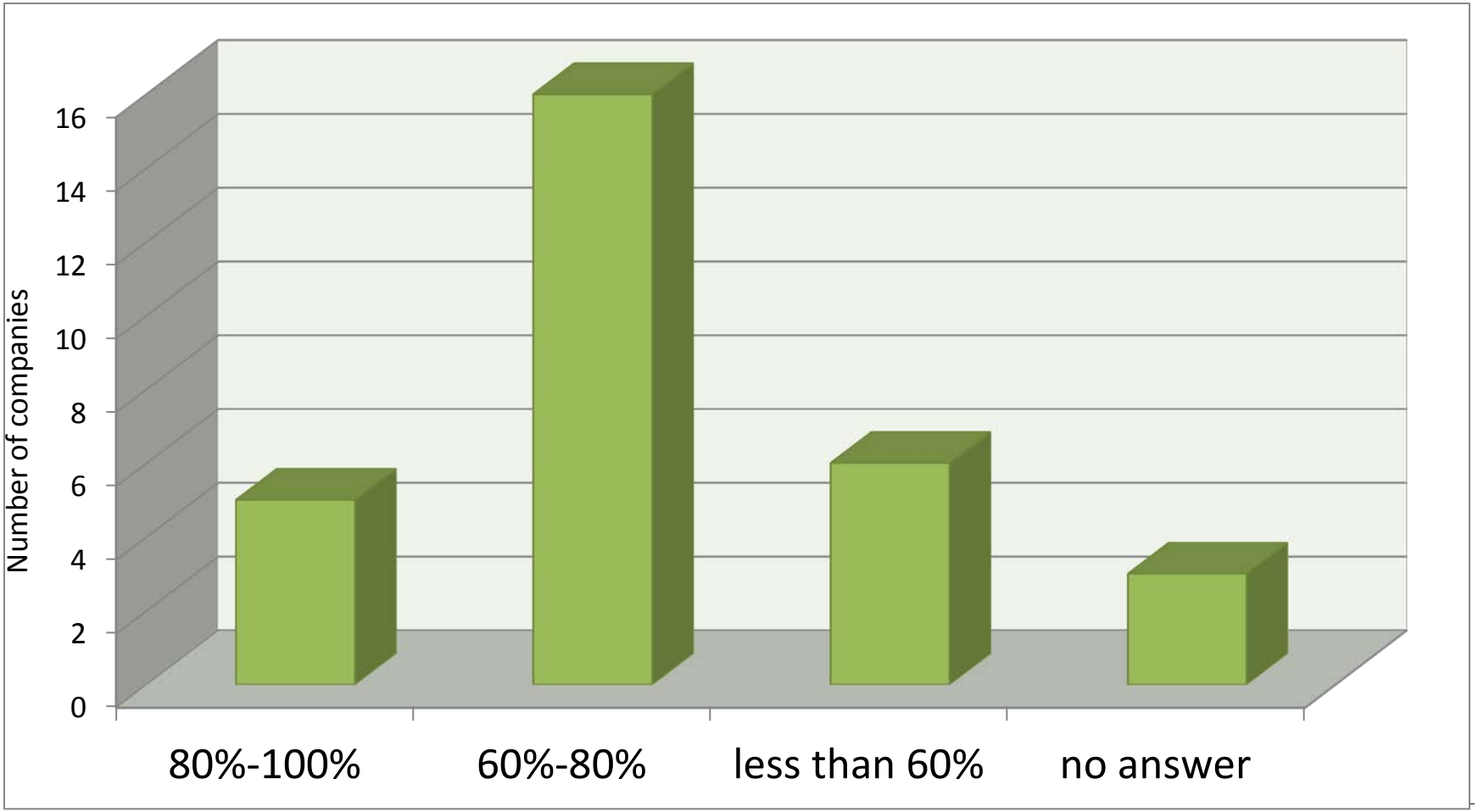
(next five years)

Main expectations are that:

- **funding** will become even less important
- academia will be more focused on the research **content**
- academia will look for even more **application**, **technology**, and **making business**

# SUCCESS FACTORS

# Percentage of successful collaborations

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# Most important success factors

(multiple choice)


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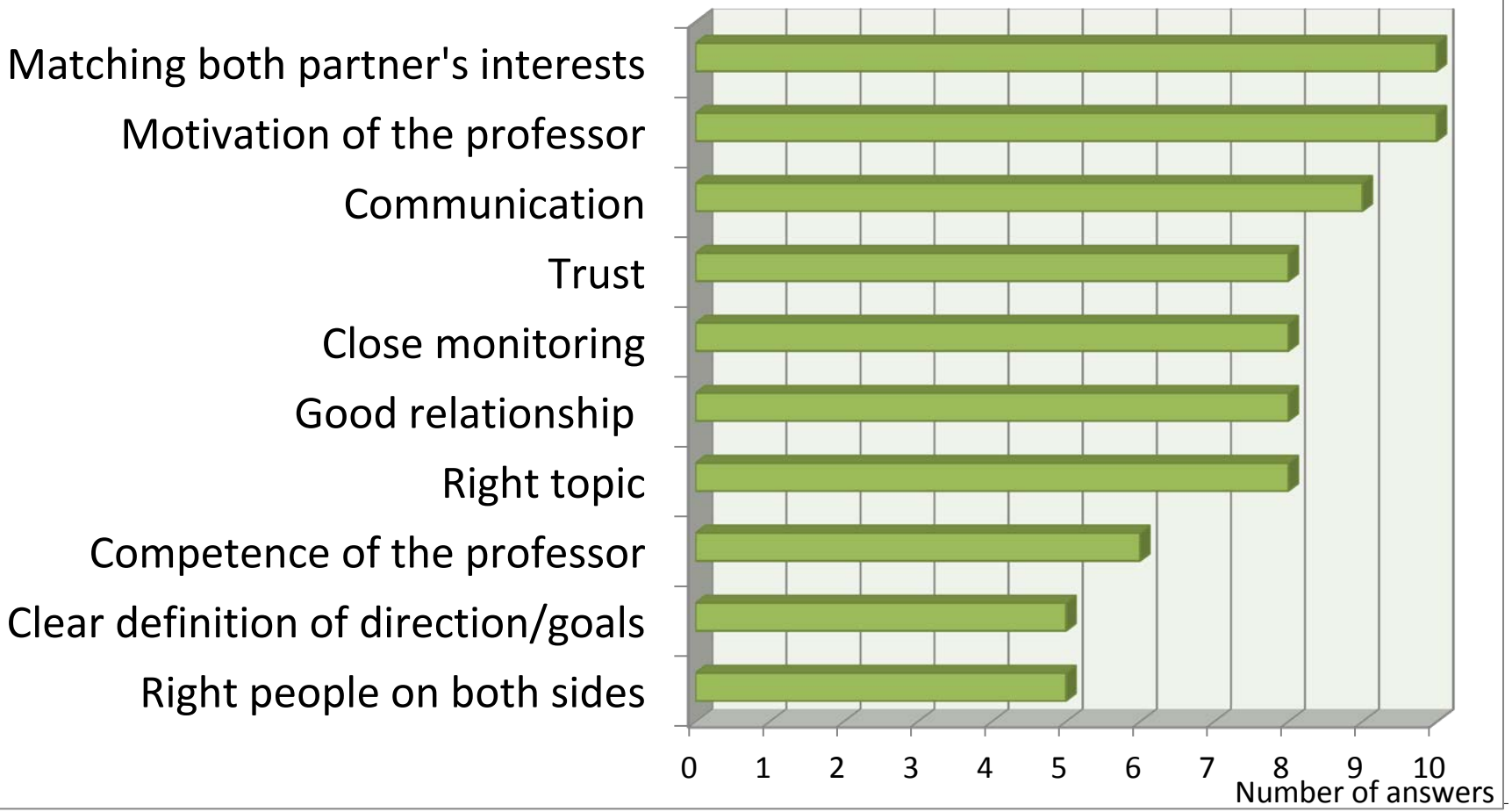
# Most important success factors
## (open question)

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# Reasons for unsuccessful collaborations

- Lack of good communication style and habits by the professors, especially problematic when researchers in other R&D centers or entities of the company are involved
- Lack of motivation on the university side
- Professors let their assistants and students do the work, either because of lack of motivation or lack of time and priority
- Lack of motivation on company side
- Frequent personal changes at the university are problematic
- Change of research priority at the university in the course of project

# COLLABORATION RESULTS AND IP

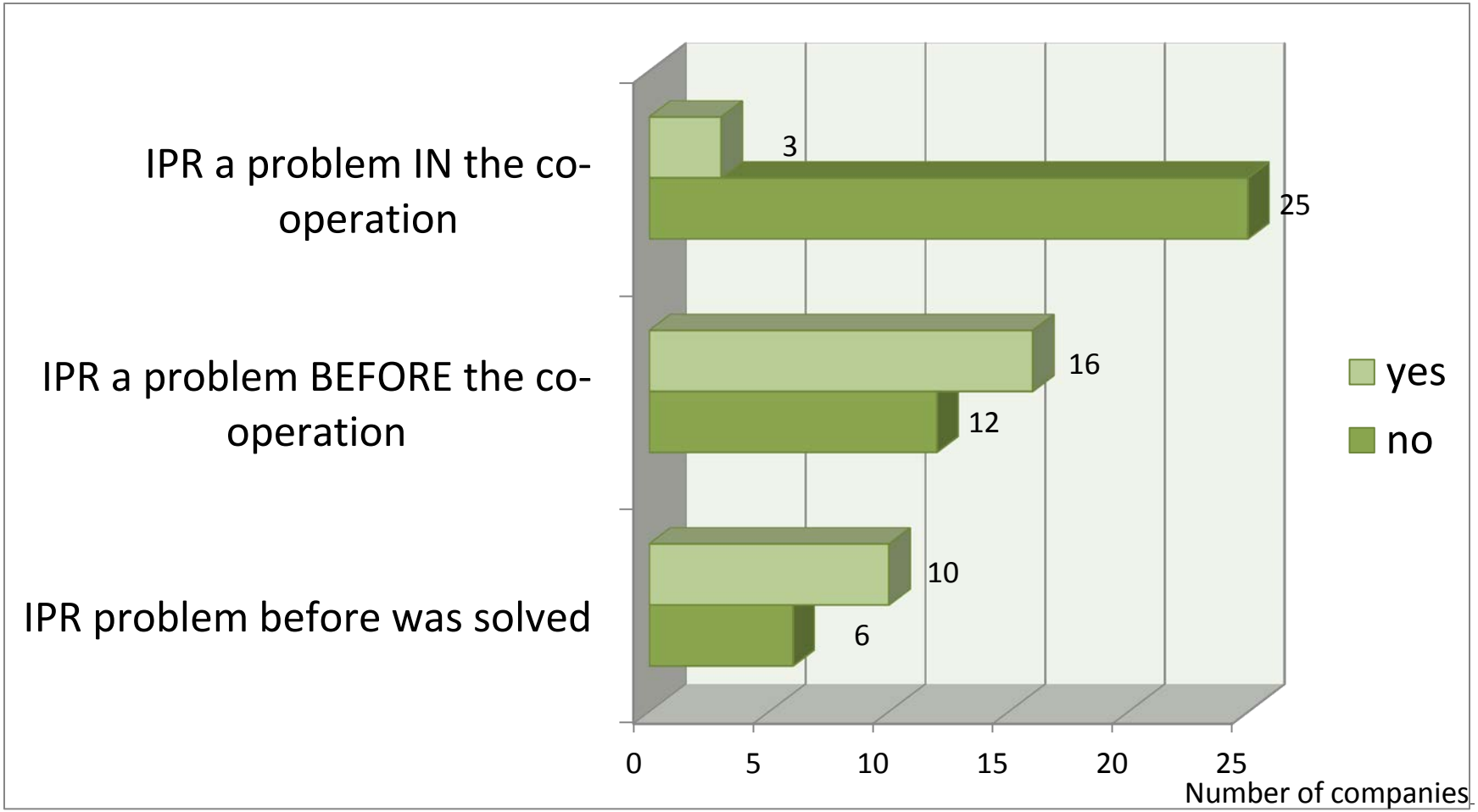
# Collaboration results

- More than half of the companies (17) have created publications and patents with their partners
- 4 companies have publications
- 1 company has patents
- 3 companies have none: some because they did not look for them, others because it is too early or because the projects have not delivered what was expected
- Yet most companies (18) acknowledge that they also have other goals for collaborations, which cannot be measured in patents or publications.

# Other goals of collaborations

- Accelerating product development, no patents needed
- Clarifications of own requirements through collaborations
- Accessing talents
- Gaining better understanding of what is happening in China in our technology fields
- Creating a good image of the company
- Speeding up our own research
- Establishing networks, relationships
- Training our partner on how to cooperate with industry

# IPR and collaborations

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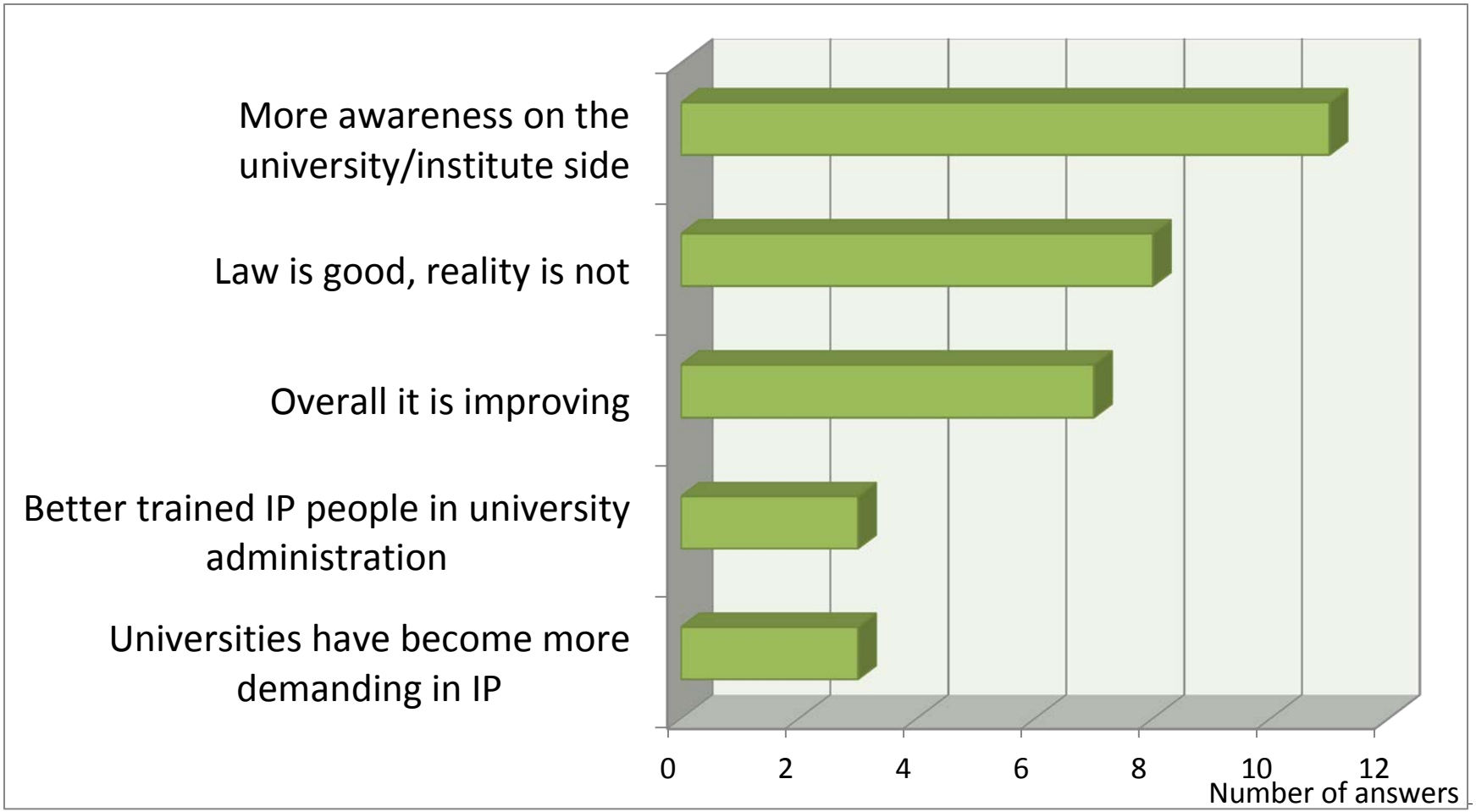
# IP related trends

(past 5 years)

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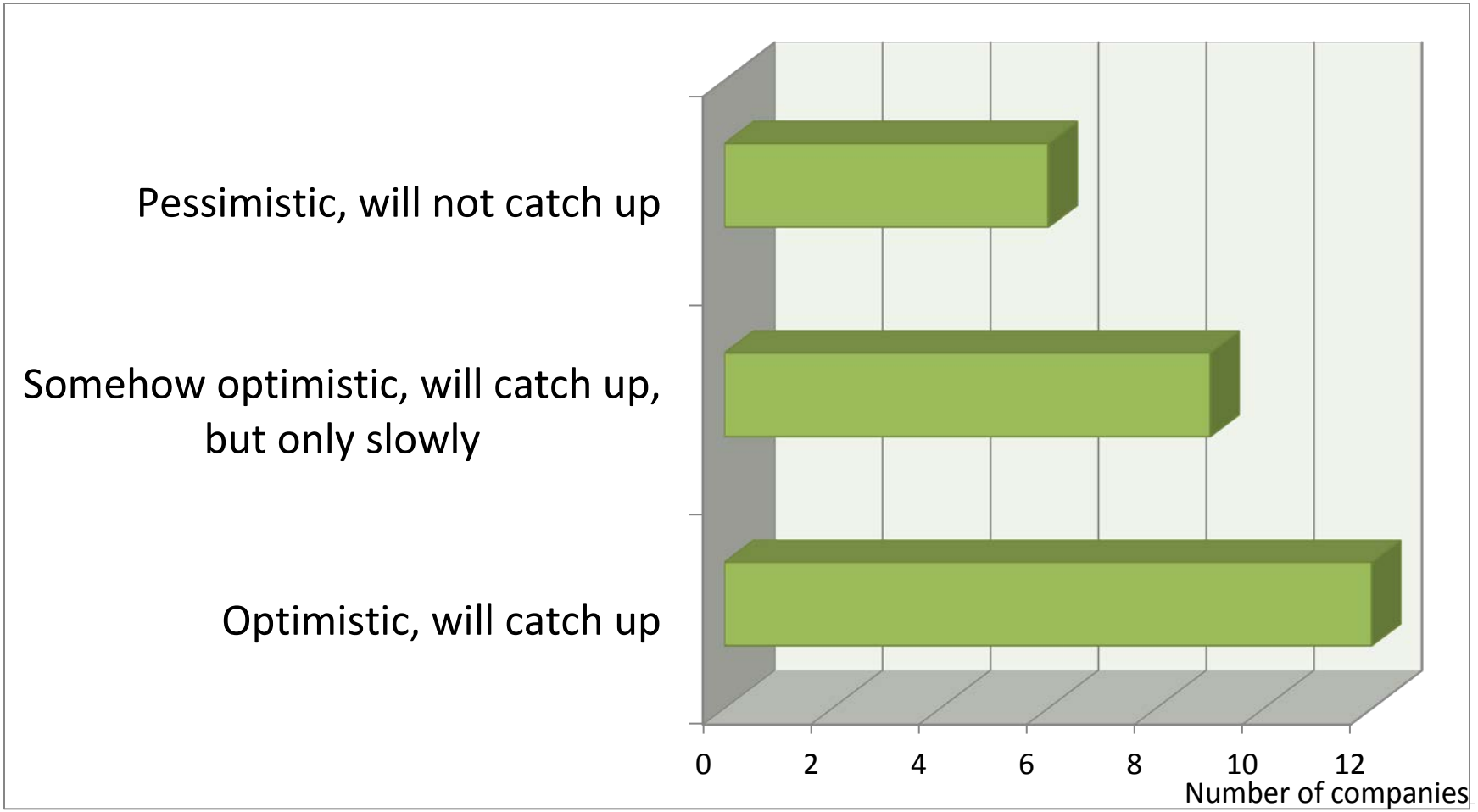
# Expectations for IP development

(next 5-10 years)

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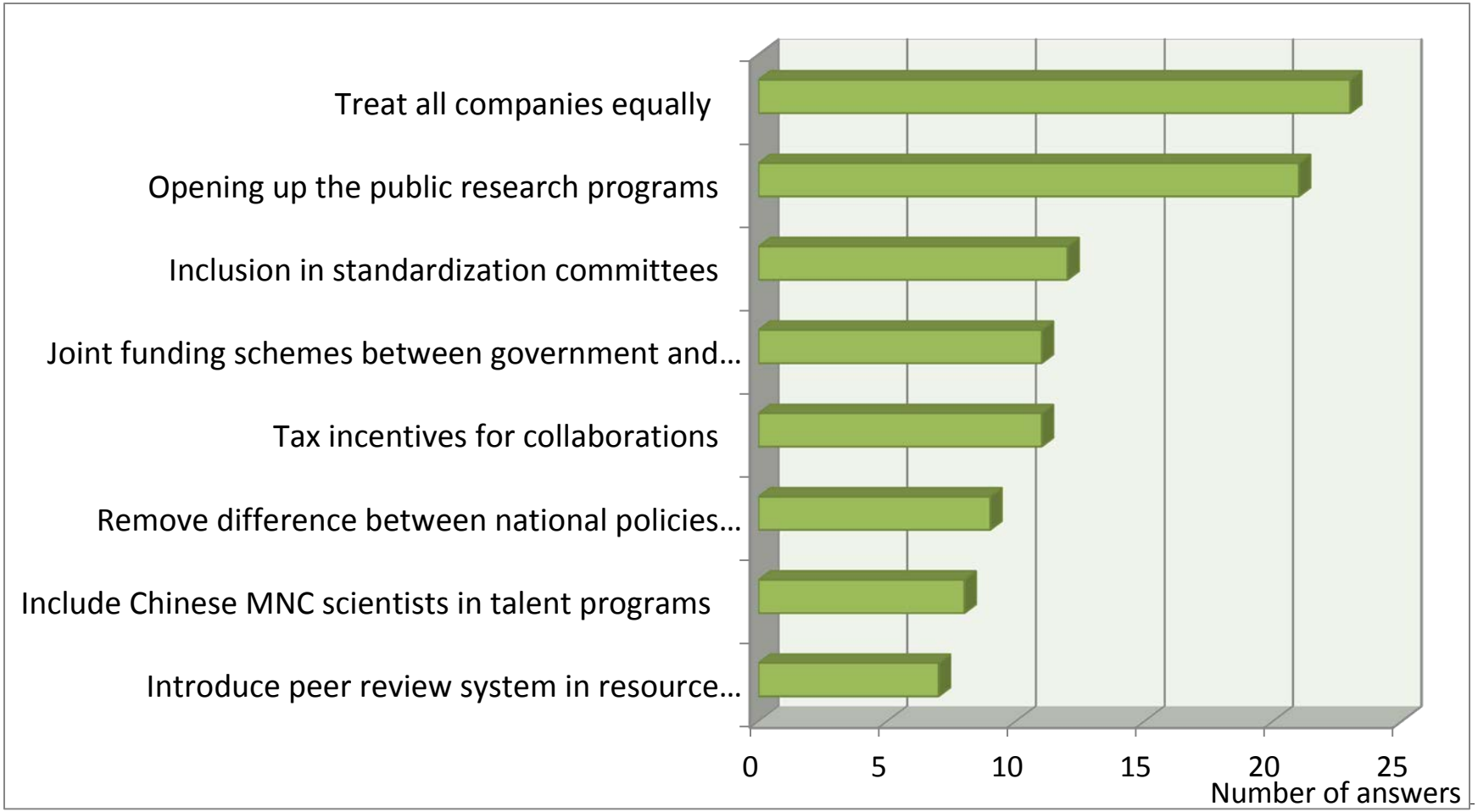
# DISCUSSION

# Changes in innovation policy to support further collaborations

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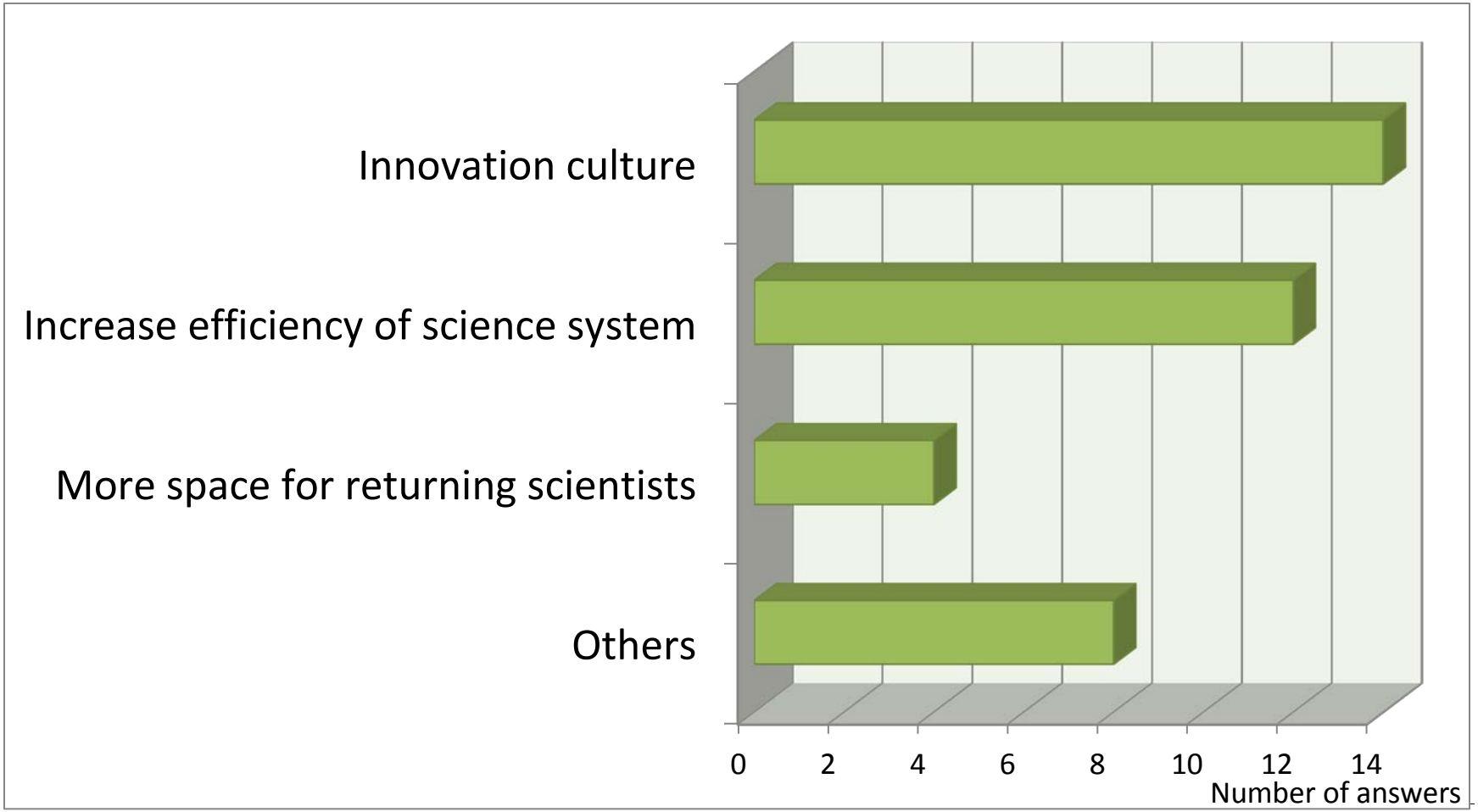
# Changes in framework conditions to increase collaboration – innovation system

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# Comments on China's innovation system

- 'Research fund allocation should be fairer and more transparent, there should be an independent peer review and there should be less impact of the academicians ' (Manager from Pharmaceutical company)
- A change in social culture is necessary, we need to value those people who focus on only one specific topic, and traditionally we do not value them enough in China
- 'Today the biggest problem is that the science system has been hijacked for political reasons, this is the biggest obstacle for collaborations, they do not develop naturally' (Manager from Chemical company)
- Policy transparency is highly needed here, is will be the key to more successful innovations in China
- 'As long as universities can make money, they will not focus on their research ' (Manager from Chemical company)
- 'The problem in China is that the government has too much intervention in the freedom of scientific research; S&T in China is strictly government by the government, not the scientists, this is the biggest problem' (Manager from Biotech company)

# Points for discussion

Research collaborations in China will remain limited in effect as long as

- different working and communication styles,
- different IP regimes,
- and too much money in the science system exists.

To make collaborations more beneficial, a reform of the science system, educations system, financial system, regional-central responsibility and hence a **systemic reform** would be necessary.

Nothing of this is yet visible.

Thank you very much for your attention!

谢谢大家！

Dr. Ulrike Tagscherer

ulrike.tagscherer@zv.fraunhofer.de

Download project report:

http://www.isi.fraunhofer.de/isi-wAssets/docs/p/de/diskpap_innosysteme_policyanalyse/discussionpaper_47_2015.pdf