Foreign & Commonwealth Office

Foundation Debate on UK – China Research Partnerships

11 June 2014

Research Drivers

Foreign & Commonwealth Office


Urbanisation


Population


Climate change

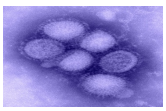

Food security

Alleviating poverty


Energy demand


Biodiversity


Water demand


Human disease


Animal disease


Counter-terrorism


Nuclear proliferation


Ageing population


International migration

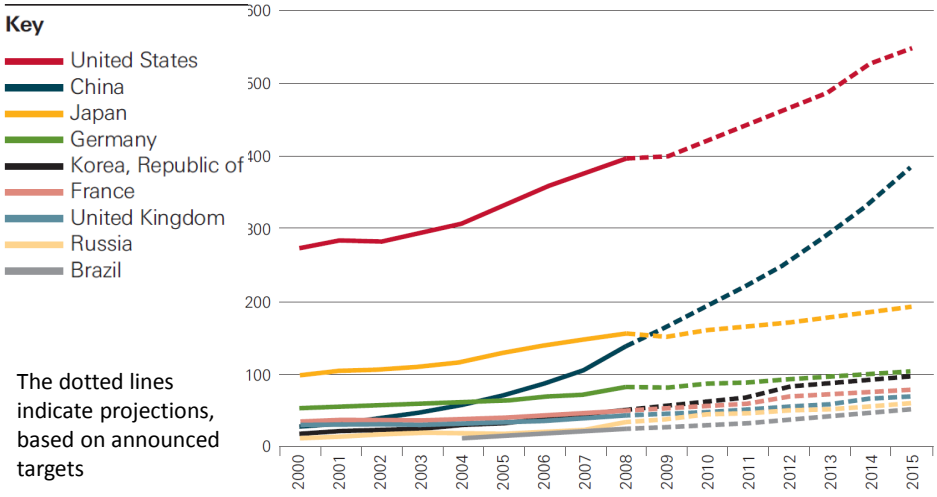

Non-infectious diseases

Knowledge, Networks and Nations: Global scientific collaboration in the 21st century

RS Policy document 03/11
Issued: March 2011 DES2096

ISBN: 978-0-85403-890-9

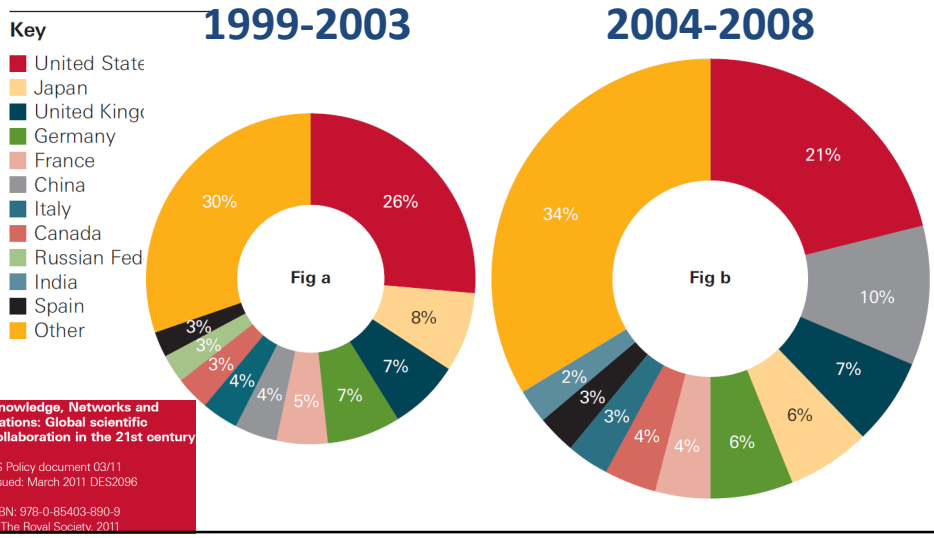
R&D spending, selected countries 2000-2015



The dotted lines indicate projections, based on announced targets

Proportion of Global Publication Authorship: Top Ten Countries

Foreign & Commonwealth Office



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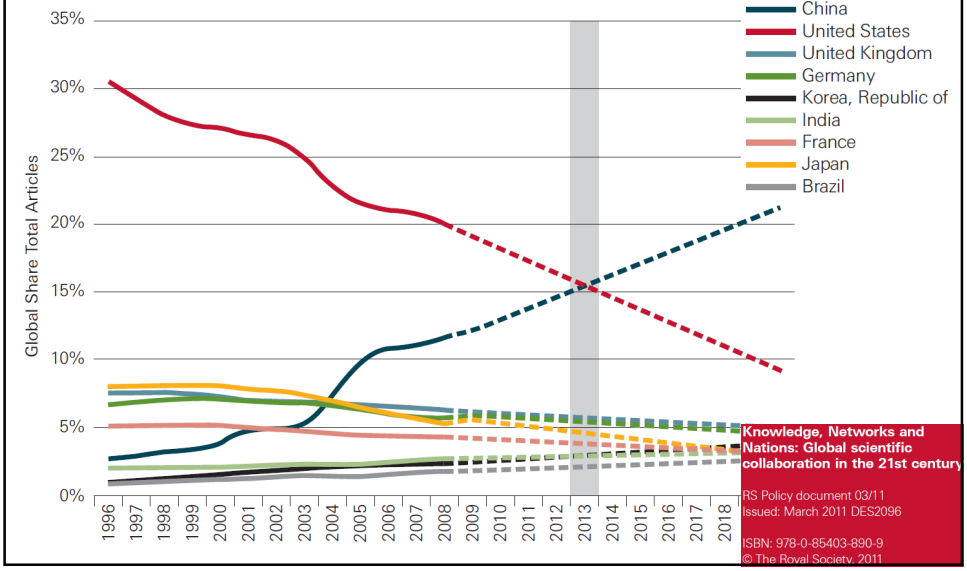
Linear Extrapolation of Future Publication Trends

Foreign & Commonwealth Office



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Risks – If we don't

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- China will become the largest science nation for:
  - Output & investment
  - Collaboration in Sci, Eng & Med (the long game).
- ∴ loss of opportunity in:
  - commercial, intellectual (top table), influence.
- Risks to UK if China does not engage in our agenda on:
  - Environmental challenges (climate, air, ozone, rivers etc)
  - Healthcare (AMR, dementia, food safety)

Technology Capability 'Valley of Death'

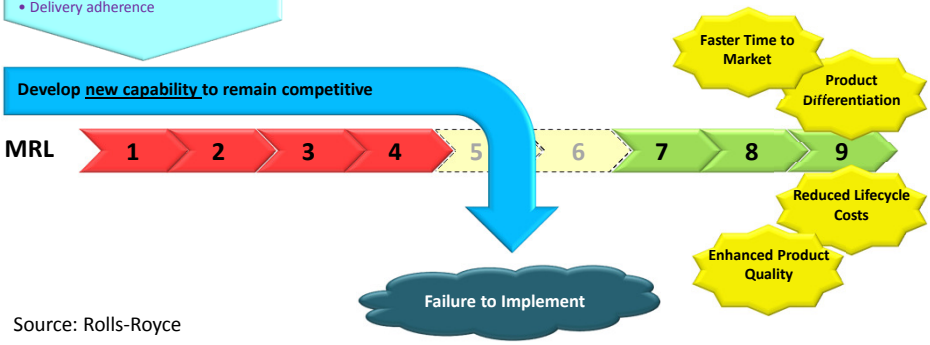
Foreign & Commonwealth Office

Product Challenges
- New materials
- Novel geometry
- Tighter specifications
- Safety & environmental needs

Business Challenges
- Lower Operational & material costs
- Improved process capability
- Reducing PI Lead times
- Delivery adherence

MCRL 4 - 6

- **Universities have less experience**
- **Industry finds this time consuming and expensive (especially SME's)**
- **Going it alone limits derived benefits**
- **Research therefore often fails to reach the market**



Source: Rolls-Royce

Top 11 Overseas Patent Registrations at the US Patent Office

Foreign & Commonwealth Office

1989		1999		2009	
Japan	20,169	Japan	31,104	Japan	35,501
Germany	8,352	Germany	9,337	Germany	9,000
France	3,140	France	3,820	South Korea	8,762
UK	3,100	Chinese Taipei	3,693	Chinese Taipei	6,642
Canada	1,960	UK	3,576	Spain	6,472
Switzerland	1,362	South Korea	3,562	Canada	3,655
Italy	1,297	Canada	3,226	UK	3,175
Netherlands	1,061	Italy	1,492	France	3,140
Sweden	837	Sweden	1,401	China	1,655
Chinese Taipei	591	Switzerland	1,279	Israel	1,404
Australia	501	Netherlands	1,247	Italy	1,346
USA	*50,184*	*USA*	*83,905*	*USA*	*82,382*
Global total	*95,537*	*Global total*	*153,485*	*Global total*	*167,349*

Source: US Trademark and Patent Office

Risks – Commercial & Security

Foreign & Commonwealth Office

- Theft and exploitation of intellectual property
  - Patent, trade mark and copyright laws are being revised, driven by domestic Chinese stakeholders.
- Infringement of trade marks
  - Loss of market share and damage to reputation.
- Trade secret misappropriation
  - 'Know-how' - loss of competitive advantage.
- Cyber espionage attacks – from a variety of sources
- Selective enforcement of regulations
- Security – duel use (legislate), harder if aggregate risk, especially if gained from more than one country.

Many Very Different Areas

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- Space
  - Satellites (duel use, but China already sophisticated)
  - If not upstream why not downstream
- Aerospace
  - China rapidly catching-up though joint ventures (required) & product development.
  - Will Chinese companies move to the UK?
- Life sciences
  - Huge market, opportunity for rapid commercialisation, requires an especially long term perspective, hard to duplicate?

Different Research Paradigms

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The university research group: Can be well interconnected and work in consortia but transfer of ideas further up the TRL is the challenge.

1909

Research driven by the entrepreneur: But dependent on a charismatic leader. Groups of entrepreneurs have worked well e.g. Silicon Valley → Intel.

1954

The corporate laboratory: Very significant 1930-1980 but many have had difficulties more recently in the west.

National Laboratories: Again very important from the 1930s but many have closed (other than military related). Some are shared (e.g. EU).

1994

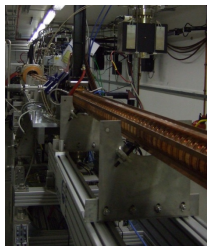
UK Science & Innovation Network

Catapult Centres

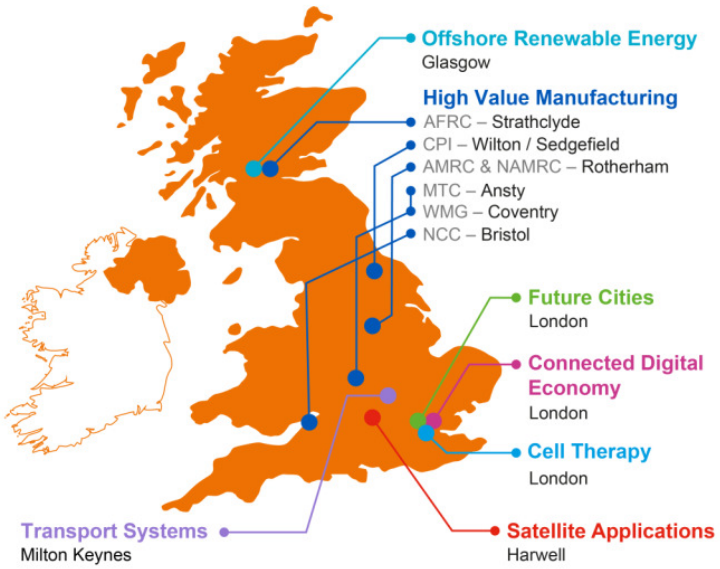
Government is investing £200m in developing business-focused centres with a world-leading capability to solve technical challenges.

Catapults will provide business with

- access to world-leading technology & expertise
- reach into the UK's world-class research base
- capability to undertake collaborative R&D
- capability to undertake contract research
- a critical mass of activity
- skills development at all levels



Catapult Locations



People to People Links

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- Students
  - 135,000 Chinese students studying in the UK
  - 75% in higher education
  - 27% STEM, 46% business
- Academics
  - 2,895 Chinese academic staff, 40% Engineering & Technology, 19% Physical sciences, 14% Medical
- Industry
- Commerce
- How many UK students are there in China?

  4,500 (but most on short term courses)

A wild guess at the future

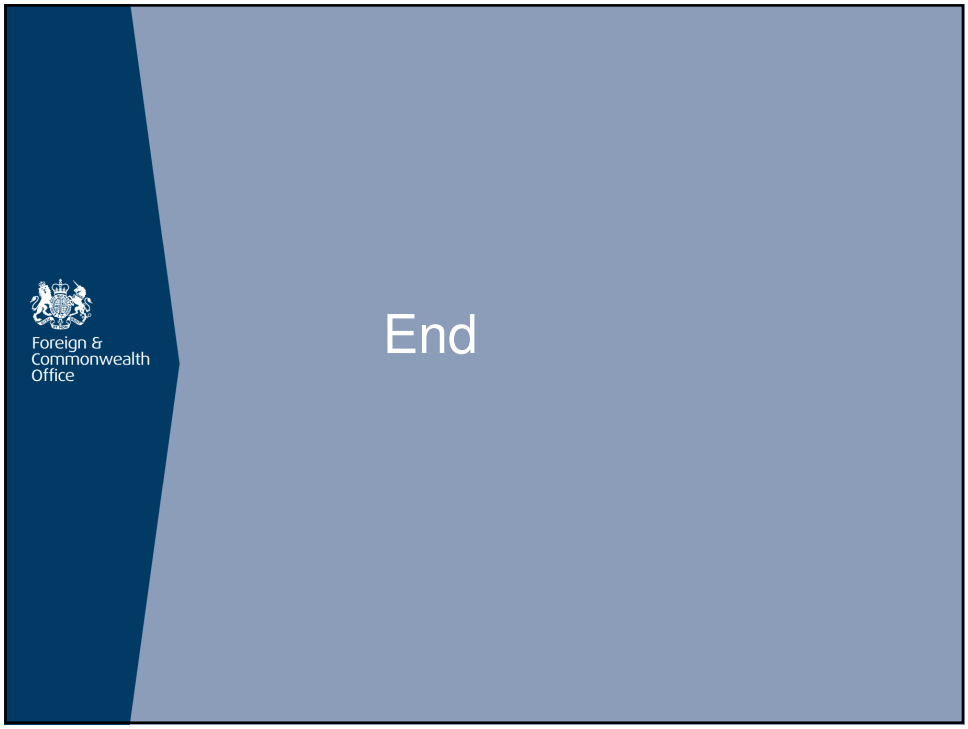
Foreign & Commonwealth Office

- A shift in where research is carried out.
- Different paradigms to enable more effective transition of science (from bench to bedside).
- More diverse teams of researchers – an even more itinerant population.
- The means of communicating will change but conferences will remain, despite skype.
- Markets will have emerged and transformed, aspirations will be greater.
- The main drivers will remain from: environmental concerns, population changes, health provision, energy, resource management….but things can change quickly.

Getting Smarter

Foreign & Commonwealth Office

- Smarter strategic collaboration.
- Best with best?
- More UK students spending time in China & Chinese students considering internships in the UK.
- Joint degree opportunities with Chinese universities.
- Possible German Humbolt Foundation type model of a long-standing relationship.
- Long-term, joined-up approach to ensure the UK is the research partner of choice not just now but in 30 years time.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