

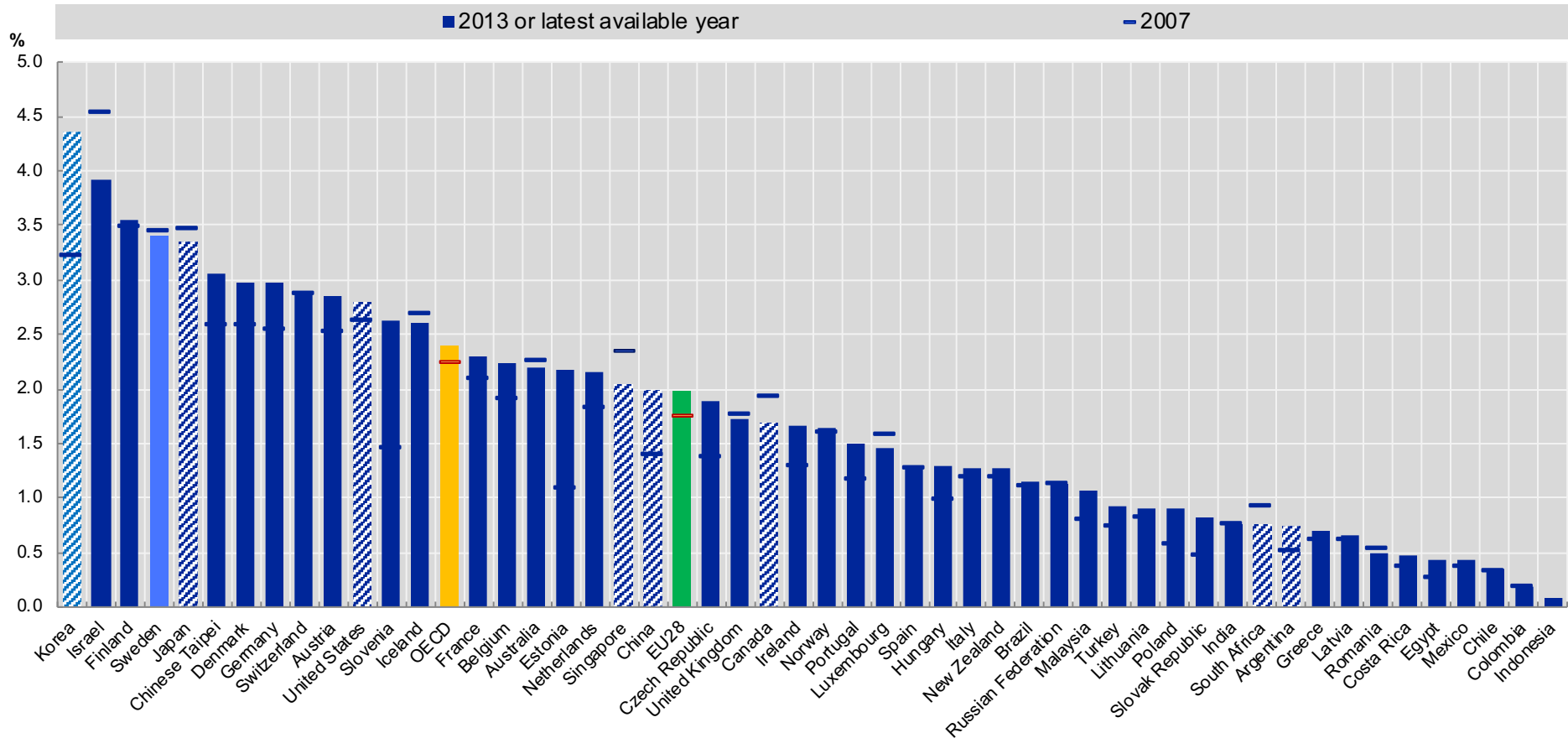
Swedish international research policies

Policies meets realities



Total investments in R&D _(GERD)

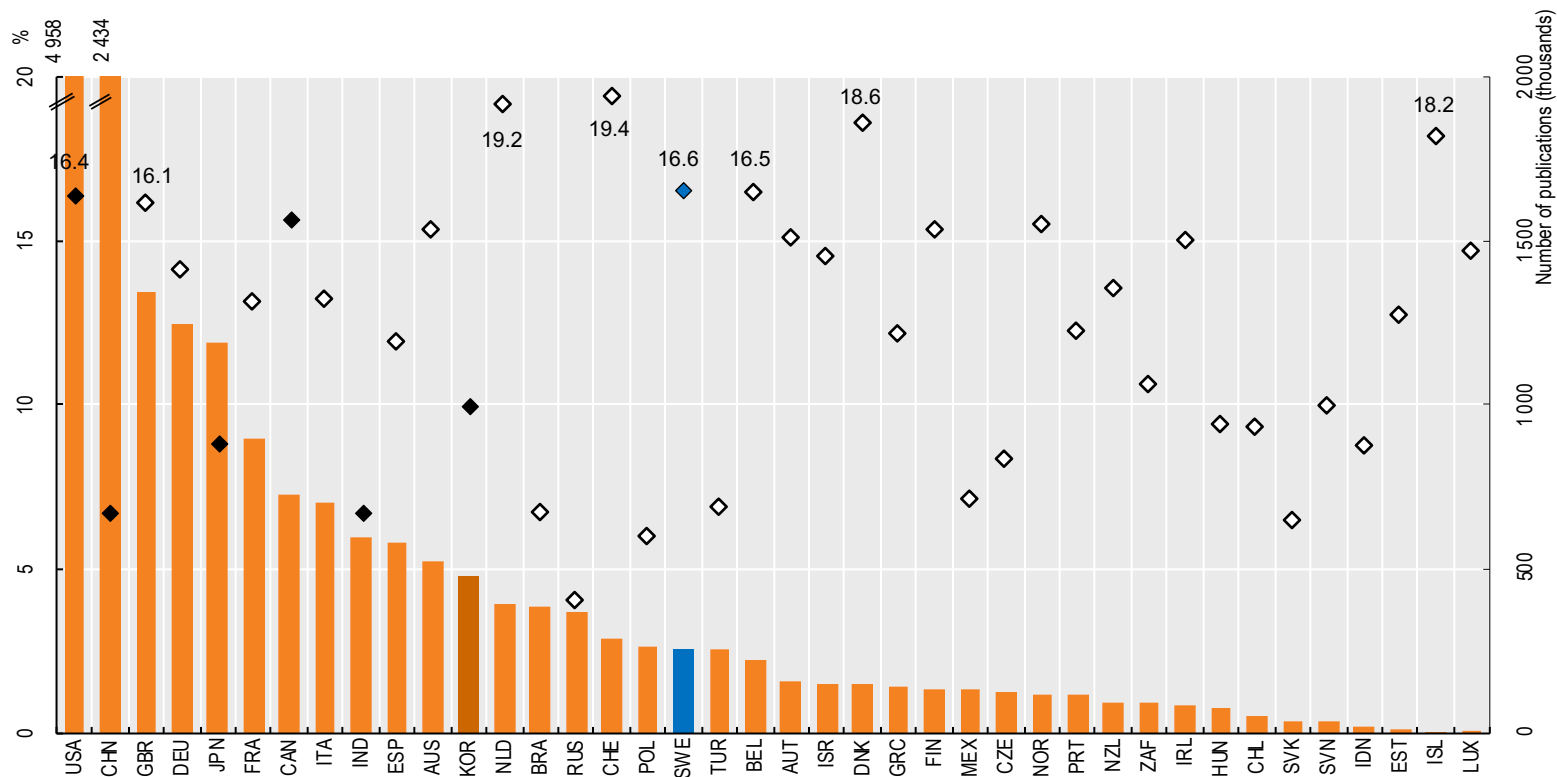
2007 and 2013 _(OECD)



Production and citations (OECD)

Number of papers

<> % of papers among 10 % most cited



International agreements 1999–2008

- **1999 – Japan**
- **1999 – S.Africa**
- **2003 – China**
- **2005 – India**
- **2006 – USA**

Framework conditions

until 2008

Invite agencies and private funders to participate

- **Private foundations, STINT, SSF**
- **Research Councils**
- **Vinnova**
- **Universities**

International collaboration

- **2008 – Strategy for international R&D collaboration**
 - Similar strengths
 - Seek countries with strengths where SE need to improve
 - International recruitment

International agreements 2008–2012

- **2010 – Canada**
- **2010 – Korea**
- **2010 – Singapore**
- **2011 – Mexico**

Framework conditions

2008–2012

Invite agencies and private funders to participate

- **Private foundations, STINT, SSF**
- **Research Councils**
- **Vinnova**
- **Universities**

2012 international policy Goals

SE should be/have:

- **Attractive place to work as scientist**
- **Attractive partner**
- **High number of international researchers**
- **Universities active partner in international coll**
- **High presence in countries with high quality research**
- **Collaborations that contribute to business**

2012 international strategy

Activities

- Identified and executed by funding organisations, possibly in cooperation with Government ministries

2012 international strategy indicators

- **Number of co-publications**
- **Number of conference contributions**
- **Joint patents with other countries**
- **Exchange of students, scientists**
- **Foreign direct investments**
- **High tech export**

2012 international strategy countries

- **Highly industrialized**
- **Fast growing economies and R&D investments**
- **Countries with potential to be growing economies**
- **Recipients of SE aid**

Choosing partner according to production and “quality”

- **USA, high prod and high quality**
- **China, high prod**
- **Japan, high prod**
- **UK, DE, FR, high prod and high quality (EU!)**
- **CAN, high prod and high quality**
- **SING, high prod (but small country), high quality**
- **IND increasing prod**
- **KOR, increasing prod and quality**
- **SA, increasing prod?**
- **Argentina**
- **Mexico**

2016 outlook research

Royal Swedish Academy of Engineering Sciences

Need:

- **Strategy (!)**
- **Increased coordination with education**
- **More international offices**
- **Foundation for stipends of foreign student**

International agreements

- **No co-ordination between selection of countries and international strategy**
- **What role should government play when funding agencies are handling the collaborations?**
- **Societal challenges**

International agreements

- 1999 – Japan
- 1999 – S.Africa
- 2003 – China
- 2005 – India
- 2006 – USA
- 2008 – International strat
- 2010 – Canada
- 2010 – Korea
- 2010 – Singapore
- 2011 – Mexico
- 2012 International strat
- 2012 – Brazil
- 2014 – Argentina
- 2016 – Indonesia
- What use for a strategy?

Framework conditions

after 2008/2012

- Assign RC and Vinnova to collaborate
- INTSAM
- Invite private funding organizations to collaborate in line with government priorities

Innovation partnership

where science cooperation is a vital part

- **Priority countries:**
- **2013: Brazil**
- **2016: India**

- **2017: France, Germany**





Policy – report to parliament

- 1977, every term of office should gov report situation in R&D to parliament
- 1981, 1983, 1986, 1989 – Prime Minister
- 1993 – Research Minister
- 1995
- 2000, 2005, 2008, 2012, 2016
- 2020

Research Minister's Policy bills

- 1992/93 - + 600 mnSEK, Humanities/social sciences; natural sciences/engineering; environment
- **1996/97 - - 20 %**
- 2000 - + 1,3 bnSEK, Bio science; ICT; Mtrl sci; Hum/Soc; Educational research; Health care; Environment; Art; libraries; Equipment; Institutional grants (30% of total increase); Free research (2,3 %);

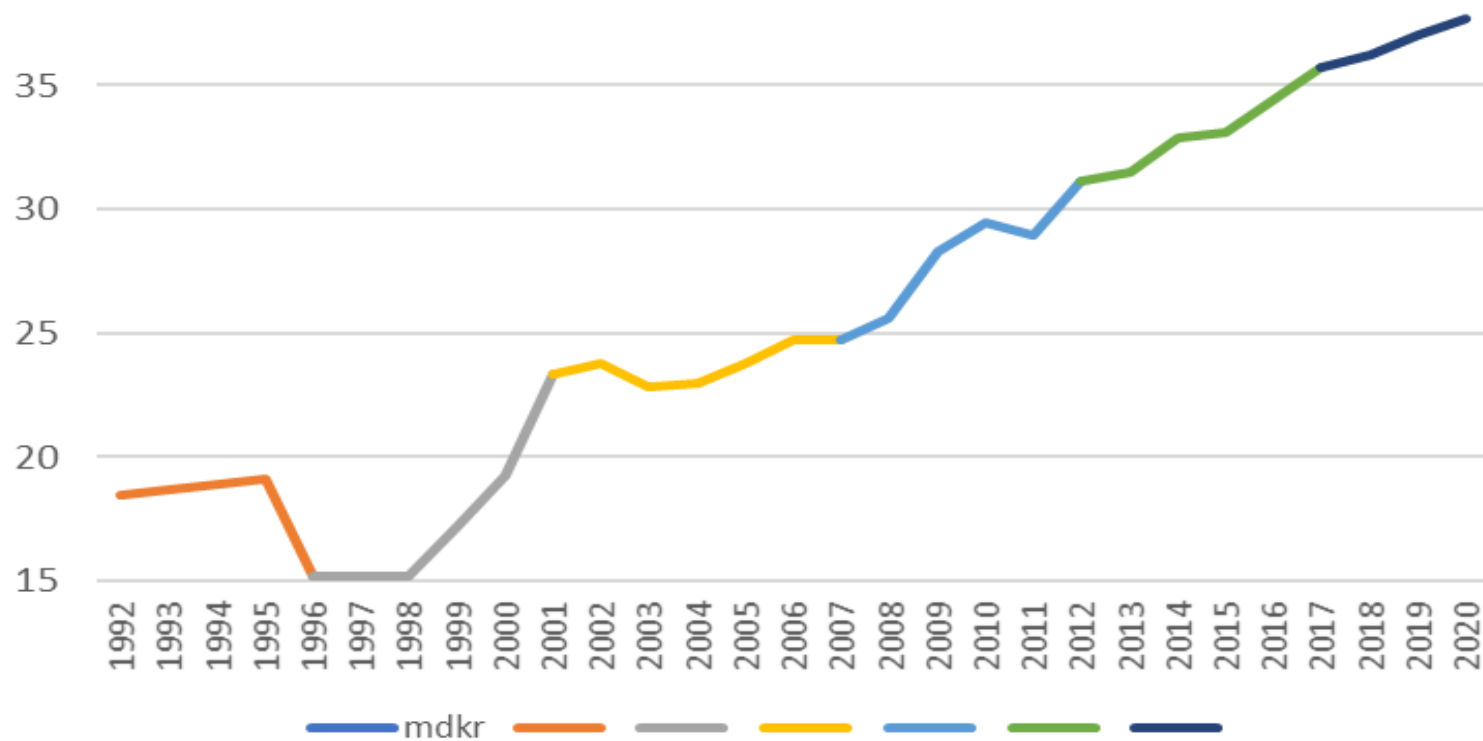
PM's policy bills

- **1981/82 - + 100 mnSEK, basic research, quality**
- **1983/84 - + 100 mnSEK + energy research programme 1,2 bnSEK/3 years**
- **1986/87 – 500 mnSEK, basic research, some research programmes**
- **1989/90 - + 1000 mnSEK, basic research, environment/energy, material research, new universities and colleges**

Research Minister's policy bills

- **2005 – + 2,34 bnSEK, free funds (13 %, quality based); recruitment (22 %); institutional grants (12 %); innovation (10 %); Equipment (2 %)**
- **2008 – + 5 bnSEK, Strategic research/High quality/GC (35 %); Institutional grants (57 %, half GC)**
- **2012 – 4 bnSEK, Grand Challenges (33 %); Innovation (17 %); Institutional grants (40 %)**
- **2016 – + 2,85 bnSEK, Institutional grants (46 %); Grand Challenges (54 %)**

Government funding R&D, bnSEK



Grand Challenges

2008, 2012, 2016

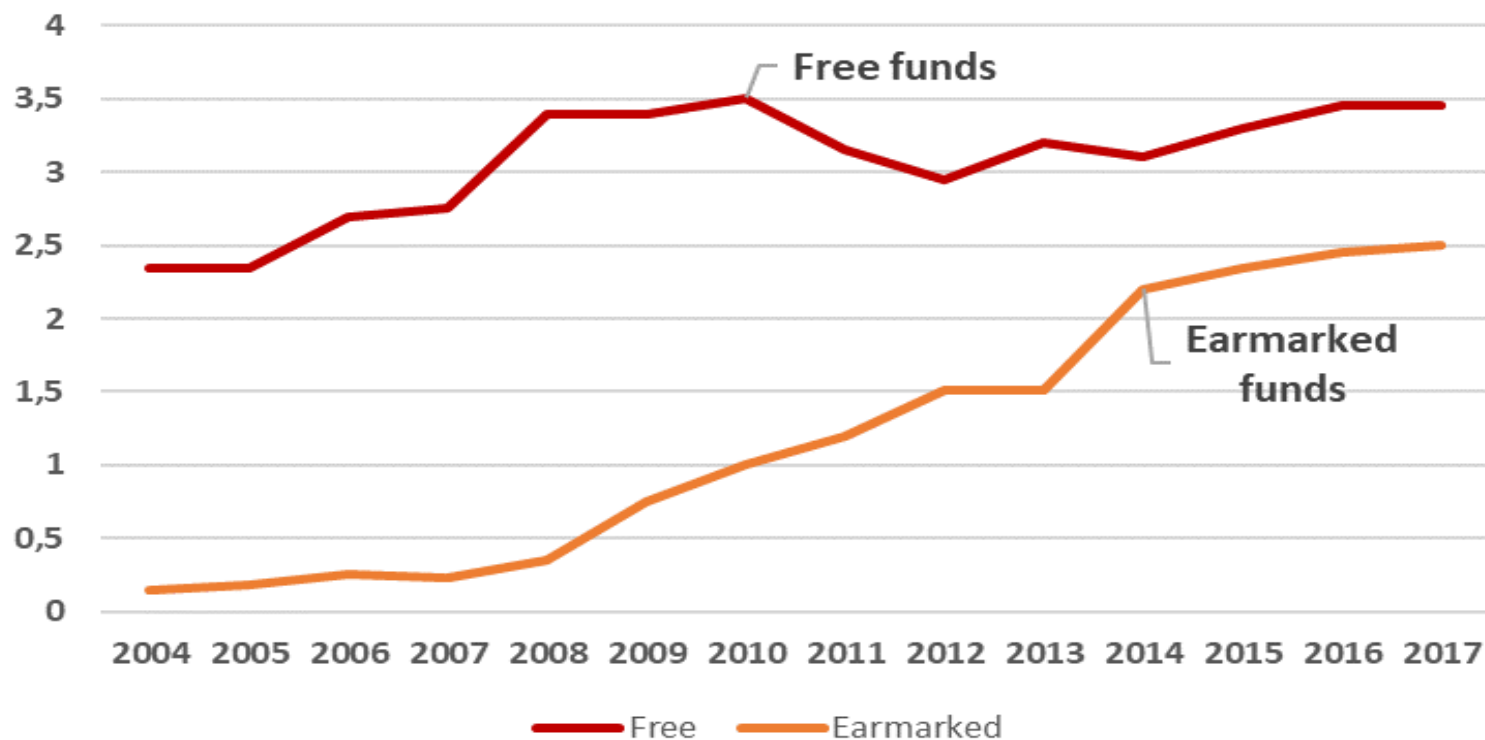
- Bioscience
- Stem cells
- Diabetes
- Neuroscience
- Epidemiology
- Cancer
- Psychiatry
- Medical care
- **Antibiotics**
- **Ageing**
- **Drug development**
- **Medical care**
- **Clinical trials**
- **Health care**
- Nano science
- E-science
- Material science
- Aviation technology
- Production technology
- Transport
- ICT
- Space
- Security
- **Climate**
- **Sustainable societies**
- **AMR, Clinical research, Biobanks and registers**
- **Gender**
- **Migration**

Grand Challenges

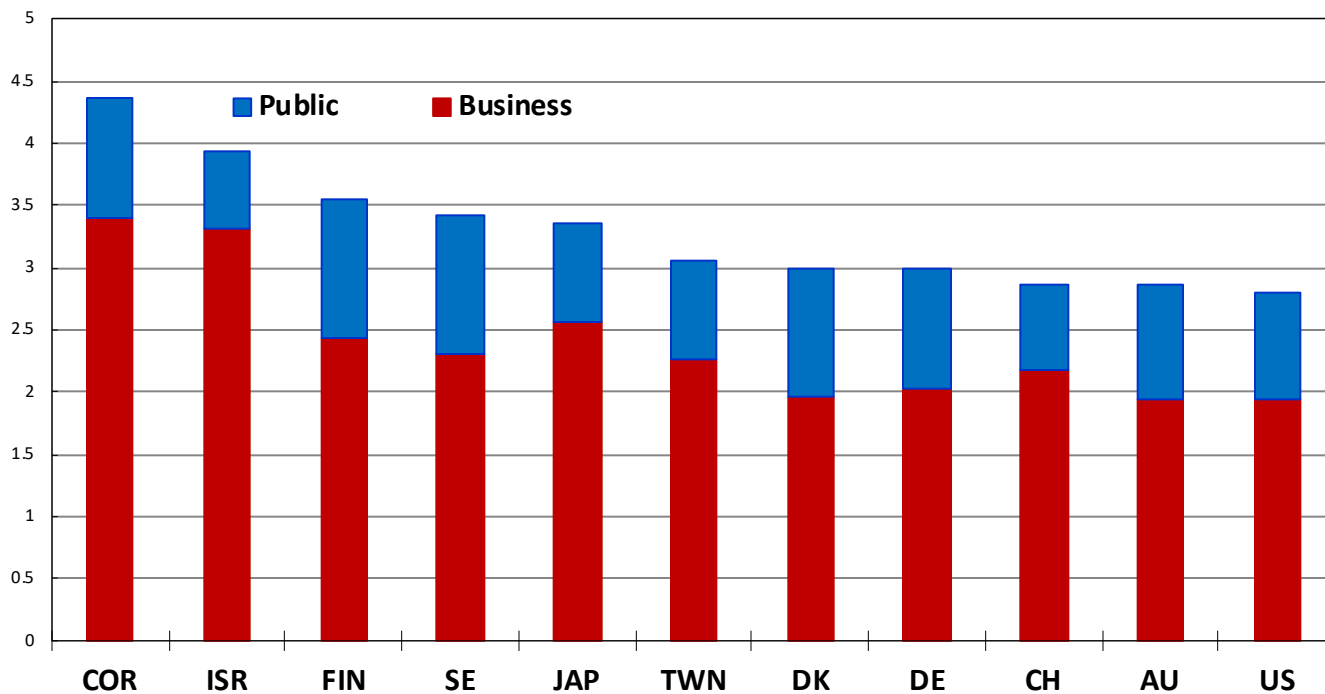
- **2000 – 8 areas**
- **2005 – 3 areas**
- **2008 – 43 areas**
- **2012 – 11 areas**
- **2016 – 22 areas**
- **Total: 75-80**

Funding Swedish Research Council

© Richard Brenner VR



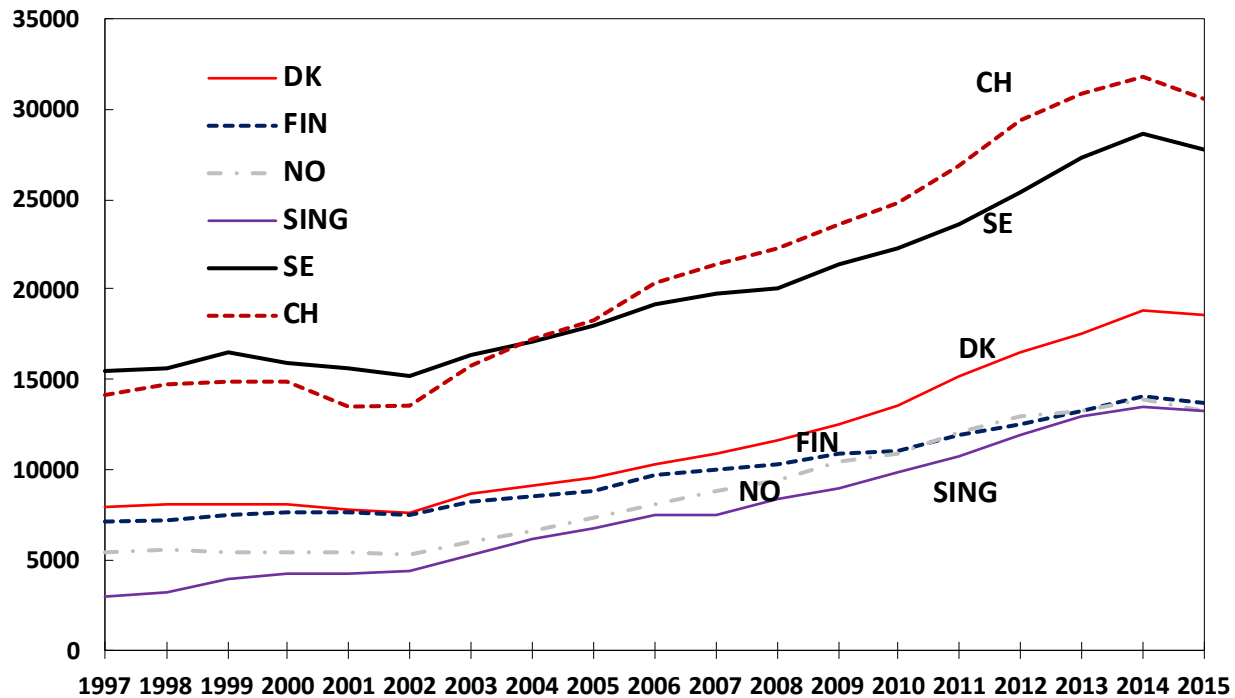
Total investments in R&D % of GDP, **business** and **public**



Source: OECD 2015, last available year

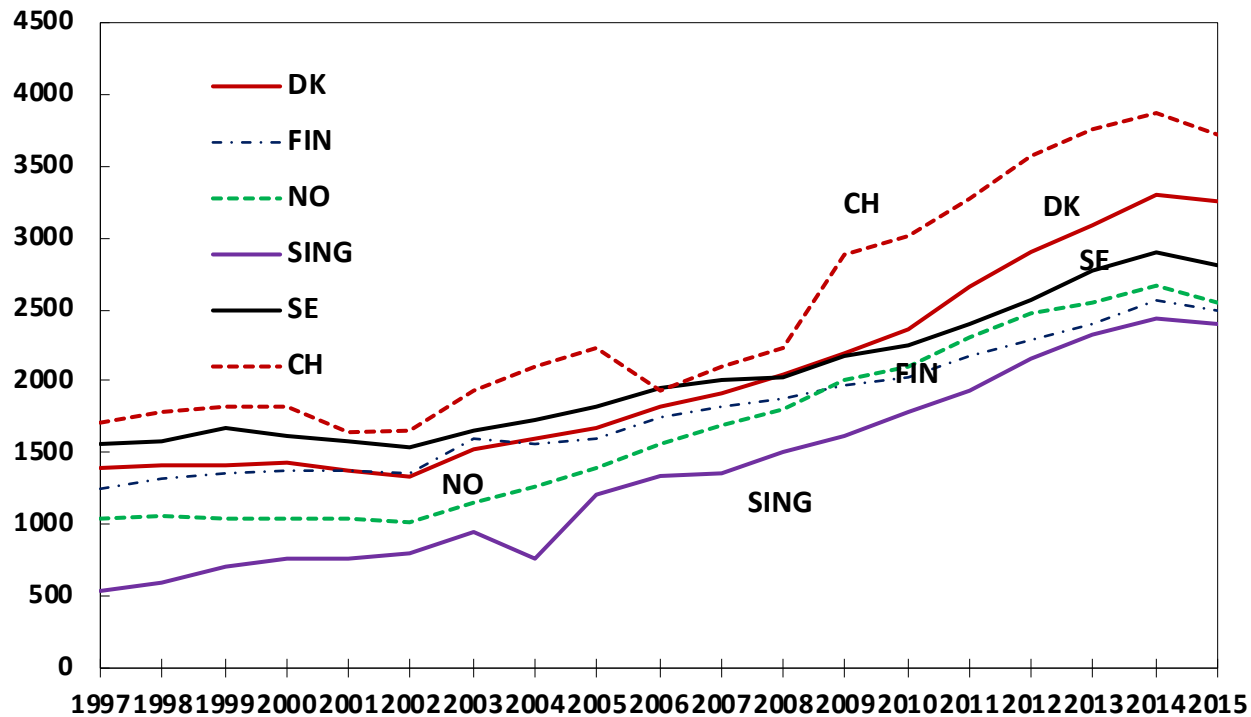


Number of papers total



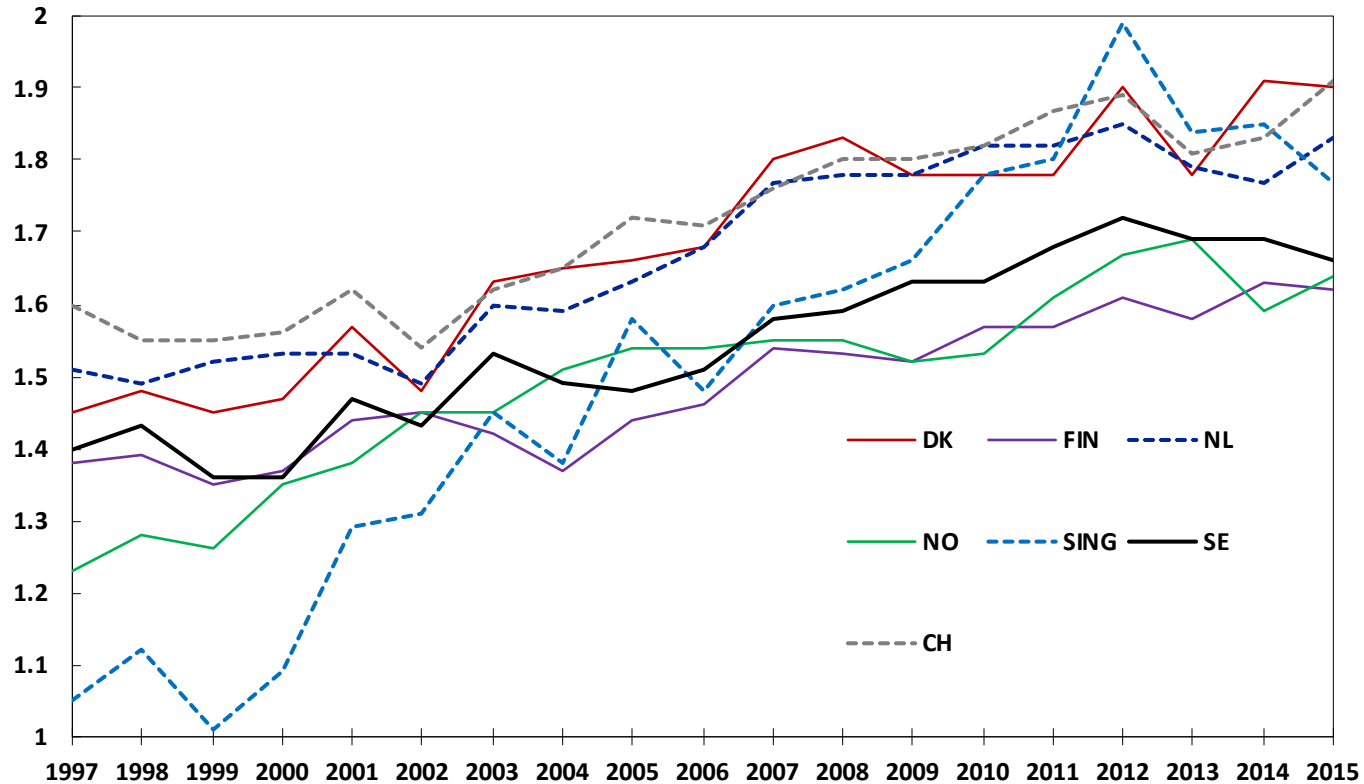
Source: Scopus 2016

Number of papers per capita



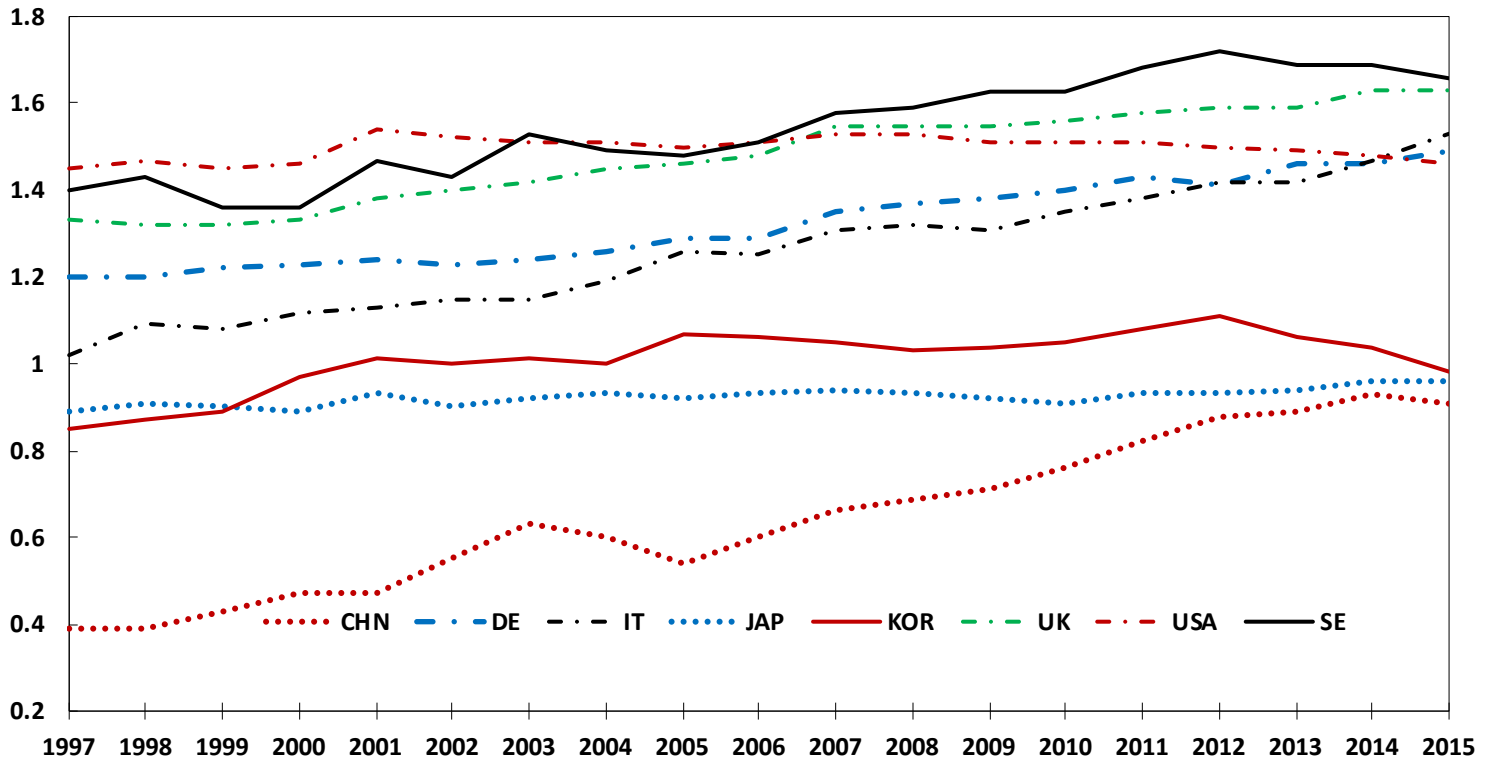
Source: Scopus 2016

Citations, 8 of top 15 countries, all areas (Scopus)



Source: Scopus 2016

Citations all areas (Scopus)

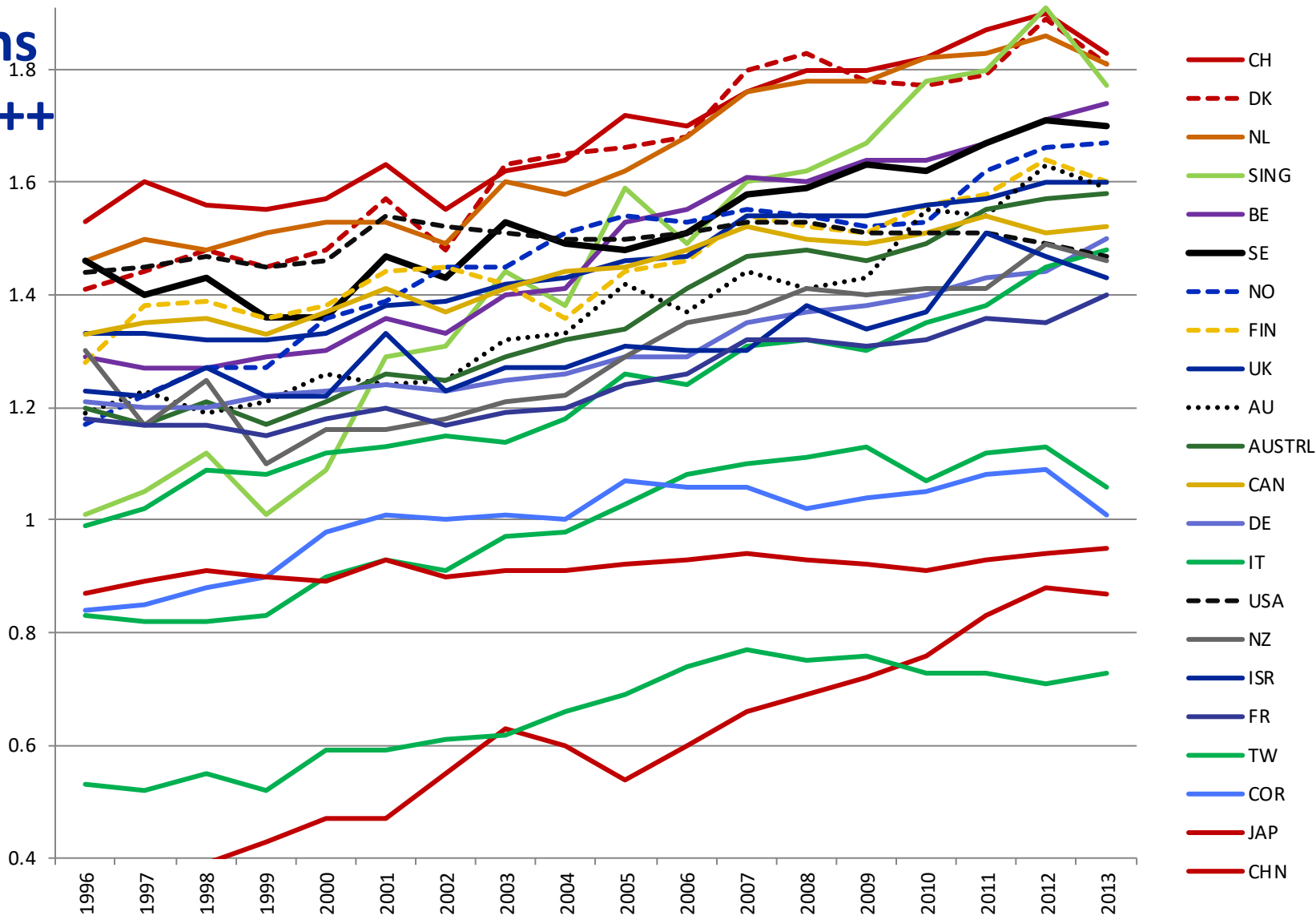


Source: Scopus 2016

To meet Grand Challenges 2001 – 2008

- **2001-2003 (21 %)**
 - Life Science 120 mnSEK
 - ICT 120 mnSEK
 - Material science 35 mnSEK
- **2005-2008 (40 % / 52 %) *High quality research***
 - Medicine 400 mnSEK
 - Engineering 350 mnSEK
 - Sustainable development 210 mnSEK
 - *High quality research 300 mnSEK*

Citations top-18 ++



To meet Grand Challenges 2009 – 2016

- **2009-2012 (49 %)**, *High quality research*
 - Medicine
 - Engineering/natural sciences
 - Environment
- **2013-2016 (46 %)**, *High quality research*
 - Life Science
 - Engineering
 - Energy
 - Infrastructure

To meet Grand Challenges 2017 – 2020

- **2017 – 2020 (53 %)**
 - Environment and climate
 - Sustainable societies
 - Health,
 - AMR,
 - clinical research,
 - biobanks and registers
 - E-Science
 - Gender
 - Migration

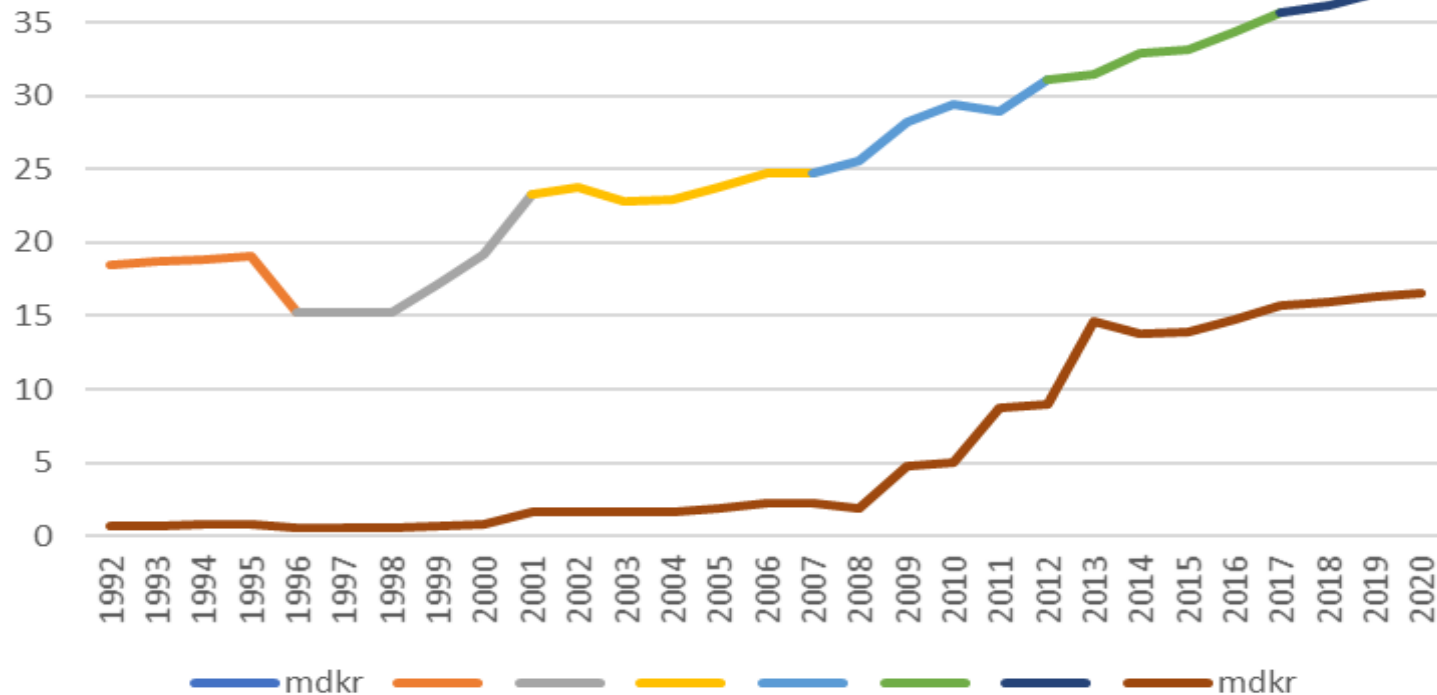
Grand Challenges 2017 - 2020

- **2017-2020 (53 %)**
 - Life science, Biobanks, registers, Clinical research, AMR (115 mn)
 - Sustainable societies, Migration, Humanities and Social science, Equality (110 mn)
 - Space (40 mn)
 - Digitalization, e-science (40 mn)
 - Societal Challenges (industry oriented) (400 mn)
 - Climate, sustainable construction (305 mn)
 - Welfare societal, work life (175 mn)

- **From 21 to 53 %**

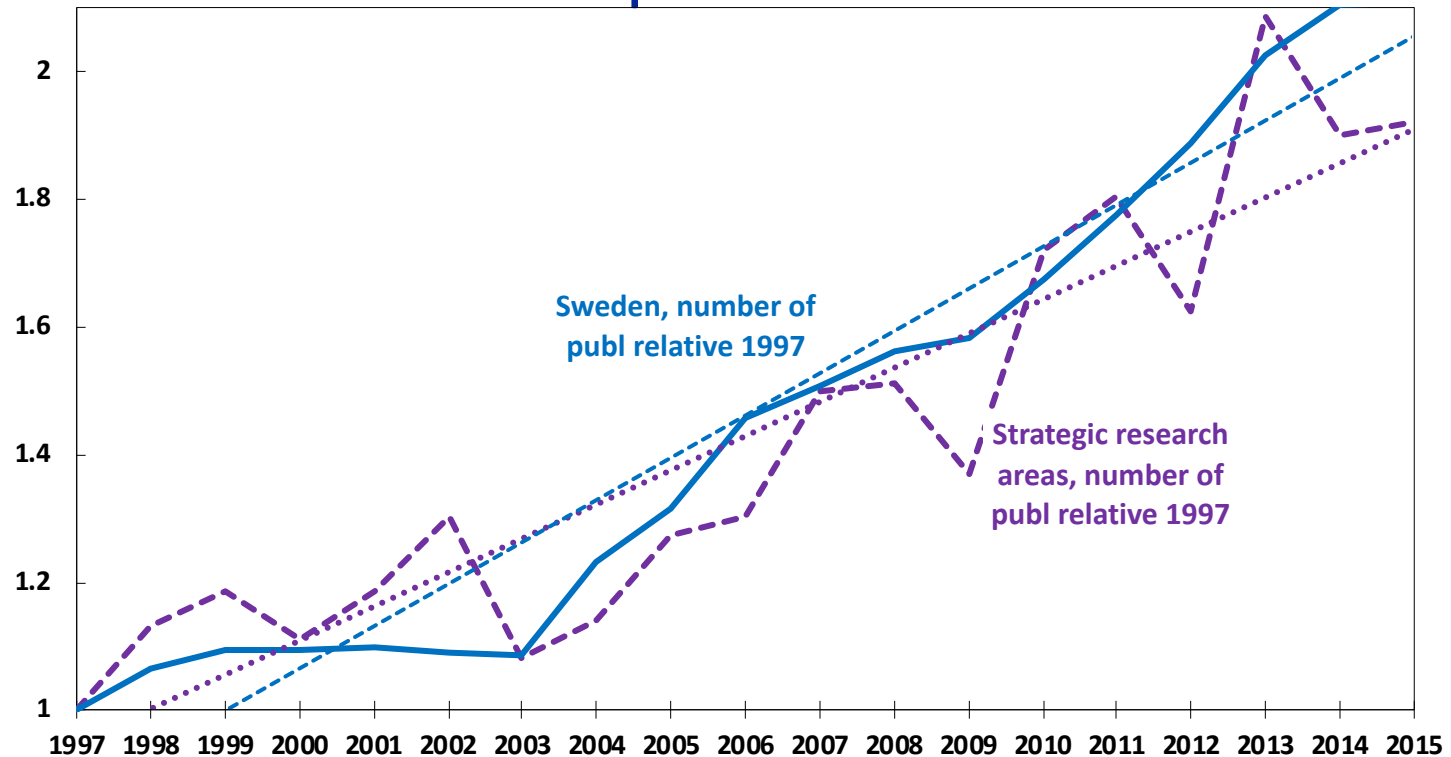
Government funding R&D bnSEK

Total and GC



Grand Challenges Strategic Research Areas

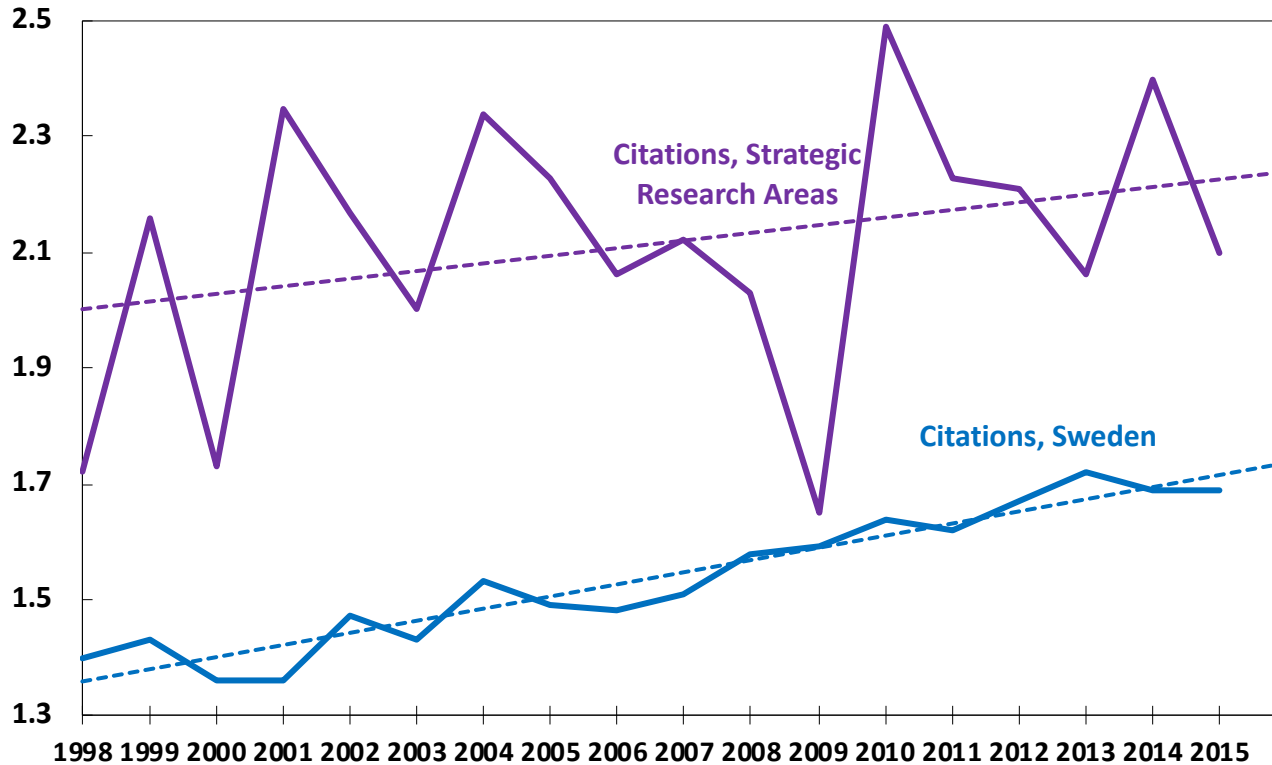
production



Source: Scopus 2016

Grand Challenges

Strategic Research Areas



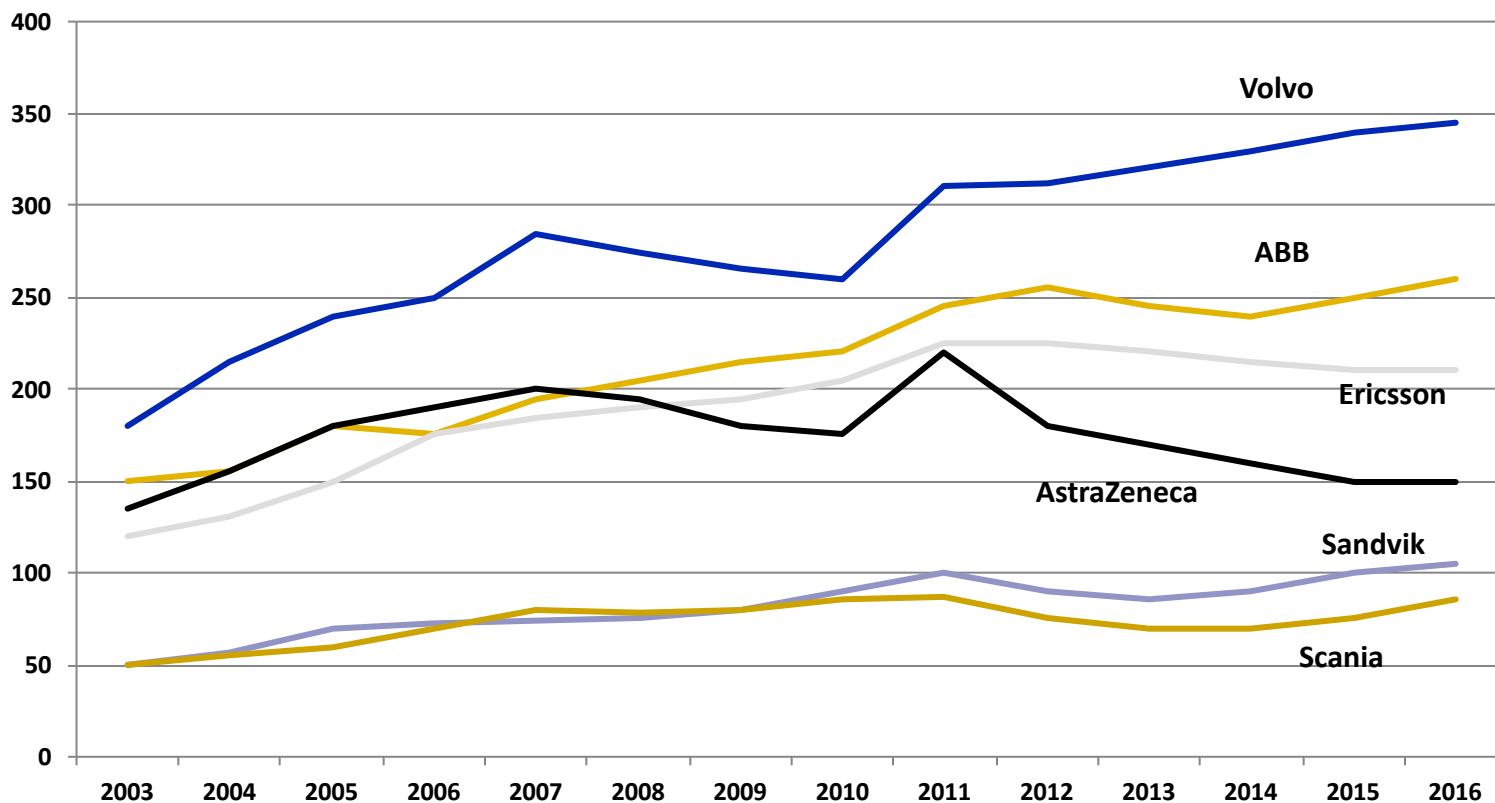
Source: Scopus 2016

Outcome

- **High quality research 2005-2008**
 - Mid-term evaluation 2014
- **Strategic Research Areas, 43 groups**
 - Evaluation 2015
 - 30 % high quality
 - 50 % improving
 - 20 % challenges

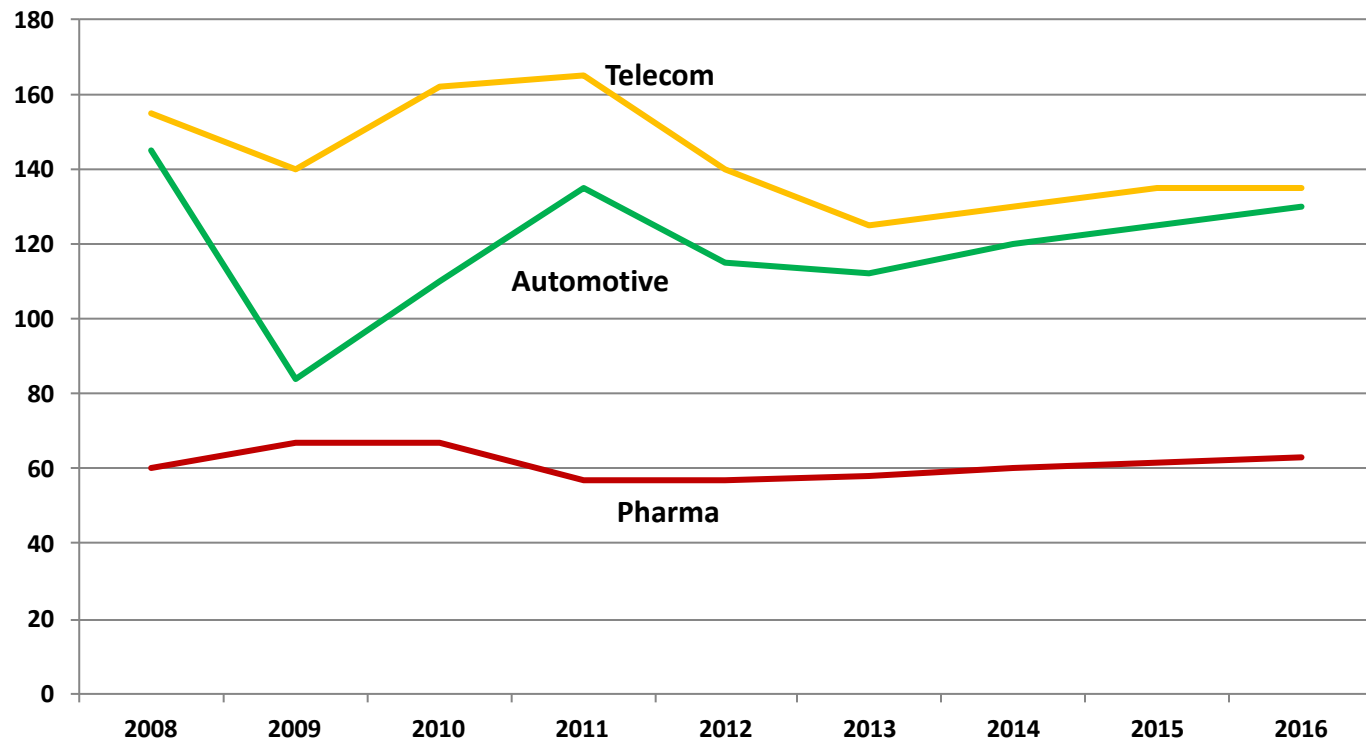


Global turnover, some high-tech businesses bnSEK



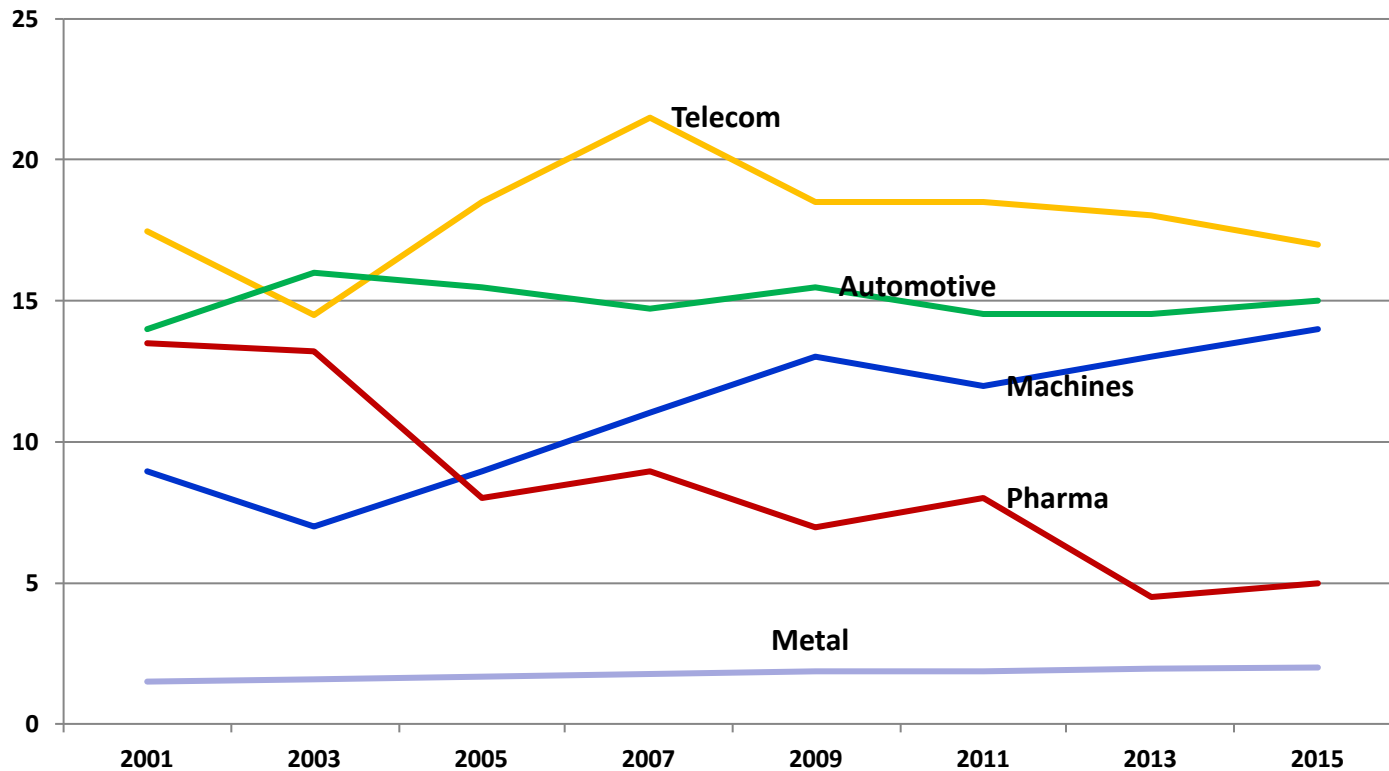
Export billion SEK

telecom decreases, automotive decreases, pharma constant (bnSEK)



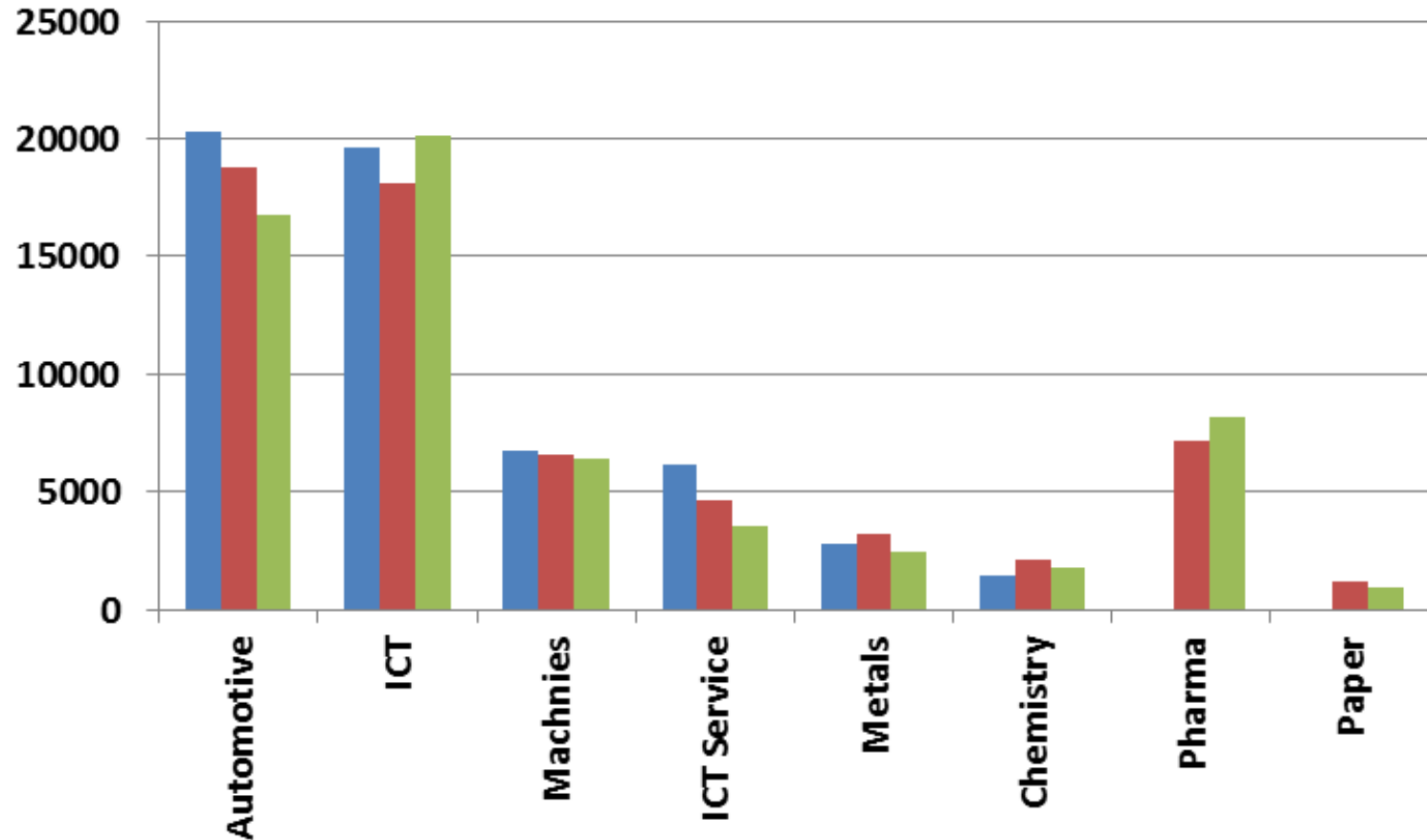
Business R&D decreases

Especially in telecom, **pharma** (bnSEK)



Business R&D, per area

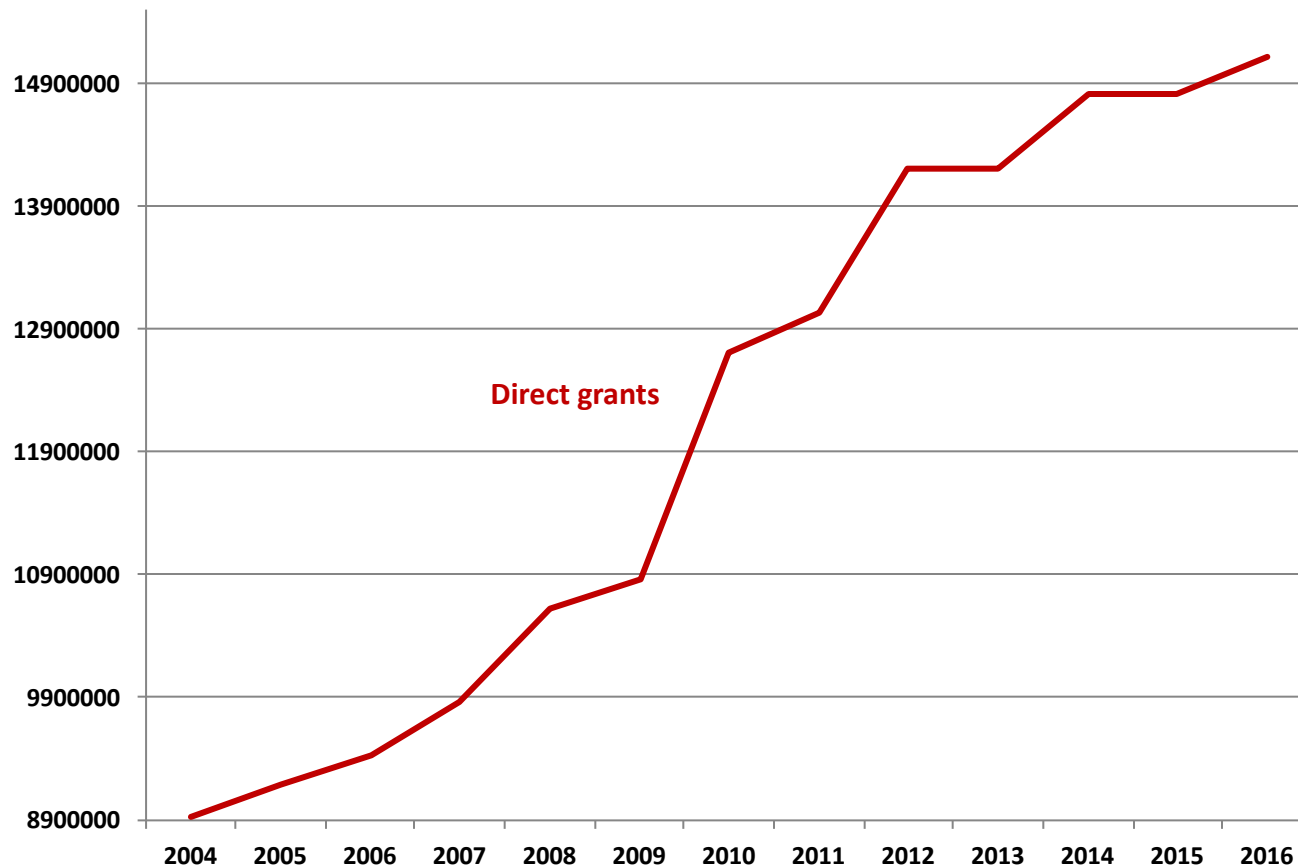
2015, 2013, 2011



Government funding since 2006

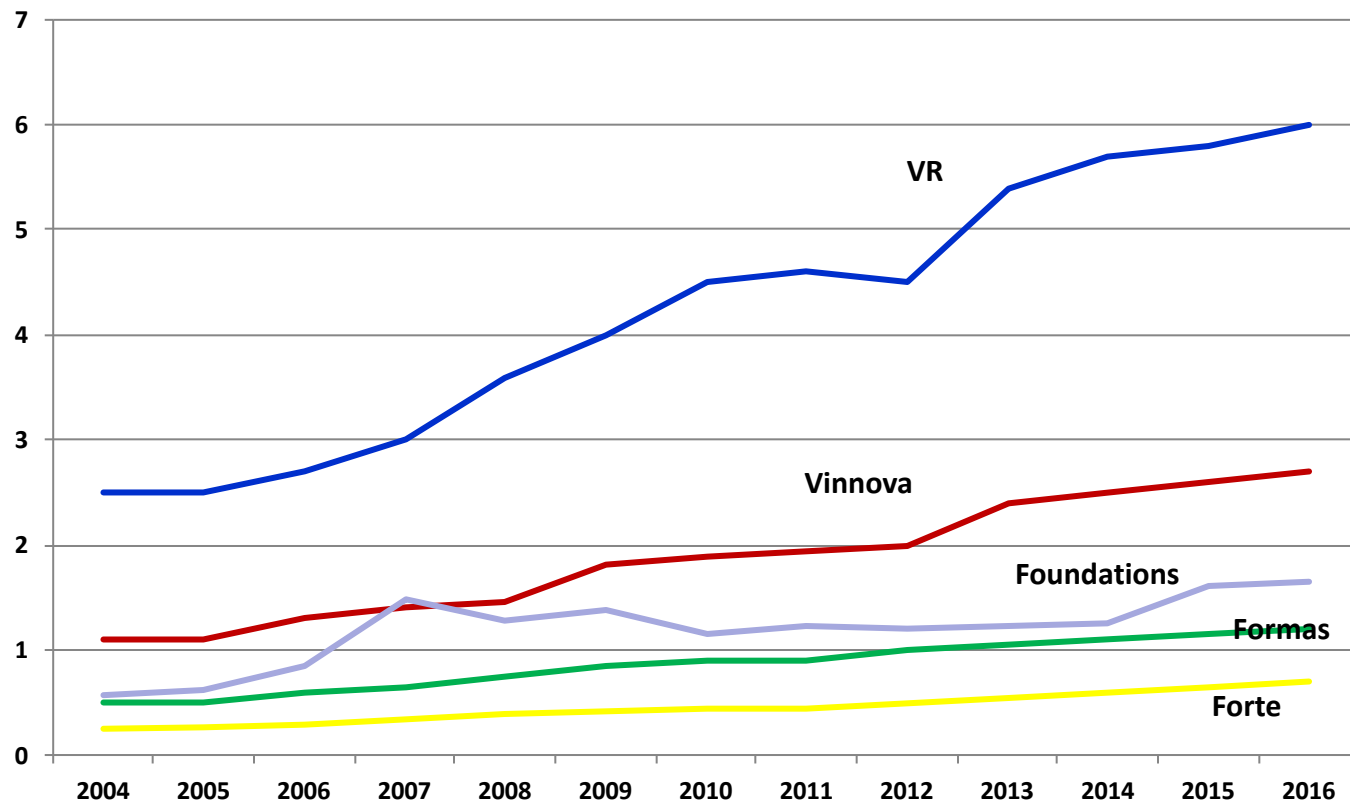
- **Total government 2006 – 24,7 bnSEK**
- **Total government 2017 – 35,7 bnSEK**
- **Total government 2019 – 37,0 bnSEK**
 - Increase by 0,5 bnSEK 2007-2008
 - Direct funding to universities: 10,8 bn -> 11,3
 - Increase by 9 bnSEK 2009-2016
 - Universities: 11,5 bnSEK -> 15,25 bn
 - Research councils: 6,2 bn -> 10,2 bn
 - Infrastructure: + 0,8 bn to ESS, Max
 - Increase by 2,8 bnSEK 2017 – 2020

Increased direct grants to universities (1000 SEK)

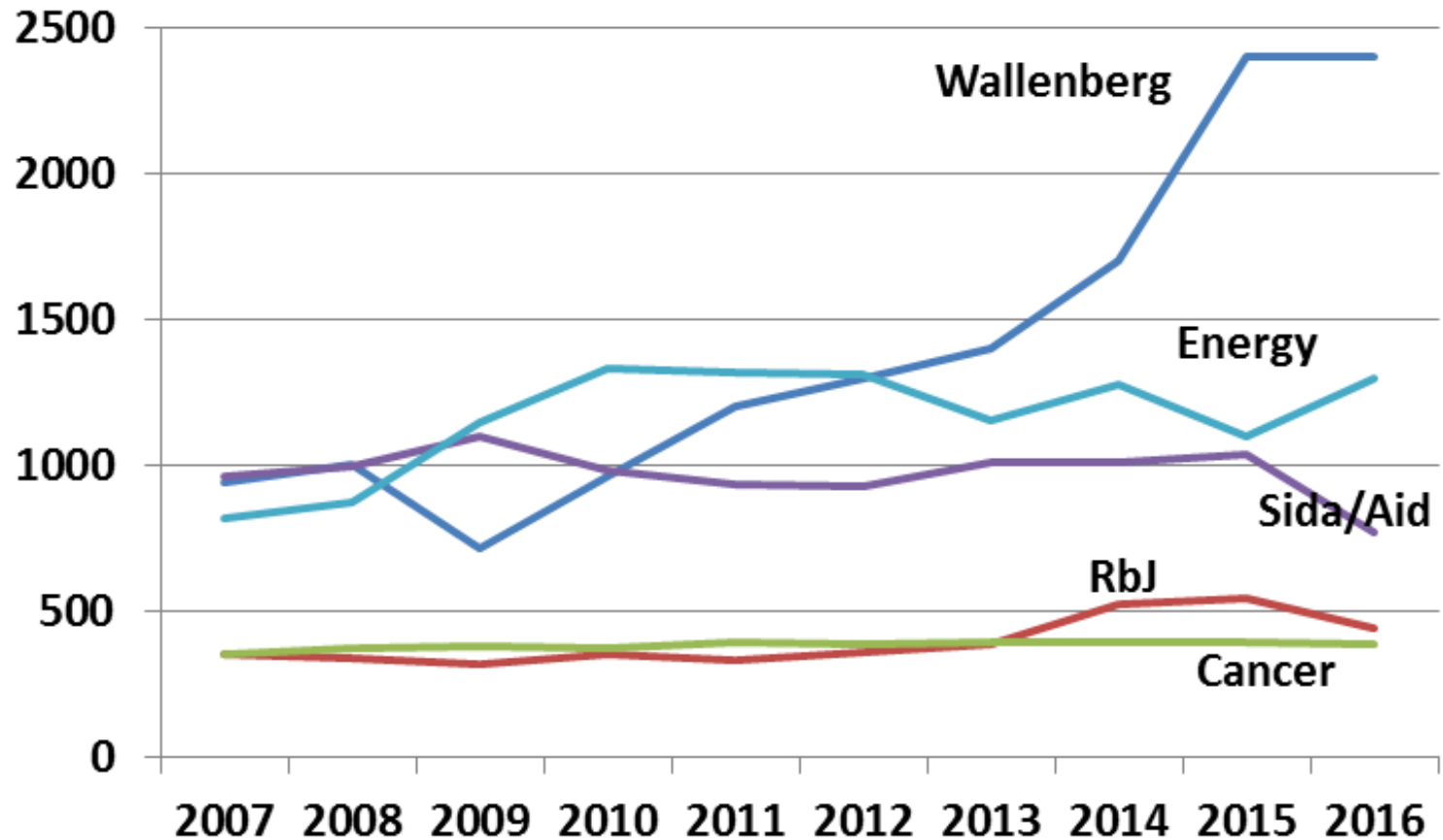


Increased external R&D funding to univ

to universities (1000 SEK)



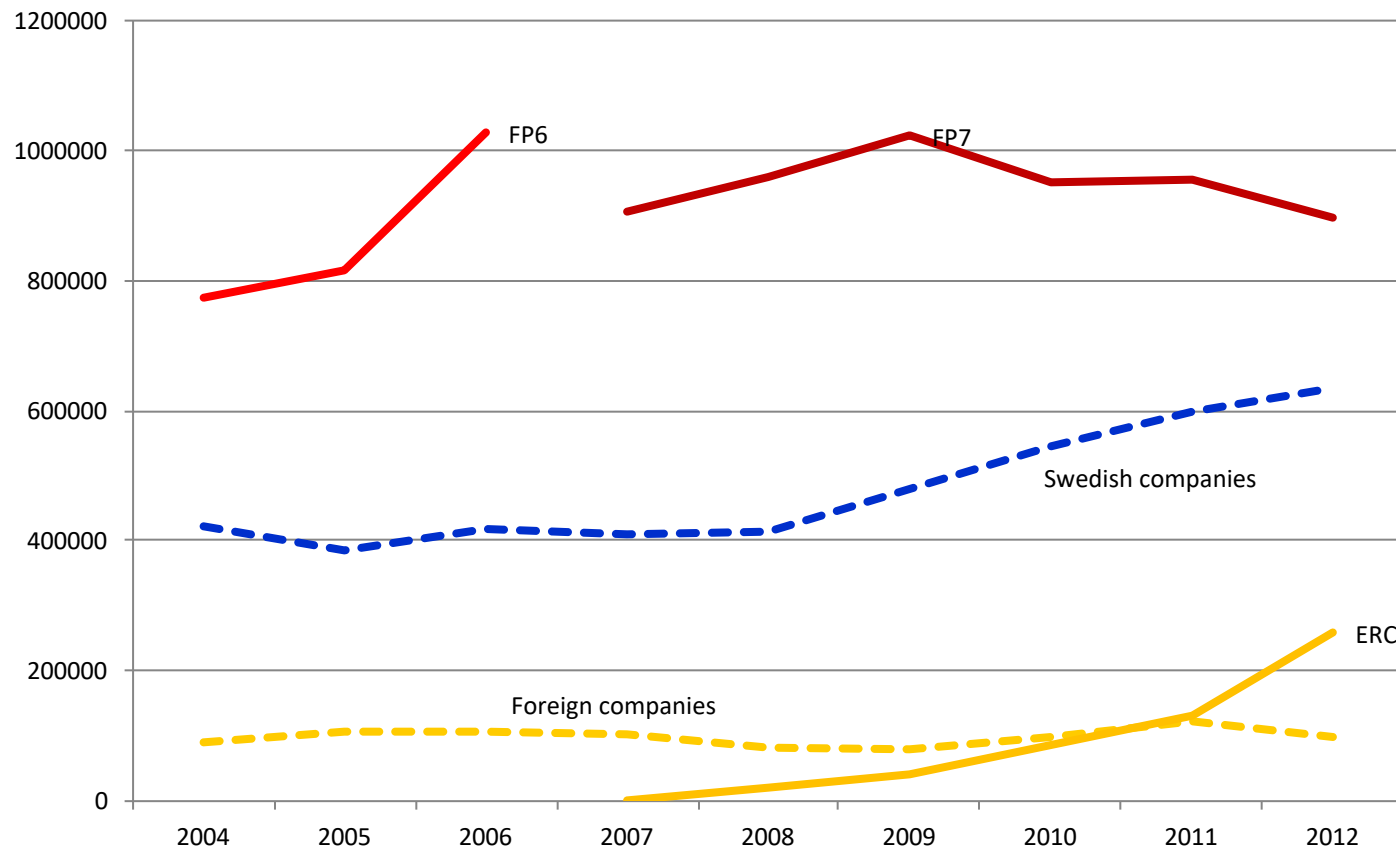
Private R&D funding to univ (1000 SEK)



Increased external R&D funding to univ (1000 SEK)

Swedish companies increases

EU constant, ERC increases



Universities – institutional grants

Increase from 10,67 bnSEK 2008:

- **3,75 bnSEK 2009-2016**
 - 1,55 bnSEK free
 - 1,3 bnSEK earmarked
- **1,19 bnSEK 2013-2016**
 - 0,9 bnSEK free
 - 0,29 bnSEK earmarked
- **1,3 bnSEK 2017-2020 “free”**

Life Science - SciLifeLab

Amount, MSEK	2013	2014	2015	2016
SciLifeLab 890 mnSEK (2012)	+150	+150	+150	+200

- **Centre for large-scale gene and protein analysis with focus in health research**
- **Collaboration – 4 universities**
- **Main campus at Karolinska institutet**
- **National resource**
- **One out of three major infrastructure investments (SciLifeLab, Max IV, ESS)**



prop. 2012/13:30, Chapter 9

Research infrastructure (mnSEK)

ESS	2013	2014	2015	2016
(150 mn/y 2012)	VR	+75	+150	+200

Max IV	2013	2014	2015	2016
2012: Phase I: 950 mnkr Phase II: +500 mnkr	-	+20	+30	+50

Databases and biobanks	2013	2014	2015	2016
	25	50	50	50

SciLifeLab	2013	2014	2015	2016
2012: 890 mnSEK	1080	1080	1080	1140



Max IV and European Spallation Source (ESS) in Lund

gov. bill. 2012/13:30, chapter 12

Grand Challenges

Strategic Research Areas

Environment

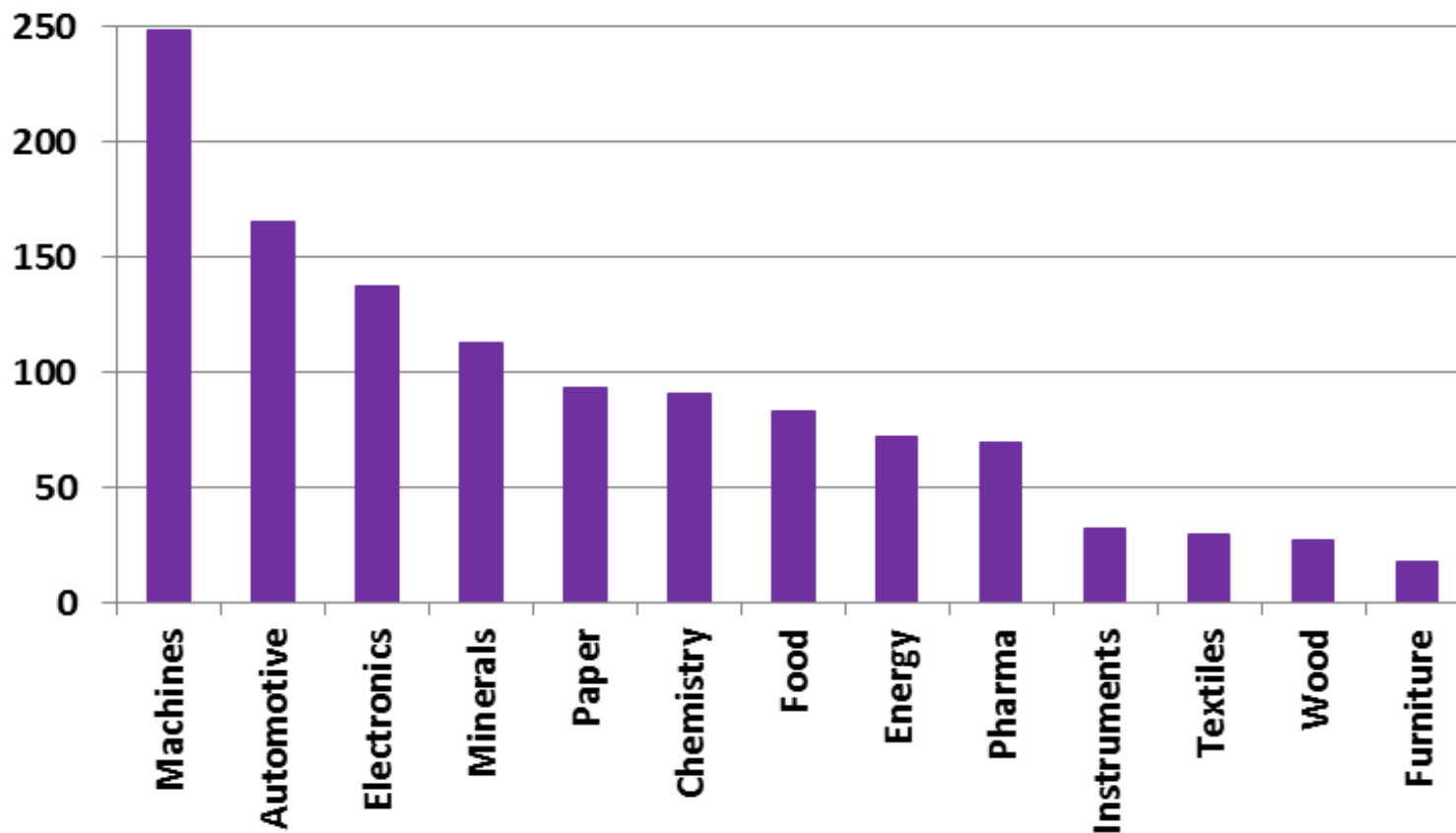
2008, 2012

Social science

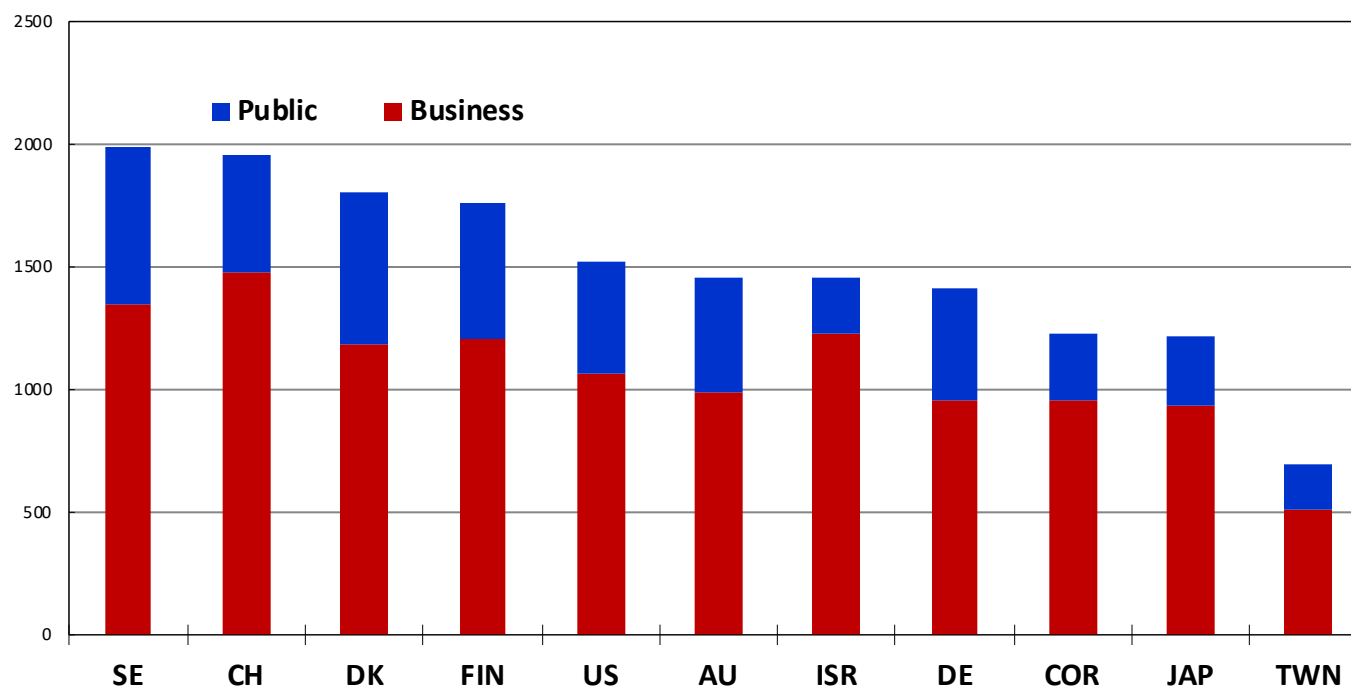
- climate models
- effects on ecosystem and biodiversity
- marine environmental research
- **utilization of natural resources**
- **Energy/Energy**
- **Forest products, biomass**
- **Sustainable cities**

- growth research
- politically important regions
- **finance markets**

Major export areas



Total investments in R&D per capita, **business** and public



Source: OECD, USD per capita, last available year