

FP7 IDEAS Programme

# The European Research Council

European Research Council



## The Promise in Computer Science Research Activities

Danny Dolev  
Member of the ERC Scientific Council

ECSS 2012  
Barcelona, November 19-21



# The European Research Council

## What is ERC



# What is ERC?

The ERC supports excellence in frontier research through a bottom-up, individual-based, pan-European competition

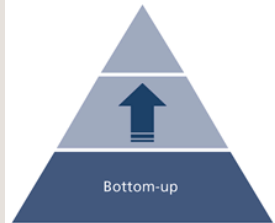
**Budget:** € 7.5billion (2007-2013) - 1.1 billion €/year

## Legislation

- Scientific governance: independent Scientific Council with 22 members; full authority over funding strategy
- Support by the ERC Executive Agency (autonomous)
- Excellence as the only criterion

## Strategy

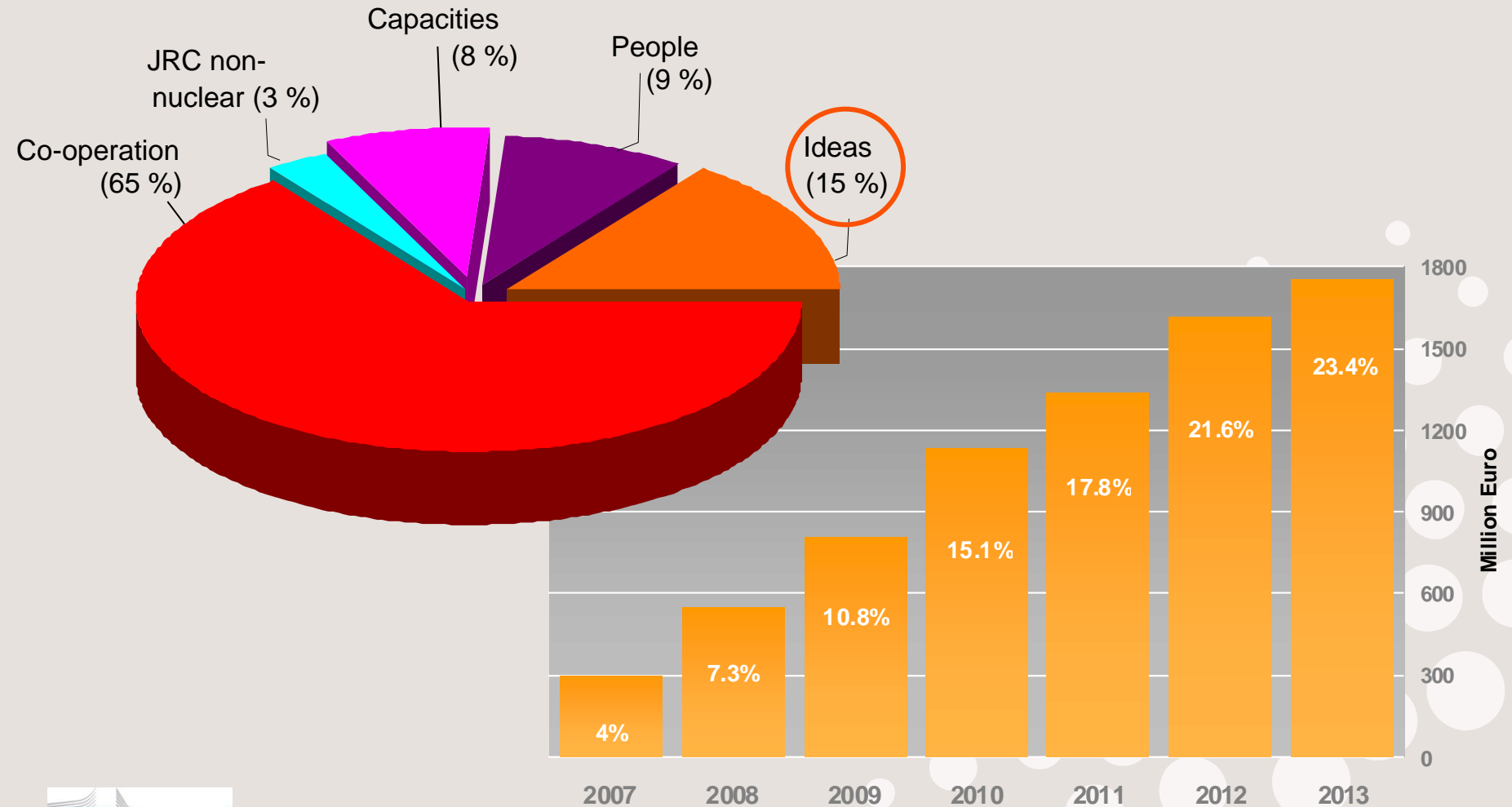
- Support for the individual scientist – no networks!
- Global peer-review
- No predetermined subjects (bottom-up)
- Support of frontier research in all fields of science and humanities





# FP7 budget € 50.5 billion

ERC budget € 7.5 billion; Increase by € 250 M/year



# ERC Grant schemes

## Starting Grants

starters  
(2-7 years after PhD)  
up to € 2.0 Mio  
for 5 years

## Consolidator Grants

consolidators  
(7-12 years after PhD)  
up to € 2.75 Mio  
for 5 years

## Advanced Grants

track-record of  
significant research  
achievements in  
the last 10 years  
up to € 3.5 Mio  
for 5 years

## Synergy Grants

2 – 4 *Principal* Investigators  
up to € 15.0 Mio for 6 years

## Proof-of-Concept

bridging gap between research - earliest  
stage of marketable innovation  
up to €150,000 for ERC grant holders

# Creative freedom of the individual grantee

## ERC offers independence, recognition & visibility

- to work on a research topic of **own choice**, with a team of **own choice**
- to gain true **financial autonomy** for 5 years
- to negotiate with the host institution the **best conditions** of work
- to attract **top team members** (EU and non-EU) **and collaborators**
- to move with the grant to any place in Europe if necessary (**portability of grants**)
- **to attract additional funding and gain recognition**; ERC is a quality label

# ERC funding process

## Peer Review Evaluation

### Starting and Advanced Grants

#### Panel Members are appointed by the ERC Scientific Council

- **25 Panels** covering all fields of science, technology and scholarship
- **3 sets of Panels:** StG Panels, Cons Panels, AdG Panels
- Each Panel consists of the **Panel Chair** and **10-15 Panel Members**
- Panel Chair **oversees evaluation process** for the proposals assigned to his/her panel in collaboration with the ERC staff
- Evaluation criteria:

#### Principal Investigator

- ❖ Intellectual capacity and creativity
- ❖ Commitment

#### Research project

- ❖ Ground-breaking nature and potential impact
- ❖ Methodology

# 25 panels for all areas of science

<p>Physical Sciences &amp; Engineering</p> <p>10 panels</p>	<p>Mathematics</p> <p>Fundamental constituents of matter</p> <p>Condensed matter physics</p> <p>Physical and analytical chemical sciences</p> <p>Synthetic chemistry and materials</p> <p><b>Computer science and informatics</b></p> <p>Systems and communication engineering</p> <p>Products and processes engineering</p> <p>Universe sciences</p> <p>Earth system science</p>	<p>Social Sciences &amp; Humanities</p> <p>6 panels</p> <p>Individuals, institutions and markets</p> <p>Institutions, values, beliefs and behaviour</p> <p>Environment, space and population</p> <p>The Human Mind</p> <p>Cultures and cultural production</p> <p>The study of the human past</p>
<p>Life Sciences</p> <p>9 panels</p>	<p>Molecular and structural biology and biochemistry</p> <p>Genetics, genomics, bioinformatics and systems biology</p> <p>Cellular and developmental biology</p> <p>Physiology, pathophysiology and endocrinology</p> <p>Neurosciences and neural disorders</p> <p>Immunity and infection</p> <p>Diagnostic tools, therapies and public health</p> <p>Evolutionary, population and environmental biology</p> <p>Applied life sciences and biotechnology</p>	



# More than 3,000 researchers funded

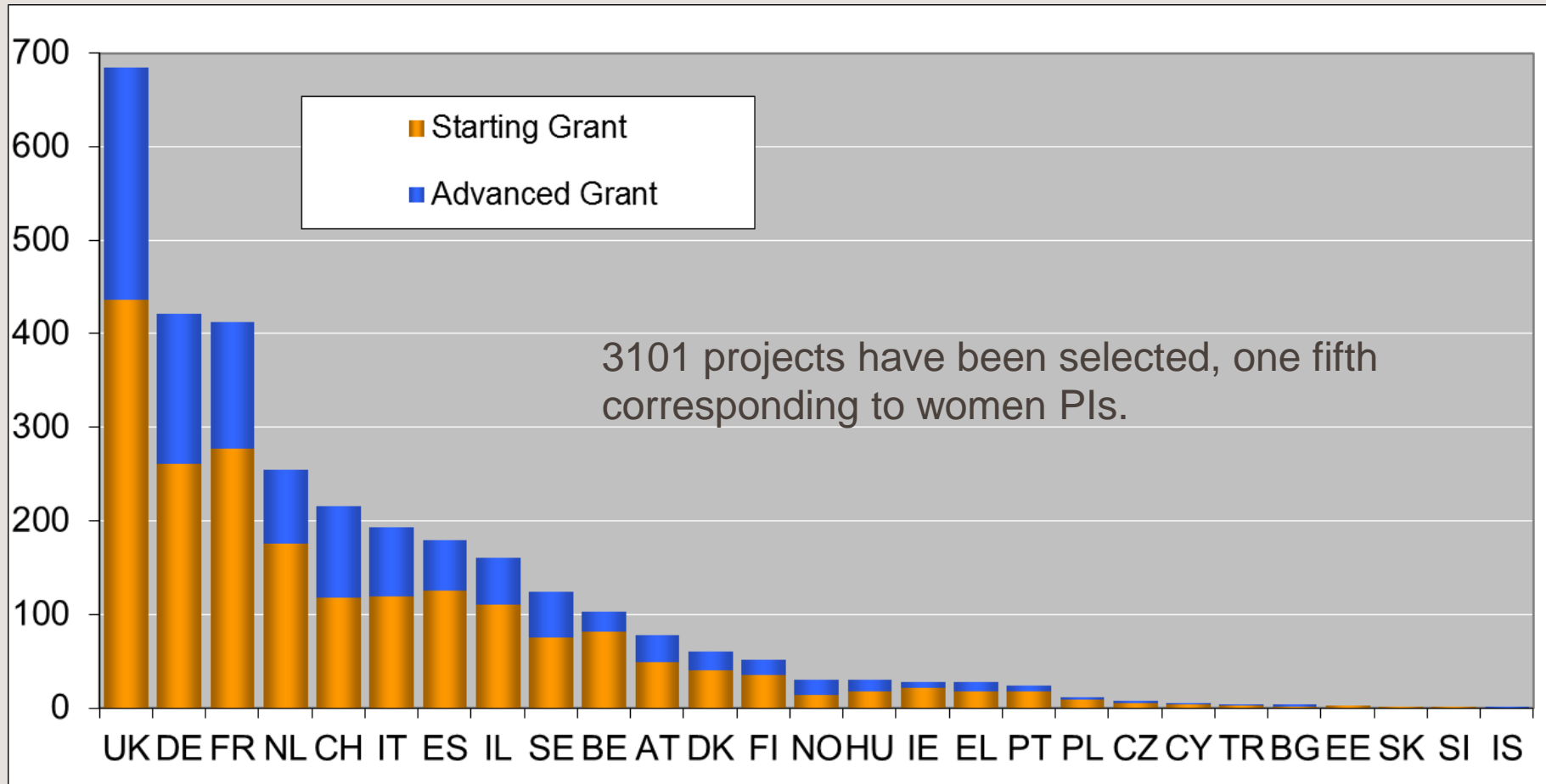
more than 5 billion euro awarded

	Total number of applications received	of which		
		Evaluated*	Funded	success rates**
Starting Grant 2007	9.167	8.787	299	3,4
Starting Grant 2009	2.503	2.392	245	10,2
Starting Grant 2010	2.873	2.767	436	15,8
Starting Grant 2011	4.080	4.005	486	12,1
Starting Grant 2012***	4.741	4.653	536	11,5
<b>Starting Grant</b>	<b>23.364</b>	<b>22.604</b>	<b>2.002</b>	<b>10,6</b>
Advanced Grant 2008	2.167	2.034	282	13,9
Advanced Grant 2009	1.584	1.526	245	16,1
Advanced Grant 2010	2.009	1.967	271	13,8
Advanced Grant 2011	2.284	2.245	301	13,4
<b>Advanced Grant</b>	<b>8.044</b>	<b>7.772</b>	<b>1.099</b>	<b>14,3</b>
Proof of Concept 2011 - 1&2	151	139	51	36,7
Proof of Concept 2012 - 1***	75	60	33	55,0
<b>Proof of Concept</b>	<b>226</b>	<b>199</b>	<b>84</b>	<b>45,8</b>

# In more than 500 institutions in 27 countries

ERC Starting grant 2007 – 2012

ERC Advanced grant 2008 – 2011



# Excellence attracts excellence:

50% of PIs in 50 institutions

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Country	Higher-Education Institution	No	StG	AdG	Total
UK	University of Cambridge	1	55	32	87
UK	University of Oxford	2	46	34	80
CH	Swiss Federal Institute of Technology Lausanne	3	38	25	63
UK	University College London	4	41	19	60
CH	Swiss Federal Institute of Technology Zurich (ETH Zurich)	5	22	29	51
IL	Hebrew University of Jerusalem	6	32	17	49
UK	Imperial College	7	28	20	48
IL	Weizmann Institute	7	30	18	48
BE	University of Leuven	8	23	8	31
UK	University of Edinburgh	9	18	12	30
UK	University of Bristol	10	13	15	28
NL	Leiden University	11	14	11	25
CH	University of Zurich	11	12	13	25
DE	University of Munich	11	10	15	25
FI	University of Helsinki	11	16	9	25
NL	University of Amsterdam	12	16	8	24
IL	Technion - Israel Institute of Technology	12	21	3	24
SE	Karolinska Institute	12	15	9	24
NL	Radboud University Nijmegen	12	18	6	24
Country	Research Organisation	No	StG	AdG	Total
FR	National Centre for Scientific Research (CNRS)	1	114	39	153
DE	Max Planck Society	2	55	29	84
FR	National Institute of Health and Medical Research (Inserm)	3	28	9	37
FR	French Alternative Energies and Atomic Energy Commission	4	30	6	36
ES	Spanish National Research Council (CSIC)	5	19	6	25
FR	National Institute for Research in Computer Science and Automatic Control (INRIA)	6	16	8	24

**Top European Institutions hosting at least 24 ERC Grantees by funding Schemes**

StG 2007-2012  
AdG 2008-2011

*First legal signatories of the grant agreement*

Data as of 26/09/2012

# ERC attracts high calibre scientists

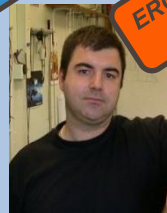
"Despite being a new, and thus untried instrument, the ERC has manifestly succeeded in attracting and funding world-class research and is playing an important role in anchoring research talent."

*The independent interim evaluation of FP7*

## 5 Nobel Prize laureates funded by ERC



Serge Haroche  
Nobel 2012



Konstantin Novoselov  
Nobel 2010



Theodor Hansch



James Heckman



Jean-Marie Lehn

ERC Grantee  
AdG 2009

ERC Grantee  
StG 2007

ERC Grantee  
AdG 2010

ERC Grantee  
AdG 2010

ERC Grantee  
AdG 2011

## 3 Fields Medalists currently funded by ERC



Stanislav Smirnov

AdG 2008

Simon Donaldson

AdG 2009

Elon Lindenstrauss

AdG 2010

## Other Prizes awarded to ERC grantees

EMBO GOLD MEDAL 2011 – Simon BOULTON - AdG 2010

FEBS|EMBO WOMEN IN SCIENCE 2011 - Carol ROBINSON - AdG 2010

EMBO GOLD MEDAL 2010 – Jason W CHIN - StG 2007

THE SHAW PRIZE IN MATHEMATICAL SCIENCES 2011 - Christodoulou Demetrios - AdG 2009

CRAFOORD PRIZE 2011 and EUROPEAN LATSIS PRIZE 2010 – Ilkka Hanski - AdG 2008

L'ORÉAL-UNESCO AWARD FOR WOMEN IN SCIENCE 2011 - Anne L'Huilier - AdG 2008

WOLF PRIZE 2010 – Anton ZEILINGER, David BAULCOMBE-AdG 2008, Alain ASPECT-AdG 2010

MILLENIUM AWARD 2010 – Michael GRATZEL - AdG 2009

## 2012 Prizes awarded to ERC grantees

EMBO GOLD MEDAL 2012

Jiri FRIML - StG 2011

Royal Society of Edinburgh

KELVIN PRIZE 2012

Colin McINNES - AdG 2008

LEIBNIZ PRIZE 2012

Michael BRECHT - AdG 2008 &

Joerg WRACHTRUP - AdG 2010

CNRS SILVER MEDAL 2012

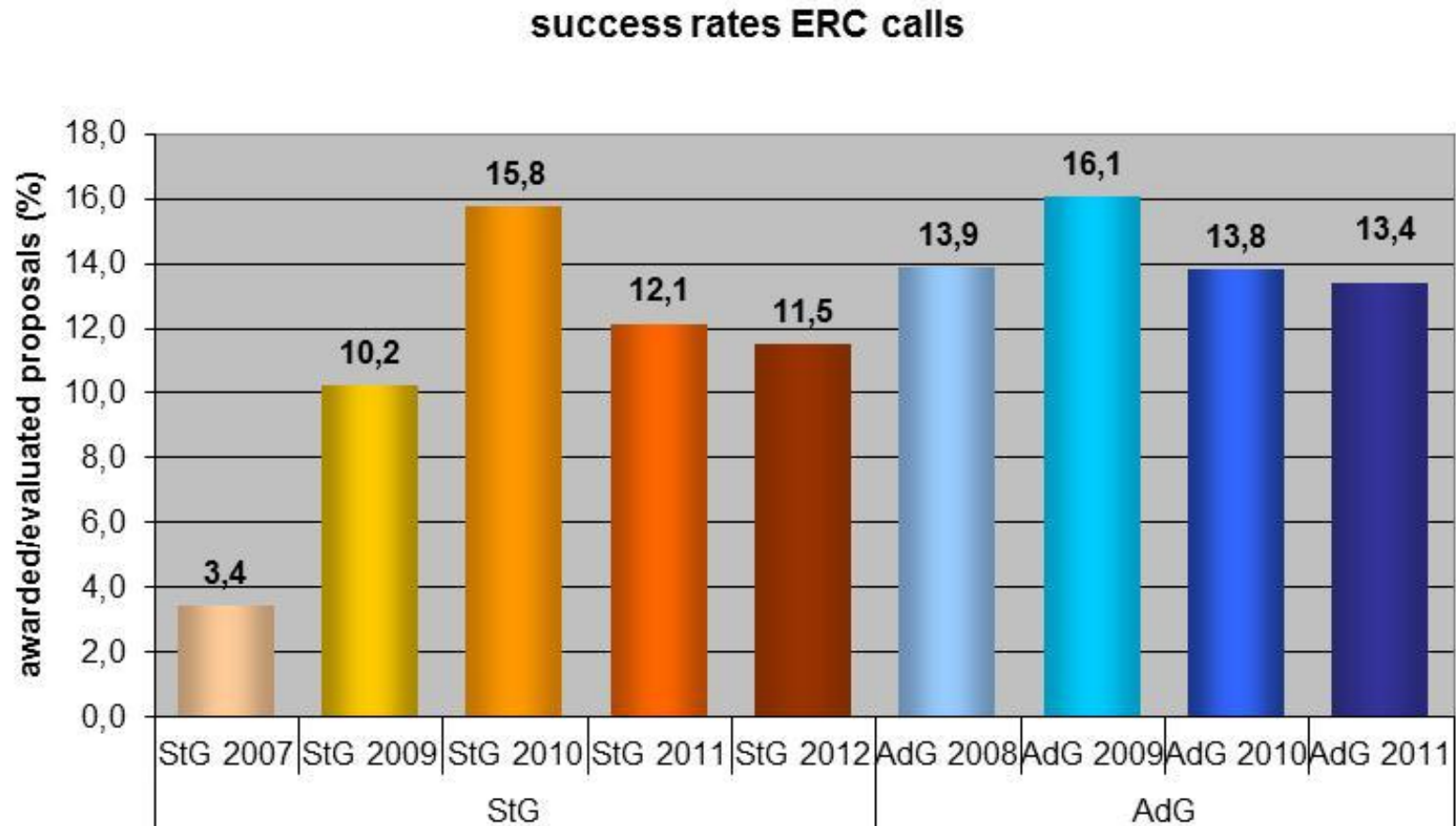
Paolo SAMORI - StG 2010

Ehrlich-Darmstaedter Prize Young 2012

Kathrin MAEDLER - StG 2010

# Highly competitive

Average success rate 12%





# Agreement between NSF and EC

An opportunity for young US-based scientists to join ERC research projects

**Scope:** to provide opportunities for US-based scientists and engineers with NSF-funded CAREER awards and Postdoctoral Research Fellowships to pursue research collaboration with European colleagues already supported through ERC grants

## Next steps:

- ERC to contact grantees to inquire about their interest to participate in the initiative (by end November 2012)
- ERC to provide list of interested grantees to NSF (by January 2013)
- NSF to launch a call for expressions of interest addressed at CAREER awardees and Postdoctoral Fellows (not earlier than January 2013)



# The European Research Council

## Considerations on panel PE6 "Computer Science and Informatics"



# Current topics in panel PE6

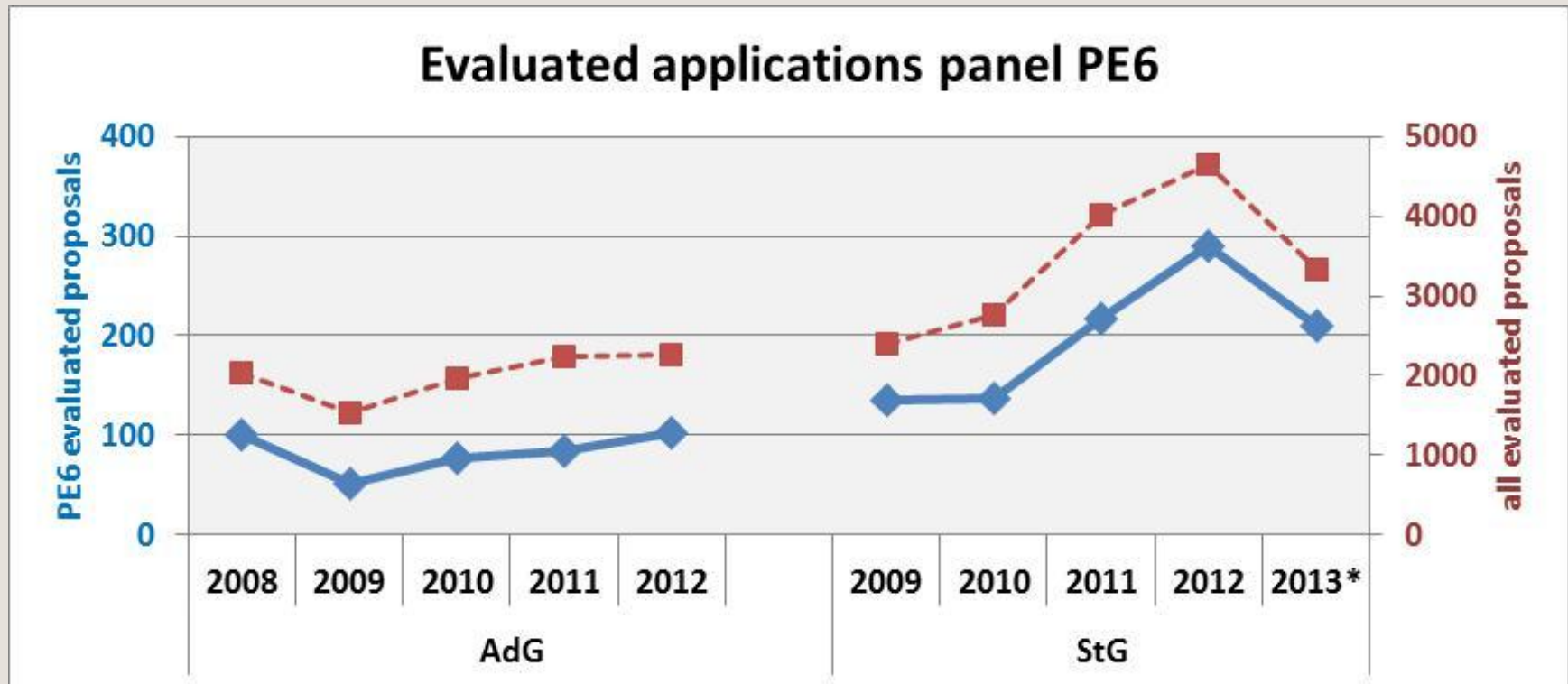
## "Computer Science and Informatics"

6_1	Computer architecture, pervasive computing, ubiquitous computing
6_2	Computer systems, parallel/distributed systems, sensor networks, embedded systems, cyber-physical systems
6_3	Software engineering, operating systems, computer languages
6_4	Theoretical computer science, formal methods, and quantum computing
6_5	Cryptography, security, privacy, quantum crypto
6_6	Algorithms, distributed, parallel and network algorithms, algorithmic game theory
6_7	Artificial intelligence, intelligent systems, multi agent systems
6_8	Computer graphics, computer vision, multi media, computer games
6_9	Human computer interaction and interface, visualization and natural language processing
6_10	Web and information systems, database systems, information retrieval and digital libraries, data fusion
6_11	Machine learning, statistical data processing and applications using signal processing
6_12	Scientific computing, simulation and modelling tools
6_13	Bioinformatics, biocomputing, and DNA and molecular computation

➤ However some aspects of computer sciences are also submitted to and funded by other panels. For example "*mathematical aspects of computer science*" are covered by **PE1 "Mathematics"**; most Quantum Cryptography projects are funded in **PE2 "Fundamental constituents of matter"**; "*networks*" and "*robotics*" are covered by **PE7 "Systems and Communication Engineering"**, and "*computational engineering*" by **PE8 "Products and processes engineering"**



# Evaluated applications in panel PE6 "Computer Science and Informatics"



\*) all submitted for StG2013; only starters

# Total grants in panel

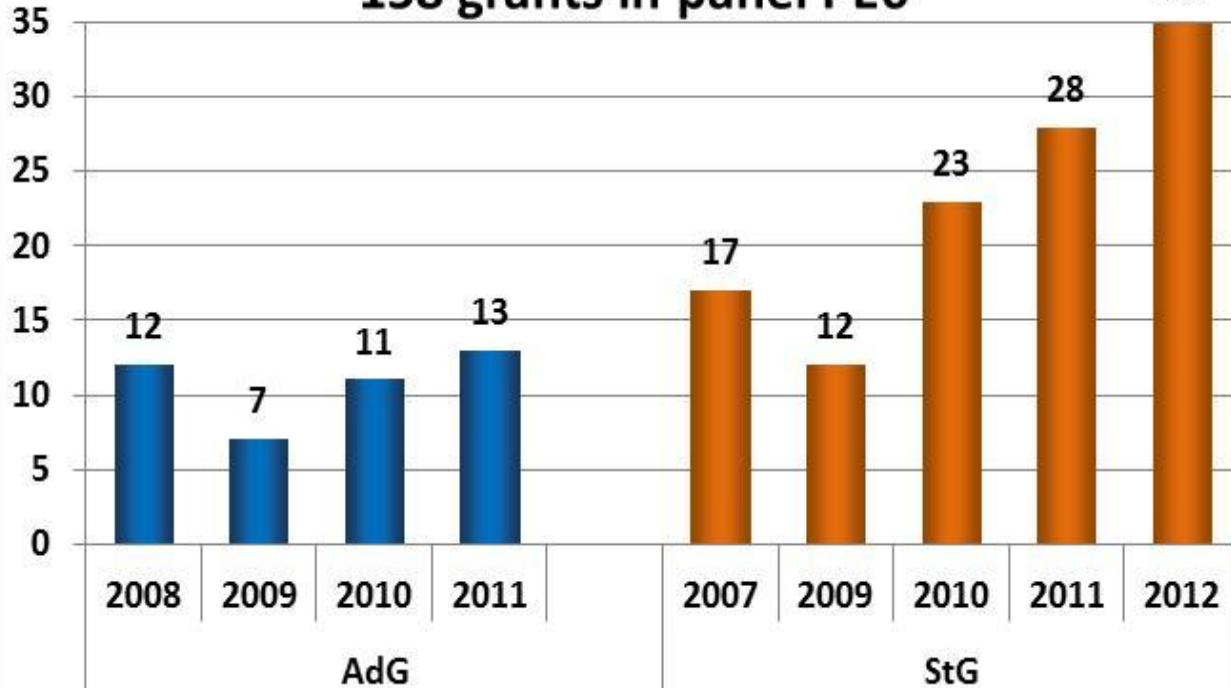
## "Computer Science and Informatics"

ERC Starting Grant 2007 – 2012

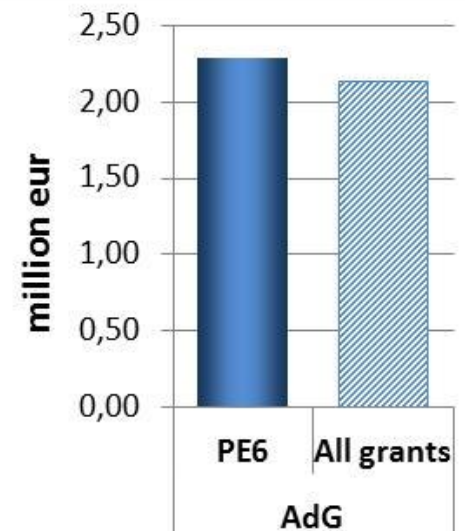
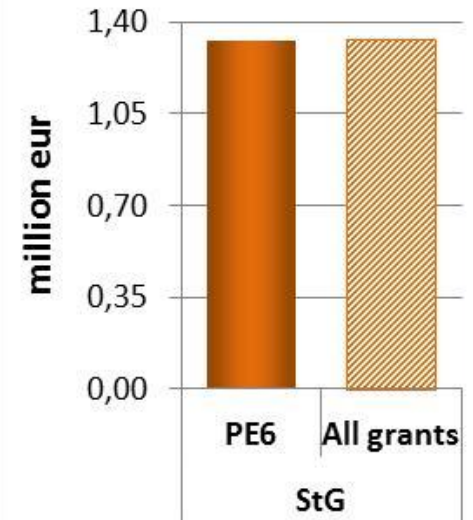
ERC Advanced Grant 2008 – 2011



### 158 grants in panel PE6

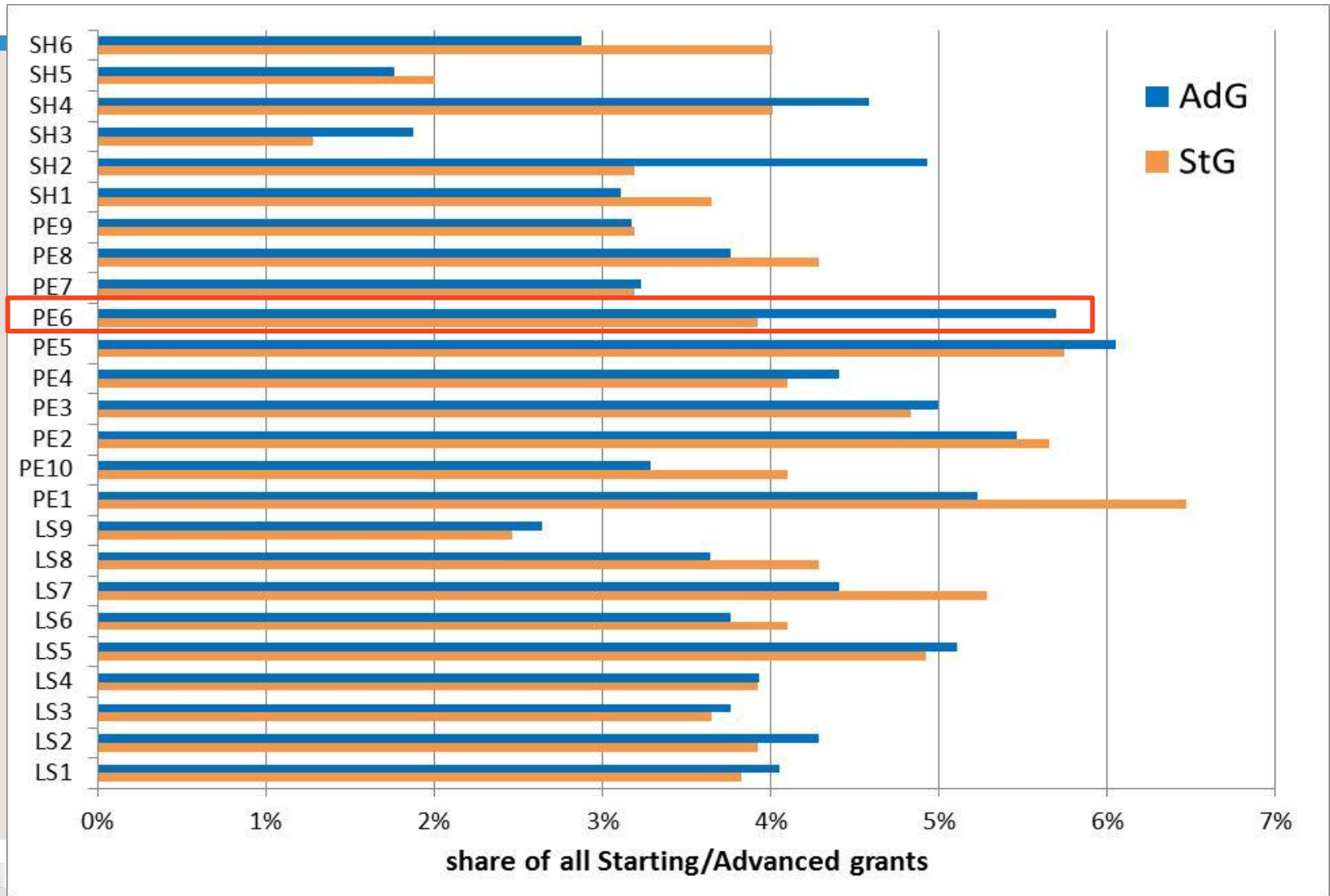


### Average project size



# Grants per panel

ERC Starting Grant 2009-2012 and Advanced Grant 2008-2011



# Topics of projects funded in panel "Computer Science and Informatics"

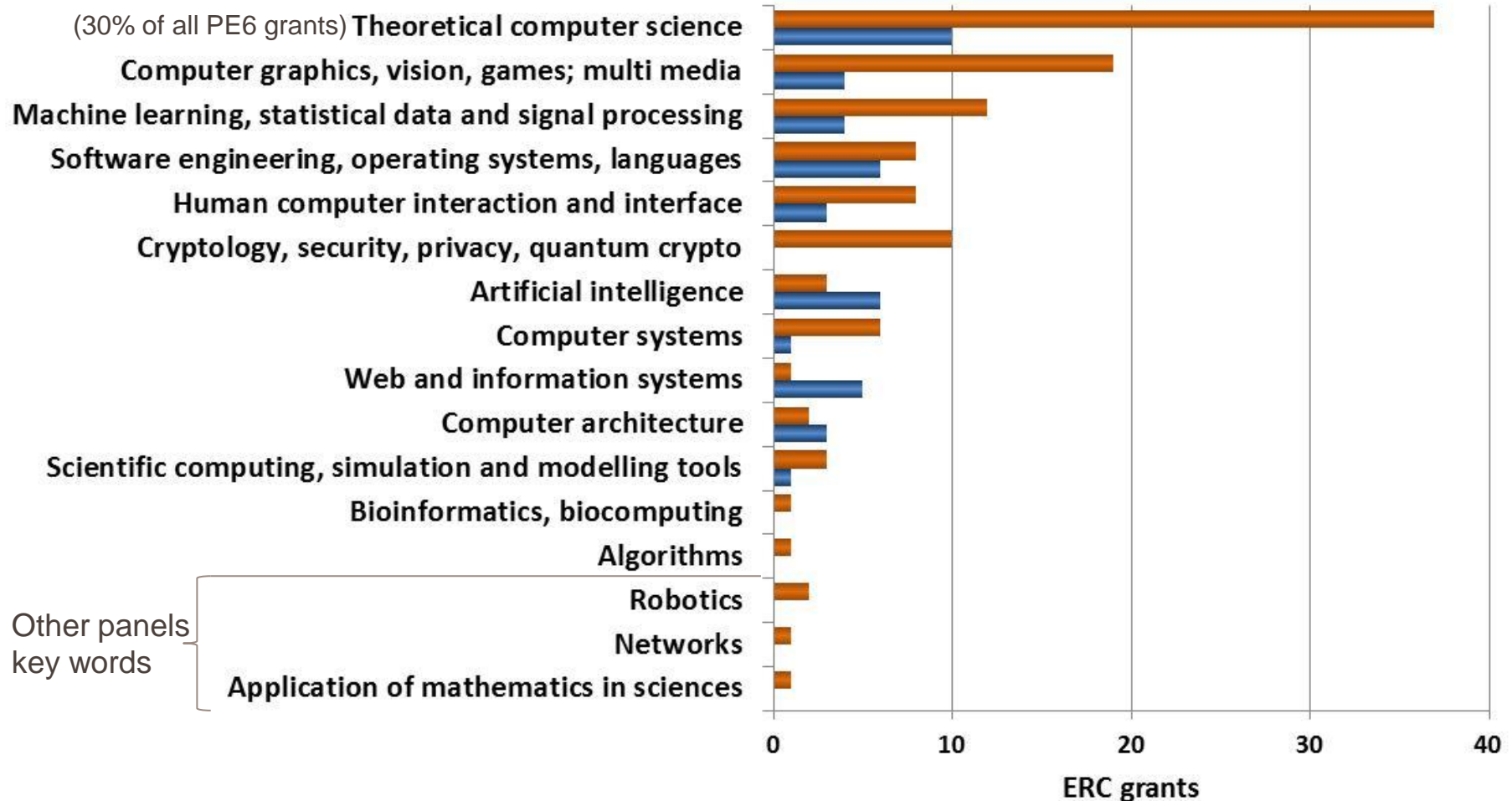
European Research Council



ERC Starting Grant 2007 – 2012

ERC Advanced Grant 2008 – 2011

PE6 topics based on the 1st Key Word



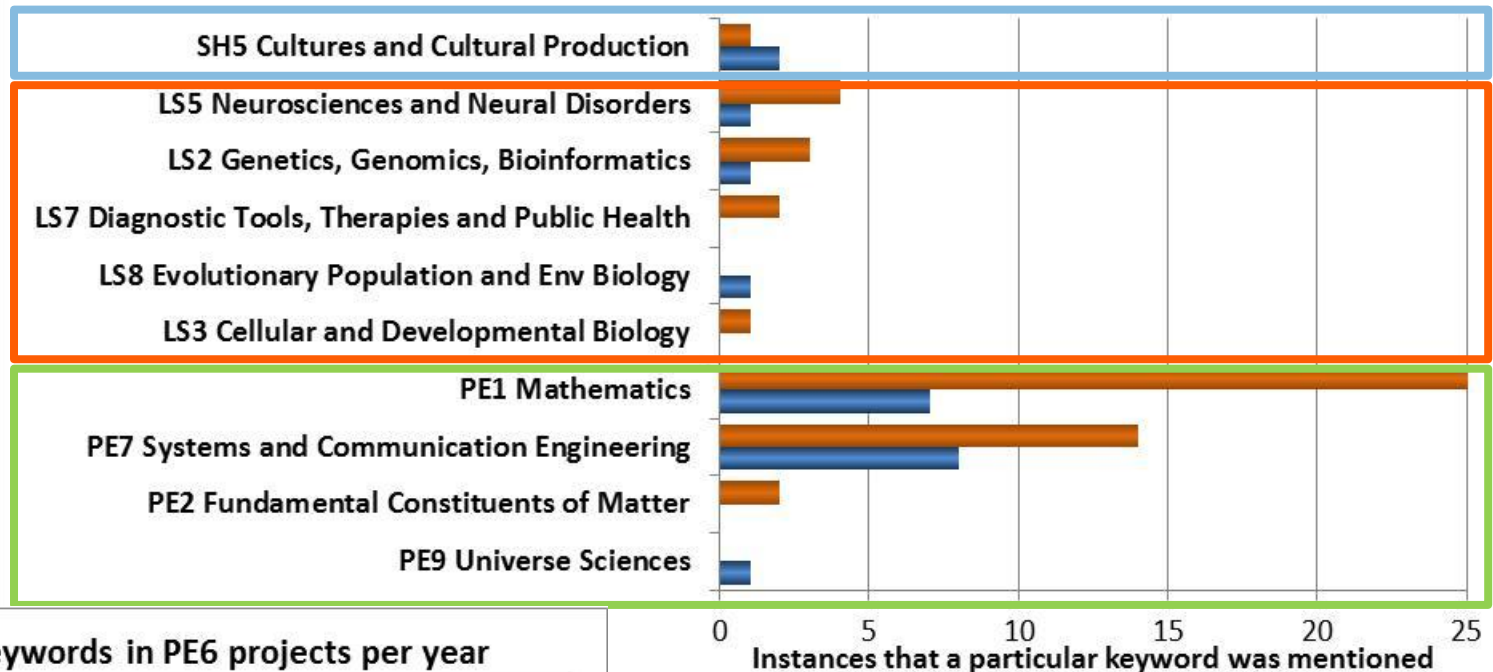


# PE6 funded projects are relevant to other domains

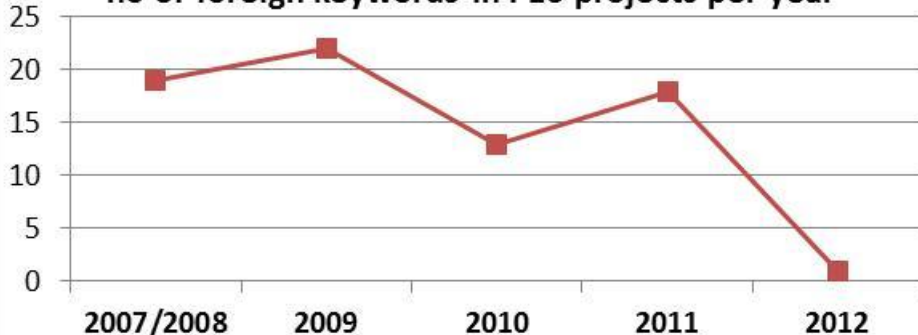
ERC Starting Grant 2007 – 2012

ERC Advanced Grant 2008 – 2011

Other fields mentioned in PE6 grants (all keywords)



no of foreign keywords in PE6 projects per year



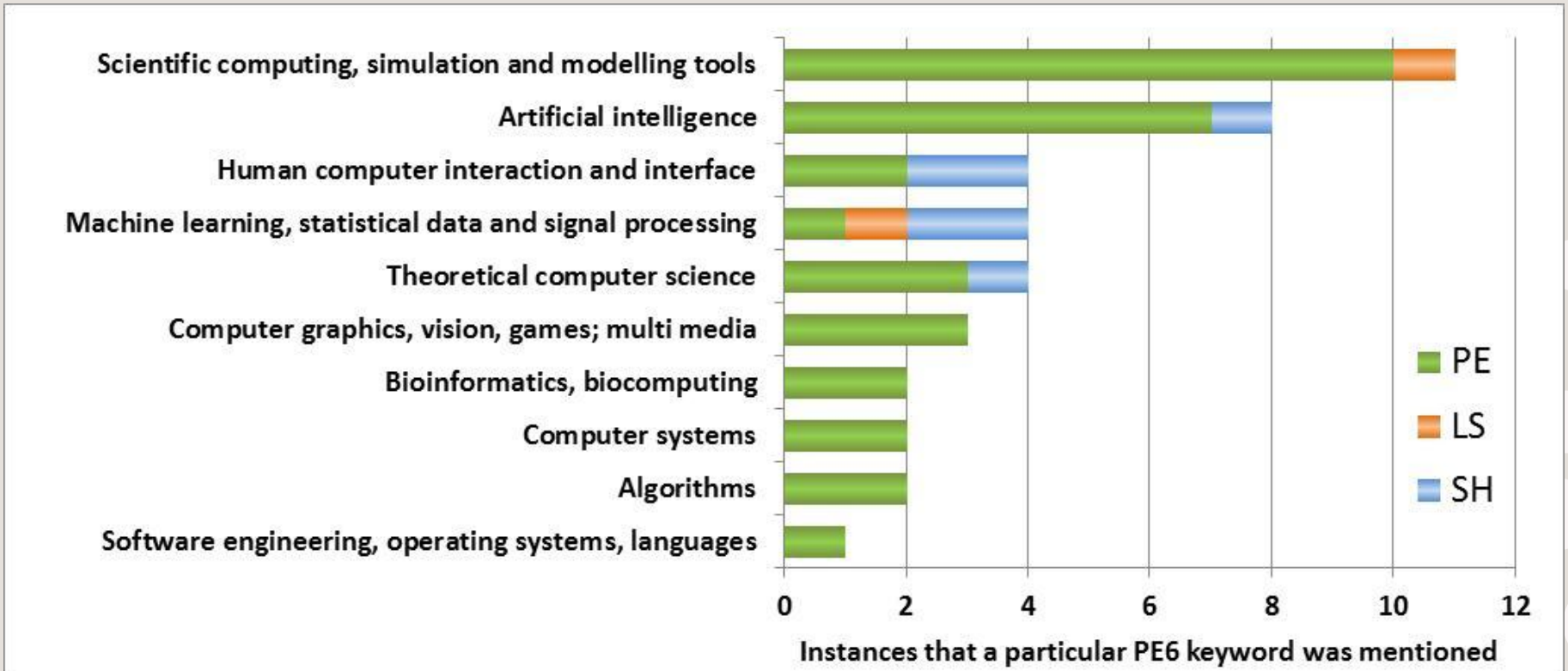
(only StG call in 2012)

# Projects funded in other areas have a computer science component



ERC Starting Grant 2009 – 2012 (Starting Grant 2007 not taken into account)  
ERC Advanced Grant 2008 – 2011

- CS keywords appear in 26 Starting and 15 Advanced grants from other panels



# Top host institutions in panel



## "Computer Science and Informatics"

ERC Starting Grant 2007 – 2012

ERC Advanced Grant 2008 – 2011

- at present **74** institutions host at least one ERC "CSI" grant
- 50% of grants in **13** institutions
- top host institutions:

Country	Host Institution	Total	StG	AdG
FR	National Institute for Research in Computer Science and Automatic Control	18	12	6
CH	Swiss Federal Institute of Technology Lausanne	10	6	4
FR	National Centre for Scientific Research (CNRS)	9	9	
IL	Technion - Israel Institute of Technology	7	6	1
CH	Swiss Federal Institute of Technology Zurich (ETH Zurich)	6	4	2
UK	University of Oxford	5	1	4
UK	University of Cambridge	4	3	1
UK	Imperial College	4	4	
AT	Institute of Science and Technology Austria	4	3	1
IL	Weizmann Institute	4	3	1

# Success rates per country of HI in panel "Computer Science and Informatics"

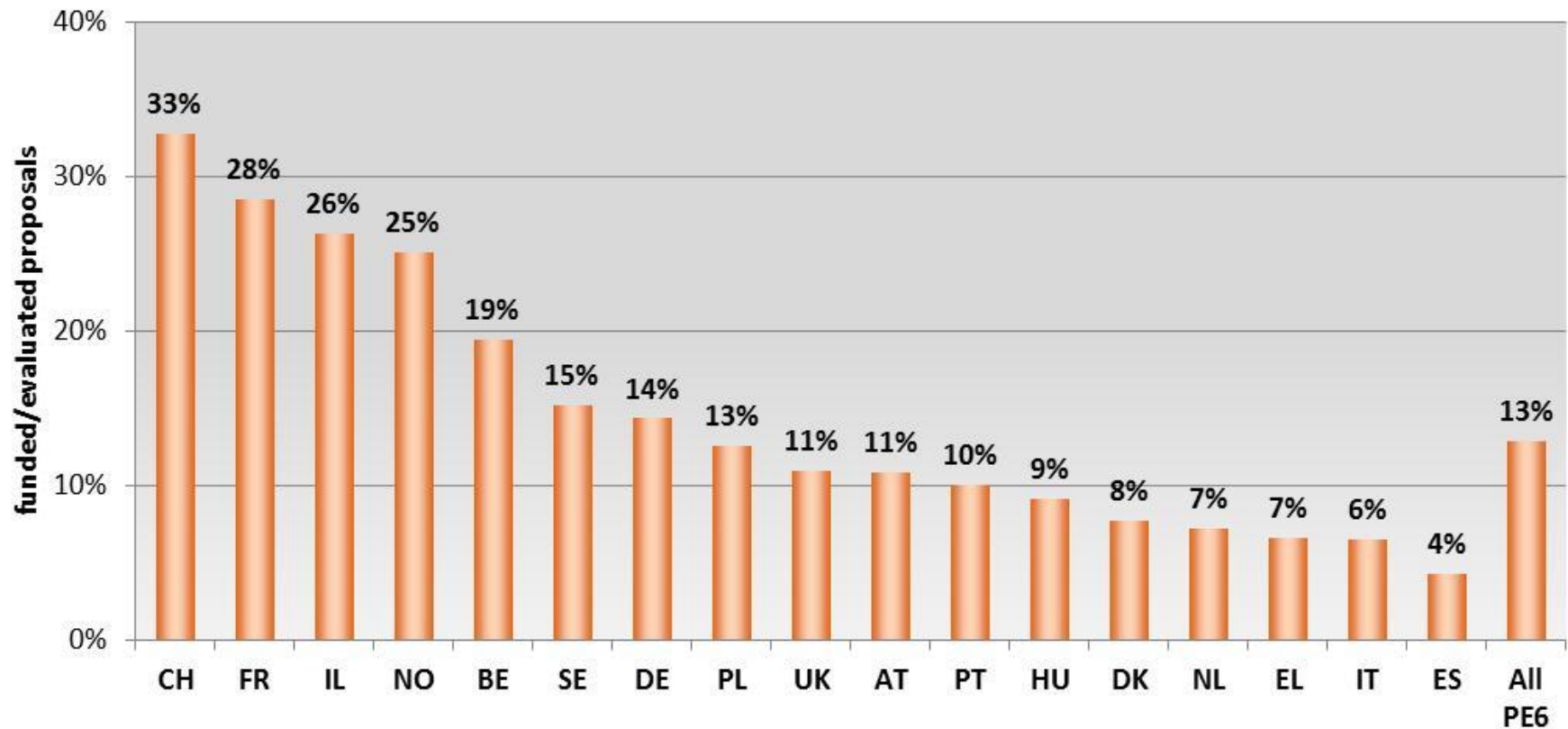
European Research Council



ERC Starting Grant 2009 – 2012 (StG2007 not taken into account)

ERC Advanced Grant 2008 – 2011

## Success rates per country of HI in panel PE6



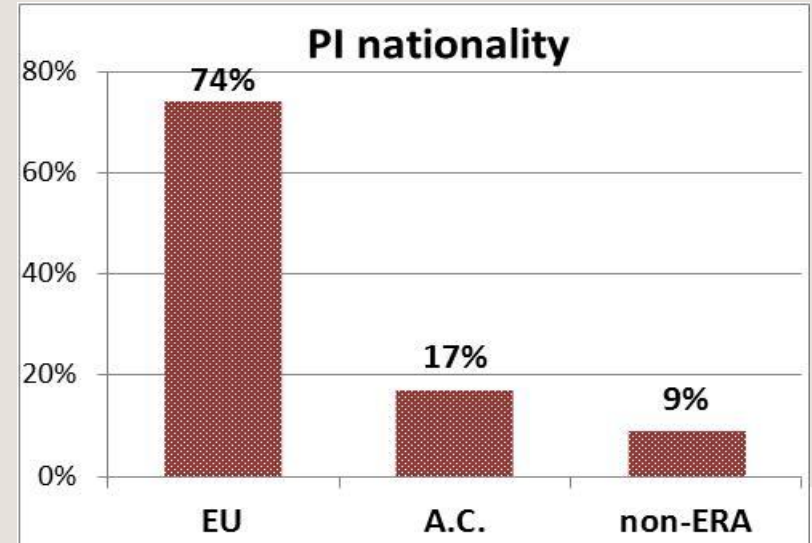
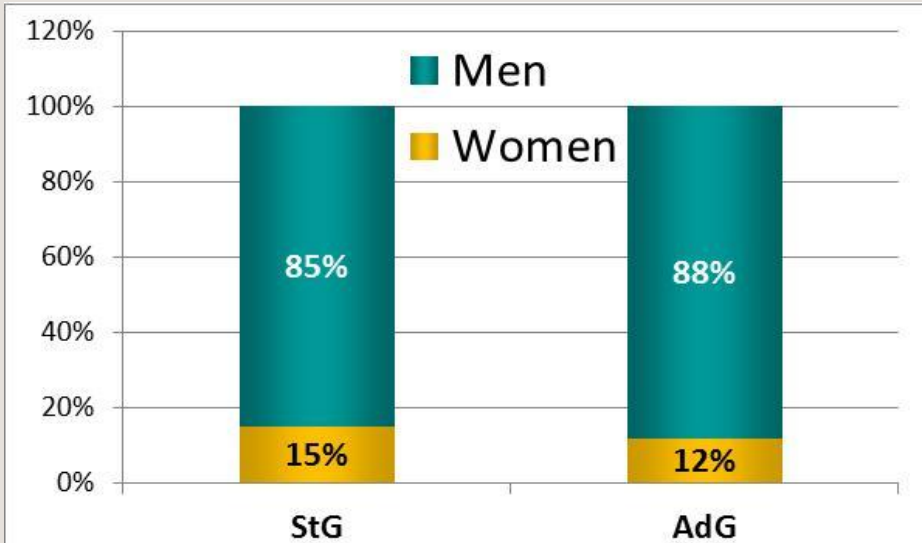


# Profile of ERC grantees in panel "Computer Science and Informatics"



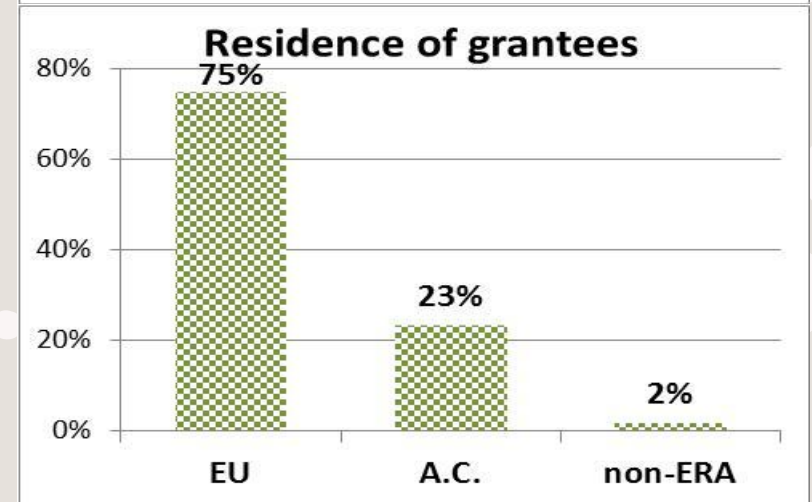
ERC Starting Grant 2007 – 2012

ERC Advanced Grant 2008 – 2011



➤ Share of women PIs in all PE grants:  
19% StG  
6% AdG

➤ Share of women PIs in all ERC grants:  
24% StG  
12% AdG



# Age of ERC grantees in panel

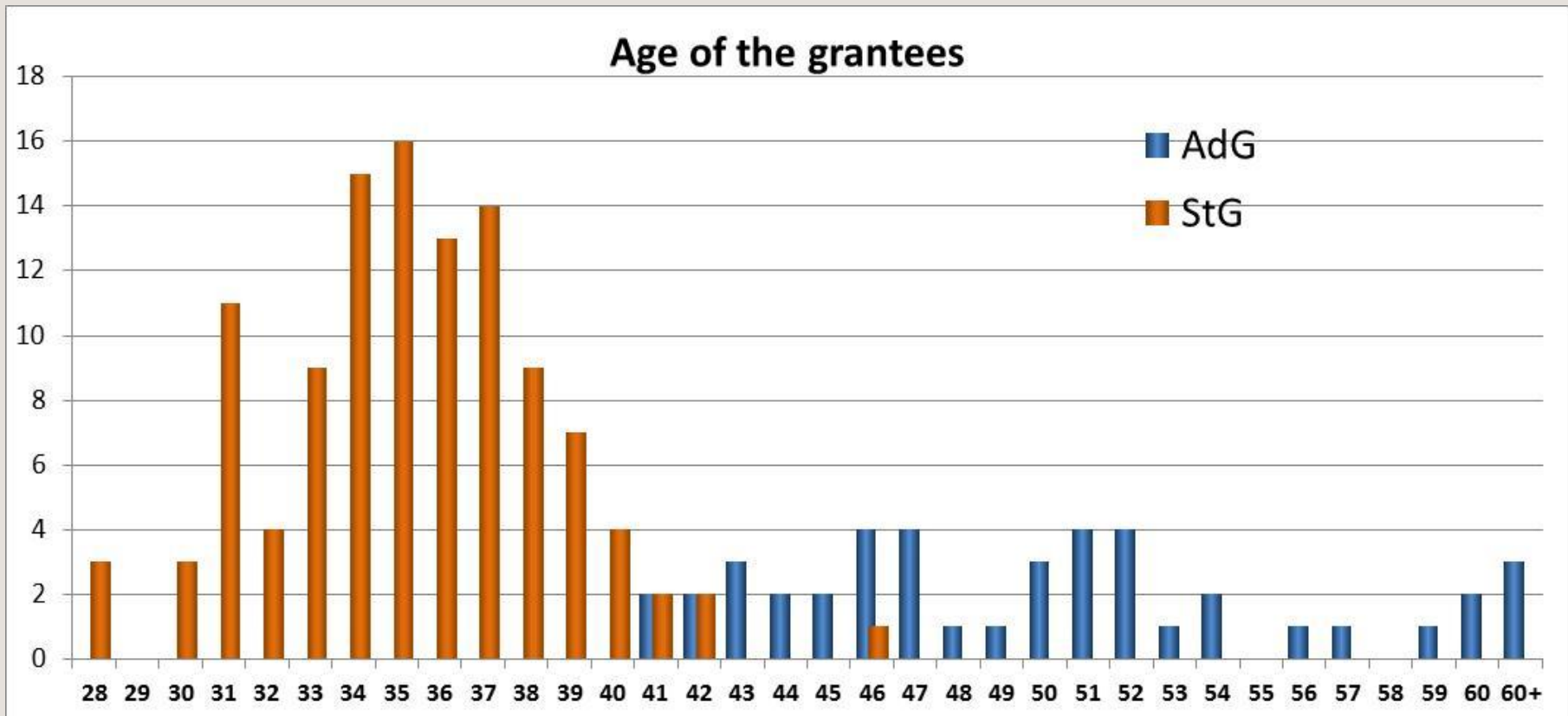


## "Computer Science and Informatics"

ERC Starting Grant 2007 – 2012

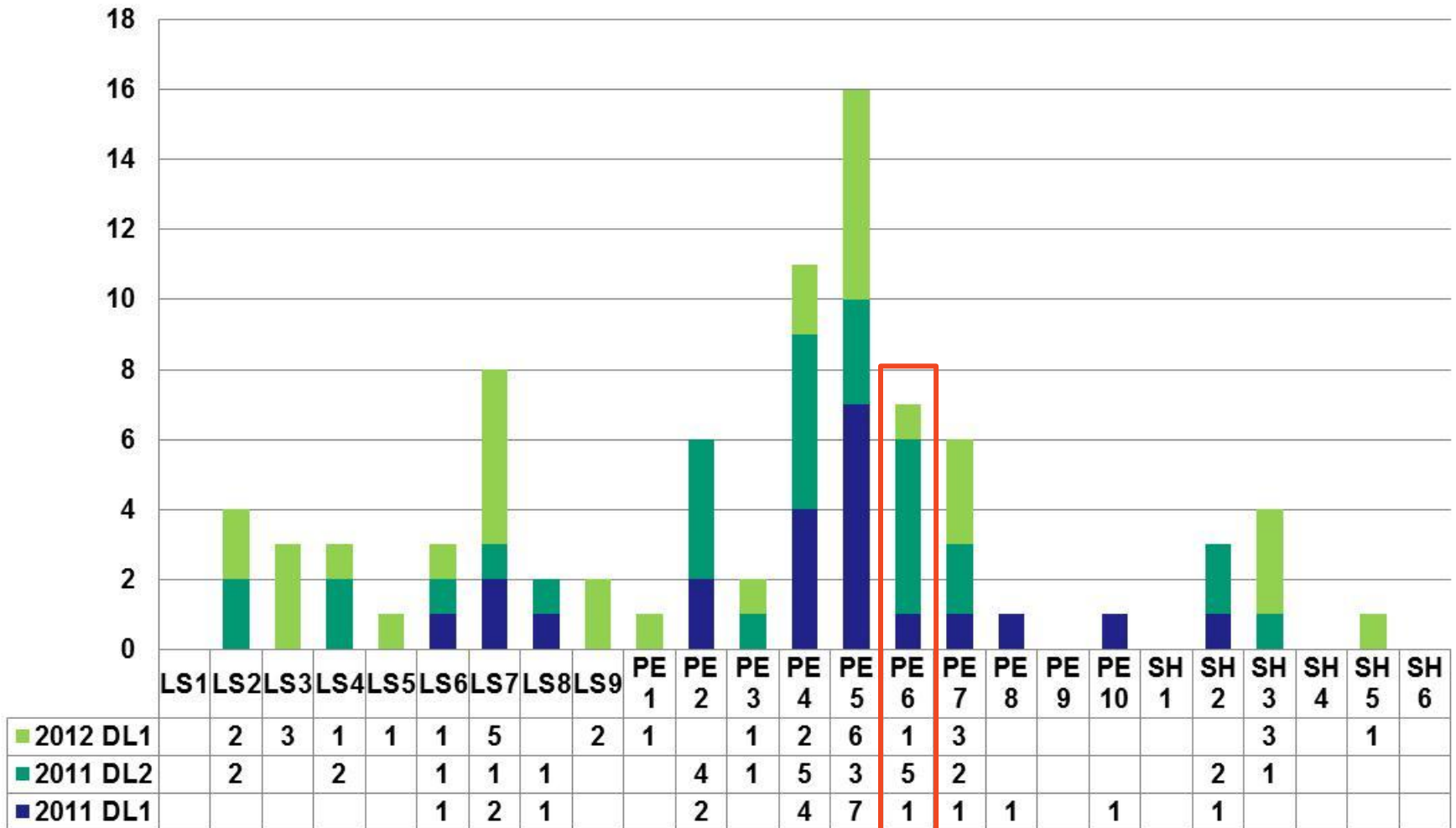
ERC Advanced Grant 2008 – 2011

- **68%** of PE6 grantees younger than 40 at the time of application
- Over all ERC grants **60%** of grantees were younger than 40 at the time of application



# Proof-of-Concept selected proposals

by panel of the original ERC grant

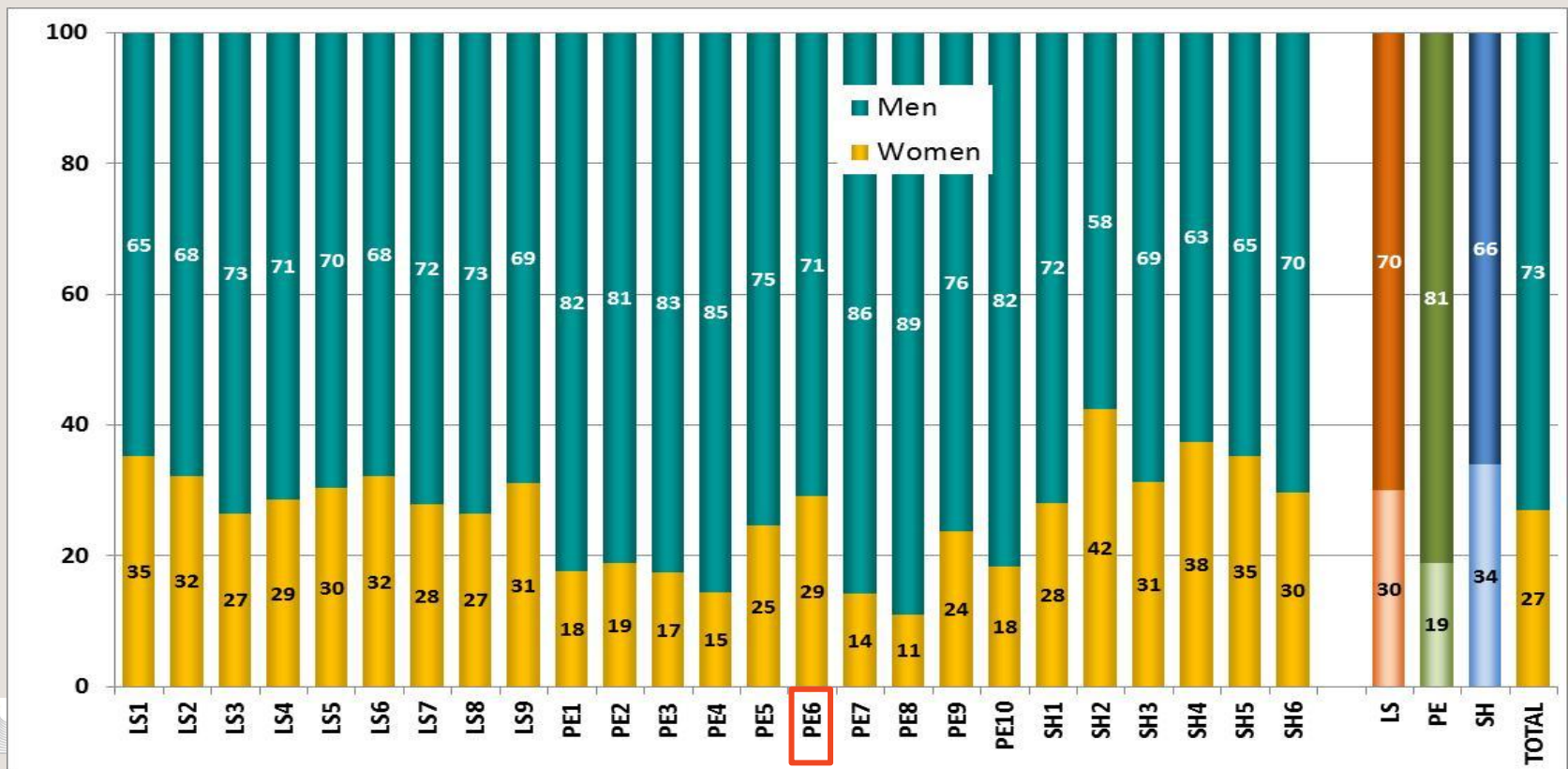


# Panel Members in PE6

## "Computer Science and Informatics"

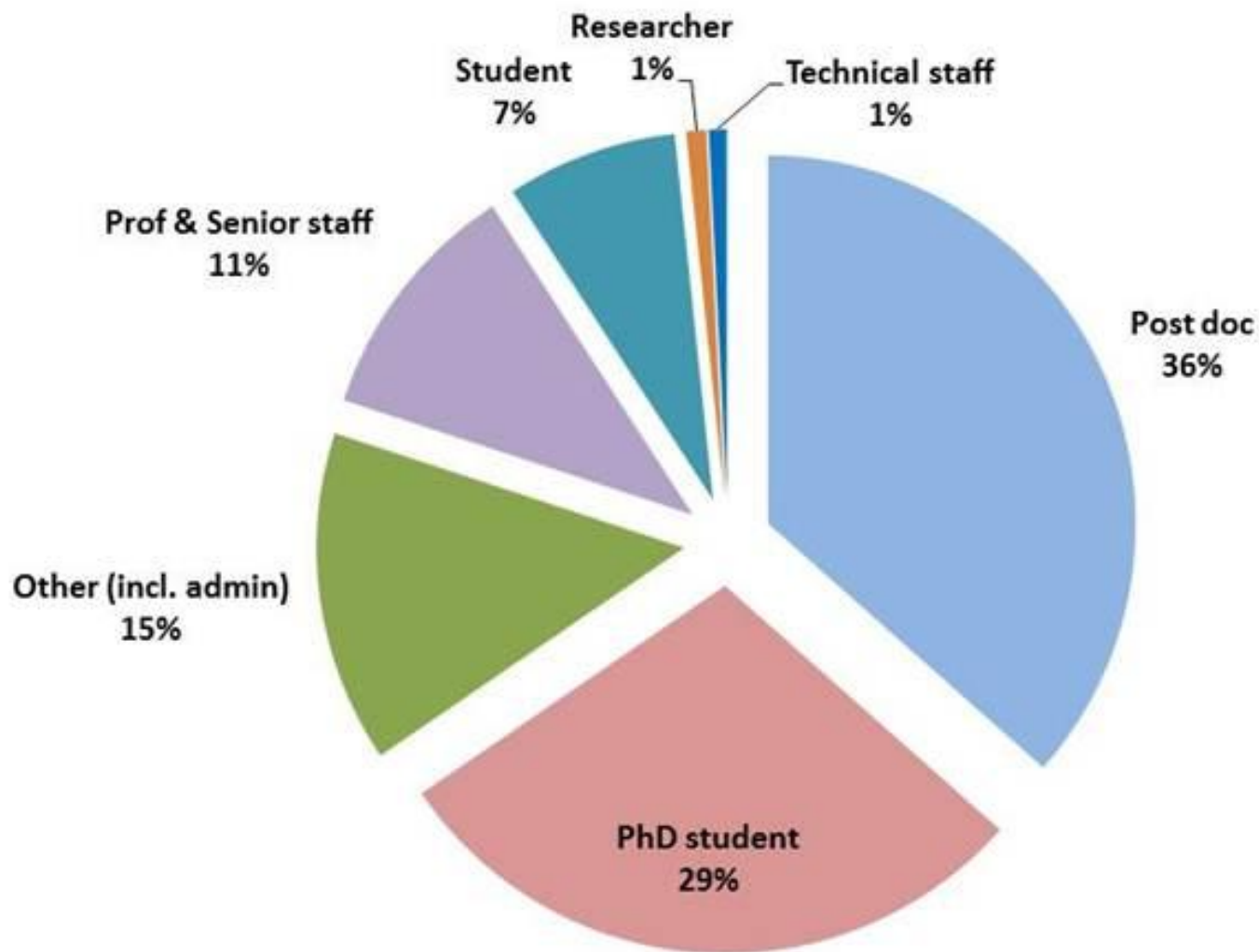
ERC calls 2008-2012 (StG2007 not included due to different panel structure)

- 30 evaluators used for AdG 2008-2012; 35 evaluators used for StG 2009-2012
- 21 nationalities among PE6 panel members (Europe, Israel, Canada, and USA)
- share of women evaluators higher than in the other PE panels



## Staff distribution by role

636 ERC projects, 3845 staff members, head count excluding PI



about 5500 PhD students and about 7000 post-docs are employed

# From Software Verification to Everyware Verification

Prof. Marta Zofia KWIATKOWSKA - UNIVERSITY OF OXFORD, UK



- Conventional hardware and software has evolved into ‘everyware’ – sensor-enabled electronic devices, virtually invisible and wirelessly connected – on which we increasingly often rely for everyday activities and access to services such as banking and healthcare.
- Ubiquitous computing must deal with the challenges posed by the complex scenario of communities of ‘everyware’, in presence of environmental uncertainty and resource limitations, while at the same time aiming to meet high-level expectations of autonomous operation, predictability and robustness.
- The central premise of the project is that there is a need for a paradigm shift in verification to enable ‘everyware’ verification, which can be achieved through a model-based approach that admits discrete and continuous dynamics, the replacement of offline methods with online techniques such as machine learning, and the use of game-theoretic and planning techniques.

# Computational models for the discovery of the world's music

Dr. Xavier SERRA – UNIVERSITY POMPEU FABRA, Spain



- Despite the world's richness in musical cultures, most of the research is centred on CDs and metadata of the western commercial music.
- This project wants to break this huge research bias. By approaching musical information modelling from a multicultural perspective it aims at advancing the state of the art while facilitating the discovery and reuse of the music produced outside the commercial context.
- The project will investigate some of the most consolidated non-western classical music traditions, Indian (hindustani, carnatic), Turkish-Arab (ottoman, andalusian), and Chinese (han), developing the needed computational models to bring their music into the current globalized information framework.

# Other projects in panel "Computer Science and Informatics" (I)

## Liberating Programming

**Prof. David HAREL - WEIZMANN INSTITUTE OF SCIENCE, Israel**

Advanced Grant 2008

## Domain-optimised parallelisation by polymorphic language embeddings and rewritings

**Prof. Martin ODERSKY - EPFL, Switzerland**

Advanced Grant 2010

## Listening to the Future: Next-generation Sound Synthesis through Simulation

**Dr. Stefan BILBAO - UNIVERSITY OF EDINBURGH, UK**

Starting Grant 2011

## Neural coding, specification, design and test of message passing neural machines

**Prof. Claude BERROU – INSTITUTE TELECOM, France**

Advanced Grant 2011



# Other projects in panel "Computer Science and Informatics" (II)

**Events, Causality and Symmetry - the next-generation semantics**

**Prof. Glynn WINSKEL - UNIVERSITY OF CAMBRIDGE, UK**

Advanced Grant 2010

**Cryptography and Complexity**

**Prof. Yuval ISHAI - TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY, Israel**

Starting Grant 2010

**Cryptographic Algorithms and Secure Hardware**

**Prof. François-Xavier STANDAERT – UNIVERSITY OF LOUVAIN, Belgium**

Starting Grant 2011

**Algorithmic Number Theory in Computer Science**

**Dr. Andreas ENGE - INRIA, France**

Starting Grant 2011

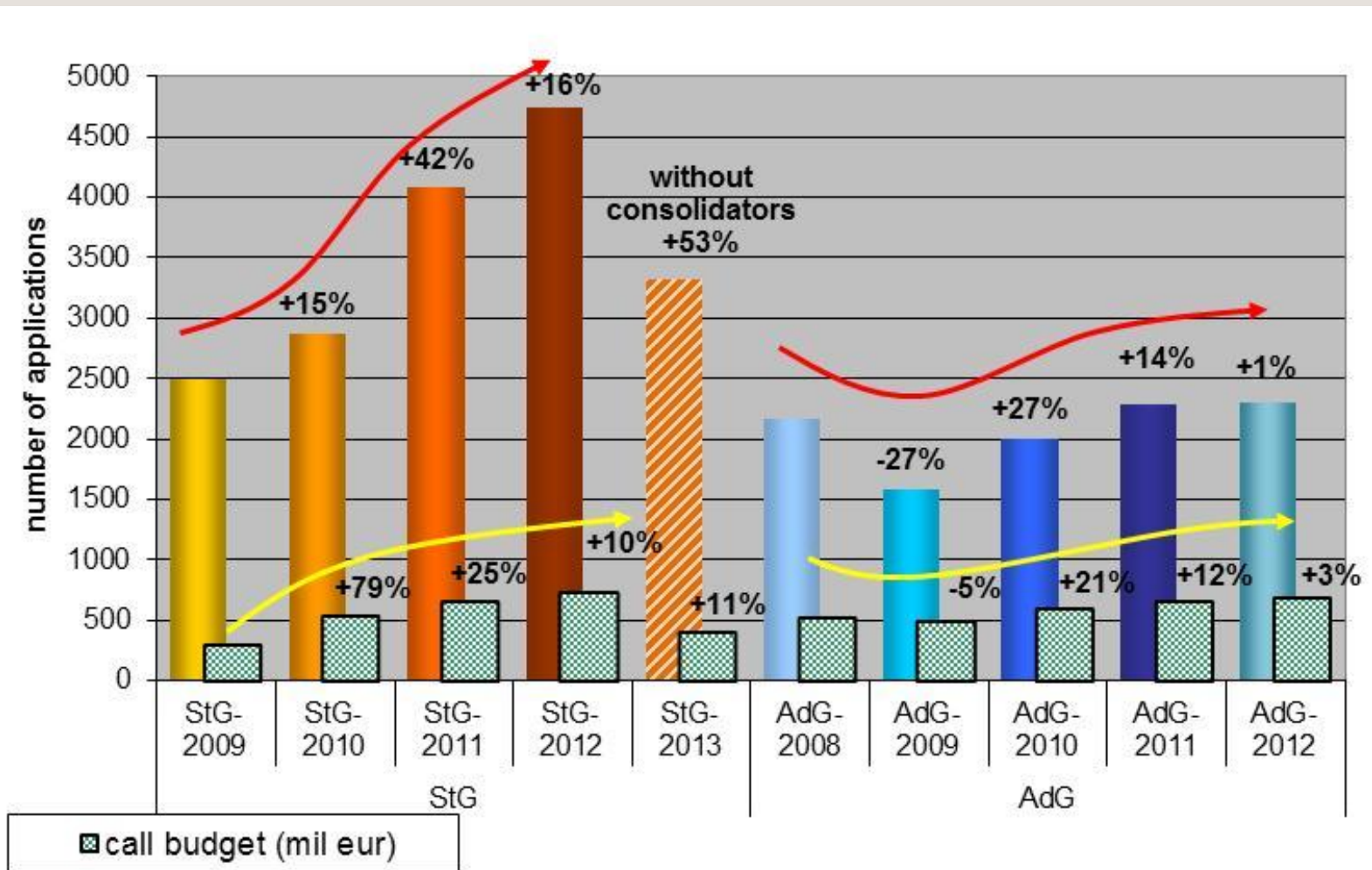


# The European Research Council

Prospects for the future



# Rising number of applications



# HORIZON 2020

- **HORIZON 2020** structure:
  - Excellence Science
  - Industrial leadership
  - Societal challenges
  - EIT
  - JRC
- **Excellent Science**: reinforcing and extending the excellence of the EU's science base and consolidating ERA to make EU's R&I system more competitive on a global scale
  - ✧ **European Research Council** (budget proposal under H2020: € 15 billion)
  - ✧ Future and Emerging Technologies
  - ✧ Marie Curie
  - ✧ Research Infrastructures

# H2020 : Timeline to approval

## EU Council

- PGA on H2020 Regulation at the Competitiveness Council 31.05.12
- PGA on Rules of Participation at the Competitiveness Council 10.10.12
- PGA on the Specific Programme and the Euratom proposal targeted at the Competitiveness Council 11.12.2012

## European Parliament

- EP Conference of Presidents decided that all EP reports under MFF (e.g. Horizon 2020) will not be adopted in Plenary until agreement is reached on Multiannual Financial Framework
- ITRE may vote on the Horizon 2020 package in October/November and then wait for vote in plenary

## MFF

- Special European Council (Heads of State / Government) has been arranged for 22-23 November to finalise the MFF

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