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Determinants of participation and potential benefits arising from the involvement of Greek organizations in EU-funded Framework Programmes

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EU-funded Framework Programmes (FPs)

- Funded programmes created by the EU to strengthen research in the European Research Area which is a “single borderless market for research innovation and innovation and technology across the EU” (EU, 2021).
- Basic pillars of European scientific and technological development, integration and cohesion since 1984
  - supporting all kinds of R&D, mainly in high technology sectors
  - favoring the participation of various organizations from different European countries
  - cultivating a sense-culture of a common European research policy in science and technology
- Project funding is allocated on a competitive basis (relevance, scientific excellence, potential impact, quality of consortium, quality of management etc.)

FPs: Evolution of rationale, priorities and budget

	Periods-budget (billion of €)	Emphasis of rationale	Main priorities	New actions
Before	1975-1983	Ad hoc basis	Fragmented	-
FP1	1984-1987 3.8	Supply or technology oriented: main aim to promote industrial competitiveness (technological catch up with global competitors)	Energy and ICT oriented	Environment, international cooperation human capital and mobility
FP2	1987-1991 5.4	Information Society	ICT oriented	Biotechnologies, marine resources, dissemination
FP3	1991-1994 6.6	Industrial competitiveness	Multiple priorities	
FP4	1994-1998 13.2	**Knowledge diffusion-oriented, increase of learning skills and knowledge**	Multiple priorities	Transport and social sciences
FP5	1998-2002 13.7	Shift towards the needs of the community and its citizens	Multiple priorities	Nanotechnologies
FP6	2002-2006 17.9	**Integration of research efforts by creating European Research Area** (ERA)	Multiple priorities	New instruments
FP7	2007-2013 50.5	Extension of the scope of the FP towards exploratory research and innovation activities	Multiple priorities	Security
Horizon 2020 (FP8)	2014-2020 77	Focus on excellence, industrial competitiveness and addressing grand societal challenges	Multiple priorities	Social challenges: health, food security, energy, transport, climate and environment, inclusive and secured societies
Horizon Europe (FP9)	2021-2027 95.5	Strengthen ERA, tackle policy priorities and sustainable development goals, boost innovation uptake, competitiveness and jobs	Multiple priorities	Research and innovation "missions" to tackle cancer, climate change, polluted oceans, and soil

The Greek case

- Long standing and solid presence in the EU-Funded FPs
  - Ranges between the 7th and 10th position among EU28 in terms of participations (1984-2020)
- Greek universities and research centers have acquired a significant role in the resulting research networks (Caloghirou and Protogerou, 2009; Protogerou et al., 2010; Siokas, 2014; Caloghirou et al., 2021)
- Competitive EU funding accounted for 10-12% of the total R&D expenditure in the country during the last seven years (Caloghirou et al., 2021)
- Main benefits from the participation in FPs are mainly knowledge creation and training improving the R&D quality in Greek and private sector organizations .
- However, absence of links for knowledge diffusion and innovation deployment among organizations holding prominent positions in EU-funded research networks and regional institutions (Protogerou, 2010; Rand, 2011; Caloghirou et al., 2021). No interconnection of EU-funded research with national priorities (EC, 2019).

The NetonKIE research project

Aims to

- explore the participation and role of the Greek organizations (universities, research centers, other public organizations and businesses) in the collaborative research networks for more than 35 years (1984-2020)
- the participation determinants of Greek organizations and how they benefit from their presence in the networks as well as the wider developmental impact of FPs (e.g., strengthening the national/regional propensity to innovate, upgrade
- the role of the young knowledge-intensive firms in these networks and the effect of their participation in their performance and evolution

Using multilevel analysis (country level, organizational level) and complementary research methods (social network analysis, survey work, expert views and secondary desk research) mainly focusing on Greece.

The aim of this paper is

to explore the impact resulting from the participation of Greek organizations in the FPs using a large-scale survey among Greek participants in the Horizon 2020

- capturing the determinants behind Greek participation
- potential benefits arising from their involvement in terms of scientific impact, economic and innovation impact (including the potential of EU-funded research collaborative networks in fostering knowledge-intensive entrepreneurship-KIE), as well as networking and social impact.

Focus on two types of benefits-impacts

- tangible scientific, innovation and economic outputs, e.g., patents, publications, prototypes, new products, processes and services, as well as the direct increase in business revenues, productivity and employment, and the creation of new firms / spin-offs (output additionality).
- development and enhancement of critical organizational resources and capabilities that can lead to tangible benefits at a later stage (human capital and technological knowledge, reputation and market access, building of permanent relationships and networking, and improvement of research, technological, learning and project management capabilities (outcome-behavioral additionality).

Methodology

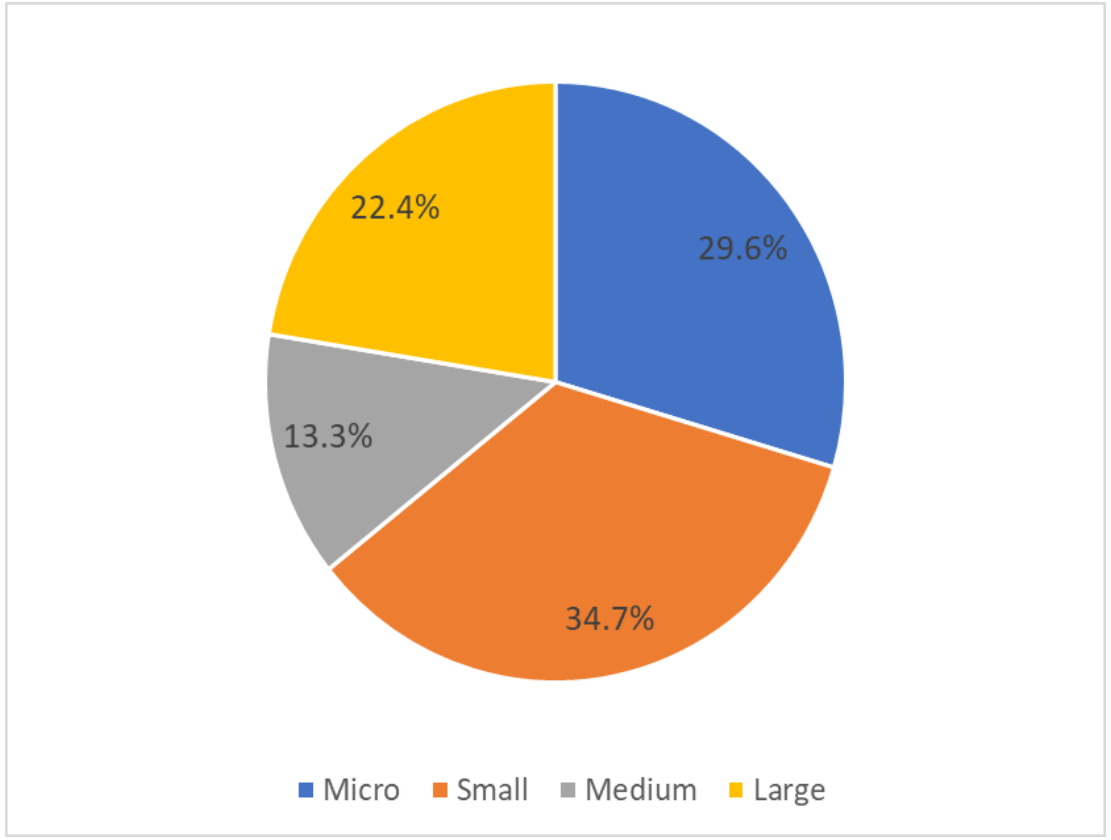
- An online survey was conducted between February and July 2022 in 261 organizations: 101 business firms and 159 research groups in universities and research centers which had participated in Horizon 2020
- Main survey instrument: two structured questionnaires (firm and university/research center version) completed by

  a) the R&D manager or the owner/founder of the firm,

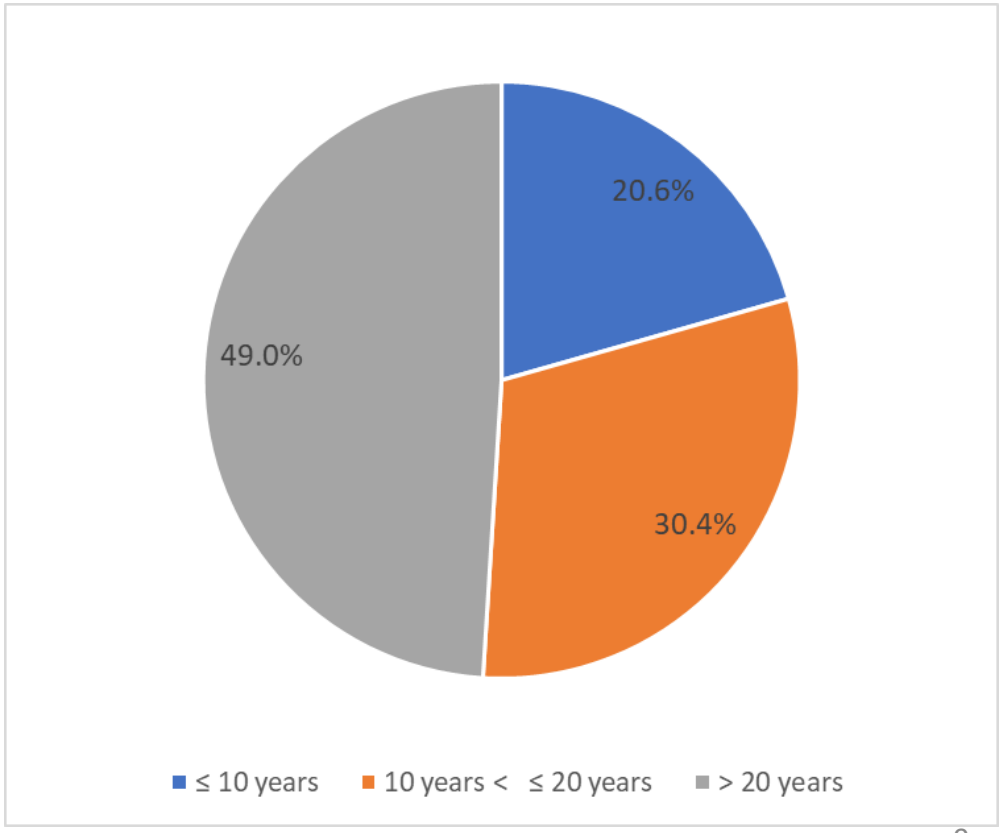
  b) the research group member with the scientific responsibility of an EU-funded research project.
- The data collected aim at the determinants behind Greek participation, the obstacles/problems inhibiting participation, potential benefits and impact arising from their involvement in EU-funded projects, value added of EU funded projects compared to nationally funded ones.

Sample Characteristics (Firms)-->Mainly micro firms and SMEs (48%), only 20.6% are young firms

Size



Age



Sample Characteristics → Research Groups in universities and research centres

	Survey Sample		
	Number of Research Groups	% of the total sample	Number of Organizations
Universities	112	70.4%	16
Research Centres	47	29.6%	11
Total Sample	159	100%	27

Sample Characteristics (Research Groups)→EU-funded projects are significant funding sources for both universities and research centers

Size of research groups

	Valid N	Mean	Median	Min	Max
Universities	110	17.6	12	3	150
Research Centres	46	19	10	3	159
Total	158	18	12	3	159

Funding sources for research activity within the last 5 years

	Total		Universities		Research Centres	
	Valid N	Mean	Valid N	Mean	Valid N	Mean
EU-funded project	152	**66.6**	108	**68.8**	42	**60.5**
National project	152	22.4	108	19.8	42	29.1
Cooperation with firms or other entities for service provision etc.	152	8.9	108	9.6	42	7.4
Regular budget of the University or Research Centre	152	2.1	108	1.8	42	2.9

Motives for participation in FPs-->access to funding, enhancing research activity in cutting-edge fields most important motives for research groups, acquisition of new knowledge, monitoring technological developments and networking most significant participation motives for businesses

Firms

	Valid N	High Extent (% of Firms)	Mean (5-point scale)
Access to funding	101	84.2%	4.26
R&D cost and risk sharing	100	56%	3.50
Monitoring key technological developments / cutting edge technologies	101	84.2%	4.38
Strengthening existing / creation of new know-how	101	**95.1%**	4.57
Faster development and market introduction of new products/services	101	63.3%	3.78
Entering a new market / improving the company's position in an existing market	101	71.3%	3.84
Networking and building solid cooperation	101	**87.1%**	4.27

Research Groups

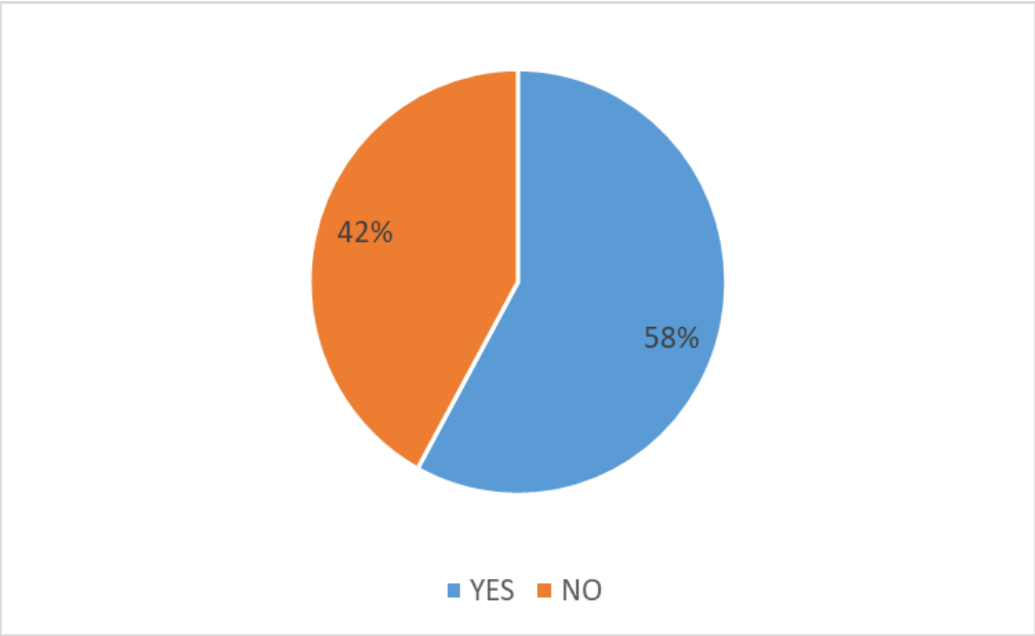
	Valid N	High Extent (% of Firms)	Mean (5-point scale)
Research activity and monitoring developments in cutting-edge fields	158	**94.3%**	4.64
Maintaining and strengthening human recourses	157	93%	4.64
Enhancing of technological technological infrastructure	156	56.4%	3.67
Strengthening scientific reputation	158	88%	4.46
Networking and building solid cooperation	158	90.5%	4.51
Access to funding	157	**97.5%**	4.78
Producing research results that could lead to commercially viable products/services	156	52.6%	3.50
Ad-hoc or permanent cooperation with the Greek diaspora	151	37.1%	2.97

Motives for participation in FPs (Firms)→Access to funding, entering to new markets, and faster product development is more important for micro/small firms while for larger firms monitoring key technological developments and acquiring new know-how are prevalent. The same applies for younger sample firms compared to older ones

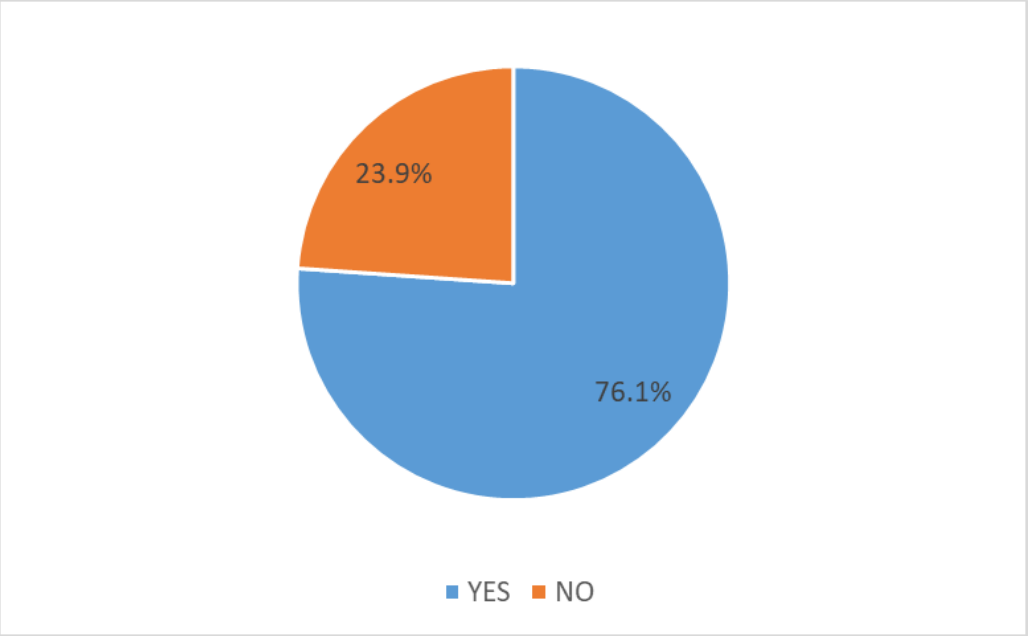
	Micro/Small firms			Medium/Large firms			Younger firms (≤ 20 years)			Older firms (> 20 years)		
	Valid N	High Extent (% of Firms)	Mean (5-point scale)	Valid N	High Extent (% of Firms)	Mean (5-point scale)	Valid N	High Extent (% of Firms)	Mean (5-point scale)	Valid N	High Extent (% of Firms)	Mean (5-point scale)
Access to funding	62	**90.3%**	4.48	35	74.3%	3.83	52	89.5%	4.44	49	79.6%	4.06
R&D cost and risk sharing	61	63.9%	3.64	35	42.9%	3.29	51	49%	3.41	49	63.3%	3.59
Monitoring key technological developments / cutting edge technologies	62	79.1%	4.29	35	**91.5%**	4.51	52	76.9%	4.27	49	**91.8%**	4.49
Strengthening existing / creation of new know-how	62	91.9%	4.50	35	**100%**	4.69	52	92.3%	4.56	49	**98%**	4.59
Faster development and market introduction of new products/services	62	**67.7%**	3.87	35	57.1%	3.63	52	**73.1%**	4.00	49	53.1%	3.55
Entering a new market / improving the company's position in an existing market	62	**80.7%**	4.02	35	54.2%	3.51	52	**82.7%**	4.13	49	59.2%	3.53
Networking and building solid cooperation	62	90.3%	4.29	35	82.8%	4.26	52	90.4%	4.31	49	83.7%	4.22

Previous cooperation with at least one of the consortium partners is important for entering a new project especially for research groups→ for most firms (77.3%) and research groups (77.5%) the context of previous cooperation is an EU-funded project

Firms
(N = 100)



Research Groups
(N = 159)



Basic role in the research project: Firms are mainly involved in the trial use of research results and applied research and development, while they are also technology providers (young KI firms). Research groups are involved more than firms in both basic and applied research and the development of new technologies. Both actors are involved in the dissemination of activities to the general public following recent EU policy for increasing the social impact of projects.

	Firms		Research Groups	
	Valid N	%	Valid N	%
Conducting basic research	90	23.3%	159	**54.7%**
Conducting applied research	95	67.4%	157	**79.6%**
Development of new technology/know-how	96	62.5%	158	69%
Trial use of research results/technology produced	94	**80.9%**	158	62%
Provision of technological services	93	45.2%	157	29.3%
Provision of other services	92	37%	157	20.4%
Provision of education/training	91	31.9%	157	42.7%
Dissemination-communication of project results to the general public (institutional bodies, society)	97	**60.8%**	156	**71.2%**

Scientific and technological outcome resulting from participation in the project:

Research groups evaluate higher than firms this type of impact. For firms, most significant impact is upgrading human resources and improving R&D and technological capabilities. For research groups, improvement of research experience and human resources, acquisition of new knowledge and enhancement of multidisciplinary research collaborations are prevailing.

Firms

	Valid N	High Extent (% of Firms)	Mean (5-point scale)
Improvement of the company's research equipment	98	41.8%	2.91
Upgrading the company's human resources (knowledge and skills).	99	**73.7%**	3.89
Improving the company's technological capability	98	55.1%	3.43
Improving the company's capability to conduct R&D	98	57.2%	3.57
Undertaking a higher-than-usual risk-taking research effort	98	37.7%	3.03
Entering a new enabling technology	99	51.5%	3.36
Creation of a research group to address a specific problem	95	37.9%	2.94

Research Groups

	Valid N	High Extent (% of Research Groups)	Mean (5-point scale)
Creation or significant improvement of research infrastructure	152	38.1%	2.83
Improvement of research experience and cooperation skills	156	88.5%	4.42
Attraction of PhD students and post-doctoral researchers	153	73.9%	4.03
Acquisition of new knowledge in a familiar research field	158	84.1%	4.27
Involvement in a new research field	152	61.2%	3.66
Increase of multidisciplinary research collaborations	154	81.1%	4.23
Improvement of educational activiities	148	42.6%	3.11

Innovation output of the research project: the majority of projects lead to a product and/or service innovation, however, more half of them also result in process and/or organizational innovation

Firms

	Valid N	% of Projects		
		YES	NO	Not a deliberate output
Product Innovation	101	52.5	12.9	34.7
Service Innovation	101	59.4	16.8	23.8
Product and/or Service Innovation	101	**78.2**	6.9	14.9
Process Innovation	101	49.5	19.8	30.7
Organizational Innovation	101	33.7	29.7	36.6
Process and/or Organizational Innovation	101	**59.4**	19.8	20.8

Research Groups

	Valid N	% of Projects		
		YES	NO	Not a deliberate output
Product Innovation	159	49.7	11.9	38.4
Service Innovation	159	53.5	11.3	35.2
Product and/or Service Innovation	159	**71.1**	5.7	23.3
Process Innovation	159	36.5	21.4	42.1
Organizational Innovation	159	32.1	22.6	45.3
Process and/or Organizational Innovation	159	**54.7**	17.6	27.7

Innovation utilization→ commercial exploitation appears to be larger among firms than research groups, especially in terms of using innovations internally to develop other products/services/processes.

Firms

Innovation Type	Utilization of Innovation	Valid N	% of Firms
Product and/or Service Innovation	has already been commercially exploited by the company	78	25.6
	has already been used internally by the business (to develop other products/services based on the know-how produced)	75	65.3
Process and/or Organizational Innovation	has already been commercially exploited by the company	56	17.9
	has already been used internally by the company to improve its operation	53	52.8

Research Groups

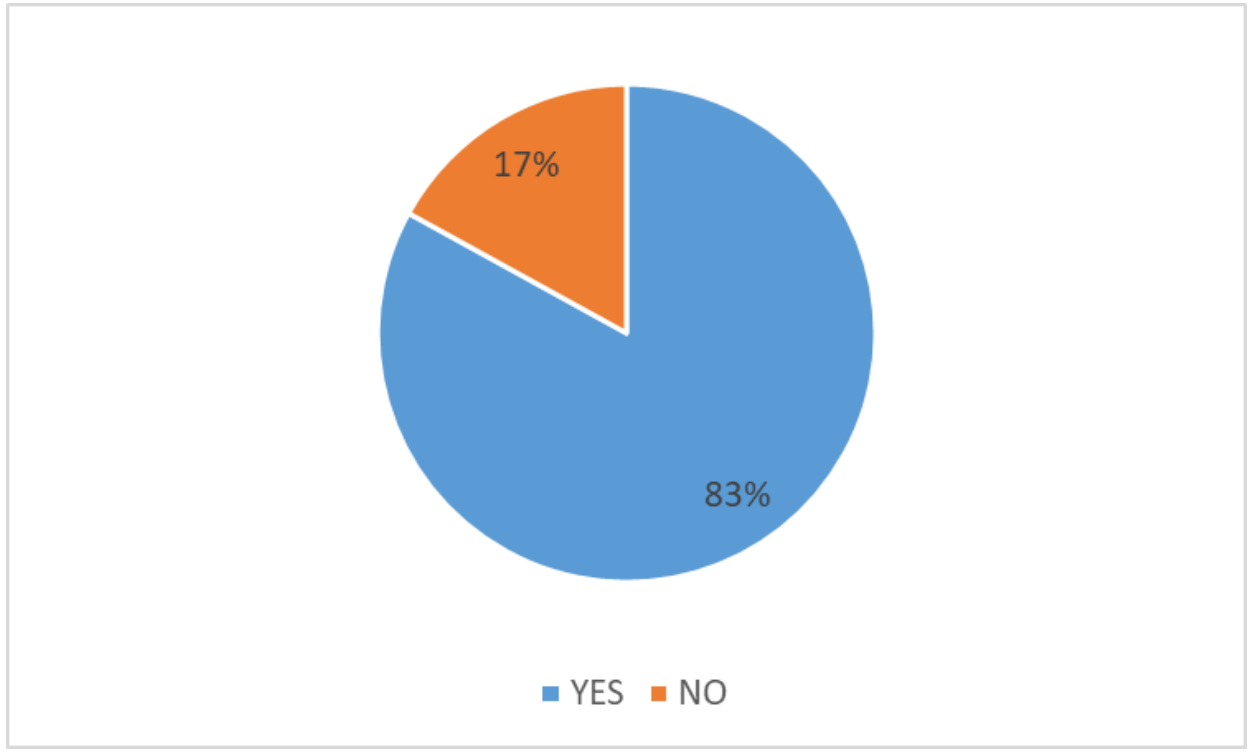
Innovation Type	Utilization of Innovation	Valid N	% of Research Groups
Product and/or Service Innovation	already commercially exploited by your research group	110	11.8
	has already been commercially exploited by other project partners	101	21.8
Process and/or Organizational Innovation	already commercially exploited by your research group	82	17.1
	has already been commercially exploited by other project partners	76	25

Economic, production and business benefits from firms' participation in the project→ improved quality of products, services and processes prevails (in accordance with innovation use), followed by R&D cost savings

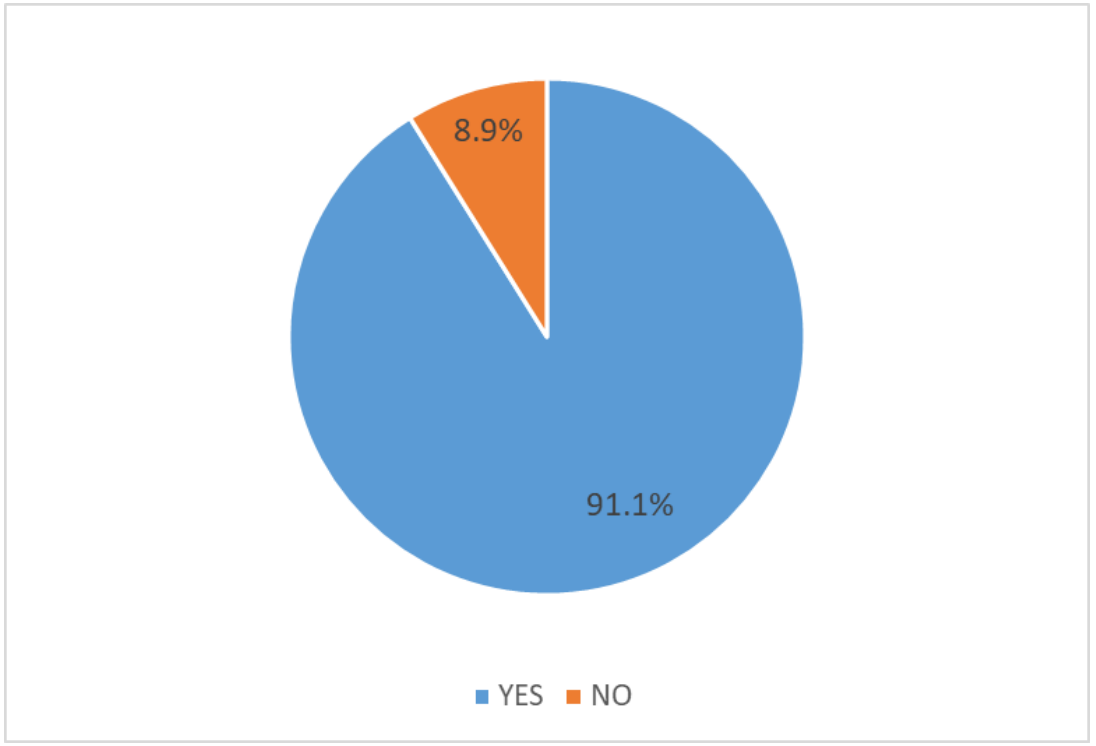
	Valid N	% of Firms	
		High Extent	Not Applicable
Improved quality of products, services or processes	97	**56.7%**	7.2%
Productivity increase	98	26.5%	25.5%
Revenue growth (increase)	98	28.6%	15.3%
Employment growth (increase) (after the end of the project, retention of employees hired during the project)	97	29.8%	19.6%
R&D cost savings	98	**35.7%**	12.2%
Production cost savings	98	15.3%	26.5%
Market share increase	98	9.2%	23.5%
New customers attraction	98	25.5%	18.4%
Exports' increase	97	10.3%	33%

Creation of new essential cooperation with other entities resulting from the research project→ Most firms and research groups developed new collaborations as a result of their participation in the specific research project

Firms (N = 100)

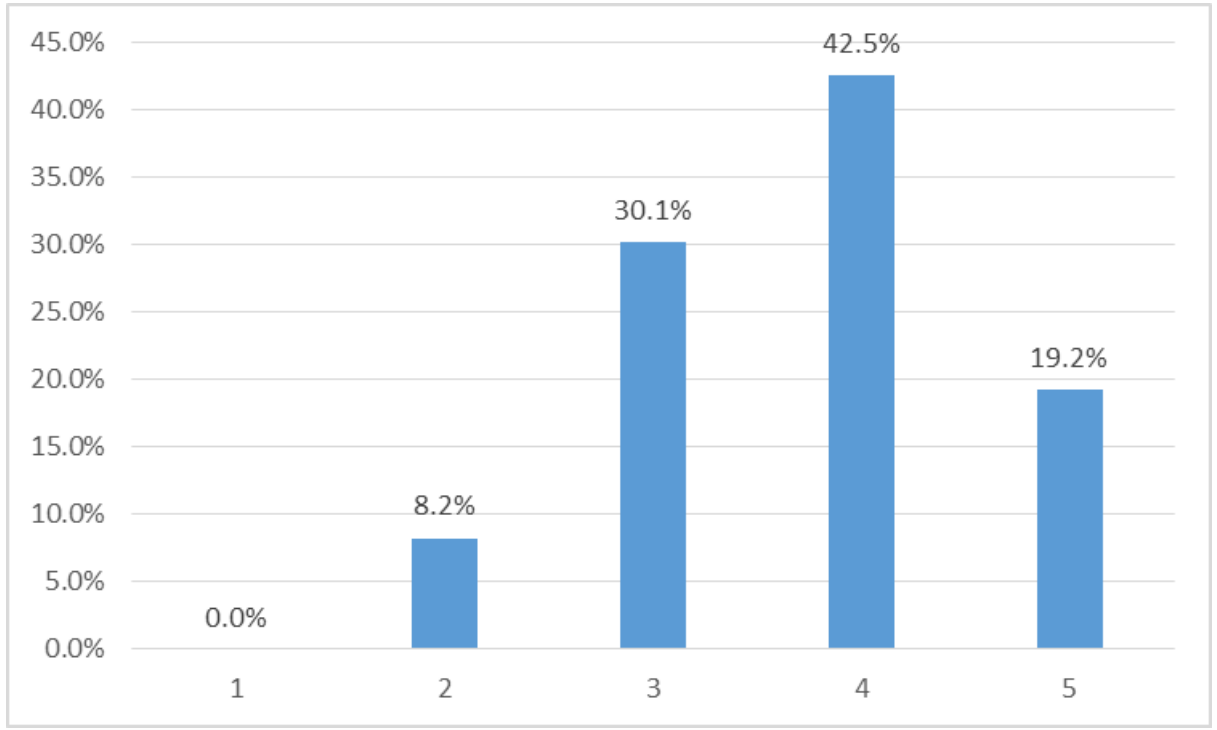


Research Groups (N = 157)

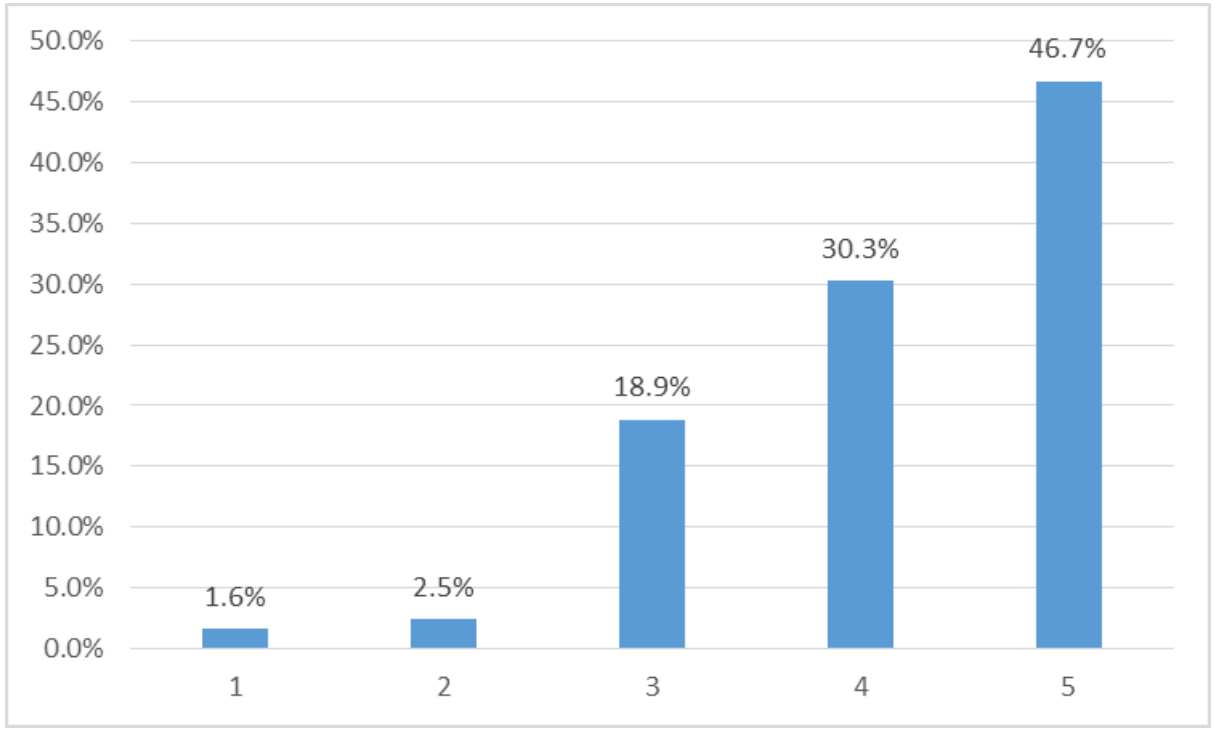


New collaborations developed in the context of the specific project have been maintained or strengthened after the project's completion (to a high or very high extent) for both firms (61.7%) and especially research groups (77%)

Firms (N = 73)



Research Groups (N = 122)

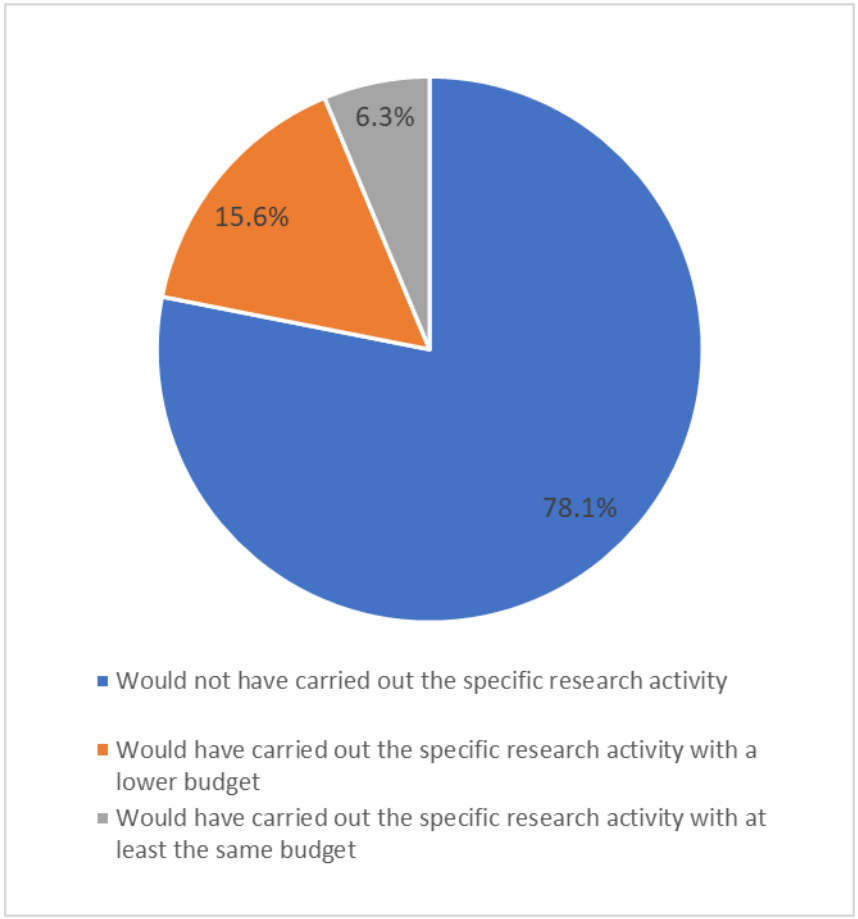


Social and environmental project impact → multiple challenges addressed as projects belong to diverse technological areas

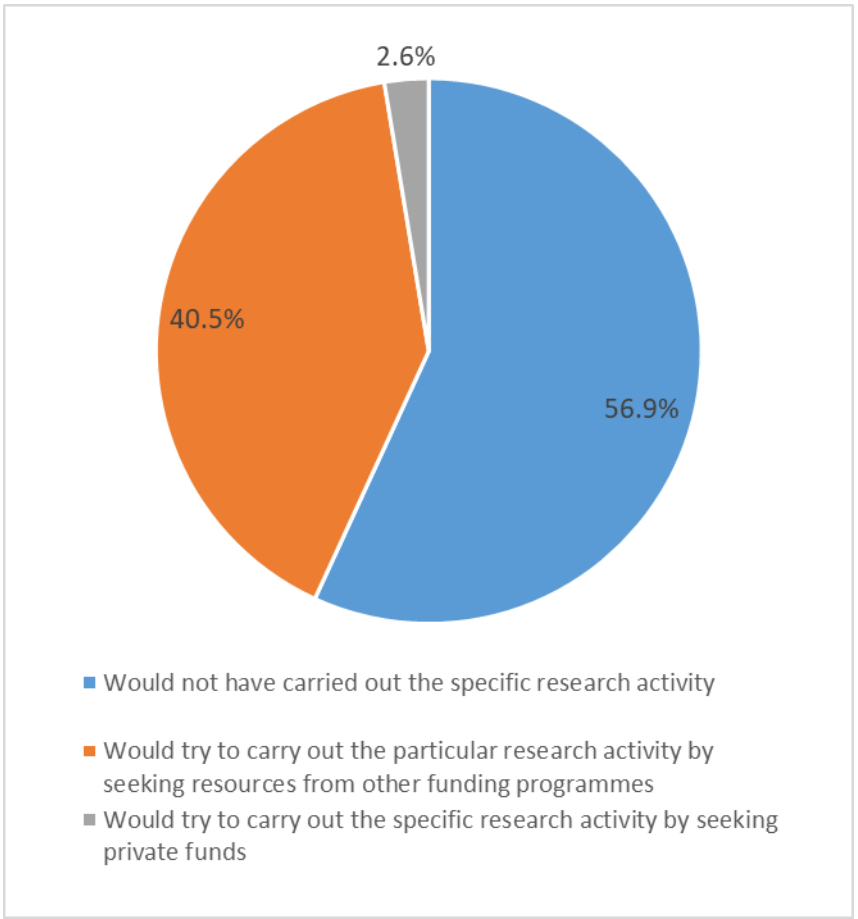
	FIRMS				RESEARCH GROUPS			
	Valid N	% Projects			Valid N	% of Projects		
		YES	NO	Not Applicable		YES	NO	Not Applicable
Protecting health, enhancing well-being and dealing with demographic changes	97	34.0	11.3	54.6	139	38.8	20.9	40.3
Food security / sustainable agriculture, livestock, forestry and fisheries	96	18.8	19.8	61.5	138	26.1	29.7	44.2
Clean, efficient and safe energy	98	29.6	18.4	52.0	142	26.8	31.7	41.5
Improving the efficiency of resources (natural, human, technological, etc.)	97	49.5	13.4	37.1	143	53.8	20.3	25.9
Strengthening the security of technologies	98	41.8	16.3	41.8	139	33.1	27.3	39.6
Development of tools to support or monitor sustainable development	96	36.5	20.8	42.7	142	38.7	22.5	38.7
Strengthening "smart", green and integrated transport	94	22.3	20.2	57.4	134	17.2	30.6	52.2
Alleviation-dealing with phenomena of social exclusion	96	8.3	21.9	69.8	135	18.5	28.9	52.6
Protection of freedom and security of Europe and its citizens	94	14.9	22.3	62.8	133	14.3	30.1	55.6
Addressing other social challenges and needs	95	24.2	20.0	55.8	132	37.1	20.5	42.4

Additionality of the research project→ the majority of firms (78.3%) would not have conducted the specific research activity, the same applies for more than half of the research groups (56.9%), however, 4 out of 10 the research groups would have tried to conduct the specific activity using other funding sources

Firms
(N = 96)



Research Groups
(N = 153)



Additionality of FPs compared with nationally funded programmes→ the large majority of both research groups and firms stated that FPs are providing a much higher added value in terms of both input and behavioral additionality

	Firms			Research Groups		
	Valid N	High Added Value (% of Firms)	Mean (5-point scale)	Valid N	High Added Value (% of Research Groups)	Mean (5-point scale)
Ability to build international research networks	100	92%	4.43	158	96.3%	4.66
Possibility of conducting research in large research consortia	100	90%	4.47	157	94.3%	4.64
Sustainable (permanent) relationships with Universities and Research Center	100	78%	4.11	157	84.7%	4.41
Higher scientific level of research	100	80%	4.18	156	79.5%	4.24
Better access to knowledge and research infrastructure	99	84.8%	4.17	154	75.3%	4.15
Greater project funding	100	85%	4.34	156	93.5%	4.68
Sustainable relationships with other organizations	99	73.7%	3.98	151	62.9%	3.83

Concluding remarks (1)

- EU-funded projects are significant funding sources for both universities and research centers
- Previous cooperation with at least one of the consortium partners is important for entering a new project especially for research groups
- Most significant motives for participation in FPs are different between firms and research groups:
  - access to funding, enhancing research activity in cutting-edge fields most important motives for research groups
  - acquisition of new knowledge, monitoring technological developments and networking most significant participation motives for businesses

Concluding remarks (2)

- Most important motives for firms' participation in FPs differentiate according to firm size and age.
- Previous participation in FP-funded project is important for entering new ones
- Different types of impact result from organization's participation in a project
  - Scientific and technological impacts
  - Innovation impacts in terms new/improved products, services and to a smaller extent in terms of new process and organizational innovation
  - Commercial exploitation of innovation appears to be larger among firms than research groups, especially in terms of using innovations internally to develop other products/services/processes

Concluding remarks (3)

- Different types of impact result from organizations' participation in a project
  - Networking impacts
  - Wider impacts tackling societal and environmental challenges
- Both research groups and firms stated that FPs are providing a much higher added value in terms of both input and behavioral additionality

Future steps (1)

- Examine the relationship between the various characteristics of the Greek organizations' participation (participation intensity, role and position in the projects/networks, characteristics of the knowledge flows, organization's objectives and strategy regarding their participation, problems and challenges each entity encounters) and the benefits gained.

Future steps (2)

- Provide policy suggestions to stimulate the public debate and policy-makers, industrial managers and business leaders to further investigate the country's structural competitiveness problem and develop an innovation-led strategy.
- Contribute to the formulation and implementation of evidence-based policy measures -considering the corresponding European policies- focusing on knowledge diffusion, technology transfer and the enhancement of KIE