technopolis group

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Evaluation and Impact Analysis Study of the International Partnerships of the Foundation for Science and Technology, I.P. with Carnegie Mellon University, Massachusetts Institute of Technology and the University of Texas

Final Report

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List of Acronyms and Abbreviations

A3ES - Agency for Assessment and Accreditation of Higher Education

AI - Artificial intelligence

AIR Center - Atlantic International Research Center

ANI – Agência Nacional de Inovação

BGI - Building Global Innovators

CEO - Chief Executive Officer

CLA - Council of Associated Laboratories

CMU - Carnegie Mellon University

CNCTI - National Council for Science, Technology, and Innovation

CoLab – International Collaboratory for Emerging Technologies

CRUP - Council of Rectors of Portuguese Universities

CS – Computer Science

CSR - Center for Space Research

CTIS - Complex Infrastructure Transportation Systems

DPTS - Doctoral Programme in Transport Systems

ECE – Electrical and Computer Engineering

EDAM - Engineering Design and Advanced Manufacturing

EIB – European Investment Bank

EPP – Engineering and Public Policy

ERC- External Review Committee

ERDF - European Regional Development Fund

EU – European Union

EuroHPC - The European High Performance Computing Joint Undertaking

FCT - Foundation for Science and Technology

FCT/UNL - Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa

FE/UP – Faculdade de Engenharia da Universidade do Porto

FIT – Future Internet Technologies

GDPR – General Data Protection Regulation

GERD - Gross domestic expenditure on R&D

GSP - Global Startup Programme

HCI – Human-Computer Interaction

HEI - Higher Education Institutions

HPC - High-Performance Computing

I&E - Innovation & Entrepreneurship

iAC net - International Advanced Computing Network

ICT - Information and Communication Technologies

ICTI - Information and Communication Technologies Institute

IIR - International Industry Roundtables

ILP – Industrial Liaison Program

INESC Porto - Engenharia de Sistemas e Computadores do Porto

INESC-ID - Instituto de Engenharia de Sistemas e Computadores - Investigação e Desenvolvimento

INESC-TEC - Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência

INL - Iberian Nanotechnology Laboratory

inRes - Entrepreneurship in Residence

ISCTE – IUL – Instituto Universitário de Lisboa

IST - Instituto Superior Técnico

IST-ID - Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento

IT - Instituto de Telecomunicações

i-Teams - MIT's Innovation Teams

ITS - Innovation for Technological Systems

IWI - International Workshop on Innovating

LT – Language Technologies

LTI - Leaders for Technical Industries

MACC – Minho Advanced Computing Center

MATH – Applied Mathematics

MISTI - MIT International Science and Technology Initiative

MIT - Massachusetts Institute of Technology

MoU - Memorandum of Understanding

MPP2030 - MIT Portugal Partnership 2030

MRSEC - Materials Research Science and Engineering Center

NOVA.ID.FCT - Associação para a Inovação e Desenvolvimento da FCT

NSF – National Science Foundation

OECD - The Organization for Economic Cooperation and Development

PI – Principal Investigator

R&D - Research and Development

R&D&I - Research and Development and Innovation

S&T – Science and Technology

SCIP – Security and Critical Infrastructure

SE – Software Engineering

SES - Sustainable Energy Systems

SIFIDE - Sistema de Incentivos Fiscais à I&D Empresarial

TACC - UT Austin's Texas Advanced Computing Center

TCE – Technology Change and Entrepreneurship

TIE - Technology Innovation and Entrepreneurship

TLO – Technology Licensing Office

TME - Technology Management Enterprise

TTO - Technology Transfer Office

UA - Universidade de Aveiro

UM - Universidade do Minho

UMIC - Agency for the Knowledge Society

UN – United Nations

US – United States of America

USC - University of Southern California

UT Austin - University of Texas at Austin

UT Dallas OTC – University of Texas at Dallas – The Office of Technology Commercialization

UTEN - University Technology Enterprise Network

VC - Venture Capitalist

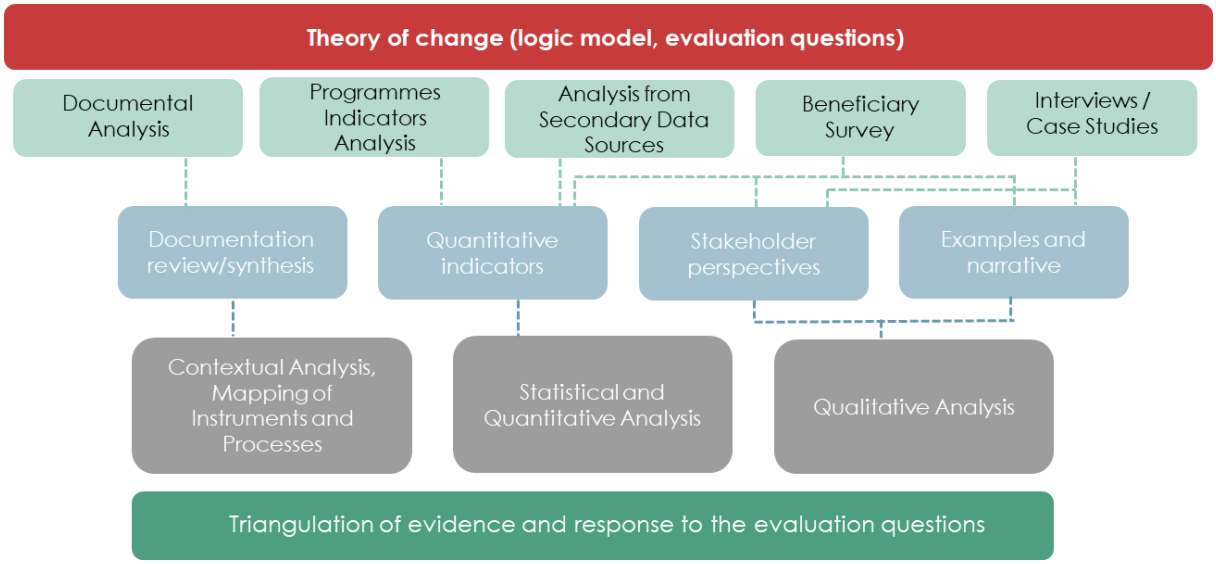
Executive Summary

The purpose of this report is to present the findings of the international partnership's programmes established with Carnegie Mellon University (CMU), the Massachusetts Institute of Technology (MIT), and the University of Texas at Austin (UT Austin), aiming to provide evidence, a reasoned analysis of the results, and a perspective on future development options to inform a position on the possible renewal of the international partnerships agreements.

Established in 2006, the international partnerships programmes evolved and adapted over three distinct phases:

- Phase 1 (2006-2012): Part of the Portuguese government's strategic plan to enhance national scientific and technological capacity.
- Phase 2 (2013-2017): Expanded its focus on entrepreneurship and innovation, despite Portugal's financial and economic crisis.
- Phase 3 (2018-2024): Operated under the GoPortugal framework, despite pandemic-related disruptions.

Building on the adaptive and evolving nature of the partnerships, our methodological approach is designed to capture this complexity by integrating multiple sources of evidence. As illustrated in the diagram below, we leverage document analysis, quantitative data, and qualitative insights to ensure a robust triangulation process that supports detailed and nuanced responses to the evaluation questions.



Overall findings

The following key findings are detailed in Section 5 of this report. In brief:

1. Collaboration dynamics between Portuguese institutions and U.S. universities:

From the Portuguese perspective, collaboration had a positive transformative impact on enhancing research capacities and promoting organisational upgrades in the national R&D ecosystem. At the individual level the partnerships were effective in advancing research work and skill development, particularly through training and short-term research periods in the US. Group collaboration created long-term links between Portuguese institutions, American universities, and companies. At the institutional level, the partnerships provided Portuguese

universities and companies with opportunities to engage in complex projects that would have been difficult to undertake independently.

2. Education:

In all three programmes, the importance of collaboration in terms of PhD programmes is a strong aspect. The partnerships facilitated the adoption of dual-degree and non-dual doctoral and master programmes, strengthening academic collaboration between Portuguese and US institutions. CMU's focus on dual degrees stands out as a unique and particularly impactful feature. Overall, the development of human capital through the programmes had a lasting effect on participants' careers, continuing to benefit both academia and industry in Portugal.

3. Research:

The programmes fostered a significant 'learning effect', enabling participants to work on cutting-edge technologies and environments, facilitating them to acquire new knowledge, skills, and collaborative networks, which contributed to enhanced scientific outputs.

Consistent evidence suggests that the programmes have significantly contributed to generating high-quality scientific results in their respective thematic fields. When compared with publications in the same year, field and type, partnership publications receive, on average, 13 more citations, representing a premium of 60%. Patents cite partnership publications three times more than comparable publications in their non-patent literature references. Public policy documents cite partnership publications four times more than comparable publications.

Furthermore, the partnerships substantially contributed to the integration of international research standards within Portuguese institutions. And sustained collaborations and institutional networks continued beyond the programmes formal support, enhancing long-term research capabilities

4. Entrepreneurship: Start-ups and Spin-offs:

The programmes have had a noteworthy role in the promotion of startups and spinoffs, through both direct and indirect mechanisms in which UTEN initiatives had a particularly important role. This acknowledgement is particularly notable on the given value to the way collaboration with US universities strengthened participants' international credibility and facilitated the access to a large and sophisticated market, offering directionality to innovation and access to venture capital.

The access to the US ecosystem also facilitated a smoother growth path that, for the successful cases, resulted in a significantly stronger performance in terms of company growth and technological development of the participating firms when compared to a control group of similar firms. In complement, it is also noteworthy that companies associated with the partnerships raised funds at a rate eight times higher than benchmark companies and were significantly more likely to secure larger amounts, such as USD 1 million and USD 10 million.

5. Innovation

5.1 Participation of firms in research activities - Industry affiliates & R&D projects:

The involvement of industrial affiliates facilitated cooperation between companies and academic institutions, alluring a deeper involvement of industrial affiliates in R&D, materialised through the provision of access to advanced training, talent and tailored research projects. The Large-Scale Collaborative Research Projects call launched in Phase 3 provided a robust platform for collaboration with national companies, using a noteworthy level of co-investment from the private sector (€9,323,664) across 30 projects.

There are also notable cases where start-ups initially involved in the programmes had, by Phase 3, become established as industrial affiliates (e.g.: Feedzai or Sword Health). Also noteworthy is the major participation of Portuguese unicorns as affiliates, including Sword Health, Feedzai, Talkdesk, Outsystems, Remote, and Farfetch.

5.2 Knowledge Valorisation and Innovation Management:

Exposure to the US innovation ecosystem was a considerable benefit of the partnerships, enabling knowledge transfer, capacity building, and sustained university-industry relations. The partnerships contributed to the professionalisation of Portuguese institutions in knowledge transfer and innovation culture practices. UTEN was a highly acknowledged programme regarding its contribution to the capacity building and organisational readiness of the Portuguese institutional framework dedicated specifically to technology transfer offices. On a different level, as previously mentioned, the partnerships, within a subset of companies, induced a more intense participation of companies in R&D processes and fostered innovation. However, some beneficiaries have reported positive indirect effects of the programmes on their propensity to patent, evidence is limited.

6. Current and Future Relevance:

The partnerships are still widely perceived as relevant. Interviewees view the partnership programmes impacts as largely positive, especially among those directly involved.

Beyond the tangible outputs of the programmes – such as PhD graduates and the creation of companies – there is a consensus that the sustainability of the partnerships' results is primarily linked to the relational capital established. Contributions to capacity-building and advancements in science and technology management are seen as lasting positive effects, as well as it is highlighted that the partnerships offer a unique opportunity for the Portuguese institutions to work at the vanguard of technology and with the most advanced institutions. Finally, it is also relevant to highlight the positive diplomatic effects that were reported, not only in terms of the Portugal-US foreign affairs, but also on the international visibility of the Portuguese institutions. However, if the partnerships are discontinued, these effects are expected to gradually diminish over time.

7. Future Relevance - Limited vs Broad Selectivity:

The partnerships focused on a select group of top universities and thematic areas, maintaining high standards and achieving impact in these fields. Some interviewees, particularly non-beneficiaries, felt that the narrow focus limited opportunities for broader participation, both geographically and across different disciplines. US partners and programme management bodies considered this selective approach necessary for achieving the partnerships' goals, but acknowledged it concentrated resources in specific areas. Non-beneficiaries suggested a broader inclusion of scientific areas and institutions could enhance the programmes' reach and relevance across Portugal.

The challenge lies in balancing the need for selectivity to maintain excellence with a desire for wider dissemination of benefits across the entire science and technology landscape.

8. Future Relevance - Limited vs Broad Selectivity:

The partnership programmes faced significant challenges in management and monitoring due to shortcomings in the governance framework associated with the different organisational readiness of the coordinator and each programmes decentralised structures, funding delays, and a lack of professional oversight. Coordination issues arose from procedural differences between US and Portuguese partners, instability in management teams, and weak alignment with national and European initiatives. Monitoring was fragmented, with no unified system to track budgets, outputs, or outcomes, and responsibilities were often unclear. The absence of

standardised metrics and a global framework hindered accountability and evaluation. Despite these challenges, Phase 3 reports show some incremental improvement in transparency and communication of outputs and outcomes.

Recommendations

Recommendations are detailed in Section 5 of this report. In brief:

- We recommend continuing partnerships with CMU, MIT, and UT Austin, maintaining at least 3% of FCT's budget allocation to sustain long-term impacts.
- We recommend leveraging the international partnerships to strengthen Portugal's and the European position in international STI networks and at the diplomatic level.
- We recommend defining thematic priorities through a participatory process, aligning US, EU, and Portuguese interests for maximum outcomes and impact.
- We recommend maintaining strong political commitment while ensuring a pathway to more inclusive and transparent strategic decision-making processes.
- We recommend introducing a more dynamic and flexible multilevel governance framework, where CNCTI could play a central role as a strategic coordinating body.
- We recommend developing a programme logic model framework.
- We recommend explicitly defining objectives, success metrics, and indicators in partnership contracts to ensure effective monitoring and evaluation.
- We recommend strengthening and expanding dual PhD programmes.
- We recommend extending student and faculty exchanges and increasing the presence of long-term visiting US professors in Portuguese institutions.
- We recommend reinstating executive master's programmes.
- We recommend that smaller exploratory projects should be reassessed to ensure they contribute more effectively to the partnerships' broader strategic goals.
- We recommend relaunching UTEN with a broader mandate and increased funding to support start-ups and strengthen innovation ecosystems.
- We recommend implementing capacity-building initiatives for science and technology management professionals to sustain long-term growth.
- We recommend establishing a more professionalised management framework to ensure the long-term sustainability and effectiveness of the partnerships.

1 Introduction

1.1 Context and evaluation objectives

Portugal's scientific and technological system developed relatively late, and catching up with other countries was a declared political objective (Gago, 1990; Rodrigues & Heitor, 2015). Integration into the European Union marked the beginning of substantial participation in the EU's framework programmes for research and technological development (Patricio, 2019). At the beginning of the 21st century, Portugal reached a remarkable level, with spending on research and development exceeding 1% of gross domestic product, reaching 1.64% in 2009 (Heitor, Horta & Mendonça, 2014). During this period, several new public policy instruments were introduced as part of a broader strategy to integrate Portuguese researchers and institutions into international networks, thus improving the country's profile and capabilities (Heitor, 2023).

This push for internationalisation was reinforced by a strategic analysis by the OECD (2007), which identified a lack of strategic planning in the Portuguese higher education system but recognised the International Partnerships with American universities as a commendable example of capacity building. Simultaneously, the Portuguese government announced the Technological Plan in November 2005, which prioritised increasing the population's formal qualifications, strengthening the country's scientific and technological capabilities and promoting an innovative environment to face the challenges of globalisation (Horta & Patrício, 2016). These initiatives, articulated with the Lisbon Strategy, emphasised the importance of an outward-looking approach and international collaboration in national science and higher education policy (Pfotenhauer et al., 2012).

Portugal, although still undergoing the consolidation of its scientific capabilities and a structural change of its economy, was able to establish formal international partnerships with three of the US's leading Universities. Horta and Patrício (2016) suggest that this achievement was driven by a combination of factors unique to the Portuguese context. First, the direct political involvement of the Portuguese government at the highest level, with the Prime Minister playing a key role in prioritising international partnerships. This political involvement and commitment is reported as necessary to overcome initial scepticism in relation to the readiness level of the Portuguese Innovation system and to develop the capacity necessary to secure the corresponding financial commitment. Second, the decision-makers and political advisors were themselves academics with extensive international experience, utilising their knowledge of the academic world and their existing networks to facilitate the negotiations. Their relationship capital and experience allowed them to navigate the complexities of establishing partnerships and to design a programme that appealed to both Portuguese and American academic institutions. Third, Portugal capitalised on academic relations and brain circulation policies that had been in place for decades (with an important emphasis on the development of Portuguese higher education since the 70s) using Portuguese academics that had previously studied or worked in the US to create a basis of trust and mutual understanding that was fundamental to the formation of these partnerships. Finally, the involvement of Portuguese professors at American universities as mediators further facilitated the negotiation process, ensuring that the interests of both parties were aligned and that cultural differences were overcome.

In October 2006, the Ministry of Science, Technology and Higher Education, through the Foundation for Science and Technology (FCT), launched the International Partnerships with leading universities in the United States, namely the MIT, CMU and UT Austin formally signed in

March 2007[1]. Overall, this strategic collaboration lasted 18 years, divided into 3 phases (1. 2006/07-2012; 2. 2013-2017[2]; 3. 2018-2024), with the following objectives:

- Support the internationalisation of national science and technology.
- Create opportunities for integration into international thematic R&D networks.
- Stimulate an entrepreneurial culture in Portuguese universities.
- Stimulate R&D investment by Portuguese companies in close collaboration with academia.
- Create national networks between different Portuguese universities and the business community.

In the 2018-2024 period[3], the Partnerships are incorporated into the goPORTUGAL initiative, which strengthens and expands the concept of international partnerships, setting additional objectives:

- Stimulate scientific and technological activities, including collaboration with the productive sector, through the adoption of good international practices.
- Developing an agenda that expands on the initial objectives, associating them with scientific and economic valorisation and the research and innovation agenda on Atlantic interactions, through cooperation between both national and international actors.

In 2019, the OECD Review of Higher Education, Research and Innovation in Portugal highlighted efforts to build critical mass in doctoral training by fostering collaboration between Portuguese institutions and these American universities. The review also examined Technology Transfer Offices, particularly distinguishing the role University Technology Enterprise Network established through a partnership with the University of Texas/Austin, has further strengthened commercialisation by fostering joint activities, exchanging best practices, and providing training for Portuguese TTO staff. Nevertheless, questions remained regarding the depth of these partnerships. To what extent have the calls led to the creation of genuine partnerships, given the large number of partner organisations involved? Furthermore, concerns were raised over the small scale of many programmes, potentially diluting the intended impact compared to similar initiatives abroad.

The purpose of this study is to evaluate the impact of ongoing international partnerships involving collaboration with CMU, MIT and UT Austin, with the aim of providing relevant evidence, a reasoned analysis of the results and a perspective on future development options to support a position on the possible renewal of the international partnership agreements between CMU, MIT and UT Austin, which expire at the end of 2024[4].

The study's primary objectives are as follows:

i) Develop an evaluation methodology to identify the main performance indicators resulting from the implementation of the programmes in their 3 phases.

ii) Identify the dynamics of effective collaboration between CMU, MIT and UT Austin and national institutions, both at individual (training), group (projects and involvement of institutions) and institutional level.

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[1] Resolution of the Council of Ministers No. 132/2006.

[2] Resolution of the Council of Ministers No. 16/2013.

[3] Resolution of the Council of Ministers No. 24/2018.

[4] Resolution of the Council of Ministers No. 165/2023 and Resolution of the Council of Ministers No. 193/2013.

iii) Identify the costs and benefits obtained by the national partners and their economic expression.

iv) Analysing the results achieved and the impact of the partnerships in relation to their objectives, whenever possible quantifying economic impacts, taking into account their future potential and alternative scenarios for other international partnerships (in other geographies, other thematic areas, other S&T environments, involving a greater number of Portuguese institutions, etc.), as well as the planned budgetary framework.

v) Drawing up overall conclusions and recommendations on the functioning of these collaborations, specifically as to the benefits of continuing them and in what form.

vi) Draw up explicit recommendations on the continuation and possible renewal of each of the programmes, including:

a. If the recommendations are positive:

(i) Suggestions on revising the scope, objectives and content, including areas and initiatives of the programmes, considering the current development of the national scientific and technological system, including national and European public policies for Science and Technology.

(ii) Considerations on the financial envelope to be mobilised for a new contractual period.

b. If the recommendations are negative:

(i) Proposal of procedures and deadlines for the phasing-out process, considering the activities still underway.

In view of these needs, the most logical methodological resource would be the theory of change, a comprehensive approach that facilitates understanding and planning of the steps needed to achieve significant change through specific interventions. This methodology helps to clearly define a project's objectives, clarifying how each activity contributes to achieving them, identifying the underlying assumptions, and creating mechanisms for monitoring and evaluation.

In FCT's International Partnerships, using a theory-of-change approach is particularly useful way to structure and document the complex and multifaceted processes involved. With objectives as ambitious as supporting the internationalisation of science and technology, integrating international R&D networks, and fostering entrepreneurship and R&D investment in national universities and companies, the theory of change offers a framework to ensure that all activities align strategically to produce the desired results. This approach also facilitates the continuous adaptation and refinement of strategies throughout the different phases of the project, allowing for a better response to the changing dynamics of the global educational and technological environment. Nevertheless, the clear and detailed structure of the methodological approach is crucial to ensuring the internal and external validity and reliability of the entire evidence-based process.

2 Methodology

2.1 Theory of Change

Impact evaluations of international partnerships face a significant methodological challenge in terms of time frame. In the context of impact assessment, it involves first examining the observed outcomes, understanding how the partnerships may have contributed to the changes seen, comprehending the logical sequences and practical modalities that allowed the interventions to influence the observed changes, testing hypotheses, and understanding whether the conditions are in place to ensure the sustainability of the effects associated with the interventions.

To address this challenge, we proposed applying a methodological approach based upon theory of change and the contribution analysis. This approach has been extensively employed in the domain of evaluating R&D&I policies and programmes. The theoretical evaluation process is predicated upon two fundamental tenets: first, the formulation of a theory, and second, the identification and verification of the implementation hypotheses:

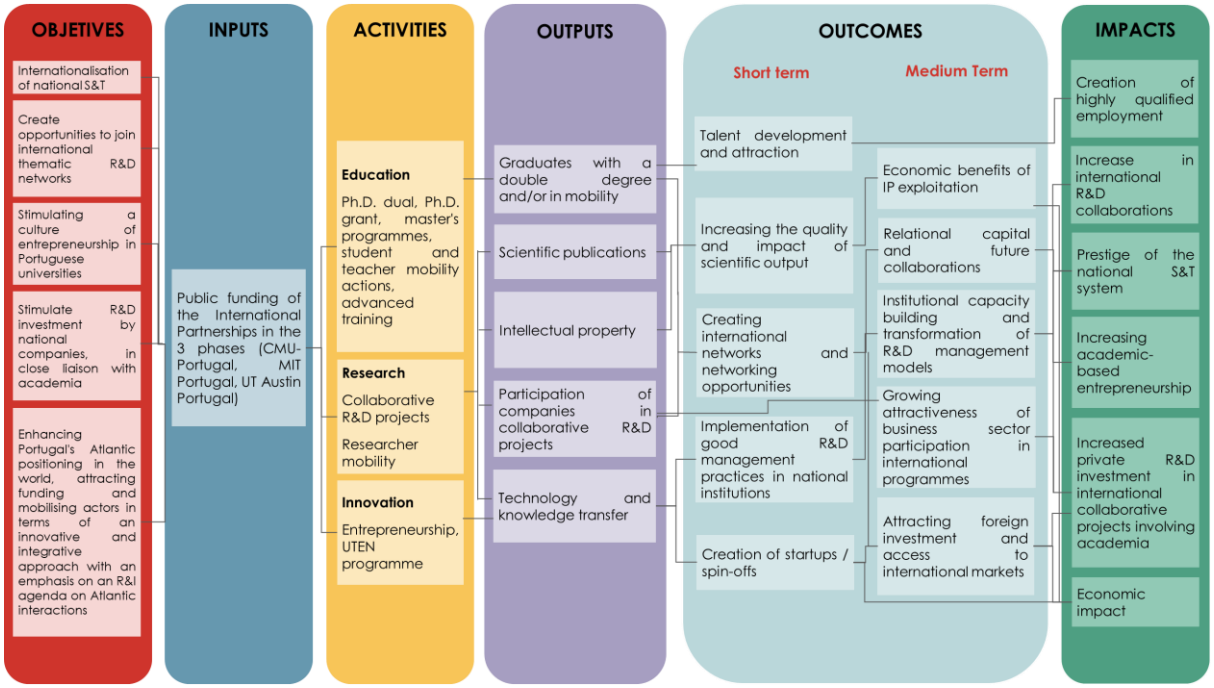
- Evaluation is structured around the enunciation of a "theory" that describes how a policy or programme causes results and represents them in the form of an intervention logic. This intervention logic presents the objectives, inputs, activities, outputs (direct products of these activities), outcomes and impacts of the intervention and highlights the logical links between them.
- The performance assumptions underlying the programme are detailed and the contribution analysis aims to explain why and how the intervention activities may have contributed to the observed results and impacts. The analysis focuses on the level of achievement of results and the level of contribution of the policy or programme to the outcome. The evaluation should ultimately make it possible to verify whether the hypotheses established at the beginning are confirmed or refuted, and to qualify and complete them.

In concrete terms, the theory of change approach is reflected in the conduct of evaluation as follows:

- During the detailed methodology design phase (phase 1), we developed a theory of change for each of the programme's axes: this highlighted the objectives, planned activities, outputs, expected outcomes and impacts, and the causal chain of assumptions. The scope definition phase of the mission allowed us to reflect on the intervention logics and, from there, direct the data collection strategy. (Figure 2).
- During the data collection and analysis phase (phase 2), field investigations, analyses, and triangulation of different data sources allowed the verification of causal hypotheses in the chain between funded activities, observed outputs, outcomes as perceived by stakeholders, and expected impacts, in the form of a contribution narrative. This responded accordingly to the issues considered in the Terms of Reference for each of the two main types of evaluation:
  - Evaluation of execution: on the effectiveness and relevance of international partnerships.
  - Impact assessment: of the International Partnerships, including the monitoring of results indicators.

The logic model is intended to serve as a guiding framework for understanding the programme activities, outputs, and intended outcomes in relation to its goals. It highlights the key pathways through which the programme is expected to produce impact, allowing the evaluation to systematically assess progress and effectiveness across multiple dimensions. Given the absence of an established model within the International Partnership Programme, this model – adapted from the one recommended by the Academy of Finland (2012) and other available documentation – provides a basis for possible future planning and refinement. However, this is not a substitute for the necessary future work with stakeholders to co-create or adapt the theory of change to ensure that it reflects their insights and experiences. The proposed outcome and impact dimensions are designed to capture both the short- and long-term effects of the programme, ensuring that the evaluation not only addresses immediate results but also the broader, systemic changes that the programme seeks to influence. Further, the model incorporates a mix of qualitative and quantitative data collection methods, ensuring a comprehensive evaluation approach that aligns with the complexity of the programme's objectives and operational context.

Figure 1. Theory of Change for FCT's International Partnerships



The following table presents a comprehensive overview of the evaluation questions, for which responses were obtained with validity and reliability in accordance with the data collection conducted. It is organised according to the key dimensions identified and also outlines the methodological approaches employed to collect the necessary data to address these evaluation questions.

Table 1. Evaluation Questions by Dimension and Methodological Approaches

Evaluation Dimension	Evaluation Question	Methodological Approaches
Effectiveness	What was the contribution of the programmes to the excellence of scientific outputs in their respective thematic fields	• Analysis of available indicators • Interviews • Case Studies • Analysis of complementary indicators from secondary data sources
	How do the programmes contribute to the creation of intellectual property?	• Analysis of available indicators • Interviews • Analysis of complementary indicators from secondary data sources
	What is the contribution of the programmes to stimulating the participation of national companies in collaborative R&D projects in close articulation with academia, and in promoting entrepreneurship and innovation?	• Analysis of available indicators
	Did the programs contribute to the adoption of international best practices in scientific and technological activities?	• Interviews • Case Studies • Questionnaire Survey
	How effective was the collaboration dynamics between Portuguese institutions and American universities at the individual, group, and institutional levels?	• Analysis of available indicators • Interviews • Questionnaire Survey
Relevance	Were the instruments mobilised in each of the programmes and their respective phases adequate to the policy objectives outlined? To what extent did the instruments meet the needs and expectations of their target audience? And did the instruments and needs evolve throughout the different phases of implementation?	• Analysis of available indicators • Interviews • Questionnaire Survey
	What is the current and future relevance of the partnership programmes?	• Analysis of available indicators • Interviews • Questionnaire Survey
Impact	What were the benefits gained by the national partners and what is their economic expression, considering the investments made?	• Interviews • Questionnaire Survey • Case Studies
	What has been the impact of the programmes in promoting access to international collaboration and knowledge transfer networks? Has this access continued beyond the duration of the support?	• Analysis of available indicators • Interviews • Questionnaire Survey
	What has been the impact of the programmes on the qualification and capacity-building of national scientific and technological institutions?	• Interviews • Case Studies
	What has been the impact of the programmes on access to international funding and markets?	• Analysis of complementary indicators from secondary data sources Interviews • Case Studies
	To what extent did the different effects produced or induced by participation in the programmes continue beyond the duration of the support?	• Analysis of available indicators • Interviews • Questionnaire Survey

2.2 Methods

The approach was based on different methods of collecting and analysing information, the cross-referencing of which ensured a complete evaluation, guaranteed by the triangulation of data sources:

- A **documental analysis** of the available data allowed for a reconstruction of the programmes' intervention logic, grounded in a refined theory of change. This analysis captured both the overarching goals and the nuances of specific instruments, providing a clear foundation for assessing outcomes. In this context, we highlighted the importance of documents such as annual and/or multi-annual progress reports, as well as those from the External Review Committee for each of the partnerships. Other documents of a legislative nature were also provided, along with the evaluation conducted by the Academy of Finland, among others. We added to this through the collection and analysis of publicly available evidence in the form of OECD policy briefs, book chapters, and peer-reviewed articles. Additionally, as a result of the interview process, positioning documents from the National Council for Science, Technology, and Innovation (CNCTI), The Council of Rectors of Portuguese Universities (CRUP) and the Council of Associated Laboratories (CLA) regarding the international partnerships were made available to the evaluation team.
- A **statistical analysis of available indicators** was conducted to assess the programme's output and outcome indicators across the three phases of implementation. This analysis provided insights into the progression of each phase, both for the programmes as a whole and individually. To address reliability and internal validity constraints, a second request for data was compiled and submitted to FCT, which in turn sought input from the programme managing bodies. Further efforts were made to establish a broader scope concerning data on the programme's inputs, activities, and outputs. This was achieved through content analysis of the available documentation, which was compiled into complementary indicators to offer a more comprehensive understanding of the programmes' dynamics.
- The **analysis of complementary indicators from secondary data sources** enabled the measurement and estimation of the programmes' results and impacts in various domains, such as scientific, technological, policy, and economic influence. These complementary indicators, drawn from bibliometric data, patent citations, public policy citations, and financial performance metrics, provided a broader understanding of the programmes' influence. The analysis was carefully designed to compare partnership outputs with relevant benchmarks, though the current data did not allow for a causal analysis. The detailed methodological approaches used for this analysis are outlined in Appendix D.
- **Interviews with the programme's stakeholders** conducted for this evaluation provided a diverse set of qualitative insights into the policy cycle and impact of the programmes. Stakeholders from various categories were interviewed, allowing for a comprehensive understanding of the programmes' effects across different perspectives, with a total of 22 conducted interviews (Appendix C). Six interviews were held with key figures from the managing bodies of the MIT Portugal, CMU Portugal, and UT Austin Portugal programmes, representing both the Portuguese and US viewpoints. Three interviews were conducted with researchers from leading Portuguese universities and research institutions. Five representatives from companies directly engaged in the programmes, reflecting on their experiences and outcomes. Three interviews were conducted with non-participants, offering external viewpoints on the programmes. Finally, five interviews were completed with other relevant stakeholders, providing further contextual insights into the broader impacts and strategic considerations of the international partnerships.

- Five **case studies** were conducted as part of this evaluation, offering in-depth analysis of specific programme impacts. These case studies were based on interviews with programme beneficiaries and a thorough documental analysis of the available information related to the programmes. For the full cases studies, see Appendix E.
- Two distinct **questionnaire surveys** were implemented to gather quantitative data on the programmes. The proposed questionnaire survey directed to programme beneficiaries was approved following the assessment of the Methodological Report. The full survey questionnaires are presented in Appendix B. As a result of the meeting held on 7 June, an additional questionnaire survey was also designed for non-beneficiaries. Technopolis Group waited for the FCT's internal collection of contacts for beneficiaries and non-beneficiaries to be surveyed, given the constraints related to the GDPR. These arrangements proceeded as planned and were facilitated through an open channel of communication between both parties. As a result, both questionnaire surveys were sent to the contacts collected by FCT on 28 August 2024, followed by a subsequent reminder on 6 September 2024. For the first survey, directed at programme beneficiaries, 994 persons were contacted by email, 208 responded actively to the survey request – resulting in a response rate of 20.9% - with full results outlined in Appendix G.1.

  The second survey, contacted 417 non-beneficiaries by email and received 38 usable responses, resulting in a response rate of 9.1%. It is important to note that this figure is too low to be considered valid for building substantial assumptions regarding the non-beneficiaries' perspectives. Nevertheless, the aggregated results for this survey are presented in Appendix G.2 to provide full transparency.
- An internal **strategic committee**[5] was established to deliberate on the future direction of the international partnerships and to reflect on the conclusions and recommendations established from the evaluation findings.

The following matrix illustrates the triangulation of data sources and the added value of the research instruments for each evaluation typology.

Table 2. Methodological approaches and evaluation typologies

Methodological Approaches	Evaluation typology			
	Efficacy	Relevance	Impact	Perspectives/ Recommendations
Documental Analysis	+	+	+	+
Scientometric Analysis	++	+	+++	+
Analysis of financial data from companies	++	+	+++	+
Statistical analysis of available indicators	+++	+++	++	+
Interviews	+++	+++	+++	+++
Questionnaire Surveys	+++	+++	++	++

[5] Following the meeting with the Steering Committee, concerns were raised regarding the potential implications of the term "Advisory Board," which might be perceived as an independent entity not composed of members of Technopolis Group. To address these concerns and avoid any misinterpretation, we have opted to use the designation "Strategic Committee," ensuring clarity that this committee is composed entirely of international team members from Technopolis Group.

Methodological Approaches	Evaluation typology			
	Efficacy	Relevance	Impact	Perspectives/ Recommendations
Case Studies	+++	+	+++	+
Strategic Committee	+	+	+	+++

Key: This matrix illustrates the degree of relevance and usefulness of each methodological approach for the different evaluation typologies, where (+) symbolises low intensity and (+++) represents high intensity.

2.3 Methodological challenges

The development of the evaluation in progress was marked by several constraints on its implementation. This section aims to describe those challenges in detail as well as the mitigation strategies put in place to overcome them.

At first, we draw undeniable parallels with the Academy of Finland's evaluation process, published in 2012 and focusing on the first phase of the International Partnerships. This process presents many of the same constraints that we have identified in the current period. In short:

"The evaluation was implemented in a relatively tight timeframe. The provided time constraints were imposed by the new Portuguese Ministry of Education and Science for two main reasons. Firstly, there was a need to avoid irreversible damage to the Programmes, as the decision on their extension beyond 2012 had to be taken at the earliest time possible. Secondly, the Portuguese Government needed a basis for an informed decision, especially as no independent assessment has been carried out in the first five-year term.

The short timeframe available for the evaluation was, however, a source of some concern, as it was felt that it will be difficult to gather and access all the relevant stakeholders" views and data in time to provide a robust analysis and sufficiently encompassing conclusions for all the Programme activities involved. Also other more data-specific challenges ensued: the fact that while the Programmes were well documented and a rich material of the Programmes and their activities was in fact available, the Programmes – even though being financed almost totally through public funding – had not been expected to provide a logic model in the beginning, nor was there a systematic monitoring system with shared indicators available. This made the data collection and analysis more challenging and in fact provided the evaluation steering group with the challenge of mapping and charting the expected logic model of the Programmes themselves" (Academy of Finland, 2012).

The present evaluation study takes place after a period of approximately 12 years without an independent evaluation, with the aim of obtaining relevant evidence, a reasoned analysis of the results, and a perspective on future development options to support a position on the possible renewal of the CMU, MIT and UT Austin international partnership contracts, which expired at the end of 2023.

Likewise, the already short timeframe for implementing the evaluation has been reduced from what was initially planned - agreed by both parties - due to the Portuguese government's need to make informed decisions by independent evidence. Firstly, the lapsed period between the kick-off meeting - on 9 April 2024 - and the approval of the Methodological Report on 12 July 2024 significantly delayed the start of the evaluation phase and pushed it into summer months making it difficult to access institutions, information and stakeholders. Second, while the originally agreed plan was to deliver the final report in November, the client asked for delivery to be brought forward to October, putting further pressure on an already short timeline.

In addition, the documental analysis quickly identified the absence of a more detailed logic model than the general objectives of the partnerships. Notwithstanding the Academy of Finland's recommendations in the previous evaluation, during the collection of information the evaluation team was faced with the absence of a structured monitoring system (e.g.: not allowing the objectives to be followed up on Key Performance Indicators) or an information

system (e.g.: not allowing the indicators periodically collected on the scientific outputs of all the programmes to be harmonised).

This last point highlights the limitations of evaluating a programme in the absence of specific goals or stage-gates at each phase of implementation. Therefore, the evaluation is limited to assessing its primary objectives.

During the data collection phase, further constrains related to the programme monitoring and information system were identified, since each programme's managing team collects the indicators, it wants in repositories that vary in terms of data consistency over time and accuracy between reports. As an example, in the first round of data collection, several programme managing bodies evidenced that there was no consistent information prior to the 3rd phase of the programme. This assumption prompted a mitigation strategy in the treatment of scientific outputs mapped by the annual activity/progress reports. Proceeding with content analysis in this way resulted in inconsistencies of information, such as the absence of annual reports or the programme's preference for drawing up multiannual activity reports without allowing for granularity of scientific outputs by year. Even if these reports included specific references to the list of scientific outputs, there were many reports from the programmes consulted whose claims in big figures - of publications, intellectual property, start-ups and spin-offs – were not supported by evidence (except for reports from the programme managing bodies during phase 3. To address these issues, Technopolis Group compiled a second request for data, aiming to mitigate these reliability and internal validity constraints as much as possible, by involving the stakeholders responsible for collecting and maintaining the data in the evaluated programmes (FCT, I.P. and programme managing bodies), seeking their support and collaboration in improving the quality and accessibility of the existing information. This allowed the evaluation team to clearly understand the limitations of the existing data and adapt the analysis approach accordingly, while also acting on the use of alternative data collection strategies and establishing priorities.

All programme managing bodies have responded with additional evidence and comments on the metadata. Despite ongoing limitations in the information provided on publications and intellectual property, the analysis proceeded more robustly, even though less comprehensive evidence was available for the earlier phases of the programmes.

Additionally, subsequent data submissions by FCT revealed further inconsistencies when compared to previously collected information. For instance, a database sent on 18 April 2024 provided detailed evidence on awarded scholarships and the completion of PhD degrees per student, while a summarised table sent on 7 October 2024 presented aggregated figures for the total number of graduates. However, the figures showed considerable discrepancies. To mitigate this risk, preference was given to the data offering the most detailed supporting evidence, ensuring greater confidence and validity in the analysis. The same approach was applied to the data on scientific outputs, patents, and involved start-ups/spin-offs, for which the programme managing bodies provided information during the second round of data collection.

Nevertheless, despite the methodological challenges encountered, the openness and willingness to collaborate demonstrated by the FCT technical team was instrumental in mitigating constraints. Furthermore, their proofreading of the initial sections of this document provided valuable and detailed insights into the design and formulation of the international partnerships.

3 Programme Inputs and Activities

3.1 Timeline and context evolution

The partnerships with CMU, the MIT, and UT Austin were formalised in 2006 as part of the Portuguese government's strategic plan to enhance national scientific and technological capacity. In the preliminary stage, three Memorandum of Understanding (MoU) were signed between the Portuguese government and the three US institutions in early 2006. The purpose of these MoUs was to identify the areas of intervention and the university groups and institutions to be involved in launching collaboration programmes. In doing so, the parties sought to align their activities with the best international practices in scientific cooperation and to plan for a diverse set of partnerships that could be developed competitively in the current international context. The initial phase of the project involved the conduction of assessment exercises by large teams of lecturers and researchers from the three US institutions. These exercises also mobilised teams from various national universities and research and development (R&D) centres, as well as a wide range of visits and joint meetings in Portugal. This process enabled the parties to reach an agreement on the scientific and technological areas to be prioritised by the partnership programmes and the type of actions to be implemented. The final decisions on the content of the programmes were taken by the FCT.

Later in 2006, partnership contracts were signed with CMU, MIT and the UT Austin, resulting in the establishment of the CMU Portugal, MIT Portugal and UT Austin Portugal programmes, respectively.

The partnership programmes have been operational for 18 years, encompassing three distinct phases of implementation:

- Phase 1: from 2006/2007 to 2012.
- Phase 2: from 2013 to 2017.
- Phase 3: from 2018 to 2023, with some activities still ongoing[6].

The planned activities for Phase 2 foresaw a stronger emphasis on entrepreneurship and technology-based innovation, alongside ongoing research and advanced education programmes, based on recommendations from an independent evaluation by the Academy of Finland. It also planned the launch of new flagship initiatives, such as the "Global Acceleration Innovation Network (biz.pt)", to support start-ups and industrial collaborations.

The preparation and implementation of Phase 2 was greatly affected by the national situation determined by the economic crisis and the subsequent Financial Assistance Programme agreed in May 2011 between the Portuguese authorities, the European Union and the International Monetary Fund, which, among other things, imposed severe restrictions on public spending. In this context, the funding set for Phase 2 of the programmes was severely reduced, with some of the planned activities not being implemented or being greatly scaled down.

In 2018, the partnership programmes were renewed for a third phase and reframed under the broader "GoPortugal – Global Science and Technology Partnerships Portugal" initiative. It should also be noted that he implementation of phase 3 has been affected by the period of highest incidence of the COVID-19 pandemic, which, in Portugal, broadly covers the years 2020 (with the first cases being diagnosed in March of that year) and 2021 (with most of the

[6] As per the phase 3 contracts signed with US partners, the programmes were due a mid-term review by the External Review Committee (ERC) at the end of 2023, in order to determine the funding for the 2024-2030 period. Since then, programmes have been extended by one year to cover activities for the year 2024.

Portuguese population already vaccinated by the end of that year). During these two years, the functioning of Portuguese higher education and research institutions was limited, and there were long periods in which the international mobility of people was severely restricted. As a result, some activities planned under the partnership programmes were postponed; others were never implemented or were only implemented very recently.

3.2 Overview of the partnership programmes

3.2.1 MIT Portugal

Phase 1

An initial assessment study was conducted to evaluate the potential for a partnership between MIT and Portuguese research and higher education institutions. This assessment, initiated in February 2006, aimed to explore the key considerations required to establish and execute the collaboration. Both MIT and the Portuguese government agreed to evaluate the intellectual objectives of the programme, determine the feasibility and scope of the relationship, and outline the necessary terms for such a partnership.

During a five-month assessment period from February 15 to July 15, 2006, MIT faculty and representatives visited various Portuguese research institutions, universities, companies, and government agencies to exchange information and ideas. The goal was to identify mutually beneficial focus areas and determine the requirements for successful projects, addressing key institutional, operational, financial, legal, and technical concerns. The assessment explored basic research initiatives that applied systems thinking to Portugal's challenges, and educational programmes, including PhDs, professional master's degrees, and short courses.

During phase 1, the programme structure revolved around three phases of financial support: institutional financing in the first year, scholarships based on open calls in the second year, and open calls for R&D projects in the third year. Activities included teaching, training, research, exchange programs, industry liaison, annual conferences, and thematic workshops.

As a result of the assessment process, the following areas were identified as initial focus areas for the MIT Portugal Programme:

- Bioengineering Systems: This focus area aimed to develop a new generation of leaders in bioengineering in Portugal by fostering innovation in industrial, healthcare, and environmental biotechnology. It supported R&D that could lead to start-ups and promoted collaboration between universities, industry, government, and society.
- Sustainable Energy Systems: The goal was to engage academia, industry, and government in the development of sustainable energy technologies and infrastructures. This area focused on educating energy leaders through research programmes, addressing energy planning, sustainable built environments, and smart energy networks.
- Transportation Systems: Aimed at developing a leading knowledge base in transportation infrastructure projects. This focus area addressed the lifecycle of large transportation projects and improved decision-making. It covered themes like intelligent transportation systems, high-speed rail, airport and airline systems, and transport systems integration.
- Engineering Design and Advanced Manufacturing (EDAM): This area sought to foster innovative product development and competitive manufacturing processes through research. It emphasised integrating design methodologies with market needs, sustainable

supply chains, and new business models, while also advancing materials and smart functions for product design.

The following Doctoral Programmes were established with degree awarding institutions:

- Bioengineering Systems Doctoral Programme: This innovative joint doctoral programme was established between MIT and three Portuguese universities -NOVA University of Lisbon, University of Minho, and Instituto Superior Técnico (University of Lisbon) -with the University of Coimbra joining later. The programme aimed to educate leaders in bioengineering, with an emphasis on technical innovation, leadership, and systems thinking, combining engineering, life sciences, and innovation at the forefront of bioengineering.
- Leaders for Technical Industries (LTI) PhD Programme: This programme, under the EDAM focus area, was a joint effort between Instituto Superior Técnico (IST), University of Minho, and University of Porto. It aimed to address multidisciplinary research problems in engineering systems, product, and process innovation, integrating economics, management, and social aspects into the decision-making processes. The structure was designed to provide a robust foundation in design, technology, management, and leadership.
- Sustainable Energy Systems PhD Programme: Promoted by several universities including the Technical University of Lisbon, University of Coimbra, University of Lisbon, and University of Porto, this programme aimed to create new knowledge on clean energy systems. It focused on energy systems integration rather than specific technologies and offered students the tools to analyse and solve complex energy challenges, with active collaboration from MIT.
- Doctoral Programme in Transport Systems (DPTS): A joint doctoral programme offered by the University of Coimbra, the University of Porto, and IST. The DPTS was designed to replace separate transport doctoral programmes at these universities, bringing together leading researchers to create a structured programme that supported Portugal's need for advanced expertise in transportation systems. It was approved by the Portuguese Agency for Assessment and Accreditation of Higher Education (A3ES) as the first doctoral programme to meet its standards.

Master's Programmes:

- Complex Infrastructure Transportation Systems MSc: This programme, offered at IST in collaboration with the University of Porto and the University of Coimbra, integrated three core domains: finance and contracts, engineering and project management, and policy and institutions. The aim was to attract ambitious students worldwide, with backgrounds in engineering, economics, or management, to prepare them for leadership in complex transportation projects.
- Business Engineering Master's in Sustainable Energy Systems (SES): Offered by IST and the University of Porto, this one-year programme trained professionals in energy systems integration and energy policy. Students from energy companies, or those looking to make a career transition into energy sectors, were given opportunities to develop skills in systems thinking and energy management.
- Business Engineering master's in technology management enterprise (TME): A joint degree programme between the Technical University of Lisbon, University of Minho, and the University of Porto. This fifteen-month programme trained technical managers in product development and production systems, combining technical and management skills, and preparing graduates to lead multidisciplinary teams in industrial operations and engineering design.

Open Research Project Calls: aiming to foster competitive research and strengthen collaboration between academia and industry. Two rounds of calls were launched during this phase:

- First Round (2008): The Portuguese Science and Technology Foundation opened the first research project competition between July and October 2008. The competition focused on the Programme's four primary research areas: Bioengineering Systems, Sustainable Energy Systems, Transportation Systems, and Engineering Design and Advanced Manufacturing. Each research consortium was required to include at least two Portuguese research centres, a supporting company, and a collaborating MIT research team. The first round helped to foster industry participation and align academic research with real-world industrial challenges.
- Second Round (2009): Building on the success of the first round, the second round of calls was launched in 2009. It continued to promote highly competitive research projects and encouraged further integration of industry players into the research process. The calls stimulated collaboration across sectors, with a strong focus on creating innovative, market-relevant solutions in key strategic areas for Portugal's economic growth.

Faculty/Research Exchange Programme: enabled Portuguese faculty to spend extended periods at MIT as Faculty Fellows. This programme facilitated knowledge transfer and allowed faculty to work closely with their MIT colleagues, expanding their professional networks and developing the necessary skills to teach new courses designed in collaboration with MIT. These exchanges were instrumental in building human capacity and fostering a culture of research and teaching excellence in Portugal. Moreover, they played a key role in introducing novel educational practices into Portuguese universities, influencing the development of new curricula across the MIT Portugal Programme.

Phase 2

In 2013, FCT, CRUP and MIT formalised the amended and restated research and education collaboration agreement. Phase 2 focused on developing integrated research activities through university–industry partnerships, aiming to create value by generating knowledge-based products and services. This strategy was designed to foster sustainable economic growth and have a positive social impact by promoting a critical mass of highly trained professionals and doctorates who would drive entrepreneurship and foster collaboration between universities and industries at both national and international levels.

The programme's strategic objectives in Phase 2 included:

- Create a critical mass of highly trained professionals and doctorates, adequately motivated to promote intra- and entrepreneurship.
- Establish new mechanisms to foster university – industry integrated research at a national and international level.
- Strengthen university network and increase public visibility.

Between 2013 and 2017, Phase 2 operated with a reduced budget and focused on supporting education connected to technology and innovation. It prioritised collaboration among graduate students, faculty, and industry experts, while aiming to make educational programmes self-sustaining, independent of continued direct input from MIT.

Phase 2 of MIT Portugal continued supporting the established doctoral programmes in Bioengineering Systems, Engineering Design and Advanced Manufacturing, Sustainable Energy Systems, and Transportation Systems. Similarly, in master's programmes such as Bioengineering, Technology Management Enterprise and Sustainable Energy Systems.

However, the Complex Infrastructure Transportation Systems (CTIS) programme, which was active in Phase 1, was reported to be suspended by the end of Phase 1 due to a lack of suitable candidates and insufficient industry support.

Visiting Scholar Programme for Portuguese Faculty: During Phase 2, the Visiting Scholar Programme continued to be a key initiative, which hosted 21 scholars at MIT. Portuguese faculty members spent extended periods at MIT, from several weeks up to six months, fully integrating into MIT labs and engaging in collaborative research projects. These visits helped faculty develop new research ideas, build networks, and immerse themselves in the MIT academic and research environment.

Research activities in the second phase of the MIT Portugal Programme were categorised into two types: integrated "test-bed" research projects and seed and exploratory research projects.

- Test-bed Projects: These projects were designed to integrate research across multiple focus areas in a holistic manner, with an emphasis on piloting and scalability for maximum impact. Multidisciplinary teams from Portuguese universities, MIT, industries, and other public or private bodies, such as hospitals, worked together to develop innovative products and services with high export potential. Test-bed projects aimed to showcase Portugal's competitiveness and contribute to economic growth. Each project received significant funding, typically around €1,000,000 for a three-year period, and non-academic partners contributed over 30% in additional private funding.
- Seed and Exploratory Research Projects: These projects were introduced to encourage novel, early-stage research that complemented the larger test-bed projects. Seed projects explored new areas of strategic relevance, such as ocean exploration, and aimed to increase the visibility and sustainability of the programme. These smaller projects were also a platform for advancing innovation and entrepreneurship and for developing new educational tools and materials.

In Phase 2, several educational modules focused on entrepreneurship and innovation were introduced across the four focus areas, aiming to embed innovation early into PhD students' academic journeys.

- Innovation for Technological Systems (ITS): This course provided a consistent educational path for PhD students, integrating the four PhD programmes. ITS included the Innovation & Entrepreneurship (I&E) Week, a cross-disciplinary event that brought together students from different fields to network and collaborate. Following I&E Week, students participated in focus-area-specific innovation courses, such as "Innovation in Bioengineering."
- Innovation Bootcamp: This leadership and teamwork development course evolved from earlier leadership modules offered in Bioengineering Systems and EDAM. During the Bootcamp, students were challenged in outdoor environments, testing their leadership skills through team challenges and role-playing exercises. This event was key in building both technical and interpersonal skills.
- iTeams Course: Over the course of a year, multidisciplinary PhD student teams worked on developing go-to-market strategies for emerging breakthrough technologies from Portuguese research labs. This initiative enriched Portuguese graduate education by offering hands-on experience in commercialising technological innovations.
- MIT International Workshop on Innovating (IWI): was an annual, hands-on, one-week residential workshop at MIT. It exposed participants to key elements of innovation and entrepreneurship, helping them translate research into real-world solutions. The workshop included interactive seminars led by MIT and MIT Portugal faculty, experts, and successful entrepreneurs. Participants engaged in individual and team exercises to develop concrete,

demonstrable innovation strategies. The IWI encouraged participants to think of the innovation journey as an ongoing learning experience, emphasizing leadership, problem-solving, and team management.

- Building Global Innovators (BGI) Venture Competition: was a flagship initiative aimed at strengthening entrepreneurship and innovation in Portugal. Launched in 2010, it provided support to new ventures with emerging technologies that had the potential for significant economic impact. BGI emphasised Go-to-Market strategies, leveraging experienced mentors and international market access to help participants grow. By 2015, BGI was recognised as one of the 100 most influential accelerators globally. It combined MIT's competition and mentoring expertise with insights from Portuguese start-ups, competition finalists, and investors, becoming a powerful tool for fostering entrepreneurship.

Furthermore, phase 2 employed various models to increase industry engagement across the programme's focus areas. These activities connected researchers and start-ups with companies and investors. Initiatives included forming an Industrial Advisory Council, launching the MIT International Science and Technology Initiative (MISTI) for Portugal, and holding International Industry Roundtables (IIR). These initiatives facilitated collaboration between academia and industry, helping bridge the gap between research and market-ready innovations. A key objective of Phase 2's doctoral programmes was to foster leadership by integrating PhD research with industry. Students from all four PhD programmes conducted research within an industrial context, allowing them to combine theoretical knowledge with practical applications. This approach helped shape graduates with both deep technical expertise and a strong connection to real-world challenges in technology and innovation. Additionally, MIT International Science and Technology Initiatives played a vital role in fostering global collaboration. MISTI operated through country-specific programmes, including one for Portugal, providing students and faculty with opportunities to engage in research, education, and innovation abroad.

Phase 3

The third phase of the MIT Portugal Programme, known as the MIT Portugal Partnership 2030 (MPP2030), was launched in 2018 following the renewal of the collaboration agreement. MPP2030 reinforced MIT's ongoing commitment to partnering with Portuguese institutions, with the goal of strengthening Portugal's knowledge base and enhancing its international competitiveness. Although the MIT Portugal Programme had been in place since 2006, 2018 marked a important renewal, with a redefined focus and strategy. MPP2030 was projected to continue through 2030. Under MPP2030, research was centred around four strategic areas:

1. Climate Science & Climate Change.
2. Earth Systems: Oceans to Near Space.
3. Digital Transformation in Manufacturing.
4. Sustainable Cities.

All these areas were anchored in data science-intensive methodologies. By promoting research, advanced training, and partnerships between academia and industry, MPP2030 aimed to contribute to the UN's sustainable development goals, such as quality education, reduced inequalities, and economic growth.

MPP2030 operated through three primary vectors:

- Research: Funding collaborative research projects of varying scales.
- Education: Awarding PhD research grants through a collaboration protocol with FCT.

- Idea Sprints: Facilitating outreach and engagement through activities designed to promote cutting-edge research and ideas.

Although education was not initially a core part of the MPP2030 agreement, a new protocol with FCT enabled the awarding of PhD Research Grants in the programme's strategic areas. These grants were intended to develop a critical mass of experts in fields such as climate science, earth systems, digital transformation, and sustainable cities. Under this protocol, PhD students could enrol in any doctoral programme at Portuguese universities that aligned with their research interests. Their research would take place at institutions associated with their respective doctoral programmes and would be co-supervised by Portuguese and MIT advisors.

Furthermore, the programme has been particularly focused on strengthening research initiatives:

- The Flagship Projects: under MPP2030 were designed to strengthen the research and development capabilities of Portuguese companies and promote internationalisation by leveraging the expertise of MIT and other renowned institutions. These projects aimed to enhance collaboration between national companies and academic entities, particularly in the strategic areas of MPP2030. A key objective was to support projects that helped consolidate the Atlantic Interactions initiative, focusing on transatlantic cooperation in areas such as earth observation, climate change, energy, and ocean interactions, using emerging data science methods. These co-promoted projects involved industrial research and experimental development, leading to the creation or improvement of products, services, and systems supported under the Go Portugal initiative (by Compete 2020, ANI, and FCT), these projects were designed to create synergies between Portuguese and MIT research teams.
- Exploratory Projects: were year-long projects hosted at Portuguese universities, designed to address emerging research topics with high potential for scalability and global impact. These projects emphasised integrated, multidisciplinary approaches and collaboration between Portuguese institutions, MIT, and public or private partners. The goal was to develop innovative solutions that could enhance Portugal's international competitiveness, particularly in knowledge-based industries. The projects were funded for a maximum of 12 months, with the possibility of a three-month extension.
- Seed Projects: involved MIT-led research in one or more of the four strategic areas of MPP2030, with a strong focus on data science. MIT Principal Investigators were encouraged to collaborate with Portuguese researchers from universities and industry.

Beyond research and education, MPP2030 fostered outreach and innovation through Idea Sprints, workshops, and meetings that encouraged idea-sharing and collaboration. These activities aimed to engage the broader research community and ensure that the programme continually pushed the boundaries of innovation and research excellence.

3.2.2 CMU Portugal

Phase 1

The CMU Portugal International Partnership Programme formally began in 2006, following the Memorandum of Understanding (MoU) signed between CMU and the Government of Portugal in March of that year. The first six months after the signing saw significant informal and formal collaboration discussions, coordinated by CMU's Assessment team, involving both Portuguese and CMU researchers. These early dialogues helped define the programme's direction based on evaluations by Portugal's Foundation for Science and Technology. This assessment phase resulted in a focus on information and communication technologies (ICT), which laid the groundwork for the programme's subsequent research and educational efforts.

After an initial exploratory stage, the programme's Innovation Agenda for 2009-2011 was established, defining its mission: "*To create new knowledge in key areas of ICT through cutting-edge research, world-class graduate education, and close collaboration with the Portuguese industry, positioning Portugal at the forefront of science and innovation*".

Additionally, from its inception, the CMU Portugal Programme sought to identify strategic areas where Portuguese universities and companies could excel globally, particularly within ICT:

- Next Generation Networks for High-Quality Trusted Services: focused on the development of pervasive communication infrastructures, from fibre optics to wireless networks, enabling seamless global collaboration, massive data transfers, and the integration of intelligent devices like smart vehicles, healthcare systems, and energy-aware technologies.
- Software Engineering for Large-Scale Dependable Systems: addressed the need for robust, adaptive software capable of supporting the complexity of globalised systems. Research here focused on improving software engineering methodologies to ensure reliability, fast adaptation, and ease of maintenance in dynamic, large-scale environments.
- Cyber-Physical Systems for Ambient Intelligence: focused on integrating computing, communication, and sensing into systems that interact with physical environments, such as infrastructure monitoring, remote healthcare, and emergency response systems. These systems would leverage distributed intelligence to solve real-world problems collaboratively.
- Human-Centric Computing: aimed to develop technologies that adapt to human behaviours and needs, focusing on intuitive interfaces and personalised computing experiences. This area required interdisciplinary research, combining engineering, sociology, psychology, and the arts to create systems that learn from and adapt to users.
- Public Policy and Analysis of Technological Change and Entrepreneurship Processes in ICT: explored how innovation policies and entrepreneurial ecosystems could be shaped to support ICT start-ups and bring scientific research to market, especially in Portugal. The focus was on understanding how to bridge the gap between research and commercialisation through in-depth analysis of regional and technological factors.
- Applied Mathematics: leveraged existing collaborations between CMU and Portuguese institutions in Applied Mathematics to develop new synergies. The goal was to respond to contemporary scientific and technological challenges by combining mathematics with engineering to produce innovative solutions.

Instruments and initiatives include:

- Competitive Research Grants: funded through FCT, these grants supported innovative research projects, requiring collaboration between Portuguese institutions, CMU, and local industry. Evaluation was carried out by international experts. The goal was to involve faculty, PhD students, and post-docs in research with clear industrial relevance.
- PhD and Post-Doctoral Fellowships: high-potential young researchers were offered fellowships in areas of strategic importance. Dual-degree PhD programmes were established in fields like:
    - Computer Science (CS).
    - Electrical and Computer Engineering (ECE).
    - Engineering and Public Policy (EPP).
    - Language Technologies (LT).
    - Applied Mathematics (MATH).

- Technological Change and Entrepreneurship (TCE).

- Senior Researcher Positions: in collaboration with Ciência 2007 and 2008 programmes, this initiative aimed to recruit experienced researchers to bolster Portugal's ICT research capacity. These positions were intended to build critical mass in areas where Portugal had a competitive advantage.
- Research Chairs: endowed by FCT and industry partners, these chairs were established to attract world-leading scientists to Portuguese universities, enhancing local expertise in ICT research.
- Institutional Seed Funding: initial funding enabled the establishment of dual-degree programmes, faculty exchanges, and the initiation of collaborative research projects. This funding was crucial for setting up the infrastructure needed to kick-start the CMU Portugal Programme.
- Dual Degree PhD, Professional Master, Courses, and Exchange Programmes: these programmes offered dual degrees where students could study in Portugal and the US, receiving supervision from faculty on both sides. Also, the Programme promotes both short and longer visits of CMU faculty of Portuguese institutions to give lectures, teach advanced courses and intensify the research collaboration. Programmes included Professional Masters in:
  - Entertainment Technology (MET).
  - Human-Computer Interaction (MHCI).
  - Information Technology – Information Security (MSE).
  - Software Engineering (MSIT-IS).
  - Information Networks (MSIN).
- Industrial Affiliates Programme: this programme facilitated collaboration between Portuguese industry and CMU. Companies could join the innovation network, benefit from advanced training, and participate in research projects tailored to their strategic needs.

Phase 2

In 2013, the CMU Portugal International Partnership Programme was renewed for another five years, continuing its mission to position Portugal at the forefront of innovation in Information and Communication Technologies. Phase 2 deepened research initiatives, enhanced industry-academic partnerships, and continued fostering entrepreneurial activities in ICT. The programme was financed by FCT, supported by the Council of Rectors of Portuguese Universities, and co-financed by industry partners and CMU.

Key Instruments and Initiatives included:

- Dual Degree PhD Programmes: Portuguese universities and CMU continued offering dual-degree PhD programmes where students earned degrees from both institutions. Programmes were available in:
  - Applied Mathematics (MATH).
  - Computer Science (CS).
  - Robotics (CS/R).
  - Electrical and Computer Engineering (ECE).
  - Engineering in Public Policy (EPP).
  - Language Technologies (LT).
  - Software Engineering (SE).

- Technological Change and Entrepreneurship (TCE).

- Professional Master's Degrees: Between 2007 and 2013, dual-degree professional master's programmes were offered in areas such as Human-Computer Interaction (MHCI), Software Engineering (MSE), Information Networking (MSIN), Information Technology - Information Security (MSIT-IS), Information Technology - Software Engineering (MSIT-SE), and Entertainment Technology (MET).From 2014, only the Human-Computer Interaction (MHCI) programme, between Universidade da Madeira and CMU, continued.
- Faculty Exchange Programme: The Faculty Exchange Programme supported extended stays at CMU, providing Portuguese faculty with exposure to global best practices in research and education.
- Undergraduate Internship Programme: Launched in 2014, the Undergraduate Internship Programme provided 8 to 12-week immersive research experiences at CMU.
- Research Project Funding: Research funding focused on Entrepreneurial Research Initiatives and Early Bird Projects:
  - Entrepreneurial Research Initiatives were large-scale, collaborative projects integrating research, innovation, and advanced training, emphasising technology commercialisation.
  - Early Bird Projects were exploratory projects aimed at identifying strategic research directions and laying the groundwork for larger ERIs.
- inRes – Entrepreneurship in Residence: Launched in 2014, inRes was an early-stage acceleration programme for entrepreneurial teams. It provided immersion experiences in CMU's innovation ecosystem in Pittsburgh, offering Portuguese ICT entrepreneurs exposure to the US market and the opportunity to refine their business ideas. The programme included preparation phases in Portugal and a structured immersion period at CMU. By 2016, the selection process had been redesigned to include a third decision point for assessing team dynamics, and additional mentoring opportunities were introduced.
- Industry Affiliates Programme: In 2014, the programme began exploring the creation of novel activities under the Industry Affiliates Programme to foster closer industry-academic collaborations. However, its implementation was postponed as resources were redirected to high-priority exploratory research projects.

Phase 3

The third phase of the CMU Portugal International Partnership Programme began in February 2018 with renewal of the agreement between CMU and the Portuguese Government, through FCT. The focus of Phase 3 was to strengthen industry-science relationships and direct research efforts towards fostering the data economy and generating social and economic impact through ICT.

Key Instruments and Initiatives:

- Dual Degree PhD Programmes: Phase 3 maintained the emphasis on dual-degree PhD programmes between CMU and Portuguese institutions. A key development occurred in January 2023, with the introduction of two new programmes in Machine Learning and Societal Computing, expanding the portfolio of existing dual degrees. The available dual degree PhDs included:
  - Computer Science (CS).
  - Robotics (CS/R).
  - Electrical and Computer Engineering (ECE).

- Engineering in Public Policy (EPP).
- Language Technologies (LTI).
- Software Engineering (SE).
- Human-Computer Interaction (HCI).
- Machine Learning.
- Societal Computing.

- Affiliated PhD Programmes: introduced in 2021 to strengthen ties between Portuguese universities, companies, and CMU, this programme enabled doctoral students to complete their PhD with a Portuguese university while conducting part of their research at CMU for up to 12 months. The programme was designed to integrate industry collaboration, encouraging candidates to work with Portuguese ICT companies on relevant projects.
- Advanced Training Programmes: these were launched as a new educational initiative aimed at addressing practical ICT challenges faced by companies. These short-duration programmes were developed in response to the needs expressed by industry affiliates for more targeted and practical training. The Master's programmes, which were a major component of Phase 1 and Phase 2, were no longer offered during Phase 3.
- Visiting Students Programme: evolved from the Undergraduate Internship Programme of earlier phases, providing master's students with the opportunity to spend up to 6 months conducting research at CMU.
- Visiting Faculty and Researchers Programme: built on the success of the earlier Faculty Exchange Programme and offered Portuguese researchers the chance to work at CMU for a term, engaging in research, education, and innovation. CMU faculty were also encouraged to visit Portuguese universities, enhancing the cross-cultural exchange of knowledge and best practices.
- Exploratory Research Projects: continued in Phase 3, with a focus on supporting short-term, high-impact research initiatives that involved collaboration between Portuguese institutions, CMU, and industry partners. These projects had a 12-month duration and were designed to stimulate new research areas of strategic importance to the programme.
- Large-Scale Collaborative Projects: became the flagship initiative of Phase 3, emphasizing co-promotion projects led by national companies in collaboration with R&D institutions. Supported under the Go Portugal initiative (Compete 2020, ANI, and FCT), these projects were designed to create synergies between Portuguese and CMU research teams.

3.2.3 UT Austin Portugal

Phase 1

A technical assessment was conducted by a team from UT Austin to evaluate Portugal's science and technology landscape. This assessment was part of a broader collaboration agreement between UT Austin and the Portuguese Science Foundation. The goal was to identify areas where cooperation could foster educational and research excellence and promote economic development in Portugal, creating opportunities for sustainable job growth and wealth generation. Following a five-month evaluation (March–July 2006), it was decided to initially focus on two programme areas:

- Digital Media: Establishing an interdisciplinary research and advanced training programme, including the development of Master's and PhD degrees.
- University Technology Enterprise Network (UTEN): Fostering technology transfer and commercialisation in Portuguese institutions.

While originally the focus of the programme was on the topic of Digital Media, two additional areas were introduced for interdisciplinary research and training:

- Mathematics.
- Advanced Computing.

Additionally, the assessment proposed launching an institutional framework for collaboration in emerging fields like nanotechnology, molecular science, robotics, and biotechnology, subject to ongoing evaluation and adjustments.

A formal agreement between the Portuguese State and UT Austin, facilitated by the Ministry of Science, Technology, and Higher Education, was signed to officially launch the CoLab initiative (International Collaboratory for Emerging Technologies). The initiative focused on interdisciplinary research and advanced training in key areas during Phase 1, which were divided into three core activities:

1. Interdisciplinary Research and Advanced Education: In areas like Digital Media, Advanced Computing, and Mathematics, establishing Master's and PhD programmes to drive innovation.
2. Training for Entrepreneurs and TTOs: Through the UTEN initiative, training programmes, internships, and exchange programmes for technology transfer officers and entrepreneurs were launched to form a "University Technology Enterprise Network".
3. Emerging Technologies: Continued identification and promotion of cooperation in cutting-edge fields like nanotechnology, robotics, and biotechnology, in collaboration with UT Austin and Portuguese institutions.

Phase 2

The extension of the UT Austin Portugal Programme was secured through a renewed Memorandum of Understanding between FCT and UT Austin, guaranteeing another five years of collaboration, supported by the Portuguese Foundation for Science and Technology and in close collaboration with the Council of Rectors of Portuguese Universities, the programme expanded its efforts to foster research, innovation, and entrepreneurship. The two main initiatives continued:

- CoLab (International Collaboratory for Emerging Technologies) focused on advancing interdisciplinary research and education.
- UTEN emphasised technology transfer and commercialisation of scientific knowledge.

The programme's goals in this phase were centred around strengthening academic and research development, building a critical mass of Portuguese students and researchers in Austin, and boosting the international recognition of Portuguese scientists. Collaborations between Portuguese institutions and UT Austin in Advanced Computing, Digital Media, and Applied Mathematics were deepened, while Nanotechnology emerged as a new area of focus.

The Digital Media programme aimed to cultivate intellectual capabilities for creating content, platforms, and applications in the digital space, some of the efforts included:

- Establishing graduate programmes (Master's and PhD) in collaboration with the University of Porto and NOVA University of Lisbon, with students engaging in long semesters and intensive summer courses at UT Austin.
- Supporting capacity-building festivals, symposia, and research initiatives in digital media fields such as e-health and interactive technologies.

- Expanding research collaborations with industry organisations like New Europe Media and cultivating strategic alliances for knowledge transfer and commercialisation.

The Advanced Computing programme continued its focus on High Performance Computing Distributed Computing and Computational Sciences:

- Collaboration with UT Austin's Texas Advanced Computing Center (TACC), home to some of the world's fastest supercomputers.
- Expansion of advanced courses in Portuguese institutions, including master's and PhD programmes in Computational Engineering and Science.
- Summer internships and advanced schools for Portuguese students, offering hands-on experience in computational research.

The Applied Mathematics programme saw substantial expansion in Phase 2, with increased collaboration between UT Austin and Portuguese universities, including:

- Ongoing joint research projects, publications, and postdoctoral exchanges.
- Summer schools, workshops, and research seminars to bring international researchers to Portugal.
- To strengthen the role of mathematics in interdisciplinary research, contributing to advances in scientific computing and other applied areas.

Nanotechnology emerged as a key focus in Phase 2, with a strong emphasis on research, education and commercialisation. The programme aimed to:

- Build capacity for interdisciplinary research in nanotechnology, linking Portuguese and US institutions.
- Promote the rapid commercialisation of nanotechnology innovations, fostering economic development in Portugal through collaboration with UTEN and industry partners.
- Develop new nanotechnology-based products and create opportunities for the formation of start-ups in Portugal.

In 2012, the external assessment conducted by the Academy of Finland highlighted the critical role of UTEN in driving Portugal's economic future through innovation and as a result, focused on the incubation and acceleration of Portuguese technology ventures in global markets. Central to this effort was the development of the Global Startup Programme (GSP), based at the IC² Institute in Austin, Texas. Through the GSP, Portuguese technology teams benefited from physical co-location space in Austin and received mentorship on business expansion and international growth. This hands-on support contributed to considerable progress in taking Portuguese innovations to the global stage.

UTEN's mission remained consistent: to transfer Portugal's scientific and technological achievements from the lab to the global marketplace. However, Phase 2 marked a strategic shift toward integrating efforts across universities, technology transfer offices (TTOs), business incubators, and entrepreneurs. The goal was to capitalise on the established network and technological resources within Portugal, further equipping entrepreneurs with the skills and knowledge needed to navigate global markets.

Building on the foundation laid in Phase 1, UTEN expanded its scope in Phase 2 with several key activities were organised along a science-to-market continuum:

- Soft-Landing Pad (Start-up Incubation): Providing start-ups with the necessary support to establish themselves and enter global markets.

- International Business Acceleration: Offering guidance and resources to scale businesses internationally.
- Global Startup Programme: Delivering hands-on mentorship and business development for Portuguese start-ups looking to expand into the US
- Observation and Assessment: Implementing annual evaluations and metrics to measure success, identify areas for improvement, and adjust strategies to maximise commercialisation outcomes.

Phase 3

The UT Austin Portugal Programme entered its third phase in 2018 with a renewed Memorandum of Understanding between the FCT and UT Austin. This phase, spanning another decade, built on the human capital, knowledge, and collaborative successes of the first two phases. A key focus of Phase 3 programming was on interdisciplinary and multisectoral approaches to addressing international societal challenges. It expanded research into emerging fields while restructuring entrepreneurial initiatives under the umbrella of Technology Innovation and Entrepreneurship (TIE), following up on the achievements of the previous UTEN programme.

International Collaboratory for Emerging Technologies

The CoLab initiative remained central to promoting close collaborative research between UT Austin and Portuguese universities and research labs. In Phase 3, CoLab focused on establishing Flagship Laboratories in four key scientific domains, with each laboratory developing a specific research and innovation agenda.

The Advanced Computing focused on creating the International Advanced Computing Network (iAC net), a collaborative framework between the Texas Advanced Computing Center and European high-performance computing (HPC) networks. This initiative promoted:

- Installation of STAMPEDE 1 hardware in Portugal, integrated with national and European HPC networks such as the Barcelona Supercomputing Center.
- Research into data analytics and visualisation for various applications, including agriculture, urban planning, fisheries, and earth observation.
- Joint projects and training actions on HPC, quantum computing, and data management, aiming to build expertise and foster innovation across different sectors.
- A comprehensive teaching and support programme to train researchers and enlarge the user base of advanced computing resources, ensuring widespread adoption aligned with international best practices.

A new addition in Phase 3, Space-Earth Interactions, promoted transatlantic and north-south cooperation in space, ocean science, and climate change. This research agenda aligns with the creation of the Atlantic International Research Centre (AIR Centre) in the Azores, focusing on:

- Collaborative efforts in space technologies, climate monitoring, and oceanography, supported by advanced data science and computational methods.
- Engagement with emerging space industries from the US, Europe, South America, and India, contributing to sustainable development and technological advancements in space-earth observation.
- Involvement of UT Austin's Center for Space Research (CSR) and TACC, enhancing the international outreach of Portuguese research by leveraging advanced computational capabilities for earth observation and climate studies.

Another new focus in Phase 3, Medical Physics, aimed to establish Portugal as a leader in advanced cancer therapies, particularly through the development of proton therapy facilities. Key initiatives included:

- Partnerships between UT Austin's Dell Medical School, MD Anderson Cancer Center, and Portuguese research groups to advance radiation oncology and high-energy particle beam therapies.
- Development of training programmes for Portuguese medical professionals in cutting-edge cancer treatment technologies.
- Collaborative research in the application of physics to medical diagnostics and treatment, contributing to global advancements in healthcare.

The Nanotechnology in Phase 3 focused on the discovery and development of innovative nanomaterials for diverse applications. Research in this area aimed to:

- Explore the potential of nanotechnologies in sectors like healthcare, energy, telecommunications, and quantum computing.
- Foster collaborations between the International Iberian Nanotechnology Laboratory (INL) and UT Austin's Materials Research Science and Engineering Center (MRSEC).
- Drive commercialisation efforts, facilitating the transition from lab research to market-ready products, with a focus on entrepreneurship and industrial collaboration.

CoLab Instruments included:

- Competitive Research Funding: provides research funding through annual calls, supporting collaborative projects between UT Austin and Portuguese researchers. There were two types of instruments:
    - Exploratory Projects: Short-term, one-year projects designed to provide seed funding (up to €100,000) for pre-competitive research. These projects are meant to test new ideas or early-stage concepts.
    - Strategic Projects: Larger, long-term projects (two to five years) aimed at addressing significant societal challenges, emphasising co-promotion projects led by national companies in collaboration with R&D institutions. Supported under the Go Portugal initiative (Compete 2020, ANI, and FCT), these projects were designed to create synergies between Portuguese and UT Austin research teams.
- Advanced Training Programmes: Training sessions on cutting-edge topics like AI, big data, nanomaterials, and clean energy, designed for Portuguese graduate students. These programmes are offered in both Portugal and UT Austin, with short to long-term durations.
- Research Exchanges: Faculty, researchers, and graduate students from Portugal and UT Austin can participate in research exchanges lasting between 1 and 12 months, promoting collaboration in the Flagship areas.
- Additional Initiatives: Other potential programmes include specialised postgraduate courses, faculty exchanges, affiliated doctoral programmes, and joint collaborative laboratories between UT Austin and Portuguese institutions.

University Technology Enterprise Network (UTEN)

In Phase 3, UTEN was planned as a broader initiative under the banner of Technology Innovation and Entrepreneurship. This planned restructuring reflected a shift towards fostering the commercialisation of Portuguese technologies on a global scale, building on the successes

of previous phases while expanding international business development efforts. TIE would introduce new instruments and activities aimed at increasing the global competitiveness of Portuguese start-ups and innovators, focusing on three main pillars:

- Development of PT-Corps: Inspired by the NSF's I-Corps™ programme, PT-Corps aimed to prepare Portuguese researchers for commercialisation success. It foresaw an annual training programme for up to 20 teams (Principal Investigator, Entrepreneurial Lead, and Industry Mentor), with a four-step process:
    - Online Introduction: Portuguese adjunct instructors and teaching assistants received training materials.
    - Three-Day Workshop: Held in Portugal or Austin, it included lectures, customer interviews, and team presentations.
    - Weekly Webinars: Five webinars for team presentations and lectures on the business model canvas.
    - Closing Workshop: A two-day event to finalise team presentations and provide final guidance.
- Customer Discovery Residency in Austin: Top-performing PT-Corps teams (3-5) would participate in a two-week residency in Austin, extending their customer discovery process in the US market.
- Ongoing Mentorship and Support: UTEN would provide ongoing mentorship to the top PT-Corps teams and selected start-ups, offering office hours and professional guidance to help scale businesses internationally. The focus would be on accessing funding, including venture capital and seed funding, and promoting entrepreneurial culture within Portuguese institutions.

However, in contrast to the initial plan of action, an examination of the annual reports revealed that only the following activities have been developed:

- Participation in the Tough Tech Summit 2019 (Boston, USA) (Further activities in this area are expected after the exploratory and strategic projects from Phase 3' kick-off).
- 2020 Annual Conference on the topic of Innovation at the Intersection of Academia and Industry.

Further analysis of minutes from the Governing Board meetings and External Review Committee reports offers insight into the organisational activities within the Area of Technology Innovation and Entrepreneurship. The decision to fund more Strategic Research Projects than originally anticipated led to a diversion of funds from TIE and the cancellation o

f the proposed PR Corps pilot.

3.3 Governance model and programme management

3.3.1 Governance model

The governance of the MIT, CMU, and UT Austin Portugal programmes was shaped within the broader framework of national oversight and policy direction, primarily led by the government official responsible for science, technology, and higher education. Throughout the various phases, the government authorised the creation and renewal of contracts between FCT and the American universities. The Minister was entrusted with the authority to approve contract drafts, appoint the state's representatives for signing, and, through FCT, oversee the monitoring and evaluation of these international partnerships. In addition, CRUP played a supportive,

institutional representative and facilitating role during Phase 2, particularly in coordinating and aligning the participation of Portuguese universities in the partnerships.

While there are extensive differences in the governance models of the MIT, CMU, and UT Austin Portugal programmes, especially across the three phases, key structural elements remained consistent, such as the core governing bodies (e.g. "Program Governing Committee", "Governing Board", or "Board of Directors"), the operational committees (e.g. "Program Operating Committee" or "Executive Board"), the External Review Committees, and industry affiliation.

Furthermore, across all programmes a number of common trends emerged in their governance models. In Phase 2, there was a tendency towards reducing the size of governing bodies (in the MIT and CMU Portugal Programmes) or reallocating key roles to smaller, more focused groups (in UT Austin). By Phase 3, all three programmes placed a stronger emphasis on industry affiliates (for the full complied list of industry and other affiliates across all phases and programmes, see Appendix F). The expansion of industry representation in governance bodies, particularly in MIT's enlarged Programme Governing Committee and CMU's Industrial Advisory Board, reflected a shift towards leveraging industrial partnerships for practical economic impact. Additionally, the External Review Committees evolved in each programme to reflect a shift towards strategic, rather than operational, oversight. In MIT, it became non-compulsory in Phase 3, indicating increased flexibility. In CMU, the frequency of reviews was extended to every 2.5 years. In UT Austin, the External Review Committee continued to play a central role, but with enhanced authority to influence midterm adjustments. The following pages provide further detail on each programme.

MIT Portugal

In the first phase of the MIT Portugal Programme, as described in the Research and Education Collaboration Agreement, the governance framework was designed around three primary entities: the Program Governing Committee, the External Review Committee, and the Program Operating Committee. The Program Governing Committee was anticipated to have six members, which would include the President of the Foundation, a representative from the Portuguese Ministry of Science, Technology, and Higher Education, as well as the Directors of the MIT Portugal Programme at both MIT and the Foundation, along with two senior administrators from MIT. This committee was set to meet annually in Portugal to review progress, approve the Annual Plan and Budget, and assess reports from the External Review Committee. Decisions were to be made by unanimous written consent or by a quorum, with a minimum of four members required, including the Chair and a senior MIT administrator.

The External Review Committee was designed to include international experts appointed by the Foundation, after consultation with the Program Governing Committee. Its role was to provide independent evaluations of the programme's scientific and educational strategies. This committee was expected to meet twice annually to submit reports, which could influence potential adjustments to the projects or programmes. Although its recommendations were advisory, the Program Governing Committee and the Program Operating Committee were expected to seriously consider its input. The Program Operating Committee was structured to include the Director of the MIT Portugal Programme at MIT (as Chair), the Director of the Programme at the Foundation, MIT faculty leading each focus area, and leaders from Portuguese institutions involved in the collaboration. This committee was expected to convene four times a year, where its duties included reviewing and providing initial approval for the Annual Plan and Budget, tracking progress, and facilitating cooperation between MIT and the Portuguese institutions.

In Phase 2, according to the Amended and Restated Research and Education Collaboration Agreement, there were substantial changes to the governance model. The Program Governing Committee was reduced to four members, including the President of the Foundation, the Dean of MIT's School of Engineering (or another representative of MIT's senior administration), a representative from the Portuguese Council, and a representative from industrial and institutional affiliates. The Directors of the MIT Portugal Programme at MIT and in Portugal were expected to attend these meetings in a consulting role. The Program Governing Committee was still planned to meet annually in Portugal to review programme progress, evaluate reports from the External Review Committee, and consider its recommendations. Decision-making procedures were similar to those in Phase 1, relying on unanimous written consent or quorum. The External Review Committee was reorganised to consist of four members, each representing one of the focus areas, and appointed by the FCT after consultation with the Program Governing Committee. This committee was to continue providing independent evaluations of the research and education strategies within these focus areas. Reports were planned to be submitted annually to the Program Governing Committee, and its recommendations could influence adjustments to projects or funding allocation. The focus of the committee's work in Phase 2 was more specialised, centring on specific scientific areas of the programme. The Program Operating Committee, while not explicitly mentioned in the Phase 2 documents, appeared to be absorbed into a more streamlined governance structure, with its former operational roles dispersed or simplified.

In Phase 3, under the Collaboration Agreement and subsequent Amendments, the governance model further evolved. The Program Governing Committee was expanded, initially planned to consist of five members, later increased to seven through amendments. This expanded committee included the President of the Foundation, three representatives from MIT's senior administration, two representatives from Portuguese participating entities (appointed by the FCT), and a leader from Portuguese industry, designated by an Industrial Advisory Board and approved by both parties. The Committee was expected to meet annually to review progress in collaboration activities, with the Programme Directors invited as guests. The expansion of this body's membership, especially the inclusion of industry representatives, reflected a shift in the programme's emphasis towards greater involvement of industry stakeholders. The decision-making procedures remained aligned with previous phases, based on unanimous consent or quorum. The External Review Committee in Phase 3 became optional, as stated in the Amendments to the Collaboration Agreement. The parties could convene the External Review Committee during the term of the agreement, depending on the need for independent scientific evaluation. When convened, the committee was tasked with reviewing the research programme, making recommendations to the Program Governing Committee, and offering evaluations that could lead to programme adjustments. Unlike in previous phases, the External Review Committee was not required to meet annually, reflecting a more flexible approach to its role in evaluating and guiding the programme's activities.

CMU Portugal

In Phase 1, governed by the Research and Collaboration Agreement, the Information and Communication Technologies Institute (ICTI) was established as a virtual institution, operating with two branches: one at CMU and the other in Portugal. ICTI was governed by a Board of Directors, which was constituted to include representatives from FCT, CMU, the Portuguese Ministry of Science, Technology, and Higher Education, and other key stakeholders, such as industry representatives, who were expected to contribute resources and guidance. The board was responsible for reviewing the institute's progress, overseeing its budget, and setting strategic directions. Meetings were held twice a year, including one face-to-face meeting and another through video conferencing. An External Review Committee (ERC) was also detailed

in the agreement, tasked with conducting annual reviews of ICTI's activities and making recommendations, including initiating new programmes or discontinuing underperforming ones. The institute's structure was organised into two key functions: research activities, including PhD programmes, and educational activities for advanced degrees. Directors for both research and education were appointed to manage these areas at each of ICTI's branches. Advisory boards, involving key industry figures, were envisioned to support this leadership.

Moreover, the agreement proposed creating a CMU-Portugal Fellows designation for faculty, students, and researchers affiliated with the programme. These fellows were expected to maintain a formal connection with a Portuguese university, fostering academic collaboration between the two countries. The Industrial Affiliates Programme was set up to encourage companies to play an active role in shaping ICTI's research agenda. Companies were expected to offer internships, fund students, and provide financial support for research initiatives. Portugal Telecom (PT) was assigned a key role in coordinating this programme in its initial phases.

During Phase 2, formalised under Amendment No. 3, the governance model was further refined to enhance operational effectiveness. One significant addition was the creation of an Executive Board responsible for overseeing daily operations, with members such as the Directors of ICTI, Scientific Coordinators, and Executive Directors from both Portugal and CMU. This board was charged with offering technical direction, resolving conflicts, and evaluating the performance of ongoing projects, marking a shift towards more hands-on management. While the Board of Directors remained the main decision-making body for strategic issues, the External Review Committee continued its annual review role but took on more advisory functions, focusing on ensuring long-term alignment with the programme's objectives. This phase also introduced two new advisory groups: the University Advisory Board and the Industrial Advisory Board, which included academic leaders and industry representatives. These boards were expected to provide feedback on progress and strategic direction, ensuring alignment between the programme's academic and industrial stakeholders.

Amendment No. 6 brought further streamlining to the governance structure during Phase 2, reducing the Board of Directors to four primary members: the President of the FCT, the President of the Council of Rectors, the President of Carnegie Mellon University, and a representative from the Industrial Affiliates Programme. The directors from both Portugal and CMU were included as non-voting participants in board meetings. This amendment also introduced a stronger focus on performance, giving the board the authority to adjust funding levels for underperforming institutions based on programme metrics.

In Phase 3, outlined in Amendments No. 8 and No. 9, further adjustments were made to focus on sustainability and long-term success. The composition of the Board of Directors remained largely the same, though the Dean of the College of Engineering at CMU now played a central role. The Directors of ICTI in Portugal and at CMU continued as non-voting members, ensuring they provided guidance but did not participate in final decisions. A key change in Phase 3 was the extension of the External Review Committee's review period. Instead of yearly reviews, the committee now conducted evaluations every two and a half years. The first of these reviews was scheduled for 2020, with a follow-up in 2023 to assess whether the programme's agreement should be extended to 2030. This longer evaluation cycle reflected a shift towards more strategic and long-term planning, ensuring the programme could adapt to changes while maintaining focus on innovation and collaboration.

UT Austin Portugal

In Phase 1, as outlined in the Research and Education Collaboration Agreement, the governance structure of the UT Austin Portugal Programme was established with a broad set of

institutions involved. The CoLab Board of Directors was intended to be the key decision-making body, comprising six members, including representatives from FCT, UT Austin, the Agency for the Knowledge Society (UMIC), and the Directors from CoLab@Portugal and CoLab@UT Austin. This board was given responsibility for overseeing all major aspects of the programme. An Operating Committee, chaired by the Portugal Director, was to manage the day-to-day operations of CoLab, ensuring coordination between Portugal and UT Austin. In addition, Focus Area Directors were to be appointed to manage research and education efforts across key areas, including Digital Media, Advanced Computing, and Mathematics, with roles assigned to directors at both sides of the partnership. The agreement also called for the creation of an External Review Committee, comprising independent experts chosen by the FCT, tasked with providing regular evaluations of the programme's progress and making recommendations to the Board of Directors, including suggestions for programmatic adjustments or changes to budget allocations.

With Phase 2 - under Amendment n. º 3 - the governance model was modified to streamline decision-making. The CoLab Board of Directors was reduced from six to four members, with representation from the FCT, UT Austin, the Council of Rectors of Portuguese Universities, and a representative from the Industrial and Institutional Affiliates. The Directors of CoLab@Portugal and CoLab@UT Austin were expected to attend these board meetings, but only in an advisory role. The planned frequency of board meetings was also reduced to at least once per year, as opposed to the twice-yearly schedule envisioned in Phase 1. The revised governance structure also provided the Board with greater authority to reduce or cancel funding for programmes that failed to meet performance expectations or the annual plan. This decision-making was to be informed by evaluations from the External Review Committee, which continued to play a crucial role in ensuring programme accountability.

In Phase 3 - as outlined in Amendment nº 5 - the governance structure was expanded to include additional oversight bodies. A new Governing Board was introduced, consisting of representatives from FCT, UT Austin, Portuguese Universities, and the newly formalised Industrial Advisory Board. The President of the FCT, or their representative, was designated to chair this board. The Principal Investigators and Co-Principal Investigators from both Portugal and UT Austin were expected to attend board meetings in a representative or consulting role, while the Executive Directors from both sides were also expected to participate as consultants. The role of the External Review Committee was maintained, but its responsibilities were expanded to include annual and midterm evaluations, with the objective of providing the Governing Board with recommendations for adjustments or enhancements to the programme. The Industrial Advisory Board was further formalised, incorporating UT Austin's industrial partners participating in the "Partnerships for the Future" initiative, and was intended to offer insights on industry collaboration and engagement. The Board of Directors, now redefined, was to include Principal Investigators and Executive Directors from both sides, focusing more on the technical and operational aspects of the programme. Finally, amendment nº 6 retained the governance structure set in Amendment nº 5, but updated personnel appointments within the Board of Directors. The roles of Principal Investigators and Executive Directors were maintained to ensure continuity in governance, with adjustments in individuals filling those roles to reflect changes in programme personnel.

3.3.2 Programme management

The coordination and management activities of each Programme was contracted to national institutions (usually higher education or research institutions). Multiannual management contracts were signed with the management structures in phases 1 and 2 of the programmes,

and yearly contracts in phase 3. Several changes in the management structures occurred during the programmes' implementation. The table below outlines the national institutions that were responsible for the coordination and management of each Programme over the different phases.

Table 3. Institutions responsible for programme management

Programme	Management Institution(s)	Years
MIT Portugal	Instituto Superior Técnico	2007 - 2016
	Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento	2016 - 2017
	Universidade do Minho	2018 - 2024
CMU Portugal[1]	Instituto Superior Técnico Faculdade de Engenharia da Universidade do Porto Universidade de Aveiro Instituto de Telecomunicações	2007 – 2012
	INESC Porto / INESC TEC	2013 - 2017
	INESC ID - Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento	2018 - 2024
UT Austin Portugal	Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa	2007 - 2017
	INESC TEC- Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência	2018 - 2024
UTEN[2]	Agência de Inovação, ADI	2007 - 2008
	INESC Porto / INESC TEC	2009 - 2013

[1] *In phase 1, management of the CMU Portugal programme was split between four institutions.*
[2] *UTEN management was contracted separately from the UT Austin Portugal Programme, , and after 2013, expenses related to UTEN were incorporated into the national management contract of the UT Austin Programme.*

MIT Portugal

The MIT Portugal Programme began its formalised operational management structure in Phase 1 with the signing of the *Acordo para a Gestão e Coordenação do Programa MIT-Portugal* in 2007. This agreement established the financing and support provided by FCT to the Instituto Superior Técnico of Universidade Técnica de Lisboa, which planned the creation of a Coordination Office. This office was expected to oversee the planning, management, and coordination of the programme's activities, with a focus on post-graduate education and research collaboration with MIT and Portuguese institutions. The National Director was tasked with the leadership of the programme, coordinating between FCT, MIT, and the Portuguese institutions affiliated. The responsibilities outlined in the document included overseeing public tenders for doctoral programmes, coordinating research activities, and facilitating international collaboration in science, technology, and higher education. The funding provided was intended to cover costs related to human resources, equipment, travel, and the dissemination of programme activities, including the establishment of a website. The Addenda from 2009, 2010, and 2011 planned refinements to the structure of the Coordination Office, introducing additional roles such as Executive Directors for Research, Operations, Education, and Communication. These roles were expected to support the strategic goals of the

programme, while additional administrative and communication staff were foreseen to assist with managing the daily operations, financial reporting, and coordination of events.

In Phase 2, as outlined in the *Acordo para a Gestão e Coordenação do Programa MIT-Portugal* from August 2013, the National Director's role continued to focus on coordinating the programme's educational and research activities, but the governance framework was designed to improve oversight. A notable change occurred with the Addendum of 2016, which authorised the transfer of administrative responsibilities from the Instituto Superior Técnico to the Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento (IST-ID). IST-ID was created specifically to support IST's research, development, and innovation activities and, while being functionally intertwined with IST, serves as its arm for research and innovation management.

By Phase 3, as detailed in the Addendums from 2018 to 2023, the programme's administrative structure was planned to change further, with responsibilities moving from IST-ID to the University of Minho. This phase continued to emphasize the importance of planning, management, and coordination, but new requirements were introduced for annual reporting. The National Director was expected to submit comprehensive reports on the material and financial execution of programme activities each year. The Program Governing Committee was assigned the role of approving the annual budget, thereby increasing oversight.

CMU Portugal

Phase 1 programme management was distributed across four key Portuguese institutions. First, Instituto Superior Técnico, led by Professor Vítor Barroso, handled the national coordination from 2007 to 2009. Then, Faculdade de Engenharia da Universidade do Porto (FEUP) and Universidade de Aveiro (UA), under Professor João Falcão e Cunha and Professor Paulo Jorge dos Santos Gonçalves Ferreira, respectively, took charge of planning and management support. From 2009 to 2012, programme management was taken over by the Instituto de Telecomunicações, with Professor João Barros assuming the role of National Director. Throughout this period, the programme maintained a structured approach to annual reporting, with material and financial execution reviewed by the ICTI Board of Directors, accompanied by evaluations from an External Review Committee.

As the programme transitioned into Phase 2, one key change in governance during this period was the appointment of Professor João Claro, from the Instituto de Engenharia de Sistemas e Computadores do Porto (INESC Porto that following a rebranding process changed its name to INESC TEC) as the National Director. This marked a departure from the more distributed management model seen in Phase 1. By the time Phase 3 began, outlined in the Acordo para a Gestão e Coordenação do Programa CMU Portugal (2017), a shift in management also occurred, with INESC-ID (Instituto de Engenharia de Sistemas e Computadores - Investigação e Desenvolvimento) assuming the role.

UT Austin Portugal

In Phase 1, according to the first *Acordo para a Gestão e Coordenação do Programa UTAustin-Portugal (CoLab)*, the Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa (FCT/UNL) was designated to oversee programme management in Portugal, supporting the National Directors in planning, management, and coordination. Simultaneously, the Agência de Inovação was tasked with assisting activities related to the University Technology Enterprise Network from 2007 to 2008, with these responsibilities transferred to INESC Porto from 2009 to 2012. Financial support from FCT was outlined to cover human resources, travel, equipment, and other operational needs essential to running the CoLab. This phase aimed to

establish the basis for collaboration between the UT Austin and Portuguese institutions, focusing on the continuous identification of emerging technologies for future cooperation.

The second phase sought to broaden the programme's focus by placing greater emphasis on interdisciplinary research, fostering entrepreneurship, and promoting technology commercialisation, FCT/UNL was expected to continue managing the programme, but with an expanded role in supporting a broader range of activities.

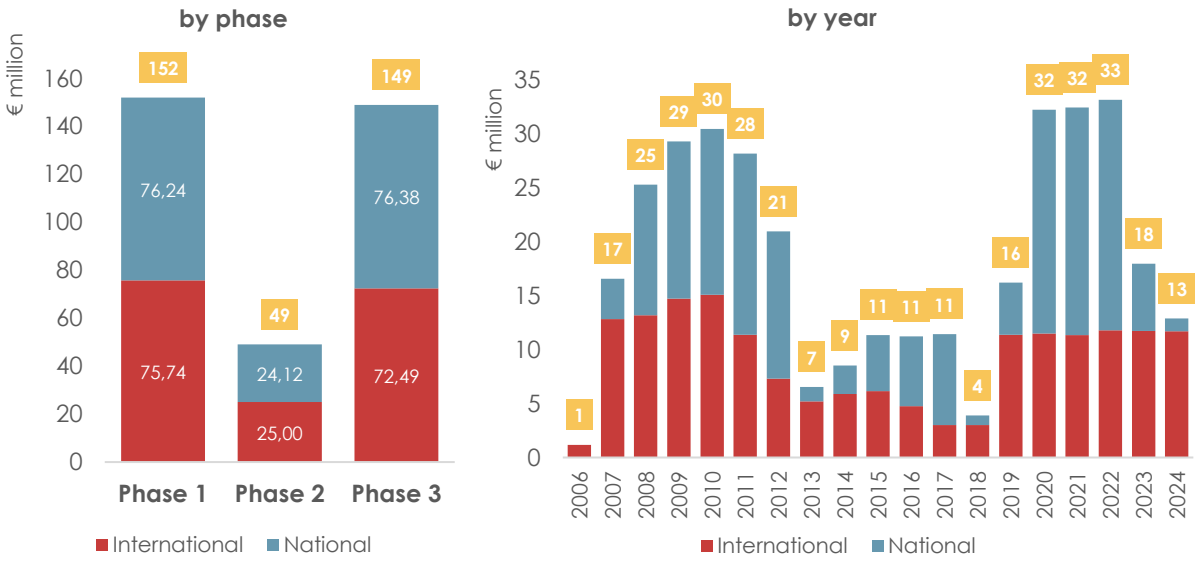
In Phase 3, as outlined in the 2018 version of *Acordo para a Gestão e Coordenação do Programa UTA-Portugal CoLab*, the programme was planned to transition into a more mature and sustainable phase. It was seen as a continuation of activities from Phase 2, but with a key change in the coordination structure: INESC TEC was designated as the Promoting Institution responsible for logistical and financial support, replacing FCT/UNL. Similarly to MIT and CMU, progress was now set to be assessed annually.

3.4 Budget and financial execution

The total budget of the partnership programmes over the course of their 18-year implementation period amounted to €350 million, comprising an approximately equal distribution of €173.2 million in payments made to the US partner institutions (MIT, CMU and UT Austin) – classified as the "international budget" – and €176.7 million dedicated to national institutions – designated as the "national budget".

Significant differences existed regarding budgetary allocations approved for the various phases of the programme. The budget for Phase 1 was €152 million, which corresponds to an average annual budget of €25.3 million. In Phase 2, the budget of the partnership programmes was significantly reduced, with the total budget amounting to €49 million (equivalent to an average annual budget of €9.8 million). However, in Phase 3, there was a notable increase in investment in the partnership programmes, with an overall budget of €149 million (equivalent to an average annual budget of €21.2 million). Additionally, normal fluctuations in the annual budget of the programmes were also observed, especially at the beginning of each phase.

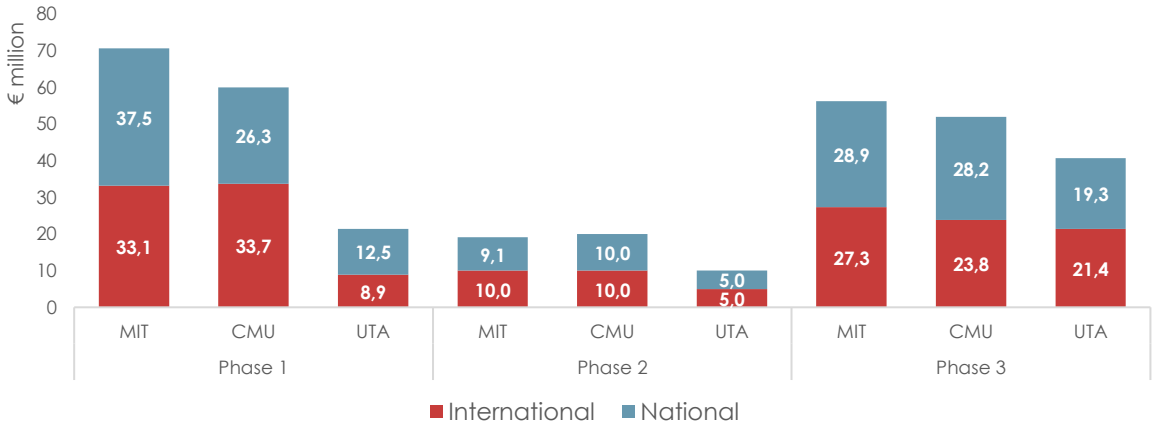
Figure 2. Partnership programmes' budget by phase and by year



Source: based on programme data provided by FCT.

The MIT partnership holds the highest budget among the three partnership programmes, with a total of €146 million, followed by CMU at €131.9 million, and UTA at €72.1 million.

Figure 3. Budget by partnership programme and phase

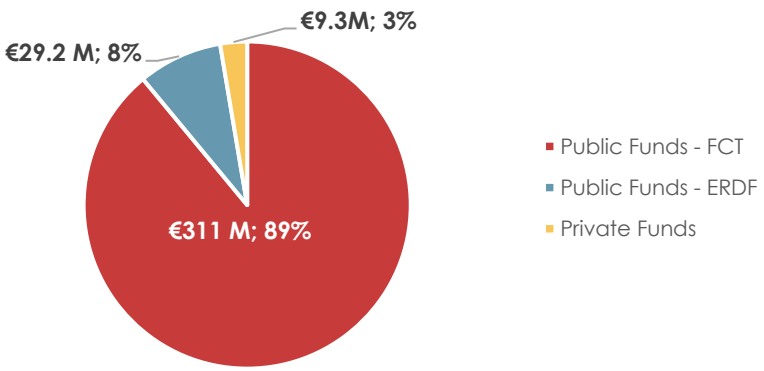


Source: based on programme data provided by FCT.

The majority of the financial resources allocated to the partnership programmes were derived from the FCT budget, including payments disbursed to US partners, and most of the funds dedicated to the national budget. In phase 3, a funding call was opened to support Large-Scale Collaborative Research projects within the partnership programmes, which combined funding from the FCT with funding from the European Regional Development Fund through COMPETE 2020 and the Portuguese Regional Operational Programmes. It was also a requirement that projects approved under this call must be led by companies and a share of the project budget must also be covered by private funds.

In total, FCT allocated a total budget of €311 million across all three phases, which represents 89% of the total budget of the partnership programmes. ERDF funds amounted to €29.2 million (8.3% of the total funding), while private funds contributed €9.3 million (2.7% of the total funding).

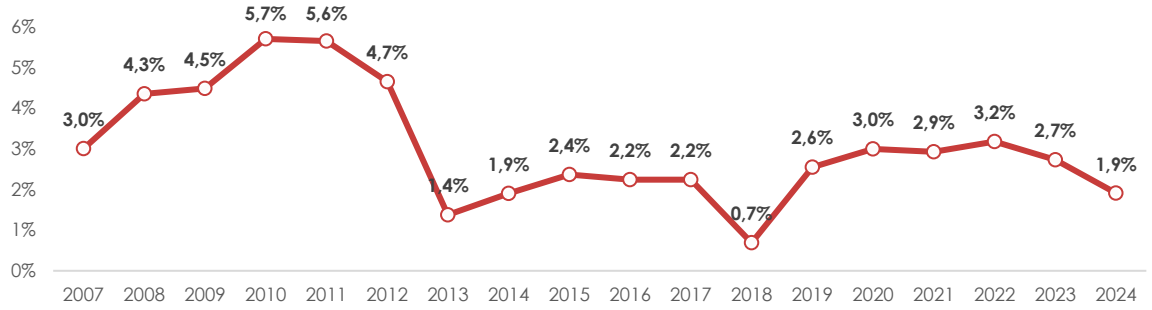
Figure 4. Funding sources of the partnership programmes (budget)



Source: based on programme data provided by FCT.

To provide some perspective on the financial dimension of the partnership programmes budget, between 2007 and 2024 FCT dedicated 3.05% of its budget to the partnership programmes. Furthermore, the share of funding for the partnership programmes in the FCT's annual budget averaged 4.61% in phase 1, 2.03% in phase 2 and 2.45% in phase 3.

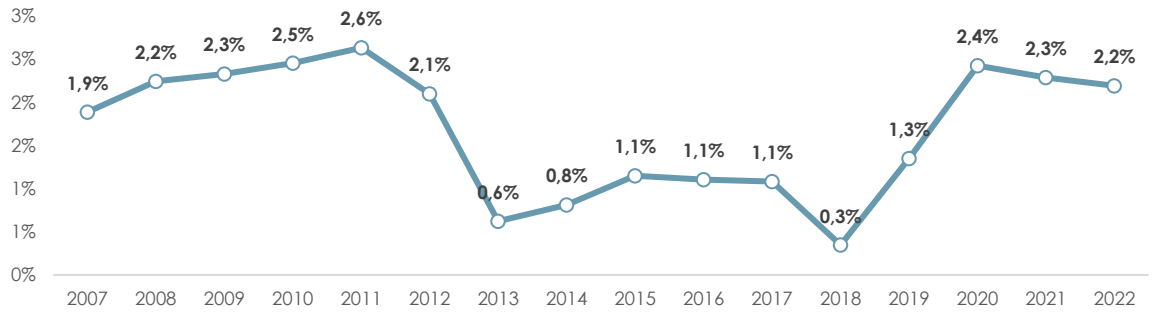
Figure 5. Share of the funds allocated to the partnership programmes budget in the annual FCT budget (2007 – 2024)



Source: calculations based on programme data provided by FCT and FCT initial annual budget data compiled from FCT Annual Activity Reports (2007-2022) and FCT Annual Activity Plans (2023-2024).

Furthermore, when the total public funds allocated to the partnership programmes (including both FCT funds and ERDF) are considered, it can be observed that the public effort in funding these programmes represented 1.72% of the national gross domestic expenditure in R&D (GERD) funded by government funds between 2007 and 2022[7], with annual rates varying between phases.

Figure 6. Public funds allocated to the partnership programmes (FCT+ERDF) as % of the annual national gross domestic expenditure in R&D (GERD) funded by government funds (2007-2022)



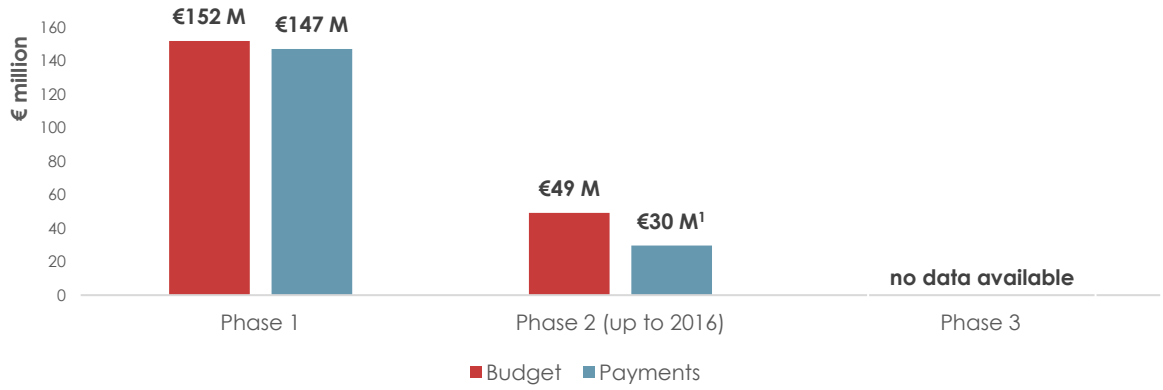
Source: calculations based on programme data provided by FCT and 'GERD by origin of funding' data from IPCTN – Inquérito ao Potencial Científico e Tecnológico Nacional 07-22.

Up to 2016, the global financial execution rate of the programmes was 93.3%, as measured by actual payments made by the FCT to US partners and national beneficiaries. The annual payments due to US partners were consistently made in full, with no financial controls being applied to the actual expenses incurred by US partners in relation to the partnership

[7] This analysis could not be done for 2023-2024 as data on national gross domestic expenditure in R&D (GERD) funded by government funds is not yet available.

programmes. After 2016, FCT ceased its efforts to monitor the financial execution of the partnership programmes, citing that "*the lack of an aggregated database does not allow for an easy and accurate retrieval of payments made to beneficiaries*"[8].

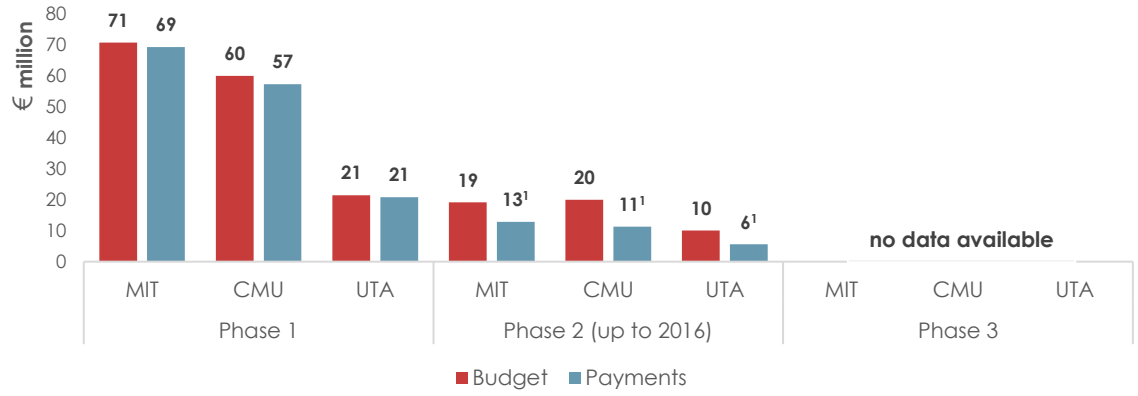
Figure 7. Budget vs. payments by phase



[1]*Data on Phase 2 payments is only available up to 31 December 2016.*
Source: based on programme data provided by FCT.

The financial execution rates exhibited by the three programmes are similar, with the rates observed in MIT Portugal demonstrating a consistent tendency to slightly exceed those of CMU Portugal and UT Austin Portugal.

Figure 8. Budget vs. payments by programme



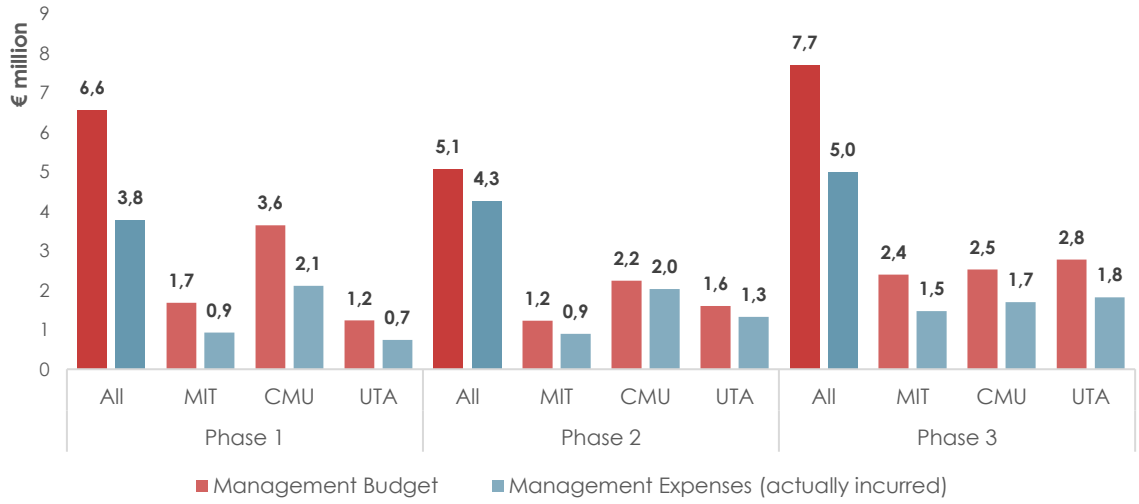
[1]*Data on Phase 2 payments is only available up to 31 December 2016.*
Source: based on programme data provided by FCT.

The budgetary allocations to cover management expenses of the programmes across various periods show some variability, most likely due to yearly adjustments made on the basis of completed and foreseen activities. The data on management budget encompasses solely the

[8] At the request of more information made by the evaluation team, FCT provided this explanation by e-mail on 16 September 2024. It is our understanding that data on the financial execution of the partnerships only exists in scattered databases (e.g. PhD scholarships, exploratory research projects, etc), and no aggregate expenditures could be correctly calculated with the data made available to the evaluation team.

amounts allocated to the national managing institutions. These are typically employed to cover costs with human resources, the procurement of goods and services and costs associated with some of the programme activities such as international mobility, missions and visits, training and entrepreneurship activities, etc, as well as a 20% overhead for general expenses. The actual payments made to the national managing institutions generally align with the budget allocations but often fall below the budgeted amounts, suggesting some degree of underutilisation.

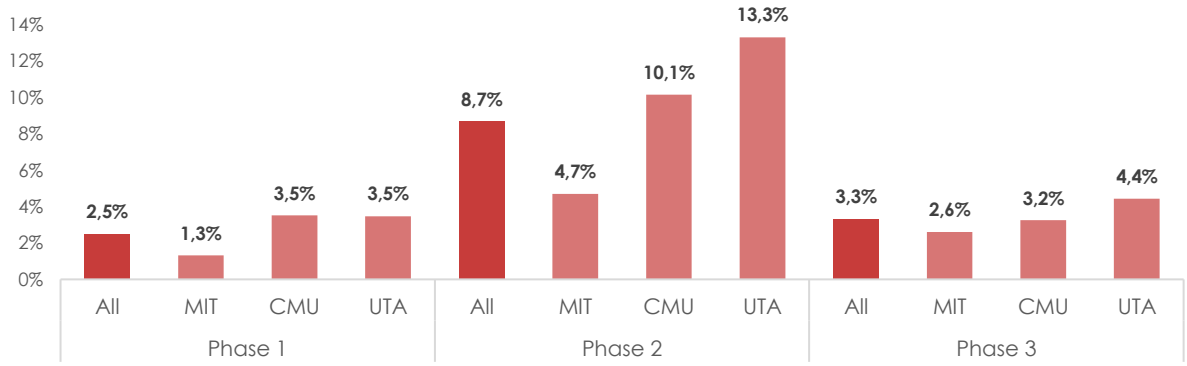
Figure 9. Management budget and expenses by programme and phase



Source: based on programme data provided by FCT.

Between 2007 and 2023, the actual management expenses incurred by the three partnership programmes amounted to 3.72% of the programmes' overall budget, averaging €629 922/year on phase 1, €851 253/year on phase 2 and €831 769/year on phase 3.[9]

Figure 10. Management expenses (actually incurred) as % of programme budget



Source: based on programme data provided by FCT.

[9] The different nature of the programme activities covered by the management budget in each partnership makes direct comparisons between them inappropriate, as the budgets are allocated to distinct purposes and objectives.

3.5 Overview of the programmes' implementation

3.5.1 *Education*

Under the 'Education' pillar of the Partnership Programmes, 18 joint PhD programmes have been developed throughout the three implementation phases. Of these, only the PhD programmes offered by CMU Portugal awarded a dual degree. Additionally, 10 master's programmes[10] have been established under the partnerships.

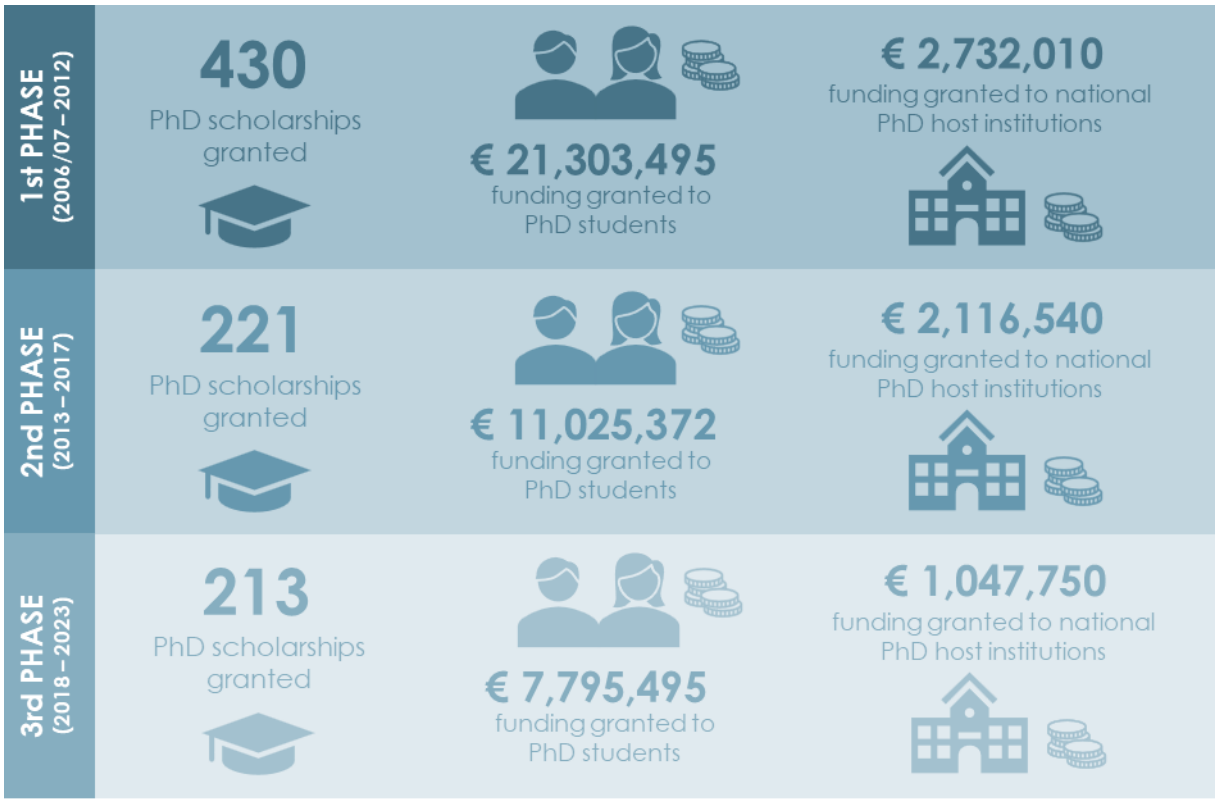
Table 4. Overview of Master and PhD Programmes

Partner	Degree of the Programme	Programme
Carnegie Mellon University	Master's Degree	• Human – Computer Interaction • Information Network • Information Technology - Information Security • Software Engineering • Entertainment Technology
	PhD (dual degree)	• Applied Mathematics • Computer Science • Engineering and Public Policy • Language Technologies • Technological Change and Entrepreneurship • Electrical and Computer Engineering • Computer Science – Robotics • Software Engineering • Machine Learning • Societal Computing
Massachusetts Institute of Technology	Master's Degree	• Bioengineering • Technology Management Enterprise • Sustainable Energy Systems • Complex Transport Infrastructure Systems
	PhD	• Bioengineering Systems • Leaders for Technical Industries • Sustainable Energy Systems • Transportation Systems
University of Texas at Austin	Master's Degree	• Digital Media
	PhD	• Advanced Computing • Digital Media • Mathematics

[10] Data on the funding attributed to Masters programmes was not made available to the evaluation team.

Since 2006/07, 864 PhD scholarships were awarded by the three Partnership Programmes, with a total funding of €46,020,662 distributed among students and institutions. A total of 430 PhD grants were awarded in the first phase. For this phase, €21,303,495 was allocated to students and an additional €2,732,010 to national host institutions. The 2nd and 3rd phases of the programme saw a decrease in the number of PhD scholarships, with 221 and 213 new grants respectively. Total funding granted in PhD scholarships was also significantly lower in the 3rd phase.

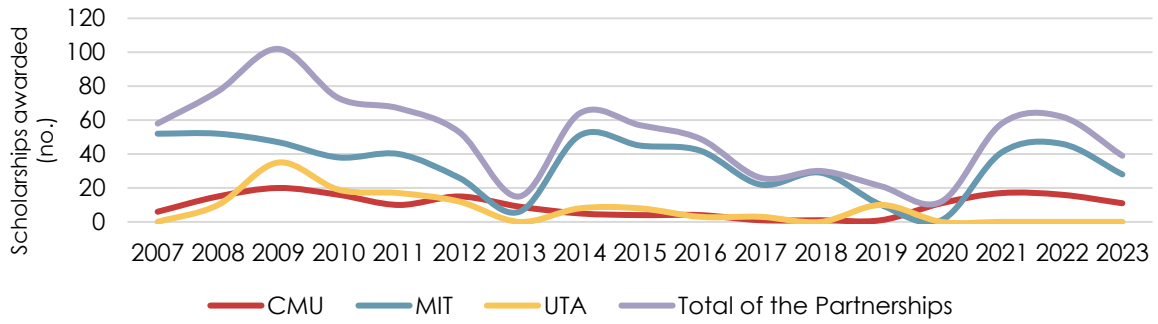
Figure 11. Programmes Overview – 'Education' funding



Source: based on programme data provided by FCT.

An analysis of PhD grant allocation over the three phases of the International Partnerships Programmes revealed a higher allocation of grants to the MIT in all phases of the programme. Specifically, 255 PhD grants were awarded in the scope of MIT Portugal in the 1st phase, 166 in the 2nd phase, and 156 in the final phase, totalling 577 grants. For CMU Portugal, 82 PhD grants were funded in the 1st phase, 23 in the 2nd phase, and 57 in the 3rd phase, totalling €5,192,364 allocated to students and €778,551 to institutions. Regarding the UT Austin Portugal, a total of 125 PhD grants were awarded across the three phases (93 in the 1st phase and 32 in the 2nd phase), resulting in €6,670,291 in funding for students and €977,510 for institutions.

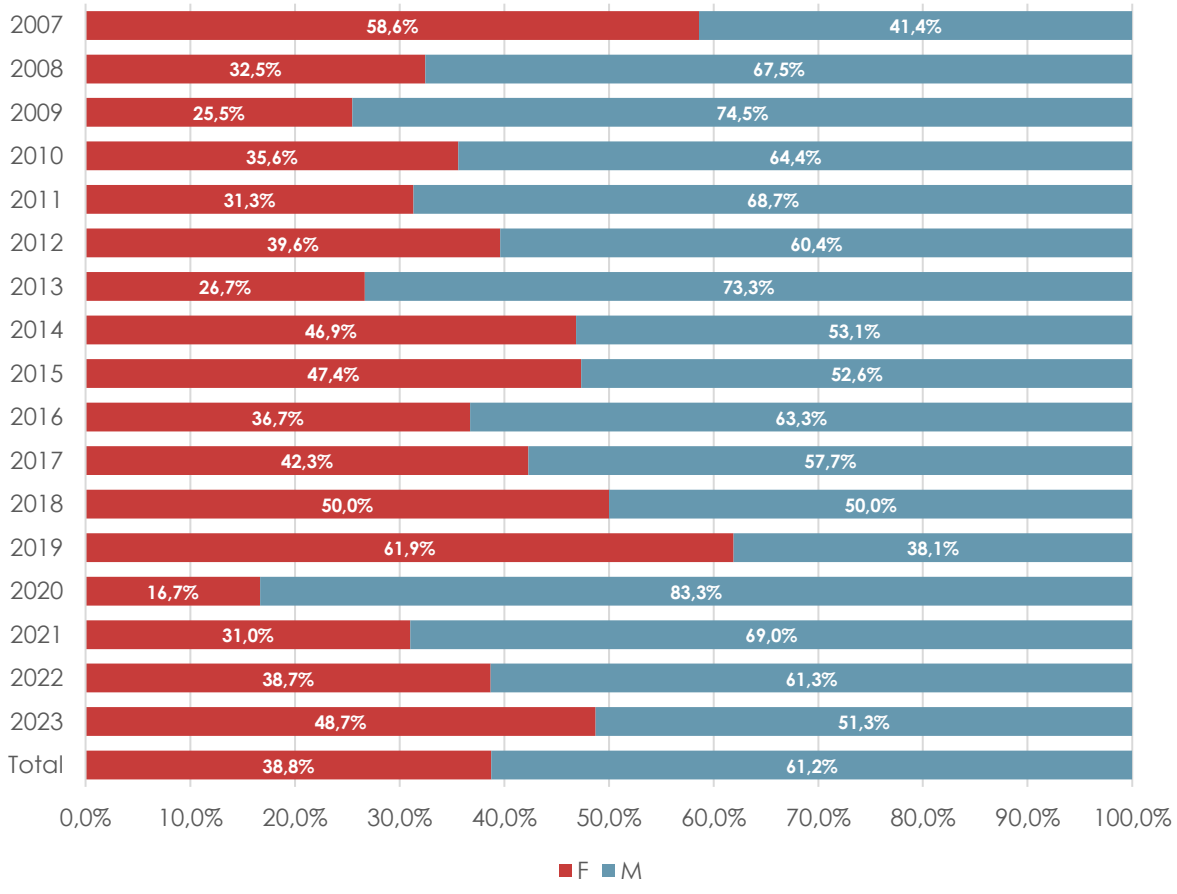
Figure 12. Distribution of PhD Scholarships by starting year (2007 - 2023[1])



[1]*Annual data corresponds to the year in which the scholarship started, regardless of the year of the PhD grant call, which may have occurred several years earlier.*
Source: based on programme data provided by FCT.

Male candidates represented 61.2% of the total PhD scholarships recipients, and gender parity in scholarship distribution was observed only in 2018. In 2019, there was a sporadic reversal of this trend, with a higher allocation of scholarships to female candidates, who received 61.9% of the scholarships that year. In total, 335 PhD scholarships were granted to female candidates and 529 to male candidates.

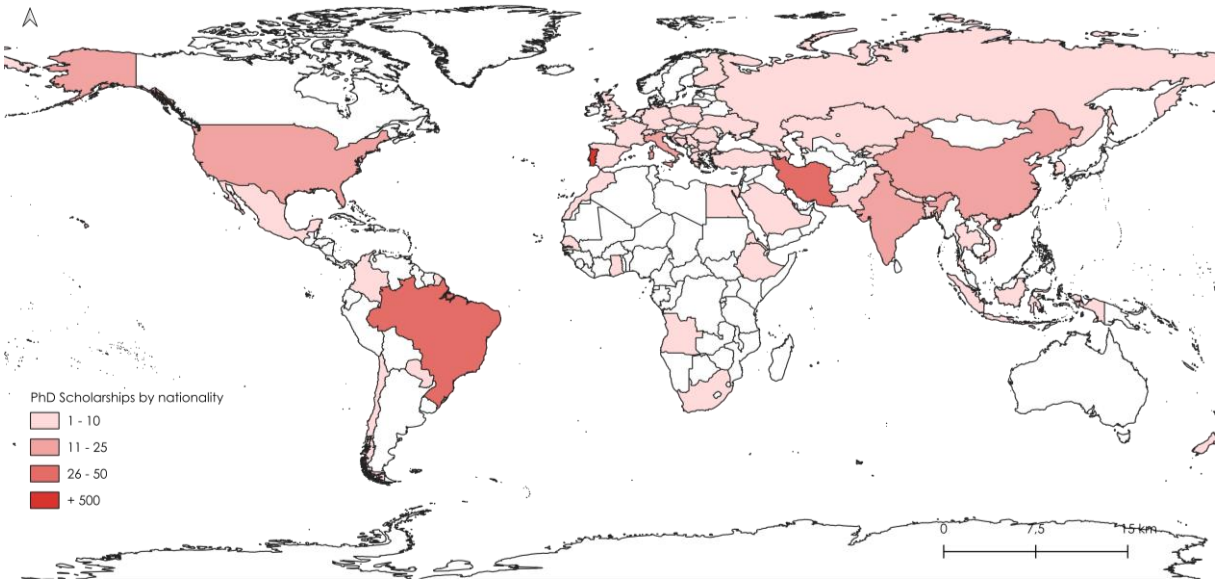
Figure 13. Distribution of PhD grant by gender per year (2007 – 2023[1])



Source: based on programme data provided by FCT.

Scholarships awarded to students of Portuguese nationality represent 70.4% of the total PhD scholarships awarded under the international partnership programmes. Brazilian nationals represent 5.3% of the students who received a PhD scholarship, and other most represented nationalities include Iran (3.2%), Italy (2.5%), the United States of America (2.2%), and China (2.1%).

Figure 14. PhD students under the three phases of the international partnership programmes by country of nationality (2007 - 2023)



Source: based on programme data provided by FCT.

The average national funding per PhD student in the partnership programmes amounts to €46 440, with some fluctuations observed between the phases of the programmes and the different partnerships. In addition to these funds, the CMU dual-degree scholarships also involve funding attributed by CMU and supported through the international budget of the partnership, amounting to approximately €350,000 per student.

Table 5. Average national funding per PhD student/scholarship holder per partnership programme (€)

Programme	Phase 1	Phase 2	Phase 3	Total by Partnership
CMU Portugal [1]	36 491,34 €	34 679,57 €	24 604,28 €	**32 051,63 €**
MIT Portugal	52 410,33 €	54 747,86 €	37 236,72 €	**48 980,43 €**
UTAustin Portugal	53 188,92 €	53 866,28 €	-	**53 362,33 €**
Total	**49 543,01 €**	**49 888,56 €**	**36 598,57 €**	**46 440,23€**

[1]*Average national funding for CMU Portugal does not include the scholarship funds attributed directly by CMU which are covered by the international budget of the partnership, amounting to aprox. €350k per student.*

Source: based on programme data provided by FCT.

An analysis of the national institution's participation across the MIT Portugal, CMU Portugal, and UT Austin Portugal PhD scholarship programmes reveals a high degree of selectivity, with a small number of institutions - mainly public universities – hosting most of the PhD scholarships.

The Instituto Superior Técnico (IST) of the University of Lisbon is the leader in total participations across all programmes, hosting 338 PhD scholarships throughout all phases. It has particularly strong involvement in the MIT and CMU programmes, with 237 and 82 participations, respectively. While IST stands out as a key partner in the MIT Programme, representing a significant portion of that programme's activities, it should be noted it is also the top participant in the CMU programme.

The University of Porto (Faculdade de Engenharia) and Universidade Nova de Lisboa (Faculdade de Ciências e Tecnologia) also stand out for their strong, consistent participation across multiple programmes, particularly in the MIT and UT Austin programmes. University of Minho has a relatively high presence in the MIT Programme. On the other hand, INESC-TEC, a research organisation focused on engineering and computer science, is the top national host for CMU scholarships.

Table 6. Top national host institutions to PhD student/scholarship holder per partnership (2007 - 2023)[1]

National Host Institution	Total PhD Scholarships hosted	PhD Scholarships by programme		
		MIT Portugal	*CMU Portugal*	*UT Austin Portugal*
Universidade de Lisboa - Instituto Superior Técnico (IST)	338	*237*	*82*	*19*
Universidade do Porto - Faculdade de Engenharia	158	*98*	*19*	*41*
Universidade Nova de Lisboa - Faculdade de Ciências e Tecnologia (FCT)	154	*100*	*13*	*41*
Universidade do Minho - Escola de Engenharia	88	*82*	*1*	*5*
Instituto de Engenharia de Sistemas e Computadores, Tecnologia e Ciência (INESC-TEC)	*79*	*33*	*28*	*18*
Universidade de Coimbra - Faculdade de Ciências e Tecnologia	58	*52*	*3*	*3*
Universidade de Lisboa - Faculdade de Ciências	28	*21*	*4*	*3*
Universidade de Coimbra - Energia para a Sustentabilidade	15	*15*	*0*	*0*

[1] *Note that several host institutions can be involved in a single PhD scholarship (e.g. multiple PhD advisors). The "Total PhD Scholarships hosted" column reflects the aggregate number of scholarships hosted by each institution across all three programmes.*
Source: based on programme data provided by FCT.

It should be noted that since their inception, the programmes have focused on a narrow spectrum of scientific and technological areas (with a strong focus on Computer Science and various other fields of Engineering, mainly oriented towards digital technologies and industry), areas in which the US partners excel. Within these areas, the sub-domains selected throughout the implementation of the programmes tended to focus on emerging technologies or those undergoing a major transformation. In turn, the participation of national institutions in the programmes could also reflect, in part, the institution's degree of alignment with these knowledge areas, especially taking into consideration the schools/departments involved.

On the other hand, this data suggests that institutions that have been involved in the management of the partnership programmes may have had higher participation in those

programmes[11]. This cannot be dissociated from the fact that management institutions were first selected due to their scientific proximity to the knowledge areas of the programmes. Other possible reasons suggested by beneficiaries and management teams in interviews include increased familiarity with programme processes and guidelines, and higher capacity to submit well-prepared grant applications. It was also often reported by institutional beneficiaries that having previous experience in a programme increased future participation chances, largely due to the enduring professional relationships and easier access to collaboration networks, particularly with principal investigators (PIs) at the US universities.

3.5.2 Research

The funding of research and development projects has been a feature of the Partnership Programmes throughout all three phases, with call typologies being defined by each Programme in their workplan. From 2008 to 2022, 26 calls for research projects supported by national programme funds were opened, and 202 projects were funded. Additionally, in the MIT Portugal programme, 8 calls for seed projects opened between 2014 and 2022, which were supported by MIT funds. 87 seed projects were funded through this scheme with a total funding of $5.500 million USD. In 2019, a call for Large-scale Collaborative Research Projects was launched by Compete 2020, ANI and FCT, combining national FCT and ERDF funding to support R&D projects led by national companies in collaboration with national academic organisations. Projects must involve at least one Principal Investigator from MIT, UTA or CMU and focus in one or more of the technological areas identified in the respective MIT Portugal, UT Austin Portugal and CMU Portugal programmes. A total of 30 large-scale projects were funded through this call[12].

During the first phase, 8 calls opened in 2008 and 2009, including one joint call between CMU and UTA, and 61 research projects were funded (approval rate = 39%). FCT funding awarded to these projects amounted to €14,383,314 on phase 1.

In the second phase, 9 calls were opened, including calls for Exploratory Projects in all three partnerships, as well as 'early bird projects' (CMU Portugal) and Entrepreneurial Research Initiatives (CMU Portugal). In this phase a larger number of applications was received, with 74 projects receiving funds (approval rate = 27.5%). FCT funding awarded to these projects amounted to €13,641,071 on phase 2.

In the third phase, 9 calls for exploratory projects were opened (three in each programme), which received a total of 309 applications of which 67 were funded (approval rate = 21.7%). In addition to these, the 2019 Large-Scale Collaborative Research Call received 41 applications, and 30 Flagship and Strategic projects approved (approval rate = 73%). FCT funding awarded to phase 3 exploratory projects amounted to €3,502,906, while the total funding awarded to projects approved under the 2019 Large-Scale Collaborative Research call amounted to €70,511,845 (including € 8.6M national FCT funds, €29.2M ERDF, €23.4M international partnership budget funds, and €9.3M private funds).

[11] Grant decisions are made by the Foundation for Science and Technology and programme management teams have no direct involvement in grant decisions.

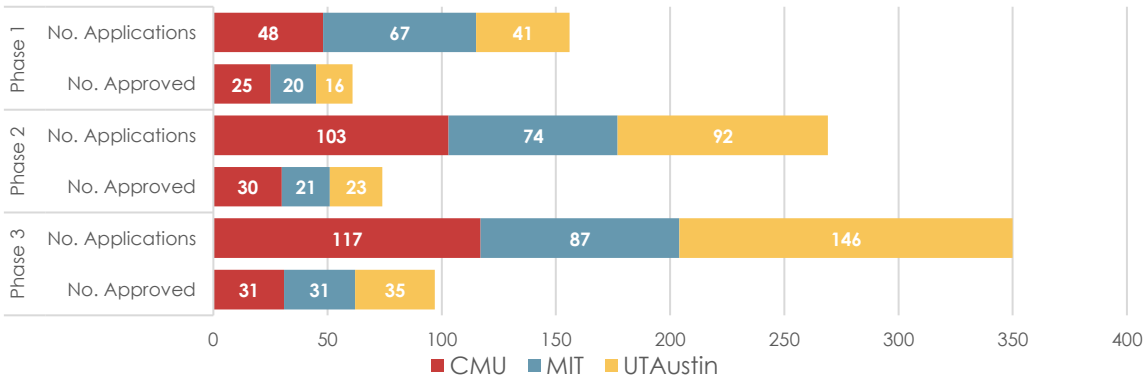
[12] Projects supported through the 'Large-scale Collaborative Research Projects' fall under the 'Flagship Projects" typology in the MIT Portugal programme and 'Strategic Projects' typologies in the CMU Portugal and UT Austin Portugal programmes.

Figure 15. Programmes Overview – 'Research' funding[1]

[1] *Data on MIT Portugal Seed projects funded by MIT is not included.*
Source: based on programme data provided by FCT.

Across the three phases, CMU Portugal calls received a total of 268 applications and approved 86 (32.1%), MIT Portugal calls received 228 applications and approved 72 (31.6%), while UT Austin Portugal had 279 applications with 74 approvals (26.5%). Across the three phases, CMU saw a steady increase in applications (from 48 to 117) together with higher project selectivity (approval rates declined from 52.1% to 26.5%). MIT also experienced a consistent rise in applications while approval rated remained similar. UT Austin calls had the highest number of applications overall and were the most selective calls, especially in phases 2 and 3.

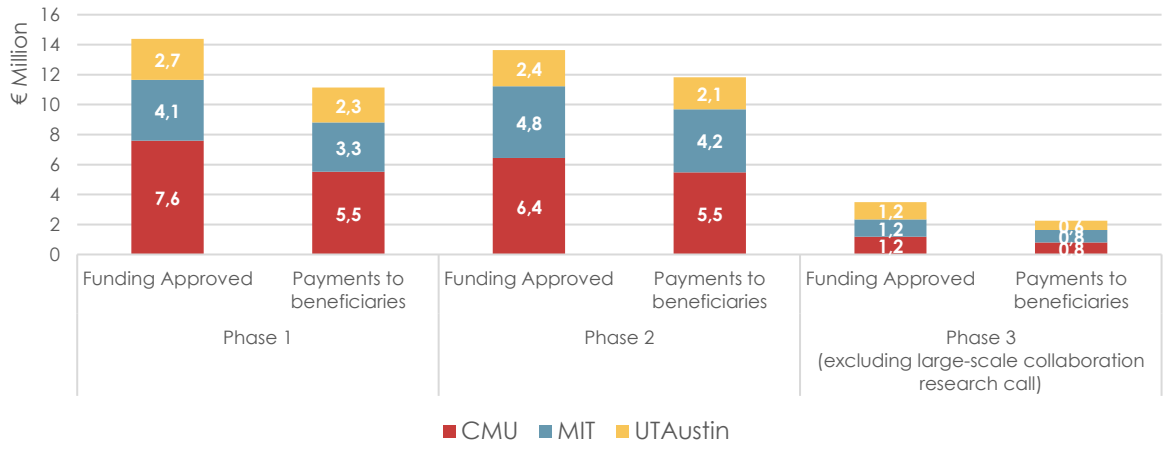
Figure 16. Applications vs. research projects funded by phase and partnership programme (no.)[1]



[1] *Data on MIT Portugal Seed projects funded by MIT is not included.*
Source: programme data provided by FCT.

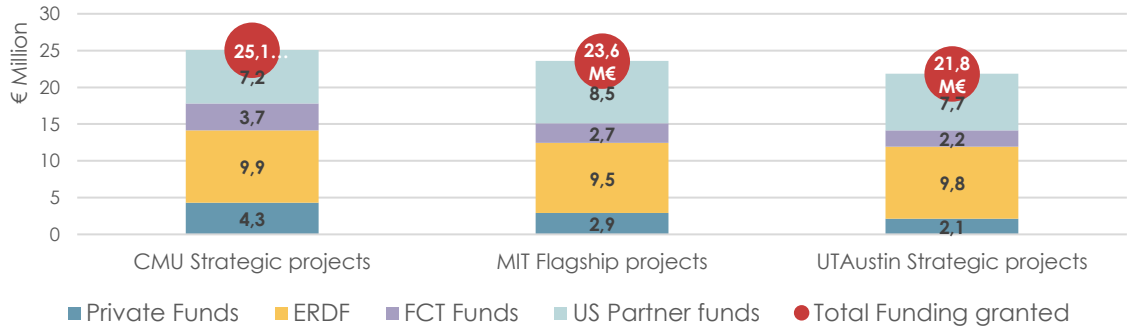
CMU Portugal projects consistently received the largest funding allocations across all phases, with a total €7.6 million funding granted in Phase 1, €6.4 million in Phase 2, and €26.2 million in Phase 3 (of which €1.2 million for exploratory projects and €25 million for strategic projects). Projects approved under the MIT Portugal partnership followed a similar pattern but with lower amounts, receiving €4.06 million in Phase 1, €4.8 million in Phase 2, and €24.8 million in Phase 3 (€1.2 million for exploratory projects and €23.6 million for flagship projects). UT Austin Portugal projects received the lowest overall funding, with €2.7 million in Phase 1, €2.4 million in Phase 2, and €23 million in Phase 3, and also registered the lowest average funding by project funding. Across the three phases, payments made to CMU Portugal research project partners amounted to 77.6% of its approved funding, in MIT Portugal, 83.1%, and in UT Austin Portugal, 81.1%. Overall, 80.1% of the total approved funding across all programmes has been paid out to beneficiaries[13].

Figure 17. Funding granted to research projects vs. actual payments by phase and partnership programme (€M)



Source: based on programme data provided by FCT.

Figure 18. Funding granted to Large-Scale Collaboration research projects (3rd phase) by source of funds (€M)



Source: based on programme data provided by FCT.

[13] Payment rates are not final as 22 Phase 3 projects are still ongoing.

Table 7. Average research project funding by phase and partnership programme (€)

Programme	Phase 1	Phase 2	Phase 3 - Exploratory projects	Phase 3 – Large-Scale projects
CMU Portugal	303 608,43	214 442,10	62 112,10	2 088 025,63
MIT Portugal	203 156,60	228 649,05	48 535,62	3 372 705,63
UT Austin Portugal	170 623,19	104 616,43	48 246,73	1 986 054,39

Source: based on programme data provided by FCT.

In terms of top beneficiaries, the Instituto Superior Técnico (University of Lisbon) leads with a total of 41 participations in research projects funded by the partnership programmes, showing a significant involvement in all three programmes, especially in the CMU Portugal and MIT Portugal programmes. The University of Minho (UM) follows closely with 37 participations, mainly in the MIT Portugal (21) and UT Austin Portugal (14) programmes, but with relatively low participation in CMU Portugal. INESC ID has a strong commitment with 34 participations, mainly in CMU Portugal (27), reflecting its focus on this partnership. The University of Coimbra (UC) also shows a balanced involvement across the three programmes, with a total of 34 participations. Faculdade de Engenharia da Universidade do Porto (FE/UP) and Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento (ISTID) register 26 and 23 participations, respectively. FE/UP has a particularly strong presence in MIT Portugal (14), while ISTID has an even distribution across the three programmes. Other organisations, such as Instituto de Telecomunicações (IT) and the University of Aveiro (UA), also make significant contributions, particularly in CMU Portugal. INESC Porto and NOVA.ID.FCT complete the top 10 with 17 participations each and a notable involvement in CMU Portugal.

Table 8. Top 10 national organisations by no. of participations in funded research projects

Organisations	Total no. of R&D project participations	R&D Project Participations by programme		
		CMU Portugal	*MIT Portugal*	*UT Austin Portugal*
Instituto Superior Técnico (IST/ULisboa)	41	*19*	*15*	*7*
Universidade do Minho (UM)	37	*2*	*21*	*14*
Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa (INESCID/INESC/IST/ULisboa)	34	*27*	*1*	*6*
Universidade de Coimbra (UC)	34	*12*	*13*	*9*
Faculdade de Engenharia da Universidade do Porto (FE/UP)	26	*5*	*14*	*7*
Associação do Instituto Superior Técnico para a Investigação e o Desenvolvimento (ISTID)	23	*7*	*9*	*7*
Instituto de Telecomunicações (IT)	23	*16*	*1*	*6*
Universidade de Aveiro (UA)	20	*9*	*5*	*6*
Instituto de Engenharia de Sistemas e Computadores do Porto (INESC Porto/FE/UP)	17	*8*	*3*	*6*
NOVA.ID.FCT Associação para a Inovação e Desenvolvimento da FCT (NOVA.ID.FCT)	17	*10*	*4*	*3*

Source: based on programme data provided by FCT.

3.5.3 *Innovation*

The emphasis on innovation and entrepreneurship activities varied in intensity depending on the partnership programme and phase. In the first phase, these activities were primarily experimental, taking the form of networking among stakeholders, exchange visits by selected groups to American universities, or, at a later stage, the implementation of pilot actions. The second phase set objectives that were transversal to all international partnerships focused on innovation and entrepreneurship, often materialised in a more mature phase of programme implementation, resulting from pilot experiences and their fine-tuning. In contrast, the third phase saw a notable reduction in programmes centred on the same types of training, ideation, and acceleration. These were replaced by financial instruments for research, development, and innovation projects.

The work conducted by UTEN, under the UT Austin Portugal programme, represented a important achievement in the first phase. Capacity building constituted a central objective, with the organisation's initiatives encompassing international internships, specialised training and networking, technology commercialisation, observation and assessment, and institutional development. These endeavours sought to equip participants with expertise in technology transfer and commercialisation, reinforce the connection between academia and Portuguese industry, cultivate technology-based entrepreneurship, and facilitate the growth of businesses at national and global levels.

Table 9. UT Austin Portugal: UTEN Innovation and Entrepreneurship activities by year (Phase 1)

Timeline	Activities
Years 1 and 2 (March 2007 – August 2008)	- Relationship and network building - UTEN-sponsored awareness-building visits to Portugal and Texas - S&T portfolio assessments at select Portuguese universities - Pilot "learning by doing" for S&T internationalization - Building Texas UTEN Partners Network (UT Austin, UT Dallas OTC, Texas A&M, etc.) - First UTEN national conference, Lisbon
Year 3 (September 2008 – August 2009)	- 23 international internships - 2 two-week intensive workshops at ICT Institute - First UTEN annual report - Continued network building at Portuguese universities - First university technology academic spin-off survey
Year 4 (September 2009 – August 2010)	- 6 international workshops focusing on technology sectors (Cambridge, Carnegie Mellon, etc.) - 6 regional training weeks (Licensing and Negotiation, Venture Creation, etc.) - Pilot in-situ training (TecMinho, University of Minho, FCT) - First ISCTE-IUL MIT | Portugal ventures competition
Year 5 (September 2010 – August 2011)	- 6 international internships: UT Austin, MIT, Carnegie Mellon, USC - Workshops at universities in Minho, Lisbon, and Porto - Continued network building (Nanotechnology, Life Sciences, Arts, Humanities) - Second TTO Survey - Formation of UTEN General Assembly, Executive Committee, and other governing bodies - Third UTEN national conference - Second ISCTE-IUL MIT | Portugal ventures competition

Timeline	Activities
Year 6 (September 2011 – December 2012)	- US Connect pilot program on business development (Portuguese start-ups, UT Austin Portugal) - Copyright for Creative Industries event - From the Lab to Market training week - Fourth UTEN Annual Report - Third University Technology Academic Spin-off Survey - 3 Day Start-up events in Porto and Lisbon - UTEN Annual Conference 2012 - In-situ training at Instituto Pedro Nunes (Coimbra) - Reverse internship of Rosemary French at UPIN (University of Porto) - Strategic session on Entrepreneurship and Regional Growth (CMU-Portugal) - Connection to Europe (5 European delegations)

Source: compiled from UTEN Portugal 2007 – 2012: A Progress Report.

During phase 2, UTEN focused on international business acceleration for Portuguese early-stage science and technology start-up companies, particularly aiming to expand their reach into international markets, including the United States, through the Global Startup Program (GSP). A key aspect of the GSP was its support for early-stage commercialisation projects led by researchers or entrepreneurs, often aimed at spinning off into new companies. For technology-based projects at this stage, typically in early development, UT Austin provided proactive business development services, over the course of 8 - 12 months, the UT Austin team worked closely with Portuguese entrepreneurs, preparing them for market launches not only in the US but also in other regions. The support included extensive market research, strategic business planning, the development of marketing materials, and guidance through business engagements. By arranging meetings with potential clients, providing coaching, and assisting in negotiations, the UTEN team ensured that these ventures had the tools necessary to succeed in competitive international markets. In addition to early-stage companies, mature technology ventures with an established sales record were also supported by the GSP. These companies, already successful in the Portuguese market, were prepared for the transition to international markets, with a particular focus on the US Drawing on the success of the US Connect initiative, which helped companies such as Feedzai, Veniam, Talkdesk, and Omniflow establish themselves in the US market, UTEN continued to offer these more advanced ventures assistance in business development, incubation, and deal-making.

Table 10. Phase 1 UTEN Workshops and Training Weeks, 2009 - 2012

Activity	Attended	Year	Event
Start-up funding: Streamlining venture capitalists & business angels	19	2012	Int'l workshop
Bayh-Dole Act: Opportunities for Portugal	22	2012	Int'l workshop
Patent portfolio strategic management	12	2011	Training week
Evaluation of intangible assets	16	2011	Training week
From the lab to the market: Deep analysis of a real case	14	2011	Training week
Negotiation of research contracts	10	2011	Int'l workshop
Development of social entrepreneurial ventures	18	2011	Int'l workshop

Activity	Attended	Year	Event
Copyright for creative industries	12	2011	Int'l workshop
Increasing commercialization outcomes for university nanotechnology laboratories	11	2011	Int'l workshop
Commercialization of space technologies	10	2011	Int'l workshop
Licensing & negotiation	33	2010	Training week
Capital sourcing & technology venturing	32	2010	Training week
University spin-off & venture creation	23	2010	Training week
University-based technology business incubation	20	2010	Training week
Setting up & managing an Industrial Liaison Office	22	2010	Training week
Nanosciences: Research collaboration & network building for commercialization	31	2010	Int'l workshop
Marine & biosciences: Research collaboration & network building for commercialization	32	2010	Int'l workshop
Commercialization & technology transfer in information & communication technology	25	2010	Int'l workshop
Licensing & negotiation	33	2009	Training week
Experiencing technology transfer with Carnegie Mellon	30	2009	Int'l workshop
Experiencing technology transfer @ Cambridge University	28	2009	Int'l workshop
Case studies on technology transfer & IP protection (Fraunhofer)	29	2009	Int'l workshop
From the lab to the market place: Obtaining strong patents for technology transfer & commercialization (General Electric)	42	2009	Int'l workshop
Licensing & technology transfer: Fostering a new dialogue with MIT	47	2009	Int'l workshop
Technology transfer with The University of Texas at Austin	51	2009	Int'l workshop

Source: Adapted from UTEN Portugal 2007 – 2012: A Progress Report.

Furthermore, UTEN acted as a boundary object in the development of its objectives, as its work extended beyond activities solely within the UT Austin framework. It also operated at the intersection of international partnerships with MIT and CMU. For instance, UTEN organised specific events aimed at fostering the growth of new businesses and preparing them for entry into international markets. The US Connect for International Business pilot programme, in close collaboration with Portuguese Technology Transfer Offices and other international UTEN partners, worked with the IC² Institute at the UT Austin to identify university-based start-ups with strong potential for international success, helping them establish business ventures, alliances, and relationships within the US market. Similarly, UTEN collaborated with ISCTE-MIT on the Technology Ventures Competitions, which aimed to promote venture competitions across Portuguese universities and support the development of successful science and technology-based businesses. Additionally, CMU launched the Entrepreneurship in Residence pilot initiative in close collaboration with UTEN, providing training, mentoring, and opportunities for Portuguese companies to collaborate with potential industry partners to enter the US market. The collective assessment of these activities was a recommendation from the Academy of Finland (2012) to extend UTEN's activities to encompass all international partnerships.

Table 11. UT Austin Portugal: UTEN Global Startup Program 2011-2017

Timeline	2011-2012	2013-2014	2014-2015	2015-2016	2016-2017
Companies Accepted	- Bioalvo - Technophage - WS Energia - Tecla Colorida - Inovapotek - Feedzai	- Abyssal - Auditmark - Celfinet - Livefabric - Omniflow - Tuizzi - Zercatto	- Metablue - IPBRICK - 2EAST - Vertequip - Farmodietica - Whale - ARPublisher - TUIZZI - RVLP Tecnologies´ - TakeTheWind	- Biopremier - Bliss Applications - Dognaedis - Eyesee - VENIAM - Line Health - XHOCKWARE - Ciengis - Beeverycreative - Coolfarm - BeMicro - doDOC - FINDSTER - PeekMed - Petable - SWITCH - SWORD HEALTH - WATT-IS	- CrowdProcess - LaserLeap Technologies - Loqr - Shelf.ai (Xarevision) - Perceive3D - Sphere Ultrafast Photonics
Total	6	7	9	18	6
Applications	N/A	28	41	34	36

Source: compiled from UTEN Portugal 2013 – 2015: A Cumulative Report and UTEN Portugal 2016: Activities Report.

Under the MIT Portugal Programme, the participation of Portuguese faculty in MIT's Innovation Teams (i-Teams) provided faculty members with practical experience in developing strategies for the commercialisation of emerging technologies. Portuguese faculty members worked alongside MIT students, researchers, and business catalysts, focusing on the assessment of the market viability of various technologies developed at MIT as part of the i-Teams programme. Such exposure to the practical aspects of innovation, including the challenges and solutions involved, enabled the participants to gain a deeper understanding of the processes involved in transforming technical ideas into market-ready products. As a result, these courses incorporated both academic and practical perspectives on innovation, preparing doctoral students to navigate the complex interface between research and entrepreneurship. In parallel, the Portuguese faculty's exposure to the broader MIT innovation and entrepreneur ecosystem deepened their understanding of the mechanisms that drive the translation of technological discovery into economic and social value. Another notable flagship initiative is the Building Global Innovators (BGI) venture competition, launched in collaboration with MIT, provided a platform for Portuguese start-ups to access international markets and investment networks. Over time, BGI became a pronounced feature of the Portuguese innovation ecosystem, recognised globally for its contribution to fostering high-potential ventures.

Table 12. MIT Portugal Programme: Innovation and Entrepreneurship related activities by Phase

Phase	Programme/Activity	Description
Phase 1	Participating in the Innovation Teams (i-Teams)	Portuguese faculty participated in MIT's i-Teams programme to gain practical experience in developing go-to-market strategies for innovative technologies. Working with MIT students, researchers, and business catalysts, they applied their learning to evaluate technologies for market potential. Insights from this experience shaped the innovation courses for the MIT Portugal Programme's Bioengineering Systems PhD.

Phase	Programme/Activity	Description
Phase 1	Exposure to the MIT Innovation/Entrepreneur Ecosystem	Portuguese faculty immersed themselves in MIT's Innovation/Entrepreneur Ecosystem, attending courses, seminars, and events like the Global Startup Workshop. They also engaged with MIT's Technology Licensing Office (TLO) and Industrial Liaison Program (ILP), gaining insights on how MIT links technological innovation to economic and social impact, which were adapted to the MIT Portugal Programme.
Phase 2	Innovation for Technological Systems (ITS)	A course designed for PhD students in all focus areas, featuring Innovation & Entrepreneurship Week (I&E Week) and focus-specific sub-modules, such as Innovation in Bioengineering.
Phase 2	Innovation Bootcamp	A leadership development programme featuring outdoor team challenges and role-playing exercises, aimed at fostering leadership and teamwork among PhD students.
Phase 2	iTeams Course	Multidisciplinary teams of PhD students collaborate to develop go-to-market strategies for breakthrough technologies emerging from Portuguese research labs.
Phase 2	Technological Change & Innovation Initiative (i2)	Led by two innovation professors, this initiative promoted entrepreneurial skills and industrial innovation. It included tailored programmes to Portuguese needs and activities like International Industry Roundtables.
Phase 2	MIT International Workshop on Innovating (IWI)	A one-week hands-on workshop at MIT designed to help participants understand innovation and develop solutions to real-world problems, through seminars by experts, successful entrepreneurs, and networking activities.
Phase 2	Building Global Innovators (BGI)	BGI is a global venture competition aimed at supporting high-potential start-ups and fostering innovation and entrepreneurship in Portugal. Launched in 2010 as a joint venture between MIT Portugal and ISCTE-IUL, BGI focuses on Go-to-Market strategies, leveraging the expertise of seasoned mentors (Catalysts) from both the US and Portugal. As of 2016, the competition received over 2,000 applications, 74 active ventures (63.8% survival rate) and raised more than €78 million in funding for its start-ups, creating over 450 jobs. It is renowned for its international networking opportunities, providing access to both local and global markets. BGI's key components include a robust mentoring system, educational sessions on scaling start-ups, access to investors, and a focus on technologies with a high potential for economic and social impact. It has been recognised as one of the top 20 EU accelerators by Fundacity and has established connections with global institutions like MIT's Deshpande Center and the MIT100k competition. The competition's unique approach combines deep research on entrepreneurial needs with practical support for emerging ventures, ensuring participants are well-equipped for global expansion.

Phase	Programme/Activity	Description
Phase 3	International Workshop on Innovating (IWI)	A hands-on, residential workshop co-organised by MIT and MPP, designed to expose aspiring entrepreneurs to the key elements of innovation and entrepreneurship. Participants engage in interactive seminars, exercises, and guest lectures from over 30 entrepreneurs and experts. The programme connects students to MIT's innovation ecosystem and offers networking opportunities with MIT Sloan's Lisbon MBA participants. Between 2018 and 2020, it has educated over 60 students from Portuguese and European universities.
Phase 3	Leadership bootcamp	*As part of the training program MPP has designed for its PhD' candidates, in 2022 the MPP coordination office organized a 2-days bootcamp in leadership. It aimed at improving student leadership skills by increasing their knowledge of behavioural profiles; communication strategies that better suit their personality; self-leadership and proactivity; strategies of self-control and negotiation; and strategies to conflict management.*

Source: compiled from MIT Portugal 2006-2011 (vol. 2); MIT Portugal Programme End of Phase 2 Report 2013 – 2019; and 2020 Report to the External Review Committee; provided information by the MIT managing body.

During Phase 1 of the CMU Portugal programme focused on building innovation networks to strengthen collaboration between academic institutions and industry partners. In 2011, CMU Portugal, in collaboration with UTEN Portugal, introduced the Entrepreneurship in Residence (inRes) programme. This initiative provided crucial support to five Portuguese companies as they sought to enter the US market. The inRes programme was structured across three phases, focusing first on preparing the companies to pitch to potential investors and customers. This preparation involved workshops and mentoring on topics like market understanding, competition, and strategic partnerships. In the final phase, the companies travelled to Pittsburgh for Business Week, where they had the opportunity to present their business ideas to investors and explore potential collaborations with US companies. The success of the inRes programme led to the launch of several editions during Phase 2.

Table 13. CMU Portugal Programme: Innovation and Entrepreneurship related activities by Phase

Phase	Programme/Activity	Description
Phase 1	Tech-based Start-up Exhibition at BIN@FEUP	CMU Portugal participated in the Tech-based Start-up Exhibition at BIN@FEUP (Nov 2010), showcasing research projects like Drive-In and Vital Responder. Researchers demonstrated their innovations to attendees, fostering connections between academia and industry.
Phase 1	Workshop: Frontiers in Entrepreneurship Research	Held at Católica University (Dec 2010), this workshop focused on Entrepreneurship, Innovation, and Human Capital. Dual degree PhD students and international researchers discussed the role of entrepreneurship in innovation, competitiveness, and economic development, with interactive presentations and discussions.
Phase 1	Innovation Networks in Key Focused Areas of ICT	Four innovation networks launched in 2010 to enhance collaboration between partner institutions and industrial affiliates, including: NET-SCIP (Security and Critical Infrastructure), NET-FIT (Future Internet Technologies), NET-STIM (Interactive Media), and NET-SE (Software

Phase	Programme/Activity	Description
		Engineering). These networks promoted synergies and innovations in key areas of ICT.
Phase 1	Entrepreneurship in Residence (inRes) Pilot	Launched in July 2011, the inRes Pilot was a collaboration between CMU Portugal and UTEN Portugal to support five Portuguese companies—Dognaedis, TreatU, Feedzai, ObservIT, and faces.in—in entering the US market. The seven-month programme consisted of one-on-one workshops and mentoring sessions with CMU experts, covering topics such as market understanding, competition analysis, and partnerships. The programme was structured into three phases: Phases I and II prepared the companies for pitching to investors and customers, while Phase 3 involved traveling to Pittsburgh for a "Business Week" to pitch to potential investors and partners. Each company was matched with US firms to explore business opportunities.
Phase 2	inRes – Entrepreneurship in Residence	Launched in 2014, inRes is an early-stage accelerator for ICT teams, providing a structured immersion in CMU's innovation ecosystem. The programme begins with a preparation phase in Portugal, where teams learn about US market dynamics and refine their business models. The core experience is a residency at Carnegie Mellon University, where teams engage with world-leading research groups and industry experts. After returning to Portugal, teams present their progress in a public pitch session. The 2015 and 2016 editions featured improvements to the selection process and mentoring, ensuring stronger team dynamics. The inRes programme supported 14 entrepreneurial teams, helping them accelerate their business ideas.
Phase 2	Innovation and Entrepreneurship Events	CMU Portugal organised various events to promote innovation and technology transfer. In 2016, CMU participated in a workshop on Software-specific challenges in technology transfer, promoting inRes as a best practice accelerator. The programme also hosted the ERIs Technology Transfer Workshop in Lisbon, focusing on collaboration between research institutions and technology transfer. Several inRes teams presented at the 2016 Web Summit, with Xhockware reaching the final round of the Start-up Challenge.

Source: compiled from CMU Portugal Progress Report 2009-2012; Strategic Plan: "An Innovation Agenda for Research, Technology and Graduate Education" 2009-2011; and CMU Portugal Directors' Report to the Board of Directors – Annual Report 2016.

4 Programme Outputs

Major challenges were identified in collecting reliable and comprehensive data regarding the outputs of the programmes. The constraints faced during data collection spanned various analytical dimensions, reflecting the poor quality and availability of output information across the different phases and partnership programmes. Most notably, the lack of an integrated monitoring system meant that, in effect, no output data was monitored at an aggregate level (e.g. across all three partnerships). To address these limitations, a request was made to the programme management institutions, via FCT, for the collection of complementary data using a set of standardised templates. This approach was intended to ensure consistency and comparability of data across the various programmes and to facilitate the identification of any discrepancies in the coherence and availability of data across all phases. The following two examples, particularly relevant to the context of this chapter, illustrate some of the constraints that were identified.

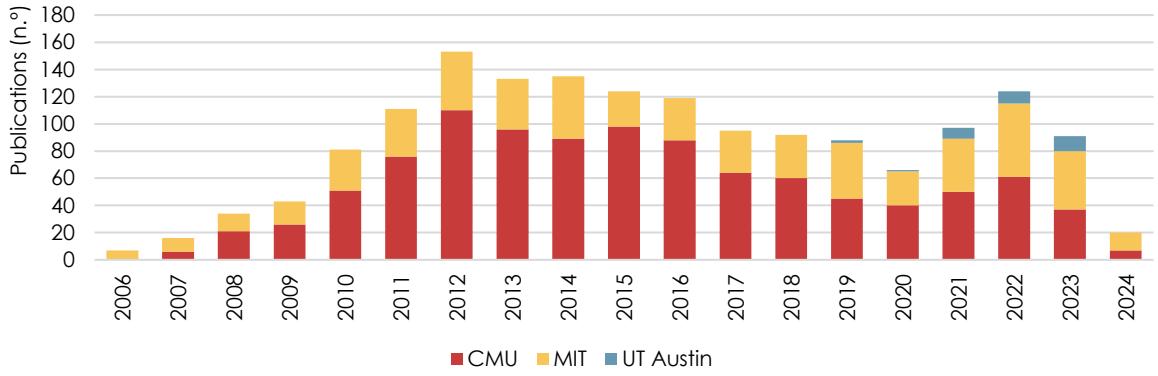
Regarding patents originated by the partnership programmes, there was a visible disparity in the comprehensiveness of the data. In the case of CMU Portugal, only quantitative figures without associated evidence had been available for the earlier phases, while detailed descriptions – including patent unique identifiers – were only available for the third phase. For MIT Portugal, detailed patent records had been provided by MIT Portugal's office, however these did not include patents originating from Portuguese universities or students. It was stated that these needed to be obtained from FCT, as researchers were required to report their patents to the funding agency rather than to the MIT Portugal coordination office. UT Austin Portugal programme faced a similar issue, where detailed patent data was only available for the third phase, and data for earlier phases had to be requested from FCT due to institutional transitions between programme phases. As a result of the additional data collection, 11 patents were evidenced, of which four had been granted (one from UT Austin and three from CMU), all corresponding to the third phase. Upon further request, FCT acknowledged that the national coordination teams rotated throughout the three phases. There was a lack of systematic datasets, as the information on outputs was not standardised over the years and across the partnerships. This is a major limitation identified in the management practices.

Similarly, for scientific publications, the availability of data varied considerably. CMU and MIT Portugal programme management institutions provided comprehensive information on scientific publications across all three phases, including publications by students and those linked to specific research projects. However, UT Austin Portugal presented a major limitation, as only the third phase had complete information. The first and second phases lacked sufficient data due to incomplete reports, making it impossible to extract reliable information. This gap in historical data was attributed to the fact that the programme had previously been managed by different managing institutions and either the record-keeping mechanisms were inexistent previously to phase 3 or the transfer of records was not properly ensured. Overall, collected data demonstrated that CMU accounted for 69.8%, followed by MIT with 28.7% and UT Austin with 1.6%, reflecting challenges in retrieving historical information from earlier phases.

4.1 Scientific publications

Data collected from the programme managing bodies identified that the partnership programmes generated exactly 2.000 scientific publications over the course of their implementation[14].

Figure 19. Publications per international partnership (2006-2024)[1]



[1] For UT Austin Portugal, available information is limited to phase 3.
Source: based on programme data provided by FCT.

While gaps on data suggest that the actual number of scientific publications generated by the partnerships could be higher, a further quantitative benchmark of this sample of scientific publications revealed that these tend to perform better when compared with a control group of similar outputs outside the partnerships.

Specifically, scientific publications of the partnership programmes present significantly stronger performance in terms of:

- Scientific influence: when compared with publications in the same year, field and type, partnership programme publications receive, on average, 13 more citations, representing a premium of 60%.
- Technological influence: patents cite partnership publications three times more than comparable publications in their non-patent literature references.
- Policy influence: public policy documents cite partnership outputs four times more than comparable publications.

Further discussion and the models used in this analysis are presented in Appendix D.

4.2 Graduates

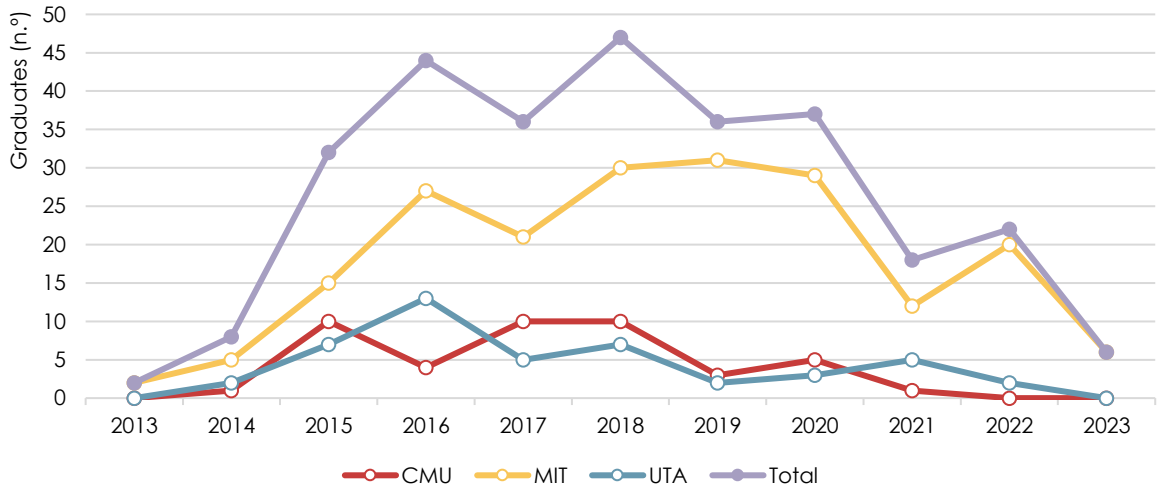
Over the ten-year period from 2013 to 2023, evidence indicates that 288 PhDs were concluded by students enrolled in the programme across the three international partnerships. This figure is supported by verifiable data, offering a reliable basis for analysis. However, data provided by FCT on 7 September 2024 referenced a significantly higher total of 434 graduates across the three phases of the programme between 2006 and 2021, nonetheless no corroborating evidence was supplied to validate this larger figure, nor was there sufficient information to enable the same granular analysis that the established sample data allowed. As a result, while

[14]Isolated information sent by FCT in 7 September 2024 made reference to much higher scientific publication counts (total count of 4.552 across the three phases). However, no publication list or other supporting evidence was supplied to allow for validation of this data.

the FCT's numbers suggest a broader impact, the lack of supporting data limits their utility for deeper analysis of gender, nationalities, or evolution per year. Therefore, for the purposes of this analysis, we will continue to assume the 288 PhDs as our sample, given the solid evidence available for this group. In addition, it will not be possible to conduct analyses such as dropout rates, since the database provided contains only the status of concluded PhDs, with data on all other statuses left blank.

The breakdown of graduations by partnership reveals a considerable disparity in output. MIT leads with 198 PhD graduates, representing 68.75% of the total, followed by UT Austin with 46 graduates (15.97%), and CMU, contributing 44 dual PhDs (15.28%).

Figure 20. Number of Concluded PhDs per International Partnership (2013–2023)

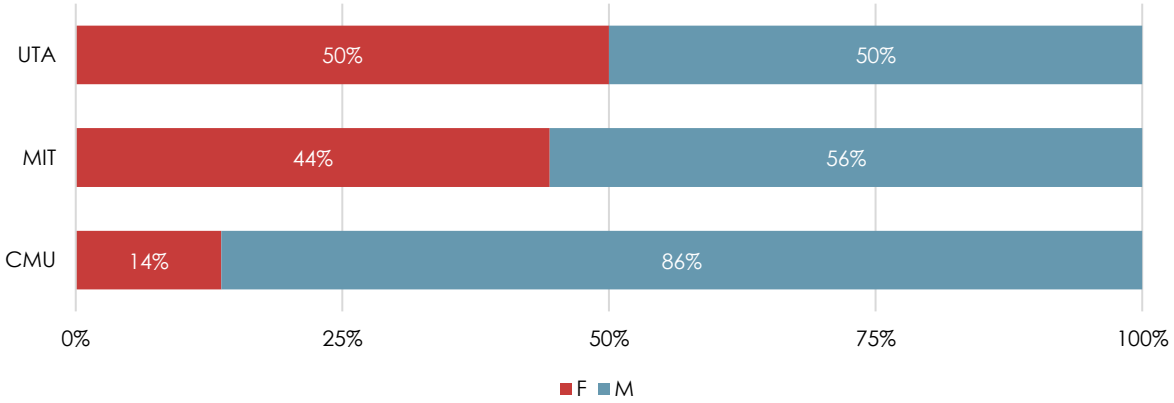


[1]*Available data covers PhD information up to the end of 2023*
Source: based on programme data provided by FCT.

A breakdown of data on an annual basis allows for a more detailed and nuanced analysis. MIT shows a consistent output from 2015 to 2020, peaking in 2018 with 30 graduates, but the numbers declined after 2020, with 20 graduates in 2022 and only 6 in 2023. UT Austin peaked in 2016 with 13 graduates, but often recorded fewer than 7 graduates per year. Its numbers dropped notably after 2020, with only 2 graduates in 2022 and none in 2023. Finally, CMU had a relatively smaller but steady flow of graduates, peaking in 2015, 2017, and 2018 with 10 graduates each year. Similar to UT Austin and MIT, the number of CMU graduates decreased in the third phase of the programme, with just 1 graduate in 2021 and none in 2022 or 2023.

Moreover, the average time taken to complete a PhD varies slightly across the partnerships. UT Austin graduates took the longest, with an average of 5.48 years to complete their degrees. CMU followed closely at 5.40 years, while MIT graduates completed their PhDs slightly faster, with an average of 5.24 years. The overall average for all three partnerships combined is 5.38 years. The slight variation in completion times may be attributed to differences in research projects, programme structures, or individual circumstances.

Figure 21. Gender of PhD Graduates per International Partnership (%)

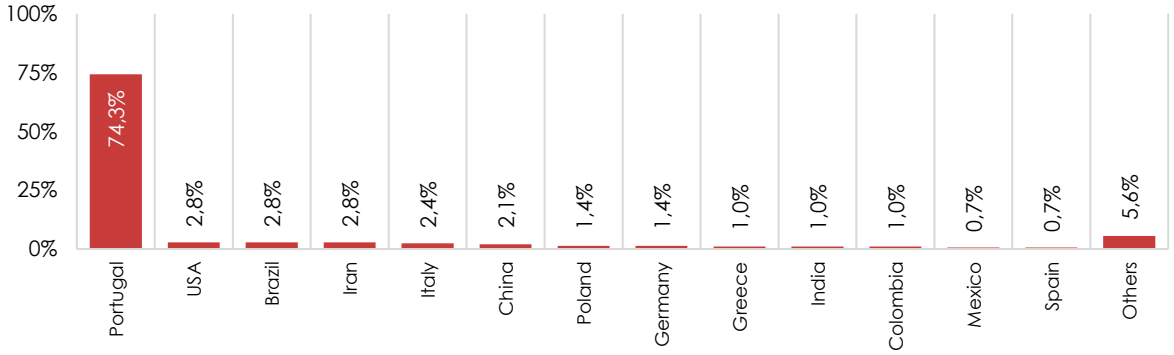


Source: based on programme data provided by FCT.

In terms of gender distribution, the international partnerships reveal significant variation. CMU has the greatest imbalance, with only 14% female graduates compared to 86% male. MIT shows a more balanced distribution, with 44% female graduates and 56% male. UT Austin displays an equal gender distribution, with both male and female graduates making up 50% of the total.

Looking at the nationalities of PhD graduates across the partnerships, the vast majority are Portuguese (74.3%), which is understandable given the focus of the programmes on national talent development. The next most represented nationalities are from the USA, Brazil, Iran, and Italy, each contributing 2.8% of the graduates. Smaller proportions of graduates come from countries such as China, Poland, Germany, Greece, India, Colombia, Mexico, and Spain, with these nationalities each representing between 1.0% and 2.1% of the total.

Figure 22. Nationalities of PhD Graduates in the International Partnerships (%)



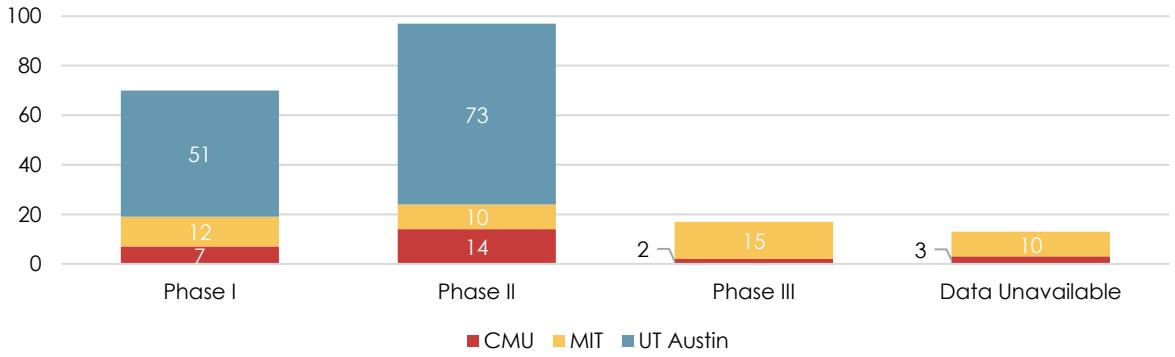
Source: based on programme data provided by FCT.

4.3 Start-ups and Spin-offs

Data collected by FCT from the programme management institutions shows that 188 distinct start-ups or spin-offs were associated with the international partnerships' programmes over the

course of Phases I, II, and III[15]. However, due to some overlap, where the same start-up was identified more than once across different phases or programmes, the total count occasionally rises to 201 when duplicates are not excluded. This overlap occurred when a start-up or spin-off was associated with one partnership (CMU or MIT) but also participated in initiatives led by UT Austin.

Figure 23. Number of Start-ups or Spin-offs involved with the international partnerships per phase



Source: based on programme data provided by FCT.

The number of start-ups and spin-offs involved in the programmes varied significantly across the different phases. In the first phase, 68 start-ups or spin-offs were identified, with 51 of them coming from the UT Austin partnership alone. This high involvement reflects UTEN's strong focus on innovation and entrepreneurship during the initial phase of the partnership. MIT and CMU contributed relatively fewer start-ups in this phase, with 12 and 7, respectively.

Phase 2 shows that 95 start-ups or spin-offs were involved, making this the most dynamic stage. UT Austin continued its strong presence with 73 start-ups, whereas MIT saw a slight decrease to 10, and CMU increased its involvement to 14. The expressive number of start-ups associated with UT Austin reflects the continued emphasis under UTEN on fostering innovation ecosystems and supporting entrepreneurial ventures in Portugal.

In Phase 3, 17 start-ups or spin-offs were identified, with MIT leading the involvement during this phase, supporting 15 start-ups. This shift suggests a reduction in focus on start-up initiatives under UTEN, which did not register any new start-ups in this phase. CMU saw only 2 start-ups in this final phase, indicating a diminishing role in fostering new ventures.

When analysing the start-ups and spin-offs by their association with the three international partnerships, it is evident that UT Austin has the largest involvement, with a total of 121 start-ups or spin-offs across the first two phases, accounting for 63.7% of the total. MIT is associated with 47 start-ups or spin-offs, representing 23.4% of the total. MIT's involvement increased considerably in Phase 3, where it became the primary driver of start-up activity, as seen with its support for initiatives like Bio-Teams and Idea Sprint. Finally, CMU is linked with 26 start-ups or spin-offs, making up 12.9% of the total.

[15] Isolated information sent by FCT in 7 September 2024 made reference to the involvement of 127. However, no publication list or other supporting evidence was supplied to allow for validation of this data.

Table 14. Start-up and spin-off Involvement across international partnerships Initiatives

IP/Scope of Involvement	No.	%
UT Austin	128	63,7%
BIZ-PT	10	5,0%
Digital Media Program	4	2,0%
Global Startup Program	63	31,3%
US Connect	10	5,0%
UTEN Pilot Program	5	2,5%
UTEN Study to Improve	36	17,9%
MIT	47	23,4%
Bio-Teams	2	1,0%
Idea Sprint 2008	1	0,5%
ISCTE-IUL MIT Portugal Venture Competition	1	0,5%
MPP alumni	31	15,4%
MPP faculty	3	1,5%
MPP PhD student	5	2,5%
Data Unavailable	4	2,0%
CMU	26	12,9%
Data Unavailable	26	12,9%
Total	201	100,0%

Source: based on programme data provided by FCT.

Further detail highlights that several key programmes and initiatives played a substantial role in fostering, if not the creation, then the development of these start-ups. The Global Startup Program (UTEN) was responsible for driving 63 start-ups. This programme represents a major component of UT Austin's entrepreneurial efforts in Portugal, helping Portuguese ventures gain access to global markets and resources.

Additionally, there are multiple cases where start-ups or spin-offs were involved in initiatives across multiple partnerships. For example, Xhockware, which originated from CMU, also participated in UT Austin initiatives, demonstrating the interconnectedness of these programmes and the shared innovation ecosystems. doDoc is another example, having been involved in both MIT and UT Austin, highlighting the collaborative nature of these partnerships in fostering start-up growth.

Finally, a wide range of start-ups and spin-offs have emerged from these international partnerships. Some notable examples include companies whose valuations have reached or exceeded €1 billion in private funding -so-called 'Unicorns'. These include Sword Health, Feedzai, and Mambu (based on Crunchbase Unicorn Board – 10/06/2024 update).

5 Evaluation Findings

5.1 Were the instruments mobilised in each of the programmes and their respective phases adequate to the policy objectives outlined? To what extent did the instruments meet the needs and expectations of their target audience? And did the instruments and needs evolve throughout the different phases of implementation?

Consistent evidence suggests that the instruments mobilised throughout the programmes, particularly in the first two phases, were generally effective in meeting the policy objectives of fostering innovation, building research capacity, and promoting collaboration between Portuguese and American institutions. However, the significant budget cuts between phases, due to external factors unrelated to the partnerships, led to a downsizing of activities in the second phase, limiting the programmes' ability to maintain the same level of ambition and effectiveness.

The three partnerships included education, research and innovation/knowledge valorisation activities. Over the course of the three phases, there have been some changes in the relative relevance of the three types of actions. For example:

- In the case of the CMU Portugal programme, in Phase 2 the emphasis shifted to research projects and the start-up dimension emerges (in Phase 1, the companies involved with the programme were more large enterprises). However, the dual degree PhD programme was maintained in all three phases, unlike the Master's programme, which was not continued.
- In the case of the UT Austin Portugal programme, the education component (PhDs) was discontinued in Phase 3.
- In the case of the MIT Portugal programme, in Phase 3 there are no longer any affiliated PhD programmes supported, while PhD research grants co-supervised by Portuguese and MIT advisors continue to be possible.
- Notably, the UTEN programme (initially a part of UT Austin Portugal and later due to become a larger initiative) was largely discontinued in Phase 3, despite being considered strategic in the planning stages of Phase 3.

➢ In all three programmes, the importance of collaboration in terms of PhD programmes stands out.

The most advanced collaboration was seen in CMU Portugal, with a dual-degree model, in which each university confers its own degree, but the student obtains the degree at a Portuguese university and at CMU. This model involved the alignment of courses from the CMU curriculum with the curricula of Portuguese universities, co-supervising dissertations and fostering a strong relationship between CMU professors and professors from the Portuguese universities involved. The model was also extended to dual executive master's programmes (although discontinued after Phase 2). Throughout the three phases of the programme, the dual PhDs were always the 'foundation' of the CMU Portugal programme, producing direct results in terms of training but also contributing to research projects and innovation/entrepreneurship.

UT Austin and MIT, on the other hand, did not offer dual degrees, citing conflict with internal university policies.

In addition to the more advanced types mentioned above, collaboration in terms of PhD programmes took the form of:

- Affiliated doctoral programmes, i.e. organised and with the degree awarded by the Portuguese university but with the seal of the international partnership programme.
- Co-supervision of PhD students, albeit to little extent outside the dual degree model.
- Internships for PhD students at US partner universities (variable duration, long and short stays).
- To a lesser extent, stays in Portugal by professors from US partner universities.

In the field of Education and for the three partnerships in general, the interviewed stakeholders consider the following results to be clearly positive:

- The strong attractiveness of the PhD programmes (with many applicants and PhD scholarships granted, including foreign candidates).
- The international contacts provided for PhD students.
- The PhD (and masters) graduates who have come out of the programmes have often continued to be involved not only in HEI and research institutions but also, to a significant extent, in the business sector.
- The organisation of the doctoral programmes encouraged collaboration not only between professors from national universities and professors from US universities, but also between professors from different national universities.

➢ The partnership programmes' research funding model effectively supported a variety of projects, ranging from exploratory initiatives to large-scale strategic collaborations.

All three partnership programmes mobilised funding for joint research activities. Two broad types of collaborative research projects were funded: exploratory projects and strategic/flagship projects.

Exploratory projects are small-scale projects with budgets ranging from €20,000 to €100,000 to fund the Portuguese partner involved. In general, these are research projects with a lower TRL level and more uncertain results, aimed at developing an idea, which could lead to larger future projects. They were the subject of annual calls.

Strategic or flagship projects were larger collaborative research projects, with varying budgets (from €1 million to €4.5 million per project; however, many strategic projects in the first phase had lower budgets, with many around €200,000) and usually multi-annual. These projects involve several partner organisations, including companies. They have been the subject of several calls, the last of which was the 2019 Large-Scale Collaborative Research call, managed by ANI (National Innovation Agency), which combined national funds with ERDF.

The assessment of the stakeholders involved in research activities is positive:

- The strategic/flagship projects focused on major technological challenges relevant to Portugal, with a technological but also societal impact (in thematic areas such as data analytics, artificial intelligence, hydrogen, nanosatellites, forest fires, submarine cables, national electricity grid, sustainable mobility).
- According to stakeholders, research projects have generated outputs and results in terms of international scientific publication and, to a lesser extent, patents. However, this statement could not be verified through the monitoring data of the programmes which was found inadequate in what concerns the monitoring of outputs.

- Contributed to strengthening national high-quality research institutions laboratories, not only by achieving scientifically excellent results[16], but also by adopting and integrating international best practices.
- They have generated considerable training for the researchers involved and contributed to their inclusion (and that of ENESII) in top international networks.
- They have led to the effective involvement of national companies, especially larger companies and technology companies in the early stages (start-ups, scaleups).

➢ The programmes contributed to the adoption of best practices in technology transfer and innovation management.

Regarding innovation and knowledge valorisation activities we identify two main outcome dimensions: capacity-building for knowledge valorisation in national higher education and research institutions, and knowledge valorisation through technological entrepreneurship (start-ups and spin-offs).

The national higher education and research institutions involved in the three partnerships recognise the impact of the international partnerships on the training of the TTOs (Technology Transfer Offices) of various universities, which has led to a substantial advance in science and technology management skills, the ability to manage intellectual property rights and the subsequent increase in the propensity to patent, as well as good practices in technology transfer. Technical staff from TTOs and technology-based business incubators had the opportunity to do internships, namely through the UTEN programme.

The CMU Portugal and MIT Portugal programmes began by working with large companies. CMU Portugal involved companies from the ICT sector (such as Portugal Telecom, Novabase and Nokia / Siemens). In the case of MIT Portugal, industrial affiliated companies were involved in sectors associated with mobility, biomaterials and sustainable cities, among others.

In the field of technological entrepreneurship, the data provided by the programmes and collected through interviews revealed that the results exceeded expectations. In all three partnerships, we observed cases of PhDs students and/or researchers previously involved in the programmes associated with the creation of new technology-based companies.

The UT Austin Portugal programme, since its inception, and the other two programmes, in later phases, implemented a series of actions to support technological entrepreneurship, namely immersion periods at US universities, allowing for acceleration actions and contacts with investors and potential clients.

Within the UT Austin Portugal programme, particular reference should be made to the UTEN (University Technology Enterprise Network) (sub)programme. UTEN focused on training TTOs from various universities and, above all, on promoting technological entrepreneurship. UT Austin visited existing incubators in Portugal and provided technical support for structuring incubation and acceleration programmes. The results were above expectations, inducing the emergence of high-capital start-ups in the field of information technology (Feedzai, Veniam, etc.). The programme allowed these companies to immerse themselves in the US start-up ecosystem, establishing contacts with investors and clients in the US. Somewhat paradoxically, UTEN was discontinued and ceased to exist in Phase 3, for reasons that seem to be largely

[16] Despite the shortcomings of the programmes' output data monitoring, the findings of our quantitative benchmark analysis provide some evidence to this statement.

related to uncertainty surrounding the shifting of programme management responsibilities[17] and lack of funding resources, rather than for strategic reasons.

In the CMU Portugal programme, the InRes sub-programme ceased to exist in Phase 2, but according to interviews conducted it will be resumed in 2024 with the configuration of an executive education and business incubation programme, with the participation of 3 Portuguese universities and CMU and in conjunction with the UNL Business School. Training will take place in Lisbon and immersion at CMU (with the aim of attracting partners and contacts with venture capital).

Overall, results in terms of innovation / valorisation of knowledge can be categorised in:

- Adoption of best practices and capacity-building in intellectual property rights leading to a stronger propensity to patent, as reported both by researchers/TTOs, consolidated companies or technology companies whose creation is strongly associated with the programmes. This result is further supported by the findings of the quantitative benchmark analysis.
- Development of innovation capabilities in emerging and consolidated companies, through access to international networks, collaboration with academia, and the outputs of the research projects.
- The creation of technology-based companies and facilitated access to international markets and funding, with at least three 'unicorns' directly linked to the partnership programmes (Feedzai, Mambu and Sword Health).

➢ A misalignment between the ambitious goals of Phase 3 and the actual implementation of key initiatives hindered effectiveness.

The third phase exhibited a stark gap between objectives and activities. One prominent example is UTEN, which was intended as a major initiative, yet never fully materialised to its planned dimension. The documental analysis to Resolution of the Council of Ministers No. 24/2018 and interviews point to a misalignment between the goals and the actual implementation of key initiatives, limiting the effectiveness of this phase. UTEN was discontinued and ceased to exist in Phase 3, for reasons that seem to be largely related to uncertainty surrounding the shifting of UTEN programme management responsibilities and lack of funding resources, rather than for strategic reasons.

➢ The third phase shifted towards research-focused projects, which led to strong academic outputs but raised concerns over the reduced emphasis on innovation and entrepreneurship.

A key development in the third phase was the sizable boost to research, primarily due to the infusion of ERDF into the programme's budget. This led to the opening of a special call within the SI I&DT for co-promotion projects. Nevertheless, as the partnerships progressed into Phase 3, the focus shifted increasingly towards exploratory and large-scale projects. While these projects were labelled differently across partnerships, they generally followed a similar pattern, with a stronger emphasis on academic research outcomes rather than innovation-driven activities or student engagement. The reduction in entrepreneurial initiatives, which had been a hallmark of earlier phases, raised concerns among interviewees about the long-term impact on Portugal's entrepreneurial ecosystem. Although research output remained strong, the

[17] UTEN was intended to become part of a broader initiative outside the UT Austin partnership, as outlined in the Resolution of the Council of Ministers No. 24/2018.

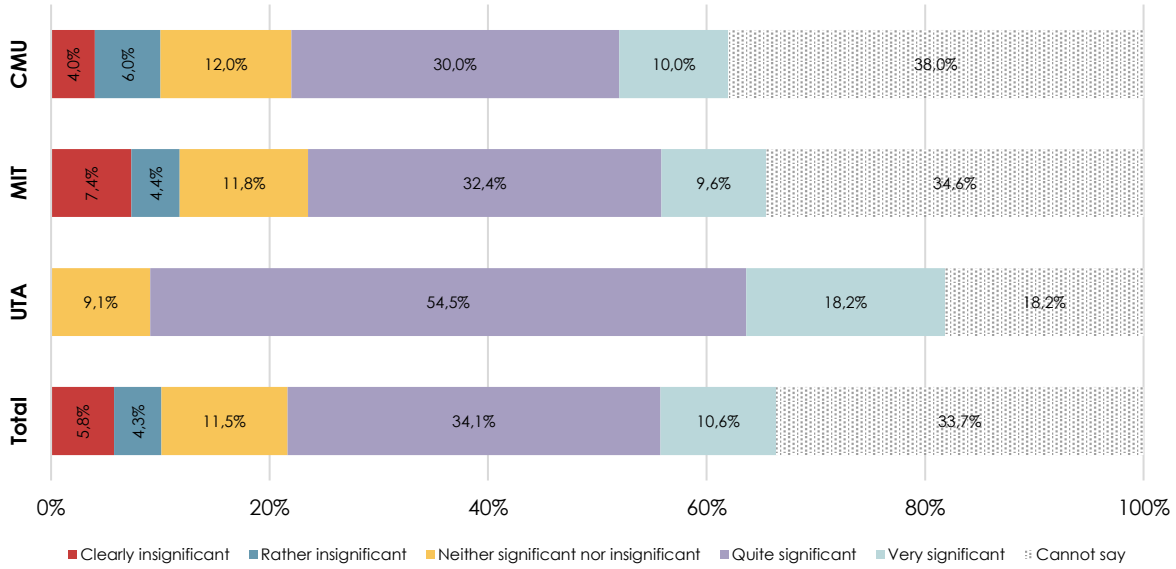
diminished focus on innovation was seen as a missed opportunity to sustain the momentum from the earlier phases.

Thus, while the instruments evolved over the years, initially focusing on talent development and institutional capacity building, which were vital in establishing Portugal's international presence in education and research, later phases saw a shift towards research-centric projects and industry collaboration. Some interviewees also highlighted how the initial emphasis on dual degrees was later overshadowed by a drive towards more industry-related initiatives, reflecting the changing priorities of the partnerships as they matured.

- The adaptation of programme instruments to meet the needs and expectations of the target audience was perceived with mixed results.

Survey results further indicate that opinions on the adaptation of instruments to the target audience's needs vary widely. A substantial portion of respondents (34.1%) found the adaptation 'quite significant,' while 33.7% felt they 'cannot say,' suggesting uncertainty or lack of complexity into the process. A smaller, though still notable, group rated the adaptation as 'very significant' (10.6%), pointing to positive alignment, yet others (5.8%) viewed the efforts as 'clearly insignificant.' these mixed responses reflect both the complexity and variability in stakeholder experiences, especially across different stages of implementation. the suggestive portion of 'cannot say' responses highlights the need for better communication and transparency regarding how the programmes' instruments were updated to meet evolving needs.

Figure 24. To what extent do you think the instruments of the programmes have been adapted to the needs and expectations of the target audience throughout the different stages of implementation? (n=208)



Source: Technopolis survey of programme beneficiaries.

The open-ended survey responses and interviewees reveal a diverse range of patterns regarding how the instruments could have failed to meet the needs of the target audience:

i) Bureaucratic and Administrative Barriers

Both open-ended survey responses and interviewees highlighted long delays in funding disbursements and administrative inefficiencies. These issues were particularly problematic for PhD students – mirroring the most frequent profile in the collect survey answers - who depended on timely support to carry out their research. Both survey responses and interviews pointed out that the short timelines of seed projects, often one year, were insufficient to achieve meaningful results. One beneficiary highlighted that the exploratory funding provided was valuable for initiating promising collaborations, but the lack of follow-up grants meant these collaborations could not fully mature. Yet another expresses communication failures that prevented students from being aware of available opportunities:

"*A lot of students are unaware of the existence of the dual-degree and affiliated PhD programs or the visiting students program. Unless they work closely with a professor that knows about these programs, it is very unlikely that a student will receive information about the programs. Communication fails to reach the target audience*".

ii) Reduced Focus on Innovation and Entrepreneurship Activities in Phase 3

For MIT Portugal, the interviews indicate that the instruments in Phase 1 were highly aligned with policy goals of fostering innovation and entrepreneurship. They effectively supported the development of new research areas and business ventures. The shift in focus from innovation and entrepreneurship to more research-oriented activities in the later phases of the programmes, particularly in MIT Portugal, raised some concerns. While the initial phases promoted strong industry collaboration and entrepreneurial growth, the reduction in funding for innovation-related activities in later stages limited the opportunities for sustained business engagement. This shift affected the ability of some companies to maintain momentum in their innovation pipelines, although the partnerships still facilitated valuable research outputs.

In the case of UT Austin, interviewees emphasised the significant added value of instruments focused on start-up acceleration and technology transfer, particularly through UTEN. These instruments were regarded as transformative, helping to equip Portuguese universities and companies to transfer knowledge to the market. Noteworthy is also the strong emphasis on student and faculty mobility between Portugal and UT Austin, providing transformative experiences across various research areas. Interviewees associated budget cuts in the second phase with the discontinuation of activities and a subsequent reduction in the number of beneficiaries. However, the third phase faced challenges in maintaining the initial impact due to changes in the policy objectives and priorities. Additionally, some interviewees mentioned how COVID-19 impacted in-person activities, limiting collaboration opportunities that would have been more fruitful through face-to-face interaction.

iii) External Factors

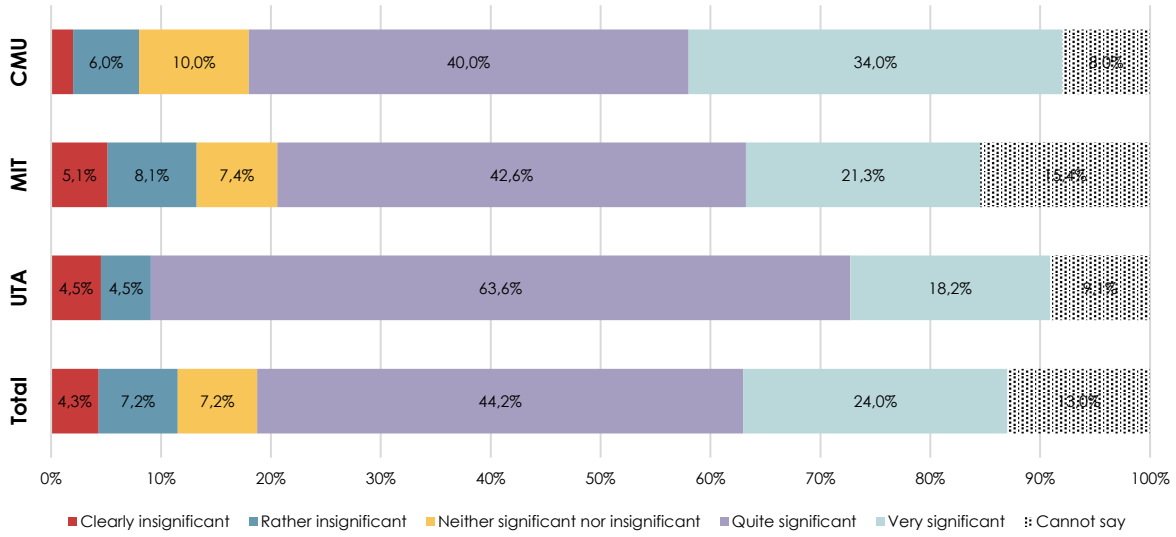
Other external factors can be considered, such as the Covid-19 pandemic, which severely disrupted some of the later-phase projects, particularly those that required international travelling and in-person interaction. The reliance on virtual meetings and remote work mitigated some of the damage, but the lack of physical mobility hindered progress, especially in innovation-driven programs that benefited from face-to-face collaboration.

5.2 *How effective was the collaboration dynamics between Portuguese institutions and American universities at the individual, group, and institutional levels?*

The collaboration dynamics between Portuguese institutions and American universities was found to be largely effective at the individual, group, and institutional levels, though challenges related to administration and funding affected long-term potential.

The initial sections of this document, particularly those addressing the inputs, activities, and outputs of the international partnerships, outline the evolution of collaboration dynamics across phases and partnerships, supported by the available evidence. Survey data also reflects a generally positive perception of collaboration effectiveness, with 44.2% of respondents rating the dynamics of collaboration as "Quite significant" and 24.0% as "Very significant," indicating that the majority found the partnerships effective.

Figure 25. How do you assess the effectiveness of the dynamics of collaboration between Portuguese institutions and American universities? (n=208)



Source: Technopolis survey of programme beneficiaries.

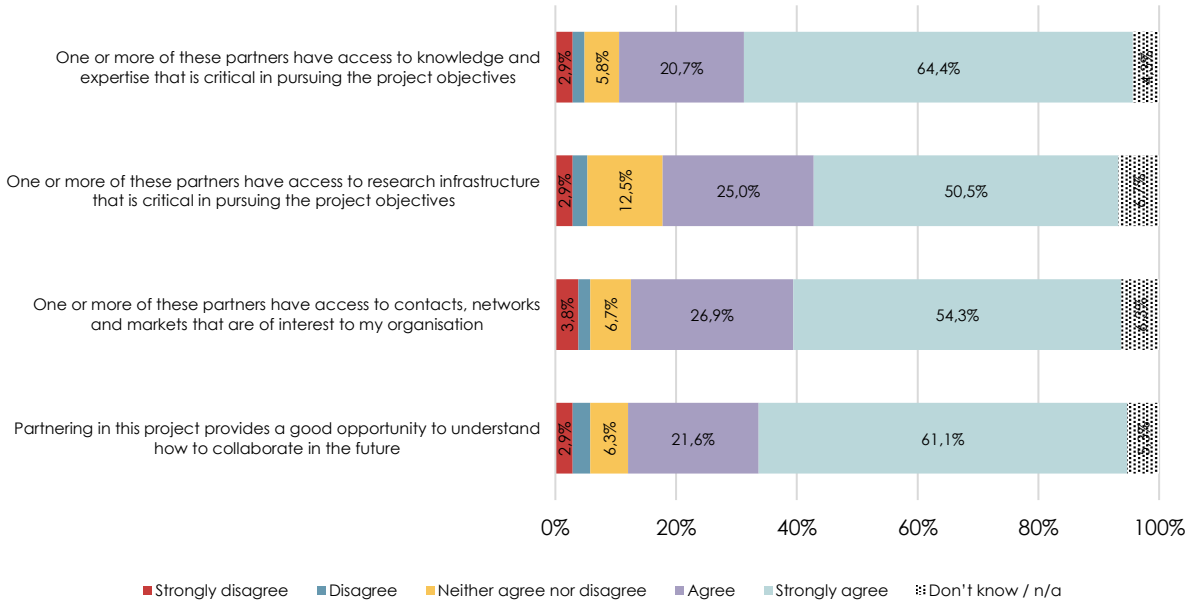
➢ From the Portuguese perspective, collaboration was transformative in enhancing research capacities and aligning the national R&D ecosystem with international standards.

Some interviewees mentioned that the partnerships were instrumental in modernising Portuguese institutions, fostering international cooperation, and increasing visibility on the global stage. At an individual level, the joint responsibility for the supervision of dual PhD candidates between Portuguese and American professors was viewed as particularly effective. Survey responses support this, with one participant emphasising the dual-degree programs, stating that these initiatives fostered "sustained, high-level collaborative research". Another respondent noted the importance of co-supervision with CMU senior researchers, adding that "access to US computational resources" was essential to the success of their thesis work, the same could be applied to UT Austin (e.g.: TACC). Another valued aspect of the international partnerships was their role in promoting institutional collaboration between Portuguese universities, which had historically been difficult due to internal competition.

However, during implementation, several key challenges emerged. Portuguese institutions frequently faced delays and administrative issues, particularly concerning funding disbursements and annual financing mechanisms. These challenges were highlighted by interviewees as creating instability and constraining the long-term potential of the partnerships. For example, projects were often delayed or scaled down due to the slow pace of bureaucratic processes, which contrasted with the more streamlined operations of their US counterparts. One survey respondent expressed frustration, stating that "Portuguese institutions are too slow" and that bureaucracy created hardships for students who sometimes faced months without funding. This perception of slow administrative processes aligns with concerns raised in the interviews. Despite these challenges, the Portuguese management bodies acknowledged the transformative impact of the partnerships, particularly in entrepreneurship and technology transfer. Initiatives like UTEN (under UT Austin) were highlighted as key drivers in fostering innovation and developing start-ups or spin-offs.

In line with the generally positive perceptions of the partnerships' effectiveness, survey results further highlight the key motivations driving collaboration between Portuguese and American institutions. A significant majority of respondents agreed or strongly agreed that their partners had access to critical knowledge and expertise, with 64.4% indicating that this access was essential for achieving the project objectives. This was further supported by 50.5% of respondents who affirmed that the partners provided vital research infrastructure. Moreover, 54.3% of respondents agreed that their collaborators offered valuable access to contacts, networks, and markets relevant to their organisation. The partnerships were viewed as a strong foundation for future collaborations, with 61.1% of respondents emphasising the opportunity to learn how to collaborate more effectively in the future. These findings are consistent with qualitative feedback from interviews, which pointed to the sustained value of access to international networks and resources.

Figure 26. To what extent do you agree or disagree with the following statements about the motivations for working with these partners, (n=208)



Source: Technopolis survey of programme beneficiaries.

- US institutions encountered fewer bureaucratic challenges but noted changes in programme focus and funding as limitations in later phases.

On the US side, the programme management bodies considered the collaborations impactful, though they stressed that US institutions experienced fewer bureaucratic challenges compared to their Portuguese counterparts. Despite some limitations related to funding cuts and changes in programme focus, particularly in later phases, the collaborations were seen as achieving substantial outcomes. A major strength of US institutions was their focus on entrepreneurship and innovation. In this context, the programmes were particularly successful in creating start-up ecosystems and advancing technology transfer initiatives. Examples from the survey responses reinforce this viewpoint, with one respondent noting that "the collaboration resulted in patent submissions" and another highlighting the commercialization of ideas as key outcomes. However, some management bodies expressed disappointment at the reduced focus on innovation in the later phases of the partnerships. While the partnerships were deemed highly successful in areas such as engineering, robotics, and business innovation, there was some acknowledgment from US management bodies that the scope of collaboration could be broadened to include more diverse sectors.

- At the individual level the partnerships were highly effective in advancing research work and skill development, particularly through training and short-term research periods in the US.

In terms of individual collaboration, interviews with other Portuguese institutions pointed to the opportunities for students or faculty to engage in training and short-term research periods in the US as a major benefit, accelerating their exposure to international academic standards and business environments. The impact on individual researchers in terms of skill development and networking was described as substantial. According to one survey respondent, having Portuguese students "spend a semester or more with the US partner" was highly effective in fostering collaboration and advancing their research work. A recurring issue was the absence of dual-degree opportunities, which made the collaboration dynamics less effective in the case of MIT and UT Austin, unlike CMU, where students could receive degrees from both their home institutions and CMU.

Similar opportunities were mentioned for non-academic staff, particularly in technology transfer. These experiences were considered critical for building skills in entrepreneurship and innovation, directly benefiting participants by giving them access to international best practices. Nonetheless, there was a noted limitation in the number of individuals able to engage in these opportunities. One respondent mentioned the critical role of the CMU tech transfer office, noting that this support "led to the submission and licensing of international patents," which further contributed to entrepreneurship outcomes.

Other interviewees, directly involved in the programmes, reported the pivotal role of the partnerships in the early development of their respective start-ups, where key individuals, now occupying leadership roles, were recruited from the programme. These individuals gained expertise in areas critical to their company's development and success, facilitated through participation in the programme and access to world-leading expertise in key technologies. Survey responses corroborate this, as one participant shared that collaboration within the program helped establish long-term ties between faculty and start-ups, which continue to drive innovation even today.

➢ Group collaboration effectively created long-term links between Portuguese institutions, American universities, and companies.

Interviews revealed that this dimension was particularly effective in creating links between Portuguese institutions, American universities, and companies. Many projects, especially those involving both Portuguese and American companies, were successful in fostering long-term collaborations. These group efforts, such as exploratory projects with companies, were seen as one of the major successes of the programme. Several participants mentioned that benefiting from the programmes helped establish long-lasting relationships with US institutions, enabling continued access to international networks even after the formal projects ended. For example, some projects helped Portuguese companies and institutions gain access to the global market in areas where they had previously lacked expertise. Another example highlighted the importance of involvement in projects that not only led to the development of cutting-edge technologies but also contributed to the company's product competitiveness. Even for large Portuguese companies, participation represented an important contribution to advancing research, absorbing best practices, and significantly transforming their innovation culture, with substantial growth in intellectual property. One survey respondent noted that regular co-supervision interactions provided substantial academic support, with access to computational resources at US institutions greatly enhancing the success of their research. Another gave a clear example, citing the collaboration on decarbonization pathways for several Portuguese cities, which was seen as a success, especially due to the involvement of multiple Portuguese universities and municipal governments.

➢ At the institutional level, the partnerships provided Portuguese universities and companies with opportunities to engage in complex projects that would have been difficult to undertake independently.

At the institutional level, the interviews revealed that the partnerships provided Portuguese universities and companies with the opportunity to engage in complex projects that would have been difficult to undertake independently. Collaboration with MIT, for example, was seen as a substantial opportunity to enhance the university's research capacities and international profile. For start-ups, particularly under CMU, the partnerships enabled access to high-quality talent and research resources critical for scaling operations. The connection with CMU provided credibility, especially important when raising capital from international investors, giving them a competitive edge in technology and global market expansion. For large established Portuguese companies, exposure to the US culture of innovation fostered a long-term change in their approach to R&D&I.

5.3 What were the benefits gained by the national partners and what is their economic expression, considering the investments made?

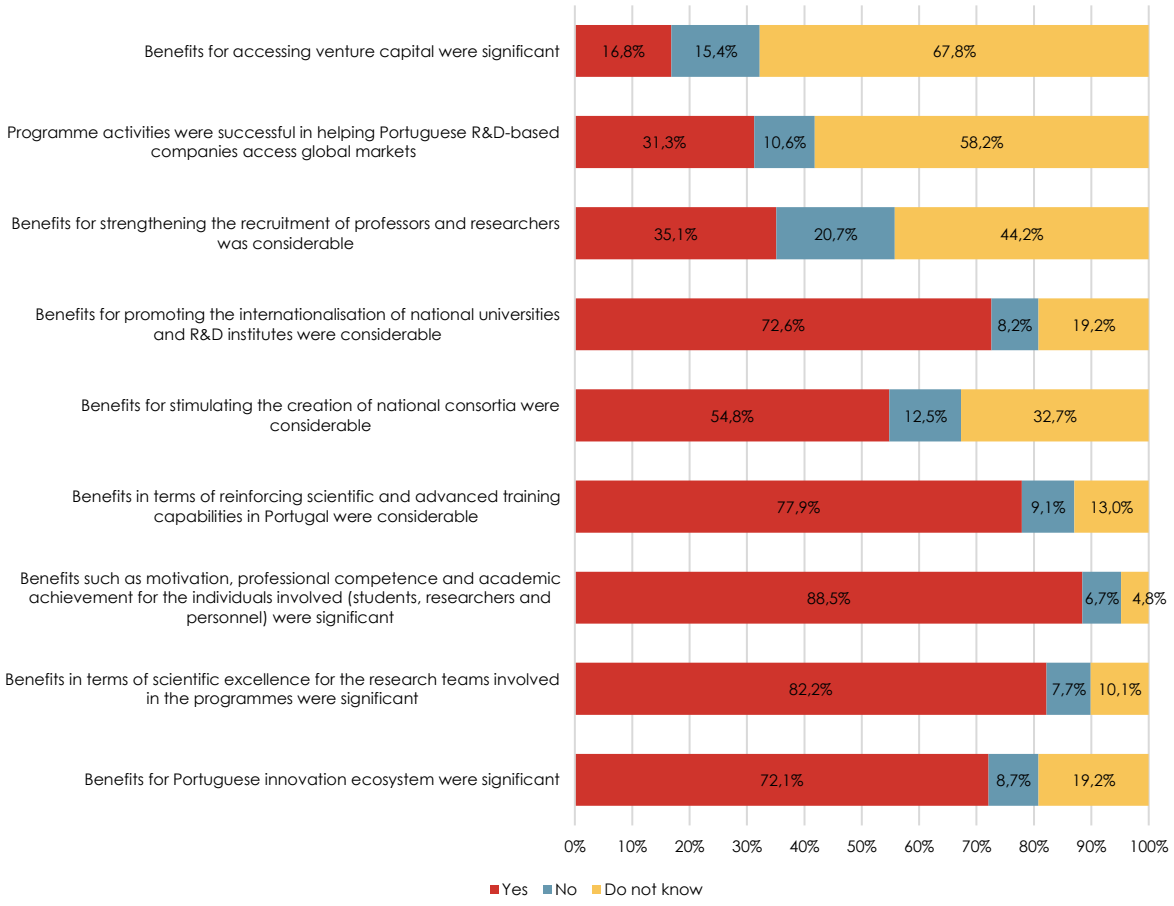
Consistent evidence from both interviews and surveys indicates that the partnerships brought benefits to national partners, particularly in enhancing institutional capacity, scientific excellence, and international reputation. While direct economic data on the outcomes remains limited, the evaluation found strong indications that the programmes contributed positively to Portuguese universities and companies.

➢ The partnerships delivered considerable returns in terms of enhancing institutional capacity for involved Portuguese universities.

Although there is limited data on the direct economic impact of the partnerships, interviews confirm that there were considerable returns for the national partners. A clear benefit was the enhanced institutional capacity of universities and their research teams, repositioning Portuguese universities through their international reputation, which increased their value among partners and within international research networks. This perception is echoed in the survey results, where 72.1% of respondents agreed that the benefits to the Portuguese innovation ecosystem were significant, and 82.2% noted the substantial impact on scientific excellence for the research teams involved in the programmes.

The exposure of research teams to the US environment and the development of new doctoral programmes, particularly the notable performance of dual degrees, strengthened their international standing. Several interviewees highlighted the prestige of being associated with these American universities and how this international reputation contributed to the development of their activities. The survey supports this perspective, with 88.5% of respondents indicating that benefits such as motivation, professional competence and academic achievement for individuals involved (students, researchers and personnel) were significant, 77.9% indicating that the benefits for reinforcing scientific and advanced training capabilities in Portugal were considerable, while 72.6% affirmed the positive impact on the internationalisation of national universities and R&D institutes.

Figure 27. Perceived Benefits of the Partnerships by Survey Respondents (n=208)



Source: Technopolis survey of programme beneficiaries.

The partnerships played a substantial role in boosting the technological and scientific capacity of Portuguese institutions. For example, universities such as the University of Algarve and the University of Minho were able to adopt best practices from institutions like CMU and MIT, particularly in technology transfer and project management. This led to improved project execution efficiency and fostered stronger collaborations with companies. Despite these advances, only 54.8% of survey respondents felt that the partnerships significantly stimulated the creation of national consortia, highlighting that there might be room for improvement in fostering national collaborative efforts.

- The partnerships introduced a more structured approach to knowledge transfer and innovation strategies for the involved companies.

The interviews suggest that companies involved in the programmes experienced a substantial shift in their approach to knowledge transfer. Through collaboration with top-tier US universities, these companies implemented more structured innovation strategies. This shift in innovation culture also resulted in increased profitability and intellectual property creation. However, when assessing the programmes' success in helping Portuguese R&D-based companies access global markets, only 31.3% of survey respondents agreed that these activities were successful, with a significant portion (58.2%) expressing uncertainty, which could be related to the profile of the respondents.

Furthermore, these partnerships helped address the gap between academic research and market-ready products and solutions. Portuguese companies participating in these partnerships developed a stronger focus on research and development with direct links to market needs. As a result, several companies brought innovative products to market, benefiting from knowledge transfer and access to advanced technological expertise provided by their US counterparts. Nonetheless, the survey reveals that only 16.8% of respondents felt that the partnerships provided significant benefits in terms of accessing venture capital, with 67.8% expressing uncertainty about this aspect. This finding aligns with the interviews, where it was noted that while the partnerships facilitated networking with US investors, direct access to venture capital was not always guaranteed.

Moreover, companies involved in the partnerships benefited significantly from access to highly skilled talent and cutting-edge research, which accelerated their global competitiveness. According to the interviews, these partnerships opened new markets for Portuguese businesses, particularly in the United States, by facilitating direct connections with the American innovation ecosystem.

TMG Automotive's Participation in the MIT Portugal Programme: An Overview of Benefits and Economic Impact

TMG Automotive is a key supplier of polymer-based materials for the automotive industry, based in Guimarães, Portugal. TMG's participation in the MIT Portugal programme began in 2008. At the time, TMG was a traditional manufacturer with significant technical expertise but limited exposure to disruptive innovation. CEO Isabel Furtado, who had experience in international markets and an appreciation for MIT's global reputation, saw the programme as a strategic opportunity to inject fresh ideas into the company and drive it toward innovation-led growth. Initially affiliated with the Engineering Design and Advanced Manufacturing (EDAM) area of the programme, TMG Automotive was involved with the MIT Portugal in several activities, including: hosting PhD students for industry-oriented research projects; development of collaborative R&D projects funded by the programme; knowledge exchanges with MIT experts, including visits from TMG staff to MIT and MIT experts to TMG; TMG's Product Development Coordinator enrolled and graduated from the MIT Portugal Technology Management and Enterprise (TME) Master's programme in 2010, later becoming the firm's R&D director.

One notable outcome of TMG's involvement was a significant organizational transformation. The company developed an in-house culture of innovation, increasing its own R&D effort, embracing continuous collaboration with academia and expanding its intellectual property portfolio. The programme's influence was also critical in fostering a forward-thinking approach towards market trends and opportunities, that resulted in the creation of a sustainability department linked to the innovation department, well ahead of industry trends. This department played a central role in TMG's long-term strategy, ensuring that sustainability became a core element of the company's operations.

The long-term economic benefits of TMG's participation in the programme were significant. The company saw a major shift in intellectual property activity, with patent registrations increasing from zero in 2010 to 85 by 2023. One of the patents developed during this period generated annual revenues of 14 million euros. Additionally, TMG's strengthened innovation portfolio helped the company access new financial markets. As an example of this, TMG was recently able to secure a 40 million euros loan from the European Investment Bank (EIB), thanks in large part to its robust innovation strategy and patent portfolio.

The company's focus on sustainability also yielded long-term economic benefits. For example, TMG's expertise in sustainable materials helped it secure a contract with Volvo to become the global supplier of interior components for the Polestar 0 project, which aims to produce the first carbon-neutral car by 2030. This contract, along with other new business opportunities, highlights how the MIT Portugal programme enabled TMG to position itself as a leader in sustainability-driven innovation within the automotive sector.

Finally, the participation in the MIT Portugal programme kickstarted a new approach to TMG's internationalisation. Today, the company has a commercial partnership with a similar group in Boston (USA) and a manufacturing facility in China, with plans to open new factories in the United States and Africa over the next years.

Source: Isabel Furtado, CEO of TMG Automotive (Interview). For the full case study, see Appendix E.

- The partnerships played an important role in accelerating the growth of start-ups and spin-offs, providing necessary training and exposure to networks.

Interviewees argued that the partnerships helped accelerate the growth of start-ups and spin-offs. Start-ups that succeeded within the scope of the partnerships benefitted from the networks and connections established through these collaborations. While interviewees acknowledge that the start-ups were not directly created by the programmes, they emphasised the crucial role the partnerships played in providing training, networks, and support that enabled these companies to grow more rapidly. While the partnerships' activities often included workshops and networks aimed at preparing start-ups for capital-raising processes, they did not directly provide access to venture capital. However, the partnerships played a vital role in helping companies connect with US investors and tap into larger venture capital resources. By offering exposure to the US ecosystem and involving start-ups in prestigious programmes, the partnerships facilitated companies in securing venture capital, which contributed to successful Series A funding rounds and helped them expand into new markets and strengthen their financial position. Yet, the survey suggests that only a minority (16.8%) believed these partnerships offered considerable benefits in accessing venture capital, again, which is expected when considering the profile of the respondents.

5.4 *What was the contribution of the programmes to the excellence of scientific outputs in their respective thematic fields?*

Although the programmes' output data was insufficient, consistent evidence from other sources suggests that the programmes have significantly contributed to generating high-quality scientific results in their respective thematic fields.

The programme outputs section of this report highlights the constraints on the availability of data on scientific publications generated by the programmes. CMU and MIT Portugal provided comprehensive information across all phases, while UT Austin Portugal faced substantial limitations in the first two phases, contributing only 1.6% to the overall count due to incomplete reports and issues with record-keeping transfer between management teams. Overall, the programmes provided verifiable evidence for exactly 2,000 scientific publications generated throughout their implementation. Nevertheless, by complementing this data with data from secondary sources as well as qualitative data from interviews, we found significant evidence that the programmes generated excellent scientific outputs.

➢ There is a substantial premium of the partnerships' outputs in terms of scientific influence, technological influence and policy influence.

The results of our quantitative benchmark analysis show that, when compared with a control group of similar outputs, the partnership programmes present significantly stronger performance in terms of:

- **Scientific influence:** when compared with publications in the same year, field and type, partnership programme publications receive, on average, 13 more citations, representing a premium of 60%.
- **Technological influence:** patents cite partnership publications three times more than comparable publications in their non-patent literature references.
- **Policy influence:** public policy documents cite partnership publications four times more than comparable publications.

The scientometric analysis followed a structured methodology, starting with linking the partnership outputs to the S&T data ocean. This linked data framework included secondary bibliometric data, non-patent literature citations from patents, and public policy documents[18].

Next, we identified a control group sample by selecting all publications acknowledging FCT funding from our bibliometric database. After filtering out the focal publications stemming from the partnerships and keeping only a common publication year window and scientific fields, the final dataset consisted of 47 522 control works and 1 156 partnership-related outputs. Most of the publications under analysis are in the overall domains of Physical Sciences and Life Sciences. Scholarly contributions in Social Sciences are also present but to a lesser extent (see full data description in Appendix D).

[18] Three data sources were used to extend our data, including OpenAlex (to retrieve data about publication dates, fields of science, cross-citation networks, publication type, and a control group of comparable publications), Overton (to retrieve data about the number of public policy citations received by the scholarly works) and PATSTAT (to retrieve data about the number of patents citing the scholarly works in their non-patent references).

The main goal of this analysis was to benchmark the programme's scientific, technological, and policy results. Therefore, the proxies or dependent variables of interest are the number of scientific citations received by the publication set and non-patent and policy citations.

We used the negative binomial regression as our primary model:

$$P(Y = y|X) = \frac{\Gamma\left(y + \frac{1}{\theta}\right)}{\Gamma(y+1)\Gamma\left(\frac{1}{\theta}\right)}\left(\frac{1}{1+\theta/\mu}\right)^{1/\theta}\left(\frac{\mu}{1+\theta/\mu}\right)^{y}$$

Where $P(Y = y|X)$ is the probability of observing y counts of forward citations. X represents a vector of independent variables, including the primary variable of interest – a binary indicator equal to one if the scholarly work is an output of the partnerships and zero otherwise. The remaining control variables account for differences in years, scientific fields and type of scholarly output.

θ is the dispersion parameter, and μ is the mean of the dependent variable. The parameter θ measures the level of overdispersion in the data, with higher values indicating greater dispersion. The gamma function Γ computes probabilities for different values of the count variable Y.[19]

The table below presents the results of three Negative Binomial regression models. Each model has a different dependent variable: science citations, non-patent literature (NPL), and policy citations. The key independent variable is a partnership dummy, which indicates whether an output stems from a partnership. The coefficients shown represent the incident rate ratios (IRRs), being exponentiated coefficients typical of Negative Binomial models.

Table 15. Negative Binomial Regression with exponentiated coefficients (incidence rate ratios)

	(1)	**(2)**	**(3)**
	Science Citations	NPL Citations	Policy Citations
main			
Partnership dummy=1	1.584***	3.743***	4.843***
	(0.0888)	(0.537)	(0.999)
Observations	48623	48543	48623
Year, Field and Type FE	Yes	Yes	Yes

Exponentiated coefficients; Standard errors in parentheses
** p < 0.05, ** p < 0.01, *** p < 0.001*

In the first model, the dependent variable is the count of science citations. The coefficient for the partnership dummy is 1.584, with a standard error of 0.0888. This indicates that outputs from partnerships have 1.584 times the number of science citations compared to non-partnership outputs. Thus, on average, partnerships' publications receive, on average, 58.4% more citations, holding other factors constant. The average marginal effect of the partnership dummy is 13.22 (not displayed). This means that partnership publications receive, on average, 13.22 more citations than the control publications, holding all other covariates constant.

[19] In all the settings, the AIC and BIC values of the Negative Binomial models are systematically below those of the Poisson regression. Moreover, the confidence interval of alpha parameters of the Negative Binomial are always above zero. These elements further support the need to use the Negative Binomial regression instead of the Poisson.

In the second model, where the dependent variable is the count of patent citations, the partnership dummy has a coefficient of 3.743 with a standard error of 0.537. Outputs from partnerships have 3.743 times more NPL citations than non-partnership outputs, suggesting a 274.3% higher number of citations for those involved in partnerships.

The partnership dummy coefficient in the third model, which assesses policy citations, is 4.843, with a standard error of 0.999. This implies that outputs from the partnerships receive 4.843 times the number of policy citations compared to non-partnership entities, which equates to a 384.3% higher number of policy citations.

All three coefficients are statistically significant at the 0.1% level ($p < 0.001$), as indicated by the triple asterisks. This means that the observed partnership premium is highly significant across all models. The models also control for fixed effects related to year, field, and type, ensuring that the variations due to these factors are accounted for with year, field and publication type dummy variables.

An element not disentangled by this benchmark is the selection effect of the partnerships (i.e. by attracting and selecting the very best, beneficiaries could potentially deliver similar outputs regardless of benefiting from the programme). Given the relative concentration of access among the most prominent beneficiaries of the programmes, we cannot entirely rule out the possibility that this selection effect may have played a role. However, data from interviews and survey suggest that there is also a considerable 'learning effect' (i.e. participants gain new knowledge, skills, or networks through their involvement in the programme leading to exceptional scientific outputs).

- The programmes fostered a significant 'learning effect', enabling participants to acquire new knowledge, skills, and collaborative networks, which contributed to enhanced scientific outputs.

Multiple interviewees highlighted how the partnerships supported specific research projects involving collaboration between U.S. and Portuguese researchers or led to projects that bridged academic research with industrial needs. These projects are often credited with leading to high-quality scientific outputs or directly improving the quality of research. Supporting this, 82.2% of survey respondents noted that the benefits to the research teams involved in the programmes, in terms of scientific excellence, were significant (Figure 27).

Similarly, several interviewees acknowledged other related benefits from these partnerships, particularly in enhancing their internal capacities, for example, they emphasized how collaboration helped Portuguese institutions learn better project management and execution techniques from their American counterparts, resulting in more agile project handling and higher-quality research.

We also note how some of the programmes specifically considered sectoral public policy as a strategic thematic area, which in turn could have led to enhanced policy influence of outputs. For instance, as detailed in the programme inputs section, CMU Portugal established the area of 'Public Policy and Analysis of Technological Change and Entrepreneurship Processes in ICT' as a strategic priority in phase 1. Additionally, a dual PhD degree in Engineering and Public Policy was introduced during this phase and remains active, further pointing to the alignment between research and policy development within this programme.

- The partnership programs produced excellent outputs that extended beyond scientific publications, contributing to broader advancements in their respective fields.

Finally, we found that excellent scientific outputs of the partnership programmes extended beyond those comprised of scientific publications. Specifically, the large-scale collaborative

research projects have been credited with playing a key role in generating a wide range of scientific outputs, including prototypes, testing facilities, advanced simulation tools, and new methodologies at the knowledge frontier of their respective fields, frequently leading to knowledge spillovers that extend beyond the direct participants (as illustrated by the following case study).

Breaking New Ground: Portugal's First Nanosatellite and Cutting-Edge Ocean Monitoring

The University of Minho (UMinho) participated in two flagship projects under the MIT Portugal Programme. UMinho contributed to the AEROS Constellation project, which resulted in the development and launch of Portugal's first nanosatellite in 2024, designed to monitor ocean environments. Additionally, UMinho was involved in the K2D: Knowledge and Data from the Deep to Space project, which developed a 2 km SMART submarine cable network now installed in the Technological Free Zone (ZLT) in Sesimbra for real-time ocean data collection.

The scientific and technological impact of these flagship projects was substantial and extending well beyond the project partners. The AEROS MH-1 nanosatellite was successfully launched on 4 March 2024 from the Vandenberg Space Force Base in California, representing a milestone in Portugal's space-earth research that will enable enhanced environmental monitoring from orbit. The K2D project's advanced ocean monitoring system, tested in collaboration with the U.S. and Portuguese navies, has strengthened Portugal's strategic capabilities in maritime research. The ZLT in Sesimbra provides a unique testing ground for these technologies, attracting ongoing interest for further collaboration.

MIT's involvement was crucial in providing expertise in satellite and ocean sensing technologies and facilitating access to international networks. These advancements reflect how the MIT Portugal Flagship Projects have helped Portugal gain recognition as a valuable contributor in these fields, with top players increasingly seeing the country as a peer in cutting-edge global research.

Source: Eduardo Pereira, Assistant Professor at UMinho (Interview). For the full case study, see Appendix E.

5.5 How do the programmes contribute to the creation of intellectual property?

We could not find significant evidence that the programmes have directly contributed to the creation of intellectual property. Secondary and interview data suggest that the participation in the programmes could have indirect positive effects on the future propensity of beneficiaries to patent, however evidence is very limited.

- Output data shows no meaningful results in terms of intellectual property directly generated by the programmes.

As detailed on the programme outputs section of this report, there's a notable lack of patent or other intellectual property (IP) output data across the partnership programmes. Whether this is because the programmes did not generate IP outputs or because those outputs were not correctly monitored is unclear. The absence of a centralised IP output database covering all programmes and phases of implementation and large inconsistencies found between the expected IP outputs of research projects (as defined by beneficiaries *a priori*), patent output counts mentioned in the programmes' activity reports, and verifiable evidence provided by FCT and the partnership programmes to the evaluation team, suggest that at least part of this information could be missing.

However, we could only verify that the programmes have generated 11 patent requests, four of which have been granted (one from UT Austin and three from CMU), all related to third phase activities.

While the direct creation of intellectual property seems to be very limited, we found some exploratory evidence that the programmes could have an indirect and/or time-dilated effect on generating new intellectual property.

- Comparative data suggests that scientific knowledge generated through the partnership programs has a bigger influence on the creation of intellectual property than non-partnership outputs.

As we have previously reported, our quantitative benchmark analysis revealed that scientific outputs (i.e. publications) from the partnership programmes receive 3+ times more patent citations than comparable non-partnership publications[20]. This finding demonstrates that the scientific knowledge generated by the programmes has a relevant role in influencing future technological developments leading to the creation of patents. Of course, this finding does not shed any light on the actual influence mechanisms or even who is reaping the economic benefits of these IP rights, so its relevance regarding the policy objectives of the partnership programmes should be interpreted with caution.

- Some beneficiaries have reported positive indirect effects of the programmes on their propensity to patent.

Some of the interviewed beneficiaries mentioned that their participation in the programmes has had a positive effect in their overall propensity to patent (regardless of the protected knowledge being associated to their participation in the programme or not).

In the case of CMU, interviewees identified that the dual degrees allowed students to work on cutting-edge research projects, stating that exposure to advanced research environments and top-tier academic resources contributed to the development of new technologies with potential for future IP creation. The same was reported for MIT, where the collaborative environment between Portuguese and American institutions, facilitated by the programme, made it easier for researchers and companies to develop new technologies and file patent requests.

In the case of UT Austin, the Portuguese programme management body drew attention to the role of technology transfer, specifically the UTEN programme under Phase 1, which was highlighted for its focus on commercialising innovations and assisting with patent registrations. Reinforcing this statement, it is important to highlight the protocol signed on 19 December 2008 between FCT and the National Institute of Industrial Property (INPI), which aimed to facilitate INPI's support for UTEN's activities focused on developing and enhancing competencies in technology transfer.

Interviewed companies often reported that participation in the partnership programmes contributed to an increase in internal R&D activities and further collaboration with academia outside of the activities funded by the programme. In some cases, it was reported that exposure to the US partners' approach to intellectual property had a positive effect on the companies' propensity to patent.

Further evidence to support this finding is that our quantitative benchmark analysis shows that start-up and spin-off companies associated with the partnerships are significantly more likely to apply for patents. Results show that start-ups associated with the partnerships file for patents at

[20] Statistically significant at a 0.1% level stemming from negative binomial regression models appropriate in case of overdispersed count data and accounting for scientific field differences, year and type of publication.

a rate 12.21 times higher than non-associated start-ups. This result is statistically significant at the 0.1% level ($p < 0.001$) using a Negative Binomial regression model[21].

5.6 *What is the contribution of the programmes to stimulating the participation of national companies in collaborative R&D projects in close articulation with academia, and in promoting entrepreneurship and innovation?*

We found consistent evidence that the collaboration between national companies the international partnerships was effective in stimulating participation in R&D projects and promoting entrepreneurship and innovation.

- The involvement of industrial affiliates facilitated strong cooperation between companies and academic institutions, providing access to advanced training and tailored research projects.

Across the partnerships, cooperation agreements established with industrial affiliates facilitated relations with Portuguese companies. In Phase 1, industrial affiliates benefited from advanced training and participation in research projects tailored to their strategic needs. In Phase 3, evidence indicates that new instruments were implemented, enabling doctoral students to complete their dual PhDs and encouraging candidates to collaborate with Portuguese companies on relevant projects.

Several interviews highlight that involvement as industrial affiliates were a successful way of accessing talent, excellence in R&D practices, and experiences that fostered cultural shifts in their organisations' innovation cultures. While Appendix F compiles the industry affiliates associated with each programme, there are notable cases where start-ups initially involved in the programmes had, by Phase 3, become established as industrial affiliates (e.g.: Feedzai or Sword Health).

Also noteworthy is the significant participation of Portuguese unicorns as affiliates, including Sword Health, Feedzai, Talkdesk, Outsystems, Remote, and Farfetch (based on the Crunchbase Unicorn Board – update of 10/06/2024).

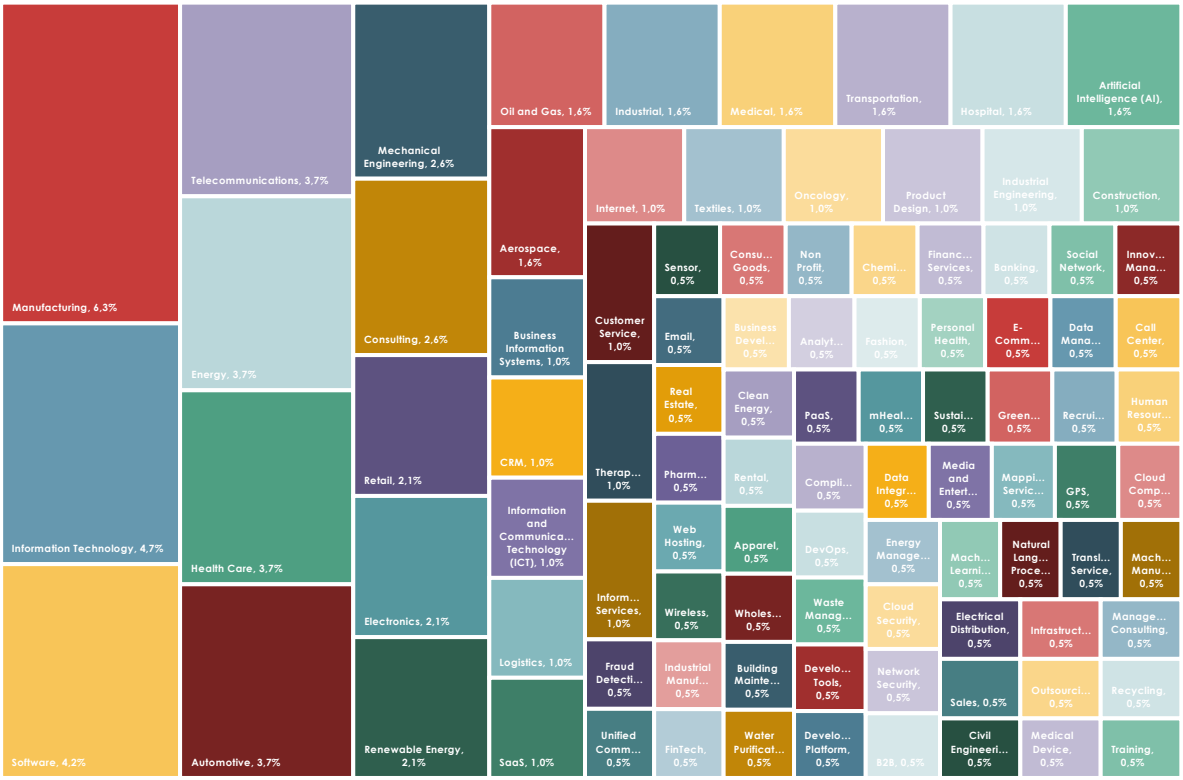
Furthermore, we mobilised the mapped industry affiliates companies (see Appendix F) using Crunchbase to determine their respective industries in phase 3. This exercise enabled the retrieval of information on 89 industry affiliated companies.

- Industry participation spanned a wide range of sectors, with software, information technology, and engineering being the most prominent sectors, but smaller companies also showed a notable presence in emerging fields such as AI and aerospace.

Overall, industry groups across the dataset reveals several key trends in the types of industries that companies operate in. The most common industry groups include Software, Information Technology, Science and Engineering, Hardware, and Manufacturing, as well as service-oriented sectors such as Professional Services and Consulting. Additionally, Transportation and Health Care are notable. Emerging industry groups, such as Consumer Electronics, Data and Analytics, and Artificial Intelligence (AI), highlight the growing of data-driven solutions.

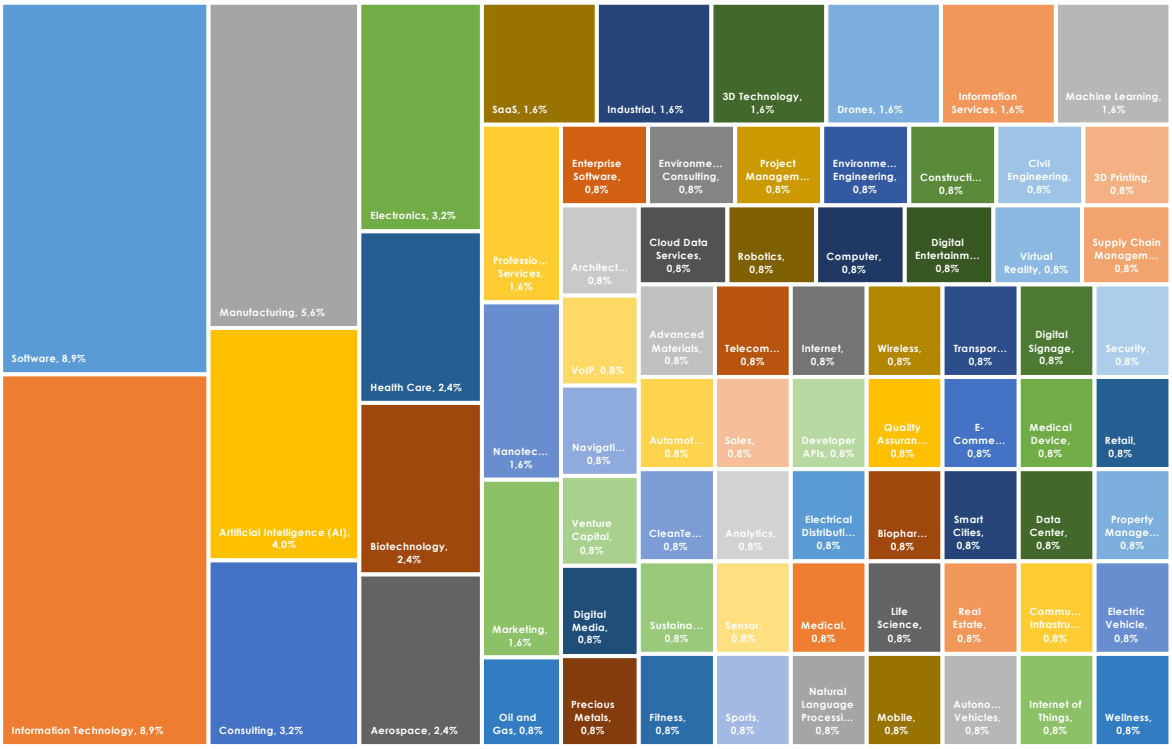
[21] Full methodology used is detailed on Annex D.

Figure 28. Industries of affiliated companies with over 250 employees in phase 3 international partnerships



Source: programme data provided by FCT and Crunchbase dataset (=47).

Figure 29.30 Industries of affiliated companies with fewer than 250 employees in phase 3 international partnerships



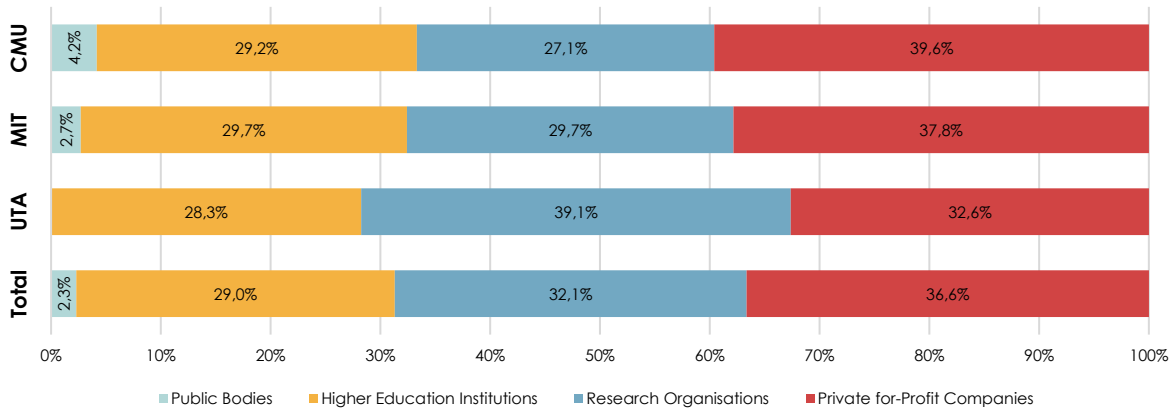
Source: programme data provided by FCT and Crunchbase dataset (=42).

Furthermore, when looking it to industries for companies with fewer than 250 employees compared to those with more than 250 employees, several similarities and differences emerge. While both groups share a strong presence in industries such as Information Technology, Software, and Manufacturing. Companies with fewer than 250 employees evidence a stronger focus on Artificial Intelligence and Aerospace. In contrast, larger companies (250+ employees) tend to dominate industries such as Telecommunications, Energy, and Automotive. Additionally, Health Care and Mechanical Engineering feature more prominently among larger companies. Smaller companies are more likely to be involved in emerging and niche sectors such as Biotechnology, Electronics, and SaaS.

- The Large-Scale Collaborative Research Projects call launched in Phase 3 provided a robust platform for collaboration between national companies, with a noteworthy level of co-investment from the private sector.

From another perspective, as mentioned in the programme inputs section, a distinctive call for Large-Scale Collaborative Research Projects was launched in 2019 by Compete 2020, ANI, and FCT to support R&D projects led by national companies in collaboration with academic organisations. As a result, a total of 30 applications were approved, with 12 associated with CMU, 7 with MIT, and 11 with UT Austin.

Figure 31. Distribution of participant organisations in Large-Scale Collaboration research projects (3rd phase) by typology and international partnership



Source: programme data provided by FCT.

Analysing the participation of national companies, the available data shows the involvement of 44 distinct companies, representing 36.6% of the total organisations involved. As part of the project funding was supported by the companies themselves, the private co-investment to fund these projects reached €9,323,664. Among the partnerships, CMU Portugal involved the highest number of companies (19), followed by UT Austin Portugal (15) and MIT Portugal (14). Notably, companies such as SPIN.WORKS S.A. and EFACEC ENERGIA participated in projects with both MIT and UT Austin.

Table 16.Portuguese companies by no. of participations in approved Large-scale Collaborative Research Projects (3rd phase)

Companies	CMU	MIT	UTA	Total
SPIN.WORKS S.A.	-	1	1	2
EFACEC ENERGIA - MÁQUINAS E EQUIPAMENTOS ELÉCTRICOS S.A.	-	1	1	2
DSTELECOM, S.A.	-	2	-	2
TEANDM - TECNOLOGIA, ENGENHARIA E MATERIAIS S.A.	-	-	2	2
CLARKE, MODET & COMPANHIA, SOCIEDADE UNIPESSOAL LDA	-	1	-	1
NST APPAREL (EUROPE) LDA	-	1	-	1
INNOVATION POINT - INVESTIGAÇÃO E DESENVOLVIMENTO S.A.	1	-	-	1
COMPTA - EMERGING BUSINESS, S.A.	1	-	-	1
PRIBERAM INFORMÁTICA, S.A.	1	-	-	1
CONTROLCONSUL - CONSULTORIA, SERVIÇOS E REPRESENTAÇÕES LDA	-	1	-	1
ZENITHWINGS LDA	-	1	-	1
CRITICAL MATERIALS, S.A.	-	1	-	1
NELSON AZEVEDO - TERAPIAS GLOBAIS, UNIPESSOAL LDA	-	-	1	1
DST SOLAR, S.A.	1	-	-	1
OUTSYSTEMS - SOFTWARE EM REDE S.A.	1	-	-	1
ADVENTECH - ADVANCED ENVIRONMENTAL TECHNOLOGIES, LDA	-	-	1	1
SPHERE ULTRAFAST PHOTONICS, S.A.	-	-	1	1
EDISOFT - EMPRESA DE SERVIÇOS E DESENVOLVIMENTO DE SOFTWARE S.A.	-	1	-	1
WAVECOM - SOLUÇÕES RÁDIO S.A.	-	-	1	1
ALTICE LABS, S.A.	1	-	-	1
INGENIARIUS, LDA	1	-	-	1
ESURFACE PORTUGAL, UNIPESSOAL LDA	-	1	-	1
INOVATOOLS PORTUGAL, UNIPESSOAL LDA	-	-	1	1
FARFETCH PORTUGAL - UNIPESSOAL LDA	1	-	-	1
NOS COMUNICAÇÕES, S.A.	-	1	-	1
FEEDZAI - CONSULTADORIA E INOVAÇÃO TECNOLÓGICA, S.A.	1	-	-	1
OMNIDEA LDA	-	-	1	1
FIRST SOLUTIONS - SISTEMAS DE INFORMAÇÃO S.A.	1	-	-	1
PETSYS ELECTRONICS - MEDICAL PET DETECTORS, S.A.	-	-	1	1
GLINTT - HEALTHCARE SOLUTIONS, S.A.	1	-	-	1
SILVAPOR, AMBIENTE & INOVAÇÃO LDA	1	-	-	1
STEMMATTERS - BIOTECNOLOGIA E MEDICINA REGENERATIVA S.A.	-	-	1	1
ALTRANPORTUGAL, S.A.	1	-	-	1
UBIWHERE LDA	-	1	-	1
VOLKSWAGEN AUTOEUROPA, LDA	-	1	-	1
GLSMED LEARNING HEALTH, S.A.	1	-	-	1
UNBABEL, LDA	1	-	-	1
GRAPHENEST, S.A.	-	-	1	1
WATT-IS, S.A.	1	-	-	1
HOSPITAL DA LUZ S.A.	1	-	-	1
WE DO CONSULTING - SISTEMAS DE INFORMAÇÃO, S.A.	1	-	-	1
IMPETUS PORTUGAL - TÊXTEIS S.A.	-	-	1	1
3 DRIVERS - ENGENHARIA, INOVAÇÃO E AMBIENTE, LDA	1	-	-	1
INCREASE TIME, S.A.	-	-	1	1
TOTAL	**19**	**14**	**15**	**48**

Source: programme data provided by FCT.

5.7 *Did the programmes contribute to the adoption of international best practices in scientific and technological activities?*

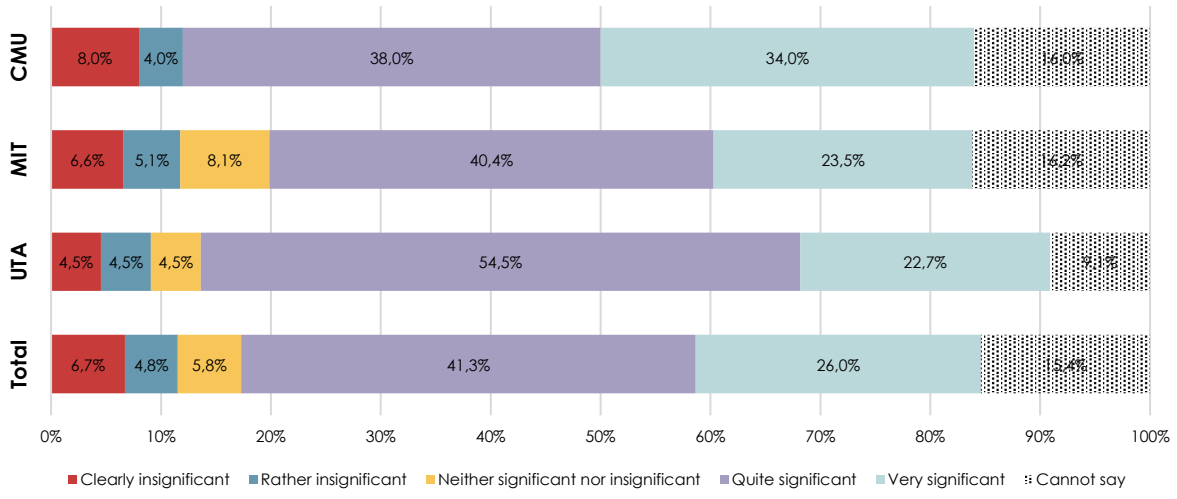
Consistent evidence from interviews and surveys indicates that the partnerships contributed substantially to the adoption of international best practices across scientific and technological activities.

➢ The partnerships substantially contributed to the integration of international research standards within Portuguese institutions.

The interviews suggest that the partnerships contributed to the integration of international research standards within Portuguese institutions. By collaborating with leading US universities, Portuguese companies and research teams were able to adopt advanced methodologies and tools in fields such as artificial intelligence, machine learning, and software engineering. One interviewee reports that the collaborative environment, where institutions with complementary skills could work together more effectively, also led to pedagogical improvements, with teachers adopting new methodologies in their classrooms. Another interviewee stated that participation helped propel the company into the global market, significantly influenced by the academic rigour and innovative methodologies introduced through the collaboration.

The survey data reinforces these perspectives, as a combined total of 67.3% of respondents rated the contribution of the programmes to the adoption of international best practices as either "Quite significant" (41.3%) or "Very significant" (26.0%). These figures suggest a strong overall perception that the programmes had a positive impact on the scientific and technological activities of Portuguese institutions. Furthermore, several survey respondents provided concrete examples of how good practices were adopted in their institutions. For example, one respondent mentioned, "The CMU-PT partnership helped establish a state-of-the-art lab in soft electronics by replicating equipment from a leading lab at CMU," highlighting a direct transfer of infrastructure and know-how. Another participant noted that their institution adopted a faculty evaluation system that became "very similar to CMU's" due to the programme, reinforcing practices that were already being developed.

Figure 32. In your opinion, how much did the programmes contribute to the adoption of good international practices in the scientific and technological activities of Portuguese institutions? (n=208)



Source: Technopolis survey of programme beneficiaries.

The partnerships not only contributed to the adoption of best practices and elevated research standards, but also led to substantial investments in advanced infrastructure that would have otherwise been difficult to achieve. One prominent example of this impact is the donation of the BOB supercomputer through the UT Austin-Portugal partnership.

- The partnerships facilitated the adoption of dual-degree and non-dual doctoral and master programmes, strengthening academic collaboration between Portuguese and US institutions.

Another example of good practices incorporated at the institutional level comes from CMU, where the interviewees suggest that there was a clear focus on promoting international best practices, especially in activities such as dual degrees, which involved significant collaboration between Portuguese and American universities. The requirements for doctorates were shared between institutions, facilitating the adoption of high-level academic standards from both sides, highlighting the joint responsibility in thesis development and the integration of Portuguese faculty into CMU. Two of the interviewees connected to programme management mentioned that involvement in dual-degree programmes and collaboration with CMU allowed the introduction of new practices that are now "almost standard" in the participating Portuguese institutions, suggesting significant internalisation of these good practices.

Survey respondents confirmed this institutional transformation. One participant stated how "new PhD students under these programmes" helped bring back practices learned abroad, further influencing local institutional practices. This cross-pollination of ideas and methods meaningfully enhanced the professional development of participants, many of whom went on to assume leadership roles in research and industry, contributing to long-term capacity building within Portuguese institutions. One interviewed researcher stated how the international partnerships contributed to the creation of critical mass in ocean observation technologies, particularly noting how MIT's practical approach to research, focusing on market-oriented solutions, helped Portuguese teams adopt methods for turning scientific results into products.

- Exposure to the US innovation ecosystem was a considerable benefit of the partnerships, enabling knowledge transfer, capacity building and sustained university-industry relations.

Interviews reveal that one of the key impacts of these partnerships was exposure to the US advanced international ecosystem. The opportunities provided Portuguese researchers and entrepreneurs with close insights into how the US innovation ecosystem functions, from university-industry collaboration to the commercialisation of technology.

Interviewees pointed out that one of the most enduring legacies of these partnerships is the creation of long-term professional networks. The frequent exchanges and collaborations fostered deep connections between Portuguese and international academics, researchers, and industry leaders. The interviews reinforce the message that these exchanges and collaborations led to the formation of long-term trust relationships between Portuguese beneficiaries and the US innovation system. They further emphasised how the programmes were instrumental in bridging top-tier institutions with Portuguese universities, which allowed for the acceleration of research projects. These initiatives not only fostered the development of joint projects but also helped students and researchers gain exposure to international standards and practices, raising the quality of scientific outputs and building capacity for innovation and leadership in global markets.

According to some survey respondents, this international exposure also had practical benefits. One noted that "collaboration in cutting-edge research and internationalisation of Portuguese research" resulted in greater visibility and impact, especially in terms of project dissemination. Another mentioned that these partnerships helped improve "rigorous testing and ways of organising research," pointing to the implementation of more structured research methods.

Some respondents also highlighted the importance of university-industry partnerships as a best practice introduced by the programme. This was seen as an effective model for fostering innovation and producing practical research outcomes. For instance, a respondent stated that "the concept and practice of university-industry partnerships for innovation" was new to many Portuguese institutions but has since gained traction.

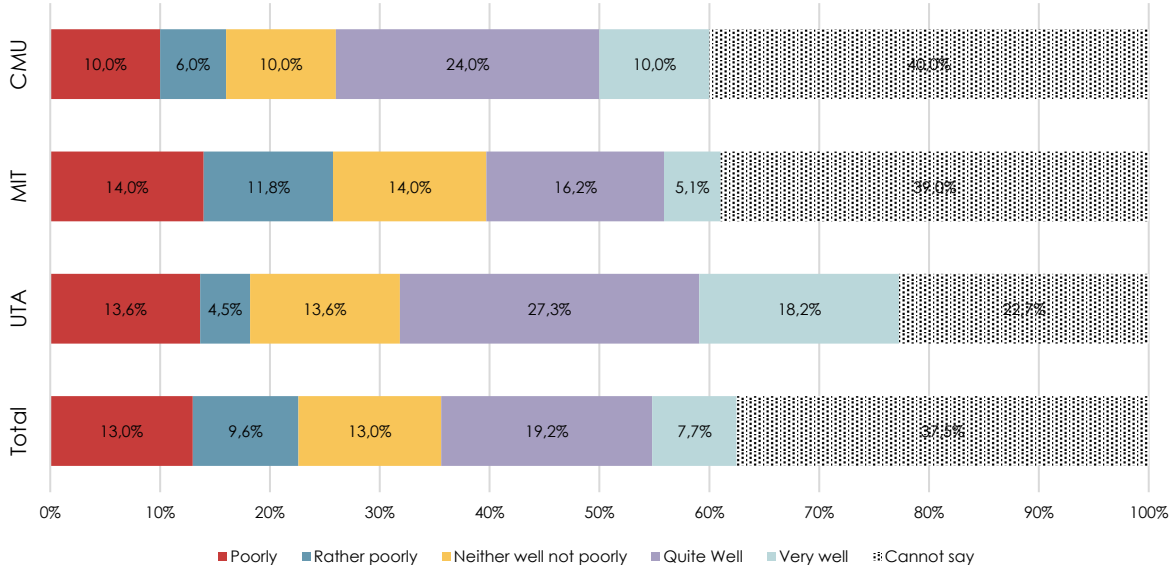
5.8 What has been the impact of the programmes in promoting access to international collaboration and knowledge transfer networks? Has this access continued beyond the duration of the support?

Consistent evidence from both interviews and surveys was found that the effects of the programmes improved access to international research, technology and innovation networks across all phases of implementation. These connections, particularly in dual-degree programmes, increased the credibility, visibility and broadened the informal network of participants within international scientific and technological communities. However, it should be noted that the evaluation team did not identify evidence from the data collected through the programme management bodies that would allow for the verification of their formal participation in international scientific and technological networks, beyond their involvement in R&D&I instruments implemented (e.g., the consortium of flagship projects) within the scope of the partnerships. Thus, the partnerships were successful in terms of their outputs (enabling access). Nonetheless, evidence points to the prevalence of informal mechanisms.

- The partnerships promoted international ties for both academic and industrial participants, enhancing research capabilities and business growth.

A recurring point made by interviewees was the significant improvement in access to international research and industrial networks, by connecting Portuguese entities to prestigious US institutions, participants – especially those involved in dual-degree programmes – gained credibility and visibility within international scientific and technological communities. Several interviewees noted that these connections allowed students to engage with international research environments, with many leveraging these ties to advance their careers. Academic institutions, as reported, also improved their global standing and secured opportunities for joint research, benefitting from continuous engagement with talent. Companies similarly benefitted, using these networks to scale up their innovation efforts, recruit talent, and establish strategic collaborations with international partners. Economic impacts were also frequently highlighted during interviews, particularly with respect to start-up growth and business development. Multiple respondents referred to companies that had emerged stronger from their participation in the partnerships, with some becoming key sectorial players in national and international markets. Several interviewees emphasised the role of entrepreneurial support in helping Portuguese start-ups refine their business models and innovate more effectively. Access to US networks and expertise, according to many, was essential to this process.

Figure 33. To what extent do you think that access to international collaboration and knowledge transfer networks has been sustained since the end of programme support? (n=208)



Source: Technopolis survey of programme beneficiaries.

Interviewees highlighted that the early phases of the programmes encouraged active institutional collaboration and knowledge exchange between professors from Portuguese and US institutions. Many commented that this fostered long-term connections, with particular emphasis on collaborations in cutting-edge areas. However, some noted that maintaining these relationships post-programme was difficult due to reduced resources. Despite these challenges, the partnerships were generally seen as successful in facilitating ongoing engagement between Portuguese researchers and international networks, though administrative and bureaucratic obstacles were frequently mentioned as barriers. These qualitative insights were supported by survey responses, where 37.5% of participants indicated that they could not assess the extent to which access to these networks was sustained post-programme. A further 13.0% believed that access was sustained "poorly," while 9.6% rated it "rather poorly," showing that around one-fifth of the respondents viewed the sustainability of these networks negatively. Nevertheless, 19.2% rated access as sustained "quite well," and 7.7% rated it "very well," suggesting that a portion of respondents perceived lasting benefits.

- The programmes were effective in facilitating knowledge transfer.

Another point raised in the interviews was the importance of knowledge transfer facilitated through the partnerships, which was seen as crucial for driving innovation. Portuguese companies and academic institutions were able to substantially enhance their research and development capabilities by engaging in joint research projects, professional training, and gaining access to advanced technological resources. Interviewees gave examples of how this knowledge transfer went beyond theoretical insights, with tangible outcomes such as patents, prototypes, and new products. One survey respondent mentioned in this regard, "we have collaborated with Meta (Facebook) in one project, and they even provided a research award to my group (147,000 USD)". In several cases, knowledge gained through collaboration helped companies become more competitive in international markets, while academic institutions strengthened their research outputs. These results were described as creating long-term value

for both industry and academia, particularly in shaping new methodologies and processes for innovation.

- Sustaining these international collaborations required additional resources, institutional commitment, and alignment of funding mechanisms, which were often lacking after the programme support ended.

In this sense, several interviewees pointed to the challenge of misaligned funding timelines between Portuguese and US institutions as a barrier to maintaining these networks. Differing financial structures and project schedules were frequently mentioned as complicating efforts to coordinate joint activities, particularly after the initial support concluded. This issue was reflected in survey responses as well. One respondent remarked, "*we did not succeed at continuing the project, although we applied multiple times for funding. A key issue is that European funding is typically restricted to European actors*". This issue was seen as affecting the sustainability of these networks, with participants from Portuguese institutions specifically highlighting how these differences hindered smooth collaboration.

Interviewees also commented on the importance of individual or institutional initiative in sustaining long-term collaboration. In some cases, private sector participants managed to continue international collaborations, though this required significant internal commitment and resources. Survey respondents echoed this sentiment, with one mentioning that "*individual friendships were key to maintaining collaboration with US institutions*" despite the lack of formal frameworks. Another stated that "*private sector participants continue collaborating without the formal programme framework, but it requires significant resources*". The lack of formal frameworks to support ongoing collaboration was commonly cited as a concern, with interviewees emphasising the need for institutional or governmental support to maintain these valued connections.

5.9 What has been the impact of the programmes on the qualification and capacity-building of national scientific and technological institutions?

Consistent evidence was found from both interviews and case studies across the three international partnerships demonstrating that the collaboration had a substantial impact on the qualification and capacity-building of national scientific and technological institutions.

- The collaboration between Portuguese scientific institutions and US partners contributed to their internationalisation.

The internationalisation of Portuguese scientific institutions emerged as a recurring theme during the interviews, consistently noted as a core benefit of the partnerships. Participants frequently highlighted that their institutions gained access research networks, which extensively enhanced both their capabilities and international visibility. For instance, collaboration with prominent American universities was repeatedly mentioned as having increased the reputation of Portuguese universities and enabled their participation in larger, more prestigious projects—opportunities that were previously less accessible. According to interviewees, this broadened the scope of education and research within these institutions, allowing them to align with internationally recognised academic frameworks.

One of the most frequently mentioned influences across interviews was the strengthening of institutional capacity. Several respondents mentioned that by engaging in joint research and

collaborative projects, Portuguese universities and research centres were exposed to international best practices. This exposure, as reported by multiple interviewees, elevated academic standards and provided valuable insights into project management and technological innovation. Respondents emphasised that these insights improved operational efficiency and research outputs within the institutions involved. The adoption of these new methodologies, frequently mentioned during the interviews, was viewed as a crucial factor in enhancing institutional capacity.

- Long-term collaborations in doctoral programmes created a lasting impact on Portuguese institutions.

Another frequently cited benefit was the development of doctoral and master's programmes, particularly dual degree initiatives, as referenced in several interviews in the context of CMU Portugal. Many interviewees noted that these programmes provided Portuguese students with internationally recognised qualifications, which contributed to increased employability and integration into academic and research networks.

Several interviewees mentioned that institutions have sustained collaborations and practices initiated through these partnerships. For example, respondents from the MIT Portugal programme noted that several doctoral programmes, which initially received funding and structure under the partnership, have continued to operate after formal support ended. These programmes, according to interviewees, are now fully integrated into the universities, continuing the legacy of MIT Portugal even without the same branding. Many respondents viewed this sustained academic collaboration as a reflection of a broader transformation in Portugal's educational ecosystem.

- The partnerships contributed to the professionalisation of Portuguese institutions in knowledge transfer and innovation culture practices.

The interviewees linked to programme management emphasised the importance of international partnerships in promoting best practices in innovation and entrepreneurship activities. In the case of UT Austin, they suggest that the programme design, especially UTEN, was originally aimed at transforming the Portuguese innovation ecosystem. Over time, there was a noticeable professionalisation and maturity in the handling of intellectual property and in the relationship with Portuguese companies, which they correlate with the adoption of international practices brought by the partnership. Across all partnerships, several beneficiary interviewees from Portuguese companies and universities mentioned the long-term impact of international exposure and hands-on training at US institutions, which allowed their institutions to adopt best practices in knowledge transfer and innovation culture, strengthening their role in fostering technological commercialisation within the Portuguese ecosystem.

In this context, a noteworthy aspect in which the stakeholders recognise the impact of the international partnerships was the training of the TTOs of various universities. This has led to a noteworthy advance in science and technology management skills, the ability to manage intellectual property rights, and an increased propensity to patent, as well as the adoption of good practices in technology transfer. Technicians from TTOs and technology-based business incubators had the opportunity to undertake internships, particularly at UT Austin entrepreneurship and innovation unit.

CRIA's Experience in the UTEN Programme: A Case of Capacity-Building and Qualification

The University of Algarve's Technology Transfer Office, CRIA, provides a compelling example of how the UTEN programme contributed to the capacity-building and qualification of Portuguese universities. Before its involvement in UTEN, CRIA was still in the early stages of developing its technology transfer operations. Through the programme, CRIA's staff, including Hugo Filipe de Brito Barros, participated in an intensive two-week training at the IC² Institute in Austin and later engaged in internships at leading institutions such as Carnegie Mellon University.

These experiences were transformative for CRIA. The office gained critical knowledge in technology licensing, commercialization, and entrepreneurship, which were then applied to improve its internal processes. CRIA adopted new decision-making frameworks and licensing strategies, strengthening its capacity to assess and commercialize technologies from the University of Algarve. Moreover, the networking opportunities provided by UTEN enabled CRIA to establish enduring relationships with international partners, such as CMU, which have since led to further collaborations and knowledge exchange.

CRIA is currently regarded as a key player in the development of a dynamic startup environment in the Algarve region, having facilitated the establishment of over 200 startups. Its capacity to drive regional and national innovation has been considerably strengthened by the expertise, methodologies, and networks acquired through the UTEN programme. CRIA's case highlights the substantial impact UTEN had on the professionalization and capacity-building of TTOs across Portuguese universities, enabling them to play a more effective role in technology transfer and commercialization on the global stage.

Source: Hugo Barros, coordinator of CRIA (Interview). For the full case study, see Appendix E.

5.10 What impact do the programmes have on the promotion of startups and spinoffs?

The programmes played a significant role in promoting start-ups and spin-offs, with evidence suggesting that they contributed to the creation and development of companies both directly, through technological entrepreneurship activities, and indirectly, by providing international exposure, access to networks, and immersion in advanced research environments.

- A substantial number of successful technology companies established in recent years are linked to participants in the partnership programs, with many benefiting directly from innovation and immersion initiatives at U.S. partner universities.

The initial sections of this report detail the development of programme activities regarding innovation and entrepreneurship and outline the involvement of start-ups and spin-offs across phases and partnerships, as supported by the available evidence.

Overall, the data collected shows that 188 distinct start-ups or spin-offs were associated with the international partnerships across all phases. UT Austin played a dominant role, particularly in Phases 1 and 2, accounting for 63.7% of the total with 121 start-ups or spin-offs, largely driven by initiatives like the Global Startup Program. MIT contributed 47 start-ups (23.4%), with a significant increase in Phase 3, becoming the primary driver of start-up activity, while CMU was linked with 26 start-ups (12.9%).

Notable examples of start-ups emerging from these partnerships include Sword Health, Feedzai, and Mambu, which have achieved 'unicorn' status. Collaborative dynamics are evident, with start-ups like Xhockware and doDoc participating across multiple partnerships, reflecting the interconnectedness of the programmes with the initiatives promoted under UTEN.

Phase 3 represents a clear shift in each programme's focus, with MIT becoming the leading contributor, supporting 15 start-ups, while UT Austin's involvement dropped to zero. This striking

reduction in UT Austin's contribution indicates a shift away from entrepreneurial and innovation initiatives and reallocation of resources to other areas.

While self-reported data from the partnership programmes is somewhat limited[22] and does not follow a common methodological approach, generally two mechanisms for start-ups and spin-offs association with the programmes could be identified: (1) the start-ups or spin-off were founded by programme participants, and (2) the start-ups or spin-offs benefited directly from programme innovation activities (e.g. BIZ.pt, Global Startup Portugal, etc). For both of these association mechanisms we found evidence that the partnerships played a relevant role in the development of the start-ups and spin-offs.

- The programmes have had a significant role in the promotion of startups and spinoffs, through both direct and indirect mechanisms.

Several interviews emphasized the role of the programmes in providing international exposure, access to networks, and advanced research environments, which played a key role in helping establish or scale-up their companies. This was especially highlighted by CMU dual-degree alumni, but also true for other start-up or spin-off associations with the involvement of students, alumni, or faculty of the programmes.

Exposure to U.S. business dynamics, legal frameworks for setting up companies, and the U.S. universities' start-up ecosystem provided critical knowledge that helped founders establish their start-up and create long-lasting industry partnerships. Through initial training, exchange, or networking activities, the partnerships facilitated the establishment of the relational capital of beneficiaries, while providing them with the reputational benefits of being associated with highly prestigious U.S. universities.

How CMU Portugal Helped Shape Feedzai, One of the Portuguese 'Unicorns'

Feedzai is a Portuguese fintech company specializing in AI-driven solutions for detecting and preventing financial crime. Headquartered in Coimbra, the company was founded in 2011 by Nuno Sebastião, Pedro Bizarro and Paulo Marques. Today, Feedzai has a global reach, with offices in the United States, Europe, Latin America, and Asia. Its technology is used for transaction monitoring in 190 countries. Feedzai employs over 600 people and has a valuation exceeding USD 1.5 billion, making it one of the Portuguese 'unicorns'.

While Feedzai was not directly created by the partnership programme, its links to CMU Portugal were important in shaping the company's development. Two of its founders, Paulo Marques and Pedro Bizarro, had established strong connections to CMU Portugal while working at a research group at the University of Coimbra, helping establish the dual-degree programme in Software Engineering and participating in faculty exchange initiatives. This relationship helped Feedzai in its early stages, particularly when recruiting talent. The programme's dual graduates, trained in both Portugal and the U.S., brought advanced technical expertise in AI and software engineering, filling key roles in the company's engineering and product development efforts.

Additionally, the networks developed through the links to CMU Portugal programme enhanced Feedzai's reputation and credibility in the international market. The relationships forged with CMU faculty and researchers, as well as the founders being credited as visiting CMU faculty members, were pivotal when Feedzai sought to raise venture capital in the U.S., as it helped establish trust and confidence with potential investors. To this day, Feedzai has raised a total of over USD 277 million in funding over 8 rounds.

Feedzai has continued to be involved in the CMU Portugal programme as an Industrial Affiliated Partner and also leading the large-scale project CAMELOT, launched in 2020 in collaboration with CMU, the University of Coimbra, the University of Lisbon (Faculdade de Ciências) and Instituto Superior Técnico.

Source: Paulo Marques, co-founder at Feedzai (Interview). For the full case study, see Appendix E.

[22] There are differences between information offered by the three programmes and a general lack of data on job creation or the available financial evaluation.

➢ Start-ups and spin-offs associated with the partnerships present a significantly stronger performance in terms of company growth and technological development when compared to a control group of similar firms.

Specifically, we assessed the company performance of the sample of start-ups and spin-offs associated with the partnerships in terms of amounts of capital raised, number of deals (common proxies for company growth and innovation potential) and number of patents (proxy for technological development). Results can be summed-up as follows:

- **Funding:** Companies associated with the partnerships raise funds at a rate eight times higher than benchmark companies and are significantly more likely to secure larger amounts, such as USD 1 million and USD 10 million.
- **Patenting:** Companies associated with the partnerships are significantly more likely to apply for patents.

The data provided by FCT and the partnership programmes was used as an initial list of programme associated start-ups and spin-offs. Our control group consists of all Portuguese companies registered in Crunchbase with a common founding year and industry classification as the companies associated with the partnerships, hence mirroring the age window and industry composition stemming from the partnership sample. Since Crunchbase is the largest database of business data focused specifically on dynamic firms raising funds in venture capital deals or engaged with other types of growth capital, our intended benchmark is not a representative sample of the overall population of firms in Portugal, but rather of comparable firms in terms of growth and innovation aspirations. We then collected funding and patent data for our entire sample, including partnership and non-partnership companies. The final dataset comprised 7031 control firms and 108 partnership companies identified within Crunchbase, 54.5% of the total (see full data description on Appendix D).

The main goal was to evaluate the statistical significance of the programme in growth capital and firm performance. Hence, we selected three dependent variables of interest: the level and number of funding raised and the number of patent fillings. We employed different regression models to account for the distinct characteristics of each dependent variable.

We implemented two Logit frameworks for the models evaluating funding raised to assess binary outcomes related to funding thresholds. Specifically, we created two dummy variables: one for companies raising more than USD 1 million in total funding and another for those raising more than USD 10 million. These variables take the value of 1 if a company exceeds the respective funding threshold and 0 otherwise.

The Logit regression model estimates the probability of a binary outcome occurring (e.g., raising more than $1 million). The formula for the Logit model is expressed as:

$$\log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \beta 0 + \beta 1X1 + \beta 2X2 + \cdots + \beta KXk$$

Where P(Y=1) is the probability of the binary outcome being 1 (e.g., raising more than USD 1 million), Xi represents the independent variables, and the coefficients β0, β1…,βk β0 describe how each independent variable affects the log-odds of the outcome occurring. A positive coefficient indicates that an increase in the independent variable raises the probability of surpassing the funding threshold, while a negative coefficient suggests a decrease in this probability.

For the remaining frameworks, we deployed negative binomial regressions to model the total number of funding rounds and patents. These are non-negative count integer variables with

high dispersion, so we followed the same approach as explained in the subsequent evaluation question for the modelling of scientific publication citations.

In this context, the key independent variable is a dummy representing participation in the programme (e.g., being associated with the partnerships vs. benchmark). Additional control variables, such as founding year, industry, and number of industries, are included to account for fixed effects, ensuring that the variations associated with these factors are adequately controlled for in the analysis.

Table 17. Regression analysis

	(1.1)	**(1.2)**	**(2)**	**(3)**	**(4)**
	Probability of raising USD 1M+	Probability of raising USD 10M+	Total number of funding rounds	Probability of applying for a patent	Total number of patents
main					
Partnership dummy=1	0.089***	0.03***	6.310***	.029***	12.21***
Standard error	(0.006)	(0.263)	(0.088)	(.003)	(0.105)
Observations	13437	10833	14699	14369	14699
Founding year, Industry and Number of industries	Yes	Yes	Yes		Yes

Models 1.1, 1.2 and 3 display average marginal effects from the logit models, and Models 2 and 4 display exponentiated coefficients representing incidence rate ratios. Standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

All coefficients explored are statistically significant at the 0.1% level ($p < 0.001$). This confirms that the observed partnership premium remains highly significant across all models.

5.11 What has been the impact of the programmes on access to international funding and markets?

We found consistent evidence that the collaboration between Portuguese companies and US universities across all three partnership programmes had a positive impact on improving access to international markets and funding opportunities.

- Start-up and spin-off companies associated with the partnerships raise funds at higher rates and are significantly more likely to secure larger capital amounts than benchmark companies.

One of the key findings of our quantitative benchmark analysis is that, when compared to a benchmark of similar companies and after accounting for sector differences and firm founding years, start-ups and spin-offs associated with the partnerships are approximately 2.6 percentage points more likely to reach the USD 1M threshold in growth capital raised and 2.8

percentage points more likely to raise USD 10M than the benchmark group. Moreover, they raise funds at a rate eight times higher than the benchmark companies[23].

Data from interviews offer some insights on the impact mechanisms that may be behind this finding, with evidence suggesting that the association with the U.S. universities has been an important factor in improving access to international financial markets, due to the strengthening the companies' perceived credibility, especially with U.S. investors.

- Collaboration with US universities strengthened participants' international credibility.

Several researchers, entrepreneurs and established business leaders interviewed shared that their collaboration with prestigious US universities had strengthened their international credibility and allowed them to compete alongside larger, established global players. Interviewees frequently mentioned that these programmes facilitated connections between Portuguese companies and global ecosystems. Respondents from technology-driven sectors described how the collaborations helped them develop products that were positioned for international markets. In some cases, these products were informed by research and development projects carried out with American universities. As a result, some companies reported success in attracting international clients and expanding their operations outside of Portugal.

The opportunity to collaborate on research and innovation projects allowed companies to present themselves as growth-oriented and innovative, making them more appealing to potential funders. Some interviewees indicated that the partnerships had introduced them to previously inaccessible investors, thus expanding the range of financial resources available to them.

While immediate access to funding was not associated with the partnerships, interviewees often spoke of their enhanced ability to secure international investments as a result of their participation. Several participants commented on the increased credibility that came from working with well-known institutions, making it easier to engage with global investors. This was seen as particularly relevant for start-ups and tech companies looking to scale their operations internationally.

- Early programme phases on innovation and entrepreneurship were crucial for opening market opportunities.

Innovation and entrepreneurship were recurring topics throughout the interviews, especially regarding the early phases of the programmes. In reference to the MIT partnership, the US management body, highlighted that the innovation phase had been crucial for establishing connections with students and companies, broadening market access. Although the focus on innovation was reduced in the third phase across all programmes, it was expressed the view that returning to this emphasis could be beneficial, given potential to link start-ups with international markets.

Regarding CMU, interviewees pointed to its role in the internationalisation of Portuguese science. They explained that the programme had facilitated collaborations with top-tier universities, particularly during the second phase when innovation and entrepreneurship gained prominence. One participant mentioned projects that were translated to start-ups, such as Unbabel, which arose from a doctoral thesis within the programme, noting that the company had grown to compete internationally with major players. This was mentioned as an

[23] See full methodology and results on Appendix D.

example of how the programme had supported the connection between Portuguese science and global opportunities.

Concerning UT Austin, the role of UTEN was mentioned beyond the activities within its programme framework, as it also operated since phase I at the intersection of international partnerships with MIT and CMU.

Unlocking Global Markets: the case of Unbabel and CMU Portugal

The involvement of Unbabel, a Portuguese startup specialising in AI-driven language translation, with the CMU Portugal programme is an illustrative case study of how such a programme can enhance a company's access to funding capital and global markets.

The connection between Unbabel and CMU has its origins in the dual degree PhD programme, which was attended by several key figures in the company's early history, including Vasco Pedro, co-founder and CEO, and André Martins, vice-president of AI Research. Unbabel was founded in 2013, and continued to be involved with CMU Portugal, recruting talent from CMU Portugal alumni and engaging in collaborative research projects, including Project MAIA, a large-scale research initiative centred on the development of multilingual customer support platforms with advanced machine translation capabilities.

As a result, Unbabel has established strong ties with CMU, notably with the Language Technologies Institute, a leading global research institution in the fields of natural language processing and machine learning. This collaboration has proved pivotal in enhancing Unbabel's scientific and technological reputation and appeal to international clients and investors. Unbabel has leveraged this partnership to attract high-profile clients in the United States, including Disney, Netflix, Microsoft, and PayPal. Currently, over 90% of Unbabel's sales are exports, with approximately 60% of revenue generated from the United States market.

On the financial side, Unbabel's association with CMU has facilitated the acquisition of considerable venture capital. The company has raised over USD 91 million across seven funding rounds, including from US investors like Google Ventures, Salesforce Ventures, and Samsung NEXT. While Portuguese companies frequently encounter difficulties in obtaining investment from American capital sources, largely due to perceptions about the local market's limitations, Unbabel's affiliation with CMU has been key in allaying some of these concerns. The reputation of CMU's Language Technologies Institute and the provision of references from CMU faculty has made Unbabel more appealing to investors who value strong academic affiliations and cutting-edge technology, conferring an important competitive advantage in funding rounds.

Source: Paulo Dimas, Vice-President of Innovation at Unbabel (Interview). For the full case study, see Appendix E.

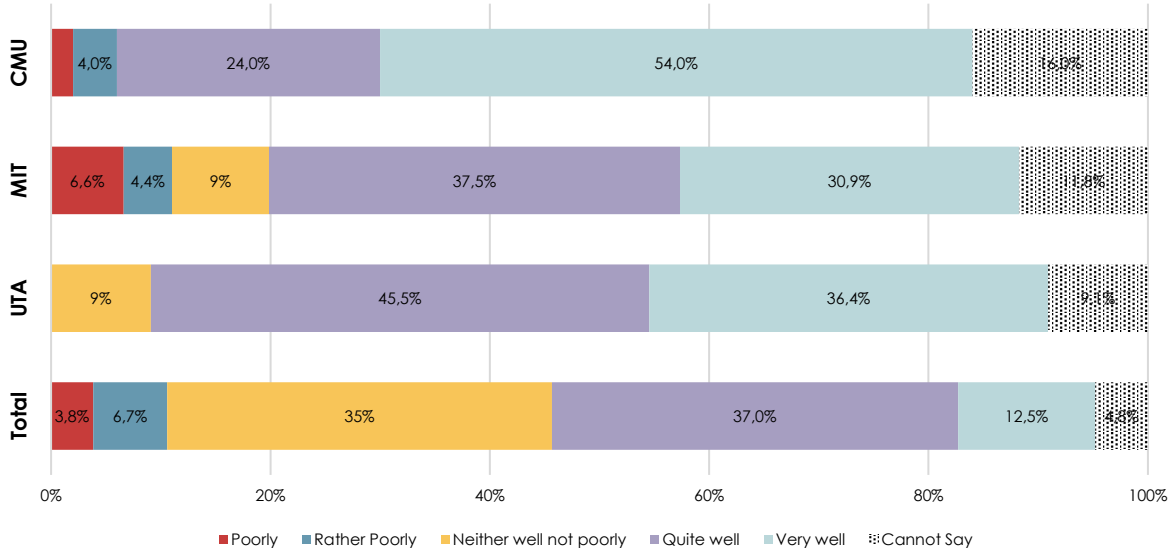
5.12 To what extent did the different effects produced or induced by participation in the programmes continue beyond the duration of the support?

Consistent evidence from both interviews and surveys was found that the effects of the programmes continued to manifest beyond the duration of the support, particularly through sustained collaborations, human capital development, and institutional capacity building.

- The programmes had a generally positive long-term impact on institutional networks and research capabilities, continuing beyond formal support.

Survey respondents assessed the long-term impact of the programmes predominantly positively, with 37.0% rating the impact as "quite well" and 12.5% as "very well." A combined 49.5% highlighted the overall beneficial effect, particularly on enhancing institutional networks and research capabilities. However, 35.1% were neutral, indicating neither a positive nor negative effect, and around 10.5% indicated dissatisfaction ("Poorly" or "Rather poorly"), suggesting that not all institutions or individuals experienced lasting benefits to the same degree, possibly due to variation in the types of support received or the discontinuation of instruments between programme phases.

Figure 34. How do you assess the long-term impact of participating in the programmes? (n=208)



Source: Technopolis survey of programme beneficiaries.

Interviewees frequently discussed how the programmes contributed to the development of institutional capacity in Portuguese universities and companies. The partnerships reportedly fostered international networks, enabling institutions to participate in consortia and attract international funding. According to respondents, these networks have expanded the scope of research projects and positioned Portugal within a broader international innovation ecosystem. Several interviewees indicated that these networks continue to offer opportunities for collaboration, which help institutions remain engaged in competitive initiatives.

Evidence from interviews and surveys highlighted that these collaborations, initially supported by the programmes, have become part of the academic structures of Portuguese universities. Many respondents observed that these connections have helped strengthen Portugal's presence within global research networks, enhancing international visibility and enabling institutions to maintain joint projects even after formal funding ended. The access to expertise and resources facilitated by these partnerships was frequently highlighted as an important factor contributing to the elevated academic profile of Portuguese institutions.

Several interviewees mentioned that institutions have sustained collaborations initiated through these partnerships. For example, respondents from the MIT Portugal programme noted that several doctoral programmes, which initially received funding and structure under the partnership, have continued to operate after formal support ended. These programmes, according to interviewees, are now fully integrated into the universities, continuing the legacy of MIT Portugal even without the same branding. Many respondents viewed this sustained academic collaboration as a reflection of a broader transformation in Portugal's educational ecosystem.

Finally, various interviewees highlighted the enhancement of the international visibility of Portuguese universities and research institutions as one of the notable outcomes of the programmes. Institutions that participated in the partnerships, according to respondents, became more engaged in international consortia and more successful in attracting international funding. Respondents from the MIT Portugal programme noted that Portuguese

institutions have become better integrated into global networks, facilitating collaboration on European-level projects even after the formal ties to programmes ended.

- The development of human capital through the programmes had a lasting effect on participants' careers, continuing to benefit both academia and industry in Portugal.

The development of human capital was consistently mentioned as another key outcome. According to the interviews, the international exposure provided by the programmes allowed students, researchers, and professionals to acquire advanced skills and build networks that continue to benefit their careers. Working alongside leading researchers and gaining access to cutting-edge facilities were noted as factors that helped participants strengthen their capabilities. Many interviewees emphasised the creation of a "critical mass" of talent, which remains influential even after formal funding phases concluded.

These benefits, as described by respondents, have persisted, with numerous participants continuing to engage in international collaborations and contribute to Portugal's expanding body of scientific knowledge. Several interviewees mentioned that the professionals trained during the programmes now hold influential positions in academia and industry. Respondents pointed to participants from the CMU programme who pursued doctoral degrees and now hold key roles in academia and innovation. These individuals were frequently described as contributing to a long-lasting ripple effect across the research and innovation sectors.

- The programmes contributed to sustained innovation and R&D within companies.

Interviewees highlighted the influence of the programmes on companies' approaches to innovation and R&D. Exposure to international practices and new methodologies was frequently described as having introduced changes in various industries. Some respondents pointed out that companies involved in the partnerships have incorporated innovation-focused strategies, evidenced by an increase in intellectual property. Many interviewees indicated that these companies expanded their technological capacities and developed long-term partnerships, allowing them to remain active in global markets. In various interviews, respondents referred to these programmes as instrumental in shaping companies' ongoing innovation strategies.

Further, interviewees noted that industry affiliates maintained long-term relationships developed during the programmes, which continue to influence their innovation strategies. Some respondents observed that companies involved in the MIT Portugal programme experienced a cultural shift towards innovation. According to interviewees, these companies adopted new methodologies for intellectual property development and continued patenting activities, maintaining collaborations with international partners even after the programme ended. Several start-ups were reported to have leveraged the networks and skills developed during the programme, which respondents described as key to their continued growth after the formal support concluded. Another notable observation relates to the start-ups initially involved in the programmes that, by phase 3, were established as industry affiliates.

- Institutional changes remained relevant beyond the duration of the programmes.

Institutional changes were also noted by several respondents, particularly regarding the integration of internationalised teaching and research practices. These practices, adopted as part of the programmes, were described as remaining relevant even after direct financial support ended. Interviewees from the CMU Portugal programme frequently mentioned the continuation of networks between companies and universities, with professors and researchers maintaining collaborations. Many respondents also indicated that companies continue to benefit from training programmes and opportunities to engage with CMU. The ability of

company doctoral candidates to undertake research residencies at CMU was highlighted by many interviewees as particularly valuable.

Survey responses reinforce these findings, with one respondent stating that their organisation had "expanded its expertise in areas that were initiated by the MIT Portugal Program," and another noting the "creation of a research unit" as a direct outcome of the partnership. The integration of these innovation strategies and new methodologies continues to allow companies to remain competitive in global markets, as evidenced by the survey comments. Furthermore, companies have maintained long-term relationships formed during the programmes, continuing to engage in collaborative research efforts and international networks.

- The entrepreneurial ecosystem in Portugal benefited from the programmes, particularly through the accelerated growth of start-ups and continued exposure to international markets.

The interviews also pointed to the programmes' contributions to the entrepreneurial ecosystem in Portugal. Start-ups that participated in the partnerships reportedly benefited from access to international markets, advanced research environments, and broader networks. While direct access to funding was not associated with the partnership's activities, according to many respondents, this indirectly accelerated the growth of several companies, which has contributed to Portugal's growing reputation as a unicorn hub. The effects of these partnerships on entrepreneurship were described as ongoing, with many of the supported start-ups or spin-offs now seen as important players in their respective industries.

Survey data to open questions further supports this, with one respondent stating, "Some alumni are now VCs in national and international companies, in other words, the decision-makers of what projects get funded." This reflects how the networks and opportunities created by the partnerships have extended into entrepreneurial and venture capital spaces, linking Portuguese research to global markets. These sustained networks have allowed Portuguese start-ups and entrepreneurs to maintain a competitive edge and continue growing in international markets

5.13 What is the current and future relevance of the partnership programmes?

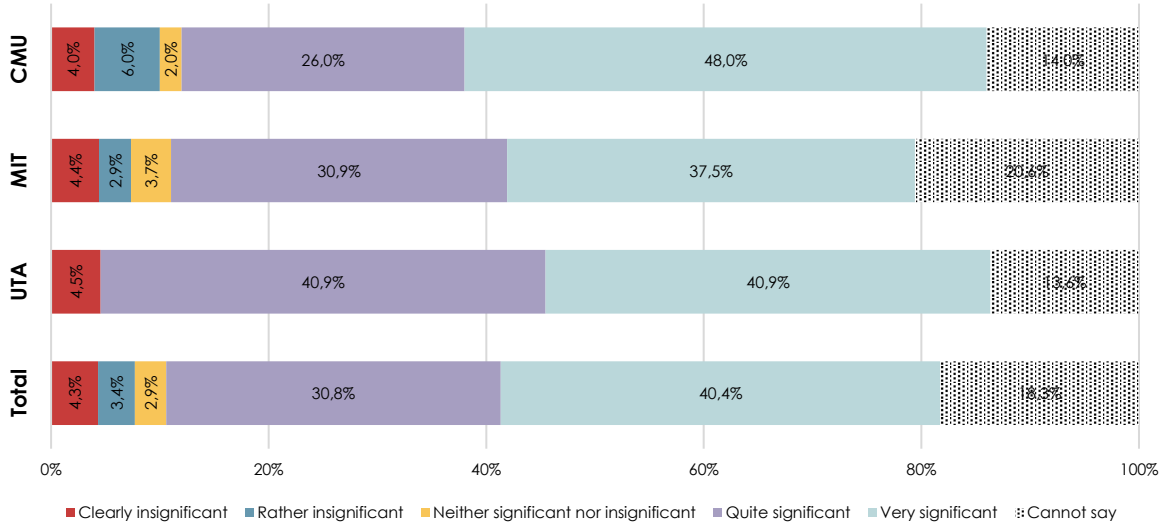
Consistent evidence suggests that the international partnerships have played a relevant role in developing Portugal's international standing in education, research and industry collaboration. While the dual-degree programmes, executive master's initiatives, and entrepreneurship and technology transfer instruments were highly effective in the early stages, the evolution towards a research-heavy focus in later phases has led to mixed perceptions. Survey responses and interview data reflect a consensus on the importance of these partnerships, but there is a need for greater balance between research and innovation activities to sustain long-term impact. The shift away from innovation and entrepreneurship in programmes such as MIT Portugal and UT Austin, coupled with bureaucratic challenges and funding discrepancies, has raised concerns about the sustainability of their impact, especially on the entrepreneurial ecosystem.

- The partnerships are still widely perceived as relevant.

There is evidence from the beneficiary interviews that the partnerships were highly relevant in their early phases, particularly in fostering Portugal's international research standing and catalysing collaboration between academia and industry. At present, the partnerships are still perceived as relevant, especially in positioning Portugal within lasting networks and creating

opportunities for both researchers and industry players. Survey results support this, with 40.4% of respondents perceiving the current and future relevance of these partnerships as 'Very significant,' and another 30.8% finding them 'Quite significant.' This reflects broad support for the programmes, suggesting they are seen as relevant for maintaining Portugal's competitive position in research and innovation.

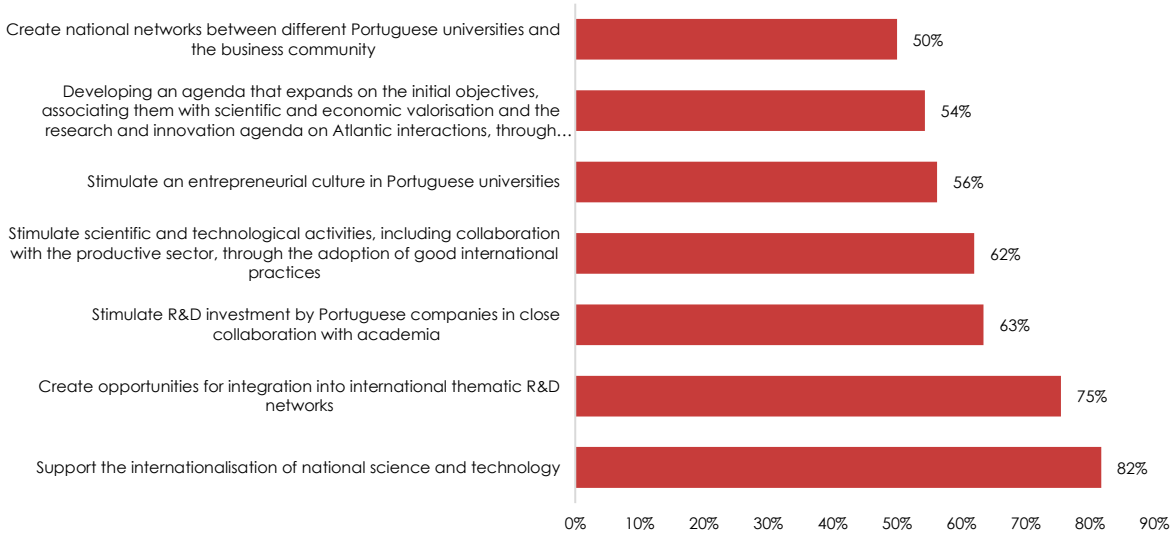
Figure 35. What is your perception of the current and future relevance of partnership programmes? (n=208)



Source: Technopolis survey of programme beneficiaries.

Further reinforcing this, data collected from 208 respondents underscores the ongoing relevance of key programme objectives. For instance, 82% of respondents still consider supporting the internationalisation of national science and technology a critical need, aligning with the overall mission of these partnerships to integrate Portugal into global research and innovation frameworks. Similarly, 75% identified creating opportunities for integration into international thematic R&D networks as a relevant objective.

Figure 36. Needs identified when setting up the programme that are still relevant? (n=208)



Source: Technopolis survey of programme beneficiaries.

Overall, interviewees consider the impacts of the partnership programmes to be positive, with the positive opinion being more emphatic on the part of the actors who took part in the actions. Beyond the tangible outputs of the programmes – such as PhD graduates and the creation of technology companies – there is a consensus that the sustainability of the partnerships' results is primarily linked to the relational capital established, including connections between researchers and connections between organisations. Additionally, the programmes' contributions to capacity-building within national organisations and advancements in science and technology management are widely viewed as having yielded lasting positive effects. However, in a scenario where the partnerships are discontinued, it is likely that these impacts would gradually dissipate over time.

An overview of the cross-cutting impacts on the different types of S&T system actors includes:

- For all three partnership programmes, participant Portuguese organisations benefited from a relevant reputational impact, increasing their international recognition, their ability to join international networks and projects (including EU ones) and their ability to access new sources of funding.
- Interactions with top universities in the scientific and technological priority areas allowed national organisations to be better positioned to understand and anticipate the current and future evolution of technological trajectories in these areas, with a relevant impact in shaping their research and innovation agendas.
- The programmes have made a significant contribution to the training of PhDs in the prioritised scientific and technological areas, and many of these PhD graduates have gone on to hold senior positions both in HEIs and research units and in industry, as well as being involved in the creation of technological companies.
- The partnership programmes generated relational capital between professors, researchers and entrepreneurs in Portugal with equivalent professionals from the three US universities.
- The programmes also generated networks of qualified human resources in Portugal, favouring synergies and close relationships.

- Globally, the programmes generated a greater capacity for collaboration and aggregation between the different national organisations that make up the national S&T system.

Additional impacts specific to S&T organisations can be summarised as follows:

- Collaboration between national researchers and those from the US partner universities led to scientific co-publications in more prestigious journals, and co-authorship with US university affiliates helped to eliminate a prejudice against Portuguese authors.
- The partnerships have provided access to advanced research facilities, enhancing the quality of research, but also informing Portuguese organisations to gain insights that informed in decisions to invest in similar facilities (e.g. the creation of Minho Advanced Computing Center).
- Portuguese universities have become more open-minded about the economic and social impact of their research activities.
- Portuguese universities now have greater capacity to promote technological entrepreneurship, with an increase in management skills in technology transfer offices and incubators associated with universities.

Additional impacts on consolidated companies, mainly large firms, can be summarised as follows:

- Companies' participation in the partnership programmes contributed to an increase in internal R&D activities and further collaboration with academia outside of the activities funded by the programme. In some cases, a positive effect on the propensity to patent has been reported.
- Globally, companies recognise impacts in terms of innovation capacity, access to markets or funding and competitive positioning, although quantification of these benefits is often not possible.
- Nevertheless, it should be noted that the increase in business R&D and the participation of companies in collaborative R&D projects in Portugal have been consistent trends over the last two decades, namely within the framework of Cohesion Policy instruments (e.g. Incentives for individual or co-promotion business R&D, mobilising programmes/agendas) or tax incentives (SIFIDE), or within the framework of instruments managed centrally by the EU (e.g. Horizon Europe), with the financial relevance of international partnership programmes being put into perspective.

Regarding technological entrepreneurship, there is a general perception of the strong impact of the partnership programmes:

- A significant proportion of successful technology companies created in recent years have been the initiative of people who have participated in projects within the framework of the partnerships, with several of the successful technology companies having benefited from immersion programmes at US partner universities. In particular, the creation of at least three of the Portuguese unicorns can be directly traced back to partnership programmes.
- The reputational benefits of being associated with partner US universities have directly influenced the ability to secure funding from US and other international venture capital firms, while also strengthening relationships with advanced clients and global leaders in their respective sectors.

Looking to the future, interviewees suggest that the partnerships have the potential to remain central to Portugal's research and innovation agenda. They noted that the partnerships facilitated access to world-class research networks and created new opportunities for both

academic and industrial players to collaborate on cutting-edge projects. However, several interviewees emphasised the need for strategic continuity to maintain the progress made. Any disruption in operations could lead to a loss of momentum, and rebuilding programmes and relationships would be challenging if there were significant gaps between phases.

Despite their achievements, several interviewees expressed concerns about the diminishing focus on faculty and student innovation and entrepreneurship activities, and institutional capacity building, particularly in the MIT Portugal and UT Austin partnerships. The reduced emphasis on these areas in the later phases is viewed as a missed opportunity to further engage and expose the Portuguese start-up ecosystem to the US The same applies to executive master's degrees, which address market needs and train highly qualified professionals for affiliated partners. Additionally, some noted that while more capital is now available for innovative ideas, there is a lack of promising projects, suggesting that while the partnerships laid the groundwork, further policy efforts are needed to cultivate new entrepreneurial ventures in Portugal.

Moreover, from an operational perspective, synchronising funding mechanisms between Portuguese and American institutions will be essential to avoid the timing mismatches identified as barriers to efficient project execution.

Further, several survey respondents highlighted bureaucratic challenges, particularly delays in processing programme funds, which created serious difficulties for researchers: "*The delays in processing the program were so low that it made it impossible for people that depend on the program to survive without the money*". Another respondent noted that the current paperwork burden makes the programme difficult to access for students of different social backgrounds, emphasising the need for simplified administrative processes: "*The paperwork should be made easier and faster so that every citizen, independently of social status, has the ability to survive*":

Non-beneficiary interviews expressed concerns about the long-term sustainability of the partnerships, especially if they continued to operate in a narrow set of fields. They suggested that a broader approach, involving other scientific areas, could enhance the future relevance of these programmes. Further, they pointed to the limited geographical and disciplinary reach of the partnerships as a missed opportunity for Portugal to benefit more widely from these collaborations. Transparency was a recurring theme, with interviewees indicating that the partnership programmes lacked clarity regarding funding mechanisms, success rates, and participation criteria. This lack of transparency made it difficult for non-beneficiaries to understand how funding was allocated and how the programmes were structured, contributing to a perception of exclusivity towards certain disciplines and regions.

While access the partnership programmes was potentially open to a broad range of S&T organisations in Portugal, the involvement of Portuguese higher education and research institutions across the three programmes was highly concentrated. Top beneficiaries include the largest Portuguese public universities and their engineering faculties or departments - namely, the University of Lisbon/IST, University of Minho, University of Porto/FEUP, NOVA and the University of Coimbra -as well as a select group of research entities such as INESC TEC, INESC-ID, and INL.

This concentrated participation reflects the stronger scientific capacities of these specific organisations in the programmes' thematic areas, a selectivity degree that most US partners view as standard practice.

As a rule, the management bodies on the Portuguese side, anchored in some of the largest Portuguese universities, consider that the objectives of the partnerships were clearly defined,

particularly regarding the scientific and technological areas to be prioritised, and they consider the high degree of selectivity that led to the choice of a restricted number of areas to be appropriate. This judgement is shared by the management teams of the three US universities.

Among other interviewees, perspectives on the adequacy and relevance of the selected thematic areas appear to be influenced by their own individual fields of expertise and, to some extent, by whether they participated in the partnership programmes. One aspect mentioned is that the initial formatting of the international partnerships was the result of a somewhat centralised decision-making process (led by the government official responsible for science, technology, and higher education and FCT). Some of the interviewees feel that there was a lack of contextualisation or justification when it came to choosing the initial thematic priorities or even when it came to choosing the partner universities (although in the latter case, their international excellence in the chosen scientific and technological areas is not disputed by the interviewees).

Nevertheless, over the course of the programmes, adjustments were made to the range of priority areas.

Given the inherently selective nature of these international partnerships – with top foreign universities and specific thematic areas – it should not be expected that they would serve as the most effective tool for disseminating potential impacts equally across the entire S&T landscape, particularly within the broader spectrum of higher education institutions. Conversely, it can also be argued that only a high degree of selectivity (and resource concentration) justifies the positive discrimination that partnerships with the US represent when compared to the already existing framework of public support to R&D open to all S&T organisations and in all scientific areas.

5.14 Further Reflections

This section presents further considerations that, although not within the scope of the defined evaluation questions, emerged during the collection and analysis of data from interviews, surveys, and other available content. These complementary dimensions, while not the primary focus of the evaluation, have been identified as relevant issues that warrant consideration, as they highlight broader operational challenges and contextual factors that have influenced the implementation and outcomes of the programmes

- Challenges in the management and monitoring of the programmes

The international partnership programmes were formally contracted between FCT and each US partner. Although the final decisions are the responsibility of the FCT, they tend to be agreed upon with the programmes' management teams. Nevertheless, it is clear that a decentralised management model prevailed, with national management teams for each programme being based in national S&T organisations (usually schools or departments of higher education institutions). Nonetheless,

, it is perhaps the management model of the partnership programmes that deserves the most criticism which can be aggregated in two main issues: absence of a professionalised management and coordination deficiencies.

The management teams were based on a degree of voluntarism, with short operating budgets, whose functioning was further aggravated by delays in annual funding contracts, especially in the third phase. Overall, the programmes were affected by gaps in the funding contractual agreements. Initially, the contracts were multi-annual; in Phase 3 they became annual, which

was generally considered negative. For example, in 2019 and 2024 there were delays of 3 to 4 months in contractual agreements, which led to uncertainty about funding and an undesirable concentration of projects in the second half of the year.

In addition, there seems to have been some instability in the management teams, with various changes both in the teams and in the organisations in which they are based, throughout the three phases.

There is a general perception that, on the US partners' side, procedures were less bureaucratic and decision times faster than on the Portuguese side, which led to coordination problems in the implementation of the programmes. There was also little effort to improve coordination or alignment of these programmes with other initiatives on a European and/or national level, failing to take stock of synergies.

Furthermore, the governance models of the partnerships and their funding instruments presented some additional coordination challenges, especially when it came to the monitoring of the programmes. While management teams (both in Portugal and US) were responsible for overseeing the funding of some of the activities of the partnership programmes (e.g. missions, events, etc), FCT retained control over funding decisions and management of some instruments (most notably PhD scholarships and research projects), in exceptional cases with the involvement of third parties (e.g. ANI). This complexity and the resulting 'institutional scattering' of management processes and records appears to have led to a certain degree of confusion and lack of accountability regarding the monitoring of both programme inputs (e.g. funding) and, especially, programme outputs. This resulted in the lack of a structured global monitoring and information process across all the partnerships regarding which no performance indicators were pre-defined, harmonised, and no regular evaluation was based on such indicators or metrics.

Additionally, we underscore the utmost importance of these findings, aligning them with similar considerations provided by the Academy of Finland (2012):

"*There is a need to create a path of continuous improvement and a more systematic management support. This could include programme support functions, but also shared standards and indicators: a logical model upon which selected indicators would be connected and a system providing support in the form of quality assurance, monitoring and documentation. This is required to assess the programme continuously and to make changes when required. While the External Review Committees have been able to do this on occasion, there should be a more formalised institutional support. Transferability of the model to other directions needs to be explored. Lessons and practices should be made public as much as possible to allow people to learn from it. The External Review Committees could also play a role in this, as they are well placed in their scientific communities to diffuse the best practice identified.*

A more systematic model of programme logic and an explicit mapping of the mechanisms behind these Programmes, with a goal hierarchy, more clearly spelled-out sub-objectives and indicators and monitoring data to be collected is a very strong recommendation for the future. An example of a simple logical model is provided as a simplified impact tree below"

Nevertheless, consideration should be given to the feedback from External Review Committees across partnerships and phases, which emphasized the importance of developing and using well-defined metrics to assess not only the programmes' outputs but also their outcomes and impacts, even suggesting the use of draft logic models in the case of UT Austin. Additionally, it should be noted that there has been a visible improvement in the transparency, communication, and valorisation of programme outputs, as reflected in the progress/activity reports consulted from all programmes in Phase 3.

Hence, we summarise the main issues found regarding the monitoring of partnership programmes:

- There is no aggregate monitoring system of the budget and effective spending of the partnership programmes. While data on both budget and payments made by FCT to programme beneficiaries and management teams exists, it is not readily available as information is scattered through FCT's internal databases and require 'manual' extraction of relevant information for monitoring purposes. FCT made an effort to monitor effective spending associated with the partnership programmes up until 2016 and has since then abandoned those efforts. No audit is made over the use of the sums paid to US partners.
- There is no aggregate monitoring of programme outputs. Typically, the partnership programmes management teams monitored outputs through annual activity reports, with methodology, indicators and granularity of data varying significantly between programmes. Occasionally, programme management teams seemed to have difficulties monitoring outputs related to activities managed directly by FCT (e.g. outputs of research projects) and we observed that there was some confusion about whose responsibility it was to monitor such results. Changes in the management teams throughout the duration of the partnership programmes often resulted in incomplete or inconsistent monitoring records. In this instance, it becomes evident that there was a substantial coordination issue arising from the apparent lack of directions from FCT to the programme management teams and absence of a common monitoring framework.

➢ Other international cooperation mechanisms and strategic positioning

The added value of the international partnerships also includes benefits in terms of international visibility, acknowledgement and diplomacy. The ability to effectively cooperate with world leading institutions had a positive collateral effect of "certification" of the readiness level of the Portuguese researchers and institutions to engage in excellence science networks internationally. In addition, a positive diplomatic gain is derived from the Portugal and US partnerships. During the interview process, several respondents highlighted the importance of the International Partnerships for the diplomatic relationship between Portugal and the US, the evaluation team contacted both countries' diplomatic bodies for interviews; however, due to scheduling conflicts and the need to meet deadlines, it was not possible to conduct these additional interviews.

However, this raises another point for reflection beyond the scope of this evaluation. concerning the grand strategic options related both to the development of Portugal's integration within the European context and its current and future Atlantic positioning.

In this context, it is also necessary to highlight Fulbright Portugal and the Luso-American Development Foundation (FLAD), which offer a wide range of instruments in the fields of science and technology aimed at facilitating the mobility of Portuguese and American students, researchers, and academics, as well as fostering their international visibility and recognition.

A further point for reflection concerns the multiplicity of instruments used in international partnerships, which cover a wide range of dimensions such as advanced training, excellence in R&D and knowledge valorisation and innovation. The wide range and complexity of these instruments limit the possibility of constructing valid and reliable comparative analyse with any other programme aimed at the internationalization of R&D&I in the Portuguese context. Nonetheless, it is important to emphasise that there are other ongoing efforts to promote the significance of international cooperation in Portuguese higher education, science, and

innovation, particularly regarding expenditures related to Portugal's contributions to international organisations of which it is a member. These encompass a variety of cooperation models, each observing different levels of financial commitment.

Table 18. Authorised expenditure corresponding to Portugal's contributions to international organizations to which it is a member (2019 – 2024)

International Organisations	2019	2020	2021	2022	2023	2024
CERN - European Organization for Nuclear Research	€11,110,784	€6,678,775	€11,124,592	€17,136,408	€16,360,907	€14,430,951,55
CYTED - Programa Iberoamericano de Ciencia y Tecnología para el Desarrollo	€250,000	€250,000	€250,000	€250,000	€250,000	€250,000,00
EMBC - European Molecular Biology Conference	€224,246	€224,400	€201,486	€183,064	€491,448	€330,000,00
EMBL - European Molecular Biology Laboratory	€1,241,916	€1,234,481	€500,198	€1,500,592	€2,177,421	€1,650,000
ESA - European Space Agency	€14,595,509	€14,965,000	€8,982,630	€28,365,649	€21,127,168	€25,000,000
ESO - European Southern Observatory	€2,605,000	€2,601,000	€1,532,000	€2,838,000	€4,344,368	€2,900,000
ESRF - European Synchrotron Radiation Facility	€954,810	€973,900	€496,690	€993,380	€1,521,900	€1,100,000
INL - International Iberian Nanotechnology Laboratory	€3,500,000	€3,570,000	€3,641,000	€2,736,603	€4,766,138	3 800 000,00
Other organisations	€4,500,000	€4,590,000	€4,681,000	€3,316,906	€4,870,945	€5,030,982
Total	€38,982,265	€35,087,556	€31,410,306	€57,320,602	€55,910,295	€54,491,934

Source: Compiled from Resolution of the Council of Ministers No. 165/2023 and Resolution of the Council of Ministers No. 193/2023.

6 Conclusions and Preliminary Recommendations

C1. The international partnerships with CMU, MIT, and the UT Austin evidence a positive impact on Portugal's scientific and technological capabilities. These collaborations have enhanced the country's position within international research networks, enabling fruitful cooperation between academia and industry, and driving the development of cutting-edge research and innovations. These collaborations have enriched Portugal's visibility and standing in international research networks, providing the country with diplomatic benefits and access to the technology development frontier.

C2. The educational impact of the partnerships is evident through the successful implementation of dual and non-dual doctoral and master's programmes, which have fostered deeper academic collaboration, facilitated the adoption of international best practices and exposed researchers and entrepreneurs to a leading culture of innovation. However, even though there is an overall positive effect, there are some asymmetries of impact related to the varying depth of involvement of each US institution. In this regard, the greater the presence abroad of Portuguese students and researchers and the greater the involvement of US institutions, the greater the impact.

CMU's focus on dual degrees stands out as a particularly strong feature. This unique approach has set high academic standards now embedded in Portuguese institutions. Survey respondents affirmed this transformation, noting how graduates brought back advanced practices, catalysing institutional growth. These programmes also contributed to human capital development, equipping students, researchers, and professionals with skills that continue to influence their careers and Portugal's scientific landscape. Various alumni now occupy prominent positions in academia and industry, reinforcing a "critical mass" of talent with enduring effects.

Additionally, long-term collaborations in doctoral programmes, particularly within MIT Portugal, led to the creation of sustained programmes that continue independently, illustrating a profound shift within Portugal's educational ecosystem toward globally aligned standards. However, by Phase 3 regarding MIT Portugal, the short mobility exchanges of Portuguese students in the U.S. and the absence of long-term visiting U.S. professors in Portugal have limited deeper academic and cultural exchanges, curbing long-term impacts.

C3. The partnerships contributed to scientific excellence in Portuguese institutions by fostering high-quality outputs, advancing international research standards, and promoting a "learning effect" that elevated local research capabilities.

Despite data gaps, scientific outputs from these collaborations outperformed control groups, achieving a 60% citation premium, and were frequently cited in patents and policy documents, reflecting their broader impact. Survey data also revealed strong benefits to research teams, with 82.2% of respondents affirming enhanced scientific quality. And interviewees highlighted how collaborations bridged academic and industrial needs, spurred improved project management, and fostered sectoral policy alignment, particularly through CMU Portugal's public policy focus. The integration of international best practices was robust, with 67.3% of survey respondents acknowledging the programmes' influence. Examples include the establishment of advanced labs and faculty evaluation systems modelled on CMU practices.

However, the limited distinctiveness of smaller exploratory projects compared to the broader pool of FCT exploratory instruments suggests a need for reassessment and realignment of their unique contribution to the partnerships.

C4. The international partnerships presented a transformational opportunity to the participating Portuguese start-ups by introducing them into an advanced innovation culture much more prone to risk, but that encompasses directionality for scalability and a clearer market-drive. It also facilitated access to a leading support ecosystem that provided capabilities, mentorship, sophisticated innovation demand, and venture capital. The international partnerships bolstered involved start-ups and spin-offs by enhancing their credibility and positioning them competitively in international markets. Collaboration with prestigious U.S. universities not only enabled connections with international ecosystems but also elevated the companies' profiles, helping them secure clients and expand beyond Portugal. Particularly in the technology sector, products developed through these collaborations found readiness for international markets, with some, such as Unbabel, originating directly from programme-supported research.

Early programme phases emphasised innovation and entrepreneurship, essential for opening market opportunities and establishing ties with global investors. Structured programmes such as inRes helped Portuguese companies to gain access to US markets, improving their technological capabilities and access to venture capital. Although immediate venture capital was not directly tied to the partnerships, an increased success in securing international investments due to enhanced credibility was noted. Quantitative analysis further confirms this, showing that start-ups and spin-offs associated with the partnerships raise capital at eight times the rate of similar firms, with increased likelihood of reaching USD 1M and USD 10M funding thresholds. Additionally, these companies exhibit higher patenting activity, underscoring the partnerships' influence in driving technological development and growth.

The association with U.S. institutions, particularly through subprogrammes such as UTEN, played a key role in fostering this access to international financial and innovation networks.

Complementary initiatives under the MIT partnership, such as i-Teams, BGI, and the MIT International Workshop on Innovating, further embedded entrepreneurial skills into research contexts and cultivated an academic-based entrepreneurship culture among Portuguese students and faculty.

C5. The involvement of industrial affiliates within the international partnerships facilitated collaboration between companies and academic institutions, offering access to advanced training, skilled talent, and research projects tailored to industry needs. This approach enabled companies to tap into academic expertise while fostering a culture of innovation. This last element induced greater permeability to R&D and innovation in some traditional sectors, promoting a new economy, but also contributing to transform more traditional firms (e.g. TMG Automotive). The Phase 3 Large-Scale Collaborative Research Projects call further amplified this cooperation, resulting in 30 projects with substantial private sector co-investment totalling €9,323,664. Notably, some start-ups that initially engaged with the programmes, such as Feedzai and Sword Health, transitioned into established industrial affiliates by Phase 3, reflecting the partnerships' support for company growth and maturation. The partnerships also attracted several prominent Portuguese unicorns as affiliates, including Sword Health, Feedzai, Talkdesk, Outsystems, Remote, and Farfetch.

C6. The international partnerships facilitated advancements in knowledge valorisation and innovation management within Portuguese institutions and businesses. Exposure to the US innovation ecosystem enabled deeper knowledge transfer, fostered long-term professional

networks, and introduced robust university-industry collaboration models that significantly benefitted Portuguese researchers and companies. Programs like UTEN contributed to change and improve how Portuguese institutions perceived and handled intellectual property, technology transfer practices and managed their research capacities.

C7. Despite UTEN playing an important role in strengthening Portugal's institutional capacity in science and innovation management, it was discontinued in phase 3, leaving a gap in capacity-building initiatives to enhance institutional readiness for science and innovation management.

C8. The strategic and operational architectures of these partnerships became, relatively, static and anachronic. Despite of Portugal's strong improvement in the innovation ecosystem, the format of the international partnership scheme has not evolved dynamically, limiting the ability of Portuguese institutions to shape their own development paths within the partnerships. Also, the governance model of the partnerships has not evolved sufficiently to align with Portugal's growing institutional capacities over the last 18 years.

C9. A strong political commitment is crucial for the success in establishing and maintaining these partnerships. The strategic decision-making process has been closed and restrictive, limiting broader institutional involvement. This lack of inclusivity may constrain the flexibility needed for adapting and responding to new opportunities within the partnerships and enlarge the breadth of Portuguese institutions involved.

C10. Good management practices and the quality assurance system have been inconsistent and lack a cohesive framework, leading to operational inefficiencies and delays in funding agreements. This has affected the efficient operation of the programmes and hindered the effective valorisation of their outcomes and impacts. Also, synergies with other programmes and instruments have been disregarded which are a symptom of a coordination failure.

C11. The international partnerships remain widely viewed as relevant. Beyond producing tangible outputs like PhD graduates and the creation of technology companies, the partnerships have fostered substantial relational capital between Portuguese and US institutions, which is seen as essential for long-term sustainability. The programmes' contributions to capacity-building and advancements in science and technology management are perceived as lasting benefits, yet there is a consensus that, should the partnerships be discontinued, these positive effects would likely diminish over time. This underscores the importance of these partnerships in maintaining Portugal's strategic position within international research and innovation networks.

Looking forward, the partnerships could continue to anchor Portugal's research and innovation agenda, yet key challenges require the upmost attention.

i. Strategically, continuity is positive and important, as any disruption risks losing momentum, making future rebuilding efforts more complex. Synergies with other programs is desirable.
ii. Concerns are also raised regarding the declining focus on innovation, entrepreneurship, and capacity building in the later phases.
iii. Synchronising funding mechanisms between Portugal and the US is essential to mitigate project delays and enhance operational efficiency.
iv. While the selective approach of engaging top universities and focusing on specific thematic areas has achieved significant impact, some non-beneficiaries believe this narrow focus has limited broader participation, both geographically and across disciplines. The challenge lies in balancing the need for selectivity to maintain

excellence with a desire for wider dissemination of benefits across the entire science and technology landscape.

C12. Overall, the partnerships have delivered benefits in terms of international prestige, increased R&D collaborations, academic-based entrepreneurship, increased private R&D investment in international collaborative projects involving academia. However, improvements in governance, monitoring, strategic decision-making, and management processes are necessary to ensure continued success and sustainability in the future.

Hence, we present the following recommendations:

R1. We recommend continuing the partnerships between Portuguese institutions and leading US universities (CMU, MIT, and UT Austin). The current allocation of 3% of the total budget of the FCT towards these partnerships represents the minimum necessary investment to maintain the success and sustainability of these collaborations. This budget ensures that the partnerships can continue to provide critical opportunities for further talent development, increased international R&D collaborations, enhanced prestige of the national S&T system, academic-based entrepreneurship and private R&D investment in international collaboration projects. Maintaining or potentially increasing this level of funding is critical to safeguarding the long-term impact of the partnerships.

The thematic focus of the renewed PT-US partnerships should also be addressed. The definition of priorities should result from the convergence of US interests, EU priorities and Portugal's interests and priorities. It is in this intersection that these programs are prone to have a more significant impact. The American Universities have mapped their key interests and the new FP10 also provides the strategic reference for Europe global cooperation. Thus, for future, the priorities contracted in these partnerships, should result from a political decision, based upon a wider participatory process and combine all these vectors.

R2. We recommend that Portugal further leverage the diplomatic and additional benefits these collaborations provide, also exploring the opportunity to access novel research networks in Europe and in other geographies. By maintaining and expanding these collaborations, Portugal can strengthen its position in international research networks, ensuring continued access to cutting-edge scientific environments for its industry, as well as the international reputational acknowledgment. This can enhance the country's capacity for research with impact and further integration into international scientific and technological ecosystems.

R3. We recommend that the format of these partnerships be clearly articulated, with contracts signed with the international partners explicitly defining objectives, success metrics, and indicators to ensure proper monitoring and evaluation over time. This structured approach would provide a clear framework for accountability and tracking progress toward strategic goals. We also recommend taking advantage of a possible gateway position between US and EU networks, establishing goals fostering greater complementarity of programs and instruments synergies throughout all stages of the innovation cycle.

R4. We recommend introducing a more dynamic and flexible multilevel governance framework that combines top-down political priorities with bottom-up institutional contributions.

This model should empower Portuguese institutions to shape their development paths within the partnerships, enhancing their decision-making capacity and adaptability.

The CNCTI could play a central role as a strategic coordinating body, ensuring broad consultation and a balance between top-down priorities and bottom-up perspectives.

Additionally, we suggest fostering national networks to support the development of less advanced Portuguese institutions, enabling them to build capacity through local collaborations before engaging in direct links with US institutions.

R5. We recommend maintaining strong political commitment to ensure the success of these partnerships, while making the strategic decision-making process more inclusive and transparent.

Expanding institutional involvement in decision-making would enhance flexibility and adaptability, allowing the partnerships to respond more effectively to emerging opportunities and challenges.

To do so, we recommend that the governance model should incorporate broader institutional input, particularly from smaller and inland universities, ensuring their participation in setting strategic priorities. This would promote greater diversity and engagement across Portugal's research and innovation landscape, creating a more inclusive national impact.

It is also crucial to introduce greater agility in the supporting policy instruments and guarantee their timely delivery. In this regard, we recommend streamlining the decision process and to introduce a design that guarantees greater predictability (e.g. establishing longer term contractual arrangements transferring the management of some of the instruments (e.g. PhD scholarships) against contracted KPIs and subject to interim evaluations. Safeguard measures would need to be included to guarantee open access to these programs and avoid possible risks of in-breeding).

R6. We recommend developing a programme logic model framework to address current inconsistencies in management practices and financial oversight, ensuring effective tracking of programme outputs and assessment of progress toward desired outcomes.

This framework should include the co-creation of clearly defined and articulated objectives, inputs, activities, and their relation to intended outcomes and impacts, to enable more structured, time-based evaluation and proper fine-tuning of the partnerships' performance. The theory of change model used in this report could serve as an effective starting point for structuring and guiding these efforts.

Regular reporting mechanisms and real-time data collection should be implemented to track progress consistently, ensure alignment with strategic objectives, and enable timely adjustments when necessary, establishing accountability and transparency mechanisms. Institutionalising a centralised information system would reduce operational inefficiencies and delays in funding agreements, contributing to smoother programme operations.

Furthermore, the capacities of the actors involved in overseeing the programmes should be systematically mapped and, where necessary, addressed through bespoke capacity-building initiatives. Leveraging the expertise of international partners, it would be highly valuable for them to share their knowledge and provide targeted training to the members of these management teams, including the coordination team of the Partnerships within the FCT.

R7. We recommend strengthening and expanding dual PhD programmes. However, we acknowledge the limitations faced in establishing dual PhD programmes across all partnerships, such as the absence of such programmes with MIT and UT Austin due to differing institutional frameworks and priorities. Nevertheless, every effort should be made to pursue these programmes, as they have proven highly successful in fostering academic collaboration, aligning curricula, and enhancing research capacity through co-supervision and long-term institutional partnerships, particularly under CMU Portugal.

R8. We recommend extending the duration of student and faculty exchanges and significantly increasing the presence of long-term visiting U.S. professors in Portuguese institutions to strengthen the educational component of the partnerships. While dual degrees have proven highly successful, at a minimum, long stays and the involvement of U.S. supervisors should be ensured to foster deeper engagement. Additionally, it is crucial to expand exchange activities beyond students to include professors and entrepreneurs, not only by facilitating visits to U.S. universities but also by encouraging more frequent and impactful exchanges where U.S. participants engage with Portuguese institutions, this component was notably limited in the most recent phase particularly in MIT Portugal.

R9. We recommend the reinstatement of executive masters, which have proven very effective. These measures would promote deeper academic and cultural exchanges, fostering long-term knowledge transfer and collaboration. Expanding the academic exchange programme would help integrate advanced research methodologies and innovation practices into Portuguese universities, contributing to a more sustained impact on capacity-building and academic development. Long-term exchanges, in particular, would strengthen institutional ties and facilitate the establishment of long-lasting academic relationships.

R10. The partnerships have successfully supported the internationalisation of Portugal's research system, particularly through large-scale collaborative research projects. However, we recommend that smaller exploratory projects should be reassessed to ensure they contribute more effectively to the partnerships' broader strategic goals.

These projects should be scaled up or better integrated into the overarching research agenda, aligning with both Portuguese and US research priorities.

A targeted investment in exploratory projects that align with cutting-edge fields would ensure these initiatives have a higher impact and foster deeper collaboration between Portuguese and US institutions.

R11. We recommend strengthening the governance and management framework to better support start-ups and young entrepreneurs, further enhancing the partnerships' impact on innovation and entrepreneurship.

Establishing more structured initiatives for Portuguese start-ups and spinoffs to connect with venture capital networks in both Portugal and the US would enhance the partnerships' capacity to nurture entrepreneurial activities.

Therefore, the relaunch of UTEN with a broader mandate and increased funding would play a crucial role in building institutional capacity for science and innovation management.

UTEN could facilitate deeper connections between Portuguese start-ups and international markets, ensuring a robust pipeline for venture capital investment and entrepreneurial growth across all partnership programmes.

R12. We recommend implementing a broader capacity-building initiative focused on developing science and technology management professionals to support the sustained growth of Portugal's knowledge and innovation ecosystem.

The success of UTEN in strengthening Portugal's institutional capacity for science and innovation management highlights the need for its relaunch.

Establishing a dedicated programme for science and technology managers, with a clear career path and professional development opportunities, would ensure that the country builds the necessary human capital to manage science and innovation effectively.

R13. We recommend establishing a more professionalised management framework to ensure the long-term sustainability and effectiveness of the partnerships.

This framework should focus on fostering an ecosystem of innovation governance, where institutions are supported by science and technology managers who are well-versed in knowledge transfer and entrepreneurial support.

Establishing long-term strategic goals with regular reviews and adjustments would provide the partnerships with the stability and flexibility needed to sustain their impact.

This professionalisation of management would ensure that the partnerships continue to nurture Portugal's innovation ecosystem and support the growth of the country's entrepreneurial activities.

To support this, we suggest earmarking dedicated funds specifically for the management of these partnerships, addressing the current uncertainties caused by annual management contracts that can only be signed in January of each year.

Additionally, the FCT could reinstate the role of a dedicated international partnerships coordinator with greater internal autonomy, as was successfully implemented during the 1st phase and part of the 2nd phase. This position would facilitate faster decision-making and resolution of challenges, ensuring more efficient programme operations.

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Appendix A: Interview Questionnaires

A1. Interview questionnaire for programme managing bodies

Introduction

- Introduction of the interviewer and clarification of the purpose of the interview.
- Explanation of the theory of change methodology and how your answers will contribute to the study.
- Explanation of the objectives of the interview and how the data will be used.
- Confirmation of confidentiality and consent to recording.

Context

- How do you describe your involvement with FCT's International Partnerships (namely at what stage or situation in a programme timeframe and specifically in which programme)?
- Can you describe the initial context in which the programmes were developed? What were the main objectives of the International Partnerships when they were initiated?

Theory of Change I

Activities:

- What specific activities have been implemented within the framework of the programmes in their different phases (respectively for CMU, UT Austin, MIT where applicable) to achieve the objectives set by FCT's International Partnerships?

Outputs:

- What results were observed as a direct consequence of the activities of the programmes in their different phases (respectively for CMU, UT Austin, MIT where applicable)? Were there any noteworthy unexpected results?

Outcomes:

- How did the immediate activities and results contribute to medium-term changes in the capacities of the institutions involved? Were there any notable differences between the programmes (respectively for CMU, Austin, MIT where applicable)?

Impacts:

- What has been the long-term impact of FCT's International Partnerships on the development of the Portuguese higher education, science, technology and innovation ecosystem? How are these impacts aligned with the initial objectives of the partnerships?

Exploring the Theory of Change

- What were the successes and challenges in the dynamics of interpersonal, inter-institutional and international collaboration promoted by the programme between Portuguese institutions and American universities (CMU, Austin or MIT Portugal)?
- What were the main challenges encountered during your involvement in the programme(s)? Are there resources or instruments that can overcome these challenges?

- What were the main benefits for Portuguese entities of participating in the programmes? And what was their economic expression considering the investments made?
- What was the impact of the programmes on developing the capacities of the national scientific and technological system to access international networks/platforms and in terms of knowledge transfer? Has this access continued beyond the programme?
- How do you assess the adequacy and change of the instruments used in each of the programmes throughout their respective phases in relation to the scientific and technological policy objectives set? And to what extent are they suited to the needs and expectations of their target audience?
- What do you see as the biggest challenges and opportunities in monitoring the programme? Do you think there are strategies that could improve this process?

Theory of Change II

Change:

- To what extent have the different effects produced or induced by participation in the programmes continued beyond the duration of the funding?
- In your view, what is the current and future relevance of FCT's International Partnerships?
- What can be expected in terms of future impact, after 18 years of collaboration for each of the programmes?
- What changes or additional results do you expect or would you like to see in the future of FCT's International Partnerships?

Lessons learned:

- Based on your experience, what lessons can be learned from the programmes that have been implemented?

Concluding remarks

- Ask the interviewee to add any other information or comments they consider relevant.
- Thank them for their participation and explain how and when the results will be used and shared.

A2. Interview questionnaire for higher education institutions/researchers

Introduction

- Introduction of the interviewer and clarification of the purpose of the interview.
- Explanation of the theory of change methodology and how your answers will contribute to the study.
- Explanation of the objectives of the interview and how the data will be used.
- Confirmation of confidentiality and consent to recording.

Context

- How do you describe your involvement with FCT's International Partnerships (namely at what stage or situation in a programme timeframe and specifically in which programme)?

Theory of Change I

Activities:

- What specific activities have been implemented within the framework of the programmes in their different phases to achieve the objectives set by FCT's International Partnerships?

Outputs:

- What results were observed as a direct consequence of the activities of the programmes in their different phases? Were there any noteworthy unexpected results?

Outcomes:

- How did the immediate activities and results contribute to medium-term changes in the capacities of the institutions involved? Were there any notable differences between the programmes (if applicable)?

Impacts:

- What has been the long-term impact of FCT's International Partnerships on the development of the Portuguese higher education, science, technology and innovation ecosystem? How are these impacts aligned with the initial objectives of the partnerships?

Exploring the Theory of Change

- What were the successes and challenges in the dynamics of interpersonal, inter-institutional and international collaboration promoted by the programme between Portuguese institutions and American universities? Can you give a specific example of how this impact has been observed in your organisation?
- What were the main challenges encountered during your involvement in the programme(s)? Are there resources or instruments that can overcome these challenges?
- What were the main benefits for Portuguese entities of participating in the programmes? And what was their economic expression considering the investments made? Can you give a specific example of how this impact has been observed in your organisation?
- Can you share experiences of how participation in the programme(s) has influenced your research and development practice beyond its duration?
- What role did these partnerships play in your professional development and your network of international collaborations?
- Did the collaboration continue beyond the end of the funding allocated via the Programme?
- (If applicable) How have the programmes facilitated collaboration between your university and the company beyond their duration?

Theory of Change II

Change:

- To what extent have the different effects produced or induced by participation in the programmes continued beyond the duration of the funding?
- In your view, what is the current and future relevance of FCT's International Partnerships?
- What can be expected in terms of future impact, after 18 years of collaboration for each of the programmes?

- What changes or additional results do you expect or would you like to see in the future of FCT's International Partnerships?

Lessons learned:

- Based on your experience, what lessons can be learned from the programmes that have been implemented?

Concluding remarks

- Ask the interviewee to add any other information or comments they consider relevant.
- In the case of university institutions/business beneficiaries interviewed that constitute case studies, request additional information and elements for the preparation of the case study.
- Thank them for their participation and explain how and when the results will be used and shared.

A3. Interview questionnaire for companies

Introduction

- Introduction of the interviewer and clarification of the purpose of the interview.
- Explanation of the theory of change methodology and how your answers will contribute to the study.
- Explanation of the objectives of the interview and how the data will be used.
- Confirmation of confidentiality and consent to recording.

Context

- How do you describe your involvement with FCT's International Partnerships (namely at what stage or situation in a programme timeframe and specifically in which programme)?

Theory of Change I

Activities:

- What specific activities have been implemented within the framework of the programmes in their different phases to achieve the objectives set by FCT's International Partnerships?

Outputs:

- What results were observed as a direct consequence of the activities of the programmes in their different phases? Were there any noteworthy unexpected results?

Outcomes:

- How did the immediate activities and results contribute to medium-term changes in the capacities of the institutions involved? Were there any notable differences between the programmes (if applicable)?

Impacts:

- What has been the long-term impact of FCT's International Partnerships on the development of the Portuguese higher education, science, technology and innovation ecosystem? How are these impacts aligned with the initial objectives of the partnerships?

Exploring the Theory of Change

- What were the main benefits of participating in the programmes? And specifically the creation of qualified employment or other categories of economic expression?
- How did the innovation programmes contribute to the creation and development of your company/start-up/spin-off?
- How have the programme(s) facilitated collaboration between your company and academia beyond their duration?
- What impacts has your entity realised in terms of access to funding and international markets as a result of participating in the programme(s)?

Theory of Change II

Change:

- To what extent have the different effects produced or induced by participation in the programmes continued beyond the duration of the funding?
- In your view, what is the current and future relevance of FCT's International Partnerships?
- What can be expected in terms of future impact, after 18 years of collaboration for each of the programmes?
- What changes or additional results do you expect or would you like to see in the future of FCT's International Partnerships?

Lessons learned:

- Based on your experience, what lessons can be learned from the programmes that have been implemented?

Concluding remarks

- Ask the interviewee to add any other information or comments they consider relevant.
- In the case of university institutions/business beneficiaries interviewed that constitute case studies, request additional information and elements for the preparation of the case study.
- Thank them for their participation and explain how and when the results will be used and shared.

A4. Interview questionnaire for other stakeholders

Introduction

- Introduction of the interviewer and clarification of the purpose of the interview.
- Explanation of the theory of change methodology and how your answers will contribute to the study.
- Explanation of the objectives of the interview and how the data will be used.
- Confirmation of confidentiality and consent to recording.

Context

- How do you describe your involvement with FCT's International Partnerships (namely at what stage or situation in a programme timeframe and specifically in which programme)?

Theory of Change I

Activities:

- What specific activities have been implemented within the framework of the programmes in their different phases (respectively for CMU, UT Austin, MIT where applicable) to achieve the objectives set by FCT's International Partnerships?

Outputs:

- What results were observed as a direct consequence of the activities of the programmes in their different phases (respectively for CMU, UT Austin, MIT where applicable)? Were there any noteworthy unexpected results?

Outcomes:

- How did the immediate activities and results contribute to medium-term changes in the capacities of the institutions involved? Were there any notable differences between the programmes (respectively for CMU, Austin, MIT where applicable)?

Impacts:

- What has been the long-term impact of FCT's International Partnerships on the development of the Portuguese higher education, science, technology and innovation ecosystem? How are these impacts aligned with the initial objectives of the partnerships?

Exploring the Theory of Change

- What were the successes and challenges in the dynamics of interpersonal, inter-institutional and international collaboration promoted by the programme between Portuguese institutions and American universities (CMU, UT Austin or MIT Portugal)?
- What were the main challenges encountered during your involvement in the programme(s)? Are there resources or instruments that can overcome these challenges?
- What were the main benefits for Portuguese entities of participating in the programmes? And what was their economic expression considering the investments made?
- What was the impact of the programmes on developing the capacities of the national scientific and technological system to access international networks/platforms and in terms of knowledge transfer? Has this access continued beyond the programme?
- How do you assess the adequacy and change of the instruments used in each of the programmes throughout their respective phases in relation to the scientific and technological policy objectives set? And to what extent are they suited to the needs and expectations of their target audience?

Theory of Change II

Change:

- To what extent have the different effects produced or induced by participation in the programmes continued beyond the duration of the funding?
- In your view, what is the current and future relevance of FCT's International Partnerships?
- What can be expected in terms of future impact, after 18 years of collaboration for each of the programmes?
- What changes or additional results do you expect or would you like to see in the future of FCT's International Partnerships?

Lessons learned:

- Based on your experience, what lessons can be learned from the programmes that have been implemented?

Concluding remarks

- Ask the interviewee to add any other information or comments they consider relevant.
- Thank them for their participation and explain how and when the results will be used and shared.

Appendix B: Survey Questionnaires

B1. Survey of partnership programme beneficiaries

The International Partnerships established with institutions such as Carnegie Mellon University, Massachusetts Institute of Technology, and the University of Texas at Austin are strategic collaborations aimed at enhancing the internationalisation of science and technology from Portugal. These partnerships, established over three phases beginning in 2006 and spanning 18 years, are designed to support the internationalisation, facilitate integration into thematic international R&D networks, foster a culture of entrepreneurship within Portuguese universities, and encourage R&D investments by national companies in close collaboration with academia. With the expansion of these partnerships under the goPORTUGAL initiative, the objectives were broadened to include stimulating scientific and technological activities through the adoption of good international practices, and developing an agenda that expands the initial objectives by linking them to scientific and economic enhancement.

This survey aims to gather valuable insights from beneficiaries like you, who have directly engaged with these programmes and subprogrammes. Your perception is crucial in assessing the effectiveness, relevance, and impact of these programmes. We assure you that all responses will be treated with the strictest confidentiality and will only be analysed in aggregate form to ensure your privacy. The survey should take approximately 10 minutes to complete.

I. PROFILE

1. Gender:

- Male
- Female
- Prefer not to say
- Other

2. Nationality:

- Portuguese
- American
    - Other

3. Designation of the Host Institution

4. Typology of the Host Institution

- Micro business (less than 10 employees)
- Small- or medium-sized business (more than 9 and less than 250 employees)
- Large business (250 or more employees)
- University
- Public Research Organisation
- Other (please specify)

5. How long have you been in your current professional position/post?

- Less than one year

- 1-2 years
- 2-4 years
- 5-10 years
- Over 10 years
- Not currently working

6. In which phase of the programme did you take part?

- 1ª (2006/07-2012)
- 2ª (2013-2017)
- 3ª (2018-2024)

7. In which year did your project begin?

8. In which year did / will your project finish?

9. Which of the programmes and subprogrammes have you participated in? If you have been involved in more than one, choose the one you know best.

- Massachusetts Institute of Technology (MIT)
- Carnegie-Mellon (CMU)
- University of Texas, Austin (UT Austin)
- University Technology Transfer Network (UTEN)

10. What is/has been your role in the programme?

- Post-doctoral researcher
- Researcher
- Partner in company/industrial cooperation
- Executive Master's student
- PhD student
- Member of faculty participating in collaboration
- Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)
- Other (please specify)

II. PERCEPTION

11. Please specify your perception of the types of programme: (Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant)

- Master's level (dual degree)
- Master's level (non-dual degree)
- PhD level (dual degree)
- PhD level (non-dual degree)
- Collaborative R&D projects between national universities, MIT/CMU/UTA and companies

- Exchange programmes (for students, staff and postgraduates)
- Industry collaboration: fostering interaction with companies
- Network and community building within Portugal: events, such as annual conferences and thematic workshops
- Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops
- Other support activities (planning the curricula, recruiting staff and students)
- Business development activities: start-up company development, consultancy, improving access to venture capital
- Reinforcing scientific and advanced training capabilities in Portugal
- Stimulating the creation of national consortia
- Stimulating economic growth through science-based innovation
- Attracting new talent and high-value activities to Portugal
- Increasing Portuguese R&D-based companies access to global markets

12. If this programme had not been implemented, what would have been different in your view?

- The most important collaborative activities would not have happened at all
- The activities would have been less extensive in terms of the expertise
- The activities would have been less extensive in terms of the network
- The activities would have been less extensive in terms of the budget involved
- The activities would have been qualitatively less important
- The activities would have been implemented through other channels
- The activities would have been implemented later
- Other (please specify)

13. The financial resources allocated to the programme were sufficient in relation to the goals set?

- Yes
- No
- Do not know

14. The organisation and governing structure of the programme worked well?

- Yes
- No
- Do not know

15. To what extent do you agree or disagree with the following statements about the motivations for working with these partners?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know / n/a
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives						
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives						
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation						
Partnering in this project provides a good opportunity to understand how to collaborate in the future						

16. Participation in the project has led to:

	To a great extent	To some extent	Not at all / Not yet
An improved ability to work together			
A better understanding of their capabilities			
A better understanding of their research agendas / priorities			
A better understanding of their ways of working			
An increased likelihood of collaborating again in the future			
The identification of further opportunities to collaborate			
Advances in research / understanding that would not have been possible without the partner			
Advances in innovation / solutions, that would not have been possible without the partner			

III. RELEVANCE AND EFFICACY

17. Please choose the needs identified when setting up the programme that are still relevant:

- Support the internationalisation of national science and technology
- Create opportunities for integration into international thematic R&D networks
- Stimulate an entrepreneurial culture in Portuguese universities
- Stimulate R&D investment by Portuguese companies in close collaboration with academia
- Create national networks between different Portuguese universities and the business community

- Stimulate scientific and technological activities, including collaboration with the productive sector, through the adoption of good international practices
- Developing an agenda that expands on the initial objectives, associating them with scientific and economic valorisation and the research and innovation agenda on Atlantic interactions, through cooperation between both national and international actors.

18. To what extent do you think the instruments of the programmes have been adapted to the needs and expectations of the target audience throughout the different stages of implementation?

(Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant)

- Can you provide an example of how a specific instrument was particularly successful or failed to meet the needs of the target audience?

19. What is your perception of the current and future relevance of partnership programmes?

(Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant)

- Can you describe how these programmes could be adapted to maintain or increase their relevance in the future?

20. In your opinion, how much did the programmes contribute to the adoption of good international practices in the scientific and technological activities of portuguese institutions?

(Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant)

- Can you identify a specific example of how these good practices have been adopted in your institution?

21. How do you assess the effectiveness of the dynamics of collaboration between Portuguese institutions and American universities?

(Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant)

- Can you give an example of a situation in which the collaborative dynamic was particularly effective or ineffective?

IV. IMPACT

22. Please indicate the extent to which each of the following areas act as barriers to international research collaboration (in general). *[Drop down menu: 5 "critical barrier", 4, 3, 2, 1, 0 "not a barrier at all", Do not know]*

- Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)
- Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)

- Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)
- Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)
- Recognition of intellectual property rights
- Enforcement of intellectual property rights
- Regulatory issues (e.g. regulation of technology imports and exports)
- Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)
- Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)
- Language / communication issues

23. The benefits for Portuguese innovation ecosystem were significant?

- Yes
- No
- Do not know

24. The benefits in terms of scientific excellence for the research teams involved in the programmes were significant?

- Yes
- No
- Do not know

25. Benefits such as motivation, professional competence and academic achievement for the individuals involved (students, researchers and personnel) were significant?

- Yes
- No
- Do not know

26. The benefits in terms of reinforcing scientific and advanced training capabilities in Portugal were considerable?

- Yes
- No
- Do not know

27. The benefits in terms of stimulating the creation of national consortia were considerable?

- Yes
- No
- Do not know

28. The benefits in terms of promoting the internationalisation of national universities and R&D institutes were considerable?

- Yes
- No

- Do not know

29. The benefits in terms of strengthening the recruitment of professors and researchers was considerable?

- Yes
- No
- Do not know

30. Programme activities were successful in helping Portuguese R&D-based companies access global markets?

- Yes
- No
- Do not know

31. The benefits in terms of accessing venture capital were significant?

- Yes
- No
- Do not know

32. To what extent do you think that access to international collaboration and knowledge transfer networks has been sustained since the end of programme support?

(Cannot say; Poorly; Rather poorly; Neither well not poorly; Quite Well; Very well)

- Can you share an example of how access to these international networks continues to be beneficial?

33. How do you assess the long-term impact of participating in the programmes?

(Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant).

- Can you identify a long-term impact that you have observed in your organisation or sector?

34. Do you have any other comments you would like to make?

35. If you would be happy to be contacted by a member of the study team to explore your answers further, please provide your email address below.

Thank you for taking the time to complete this questionnaire. Your response has been saved automatically, and you can close this survey.

B2. Survey of non-beneficiaries

We are conducting a survey as part of an evaluation of partnership programs between Portugal and several prominent US universities, including MIT, CMU, and the UT Austin.

This survey is specifically directed at individuals who have been affiliated with foreign universities where formal partnership programmes with Portugal do not exist. The purpose of this survey is to gather data from a control group to compare experiences and outcomes with those from the formal partnership programmes. Your insights will help us understand the broader impact and benefits of international university affiliations.

Taking part in this survey, you will contribute valuable information that will aid in improving and enhancing future academic partnerships. Participation is crucial to the success of this study.

The survey should take approximately 10 minutes to complete.

I. PROFILE

1. Gender:

- Male
- Female
- Prefer not to say
- Other

2. Nationality:

- Portuguese
- American
- Other

3. Designation of the Host Institution (in Portugal)

4. Typology of the Host Institution (in Portugal)

- Micro business (less than 10 employees)
- Small- or medium-sized business (more than 9 and less than 250 employees)
- Large business (250 or more employees)
- University
- Public Research Organisation
- Other (please specify)

5. How long have you been in your current professional position/post?

- Less than one year
- 1-2 years
- 2-4 years
- 5-10 years
- Over 10 years
- Not currently working

6. Which programme did you take part in?

7. In which year did your programme in a foreign university begin?

8. In which year did / will your programme in a foreign university finish?

9. What is/has been your role in the programme?

- Post-doctoral researcher
- Researcher
- Partner in company/industrial cooperation

- Executive Master's student
- PhD student
- Member of faculty participating in collaboration
- Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)
- Other (please specify)

10. Please choose from the following types of activities in which you have taken part:

- Master's level (dual degree)
- Master's level (non-dual degree)
- PhD level (dual degree)
- PhD level (non-dual degree)
- Collaborative R&D projects between national universities, MIT/CMU/UTA and companies
- Exchange programmes (for students, staff and postgraduates)
- Industry collaboration: fostering interaction with companies
- Network and community building within Portugal: events, such as annual conferences and thematic workshops
- Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops
- Other support activities (planning the curricula, recruiting staff and students)
- Business development activities: start-up company development, consultancy, improving access to venture capital
- Reinforcing scientific and advanced training capabilities in Portugal
- Stimulating the creation of national consortia
- Stimulating economic growth through science-based innovation
- Attracting new talent and high-value activities to Portugal
- Increasing Portuguese R&D-based companies access to global markets

II. PERCEPTION

11. Please specify your perception of programme activities you have taken part in: (Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant)

- Master's level (dual degree)
- Master's level (non-dual degree)
  PhD level (dual degree)
- PhD level (non-dual degree)
- Collaborative R&D projects between national universities, MIT/CMU/UTA and companies
- Exchange programmes (for students, staff and postgraduates)

- Industry collaboration: fostering interaction with companies
- Network and community building within Portugal: events, such as annual conferences and thematic workshops
- Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops
- Other support activities (planning the curricula, recruiting staff and students)
- Business development activities: start-up company development, consultancy, improving access to venture capital
- Reinforcing scientific and advanced training capabilities in Portugal
- Stimulating the creation of national consortia
- Stimulating economic growth through science-based innovation
- Attracting new talent and high-value activities to Portugal
- Increasing Portuguese R&D-based companies access to global markets

12. If the programme in a foreign university had not been implemented, what would have been different in your view?

- The most important collaborative activities would not had happened at all
- The activities would have been less extensive in terms of the expertise
- The activities would have been less extensive in terms of the network
- The activities would have been less extensive in terms of the budget involved
- The activities would have been qualitatively less important
- The activities would have been implemented through other channels
- The activities would have been implemented later
- Other (please specify)

13. Please specify for each case how collaboration in the programme has led to:

	To a great extent	**To some extent**	**Not at all / Not yet**
An improved ability to work together			
A better understanding of their capabilities			
A better understanding of their research agendas / priorities			
A better understanding of their ways of working			
An increased likelihood of collaborating again in the future			
The identification of further opportunities to collaborate			
Advances in research / understanding that would not have been possible without the partner			
Advances in innovation / solutions, that would not have been possible without the partner			

14. How do you assess the effectiveness of the dynamics of collaboration between your host institution and the foreign university you were affiliated with?

(Cannot say; Clearly insignificant; Rather insignificant; Neither significant nor insignificant; Quite significant; Very significant)

15. Do you have any other comments you would like to make?

16. If you would be happy to be contacted by a member of the study team to explore your answers further, please provide your email address below.

Thank you for taking the time to complete this questionnaire. Your response has been saved automatically, and you can close this survey.

Appendix C: List of Interviews

Cohort	Organisation	Interviewee(s)	Date
Programme Managing Bodies	MIT Portugal (Portugal)	*Pedro Arezes*, National Director	09/05/2024
	MIT Portugal (USA)	*Doug Hart*, Co-Director of MIT Portugal Programme at MIT *John Hasman*, Co-Director of MIT Portugal Programme at MIT	16/05/2024
	CMU Portugal (Portugal)	*Inês Lynce*, National Director *Nuno Nunes*, National Co-director	03/05/2024
	CMU Portugal (USA)	*José Fonseca de Moura*, Director at CMU	20/05/2024
	UT Austin Portugal (Portugal)	*José Manuel Mendonça*, Director *Rui Oliveira*, Co-director *Andreia Passos*, Executive Director	02/05/2024
	UT Austin Portugal (USA)	*John Ekerdt*, Principal Investigator at UT Austin *Marco Bravo*, Co-Principal Investigator and Executive Director at UT Austin	16/05/2024
Programme participants - Higher Education Institutions/ Researchers	Instituto Superior Técnico - Universidade de Lisboa	*Zita Martins*, Researcher	16/07/2024
	Universidade do Minho	*Eduardo Pereira*, Researcher	01/07/2024
	Universidade do Algarve - CRIA	*Hugo Barros*, Coordinator at CRIA	24/07/2024
Programme participants - Companies	TMG Automotive	*Isabel Furtado*, CEO	11/07/2024
	Unbabel	*Paulo Dimas*, Vice-president of Innovation	26/09/2024
	Ultrafast Sphere Photonics	*Rosa Romero*, Co-founder and CEO	24/07/2024
	Feedzai	*Paulo Marques*, Co-founder	27/09/2024
	Watt-is	*Miguel Carvalho*, Co-founder and CEO	12/07/2024
Non-participants – Higher Education Institutions/ Researchers	Universidade de Coimbra	*Helena Freitas*, researcher	05/08/2024
	Faculdade de Engenharia da Universidade do Porto / INESC TEC	*José Fernando Oliveira*, Researcher	05/08/2024
	Faculdade de Medicina da Universidade de Lisboa	*Luisa Figueiredo*, Researcher	30/07/2024
Other stakeholders	CNCTI	*Guy Villax*, member of CNCTI and board member of Hovione	26/09/2024
	CRUP	*Paulo Jorge Ferreira*, President	10/10/2024
	Conselho dos Laboratórios Associados	*João Rocha*, Coordinator	26/09/2024
	António Rendas, former Rector of Universidade NOVA de Lisboa and former President of CRUP		24/09/2024
	Manuel Heitor, former Minister for Science, Technology and Higher Education of Portugal		26/09/2024

Appendix D: Quantitative Benchmark Analysis Results

D1. Non-technical summary

The present analysis contains a non-causal quantitative assessment of the scholarly works and start-up activity associated with the partnerships. The analysis reveals a substantial premium or positive association over all the dimensions under analysis. However, this quantitative exercise aims to supplement the qualitative strands. In isolation from other strands, the quantitative results cannot form the basis for policy recommendations due to the non-causal nature of the analysis. The results show that, when compared with a control group of similar outputs, the partnership presents significantly stronger performance in terms of:

- **Scientific influence:** when compared with publications in the same year, field and type, partnership publications receive, on average, 13 more citations, representing a premium of 60%.
- **Technological influence:** patents cite partnership publications three times more than comparable publications in their non-patent literature references.
- **Policy influence:** public policy documents cite partnership publications four times more than comparable publications.
- **Funding:** Companies associated with the partnerships raise funds at a rate eight times higher than benchmark companies and are significantly more likely to secure larger amounts, such as USD 1 million and USD 10 million.
- **Patenting:** Companies associated with the partnerships are significantly more likely to apply for patents.

While these results are positive and statistically significant, triangulation with the qualitative segments of the evaluation is crucial. For example, by not having a causal nature, the analysis does not reveal whether the positive outcomes arise from the programme's ability to attract top-tier participants (a selection effect[24]), from the practical learning and experience gained during the partnerships, or both. Both factors are likely contributors, but the quantitative analysis alone does not disentangle their effects. A causal evaluation would require access to additional data and resources, such as detailed information on unsuccessful applicants, which were unavailable for this study segment.

The sections below provide technical details about the empirical methodology, result tables, and interpretation of leading indicators.

D2. Technical details

The analysis required plugging in the data provided by the contracting authority (and each partnership) with Technopolis' S&T Data Ocean[25]. In particular, we augmented the scientific outputs from the programme's partnerships with three data sources, including:

[24] The selection effect could reflect the possibility that beneficiaries would have achieved high-impact, high-quality outputs even without the programme's support. In such cases, the results reflect the beneficiaries' inherent capabilities rather than the programme directly contributing to their learning or the outcomes of their participation in the partnerships.

[25] The Science and Technology (S&T) Data Ocean is a framework of various datasets linked by Technopolis-group for science and technology policy analysis.

- OpenAlex: to retrieve data about publication dates, fields of science, cross-citation networks, publication type, and a control group of comparable publications.
- Overton: to retrieve data about the number of public policy citations received by the scholarly works
- PATSTAT: to retrieve data about the number of patents citing the scholarly works in their non-patent references
- Crunchbase: to retrieve firm-level data about growth potential and technological activity.

We assess dependent variables as proxies for scientific, technological, and policy influence, recognising their strengths and limitations. Forward citations, the frequency a scholarly work is referenced, serve as our primary measure of scientific impact. While widely accepted, this metric has exceptions, such as citation mills or negative citations, and its overuse may bias evaluations, overlooking other research attributes (Machado, 2021) [26]. To address this, we complement citation analysis with measures of technological and policy influence.

We use citations from patents to scientific publications as a proxy for technology influence. Inventors cite prior patents and non-patent literature, such as scientific publications, to support novelty claims and disclose their technological discoveries. While this link is valuable for assessing technology influence, it has limitations. Not all technologies are patentable, and not all patentable technologies seek patent protection. Thus, non-patent literature citations reflect technology activity but do not capture the full spectrum of technological developments.

Citations from public policy documents, including those by government bodies and policy think tanks, serve as a proxy for policy influence. These references have clear advantages: they illustrate how research shapes regulations, supports public initiatives, and underpins evidence-based policymaking. They also offer a tangible connection between scientific work and societal decision-making. Nonetheless, there are important caveats. Many policy decisions lack formal documentation; even documented policies may not explicitly cite scientific studies. As a result, while policy references provide valuable insights into the intersection of science and policy, they reflect only part of the broader impact of research on policymaking and societal outcomes.

We use the number and amount of funding deals involving start-ups as proxies for growth potential and innovation dynamics. These metrics are well-suited for early-stage firms, where traditional indicators like revenue or profitability often fail to reflect their growth trajectory. Additionally, we use patents filed by these companies as a proxy for technological innovation, as patents formalise efforts to protect and commercialise novel ideas. Together, these indicators highlight the aspirations and innovative capacity of start-ups.

However, these start-up metrics have interpretation caveats. Funding data reflects market interest and investor confidence but does not always translate into sustained growth or long-term success. Similarly, while patent counts are a useful proxy for technological activity efforts, they overlook unpatented innovations and vary in value depending on their commercial and technological impact. As such, these measures should be viewed as indicative of potential rather than definitive indicators of performance or impact.

[26] Machado, D. (2021), "Quantitative indicators for high-risk/high-reward research", OECD Science, Technology and Industry Working Papers, No. 2021/07, OECD Publishing, Paris, https://doi.org/10.1787/675cbef6-en.

D3. Scientometric analysis: scientific, technological and policy benchmark

The scientometric analysis follows a structured methodology, starting with linking partnership outputs to the S&T data ocean. This linked data framework includes secondary bibliometric data, non-patent literature citations from patents, and public policy documents.

Next, we identify a control group sample by selecting all publications acknowledging FCT funding from our bibliometric database. We refine this sample to include only publications that fall within the same time window, fields, and types as the partnership outputs.

The core of the analysis uses negative binomial regressions, which are suitable for highly skewed count data. We develop three models, each with a different dependent variable: scientific citations, patent citations, and policy citations. The primary independent variable is a binary indicator that distinguishes whether the output originated from a partnership (value of one) or not (value of zero). The models account for publication year, type, and field by incorporating fixed effects for these factors.

D3.1. Methodological approach

D3.1.1. The data

Our analysis's benchmark group is the population of publications acknowledging funding from FCT. After filtering out the focal publications stemming from the partnerships and keeping only a common publication year window and scientific fields, the final dataset consisted of 47522 control works and 1156 partnership-related outputs with publication years dating from 2008 to 2023. Note that publications acknowledging FCT funding do not represent the population of FCT funding, as acknowledgement practices are not uniform. Therefore, the evaluation treats this control data as a sample or best proxy of general FCT publications accessible to the project team. The contracting authority (and each partnership) provided the project team with the focal list of publications associated with each partnership.

Most of the publications under analysis are in the overall domains of Physical Sciences and Life Sciences. Scholarly contributions in Social Sciences are also present but to a lesser extent. The table below presents the top ten fields of the publication set under analysis according to the ASJC (All Science Journal Classification) scheme and sorted by the partnerships' counts.

Table D 1. Top ten scientific fields by ASJC

ASJC Field	FCT- controls	Partnerships
Computer Science	2335	372
Engineering	7677	332
Medicine	5463	93
Biochemistry, Genetics and Molecular Biology	4035	73
Environmental Science	4947	46
Physics and Astronomy	3145	44
Social Sciences	1802	36
Materials Science	3108	36
Economics, Econometrics and Finance	794	18
Business, Management and Accounting	760	17

Source: Technopolis analysis based on OpenAlex data

The main goal of the analysis is to benchmark the programme's scientific, technological, and policy results. Therefore, the proxies or dependent variables of interest are the number of scientific citations received by the publication set and non-patent and policy citations. As described in the summary statistics table below, all these variables present incredibly high levels of skewness, with the vast majority of publications receiving very little or no citations. This is an expected and common feature of citation data. Note that the unit of observation in this analysis is always the same: the 47522 control works and 1156 partnership-related publications. Therefore, the total N is 48678.

Table D 2. Summary statistics for the main variables of interest

	mean	std	min	25%	50%	75%	max
Scholarly citations	23,1	55,96	0	4	11	25	6055
Non-patent literature citations	0,08	1,1	0	0	0	0	132
Public policy citations	0,1	0,9	0	0	0	0	85

Source: Technopolis analysis based on OpenAlex, PATSTAT and OVERTON data

D3.1.2. Model

The dependent variables in this analysis are integer-count variables counting citations. A linear regression model with such count data yields inefficient, inconsistent, and biased coefficient estimates (Long, 1997)[27]. The econometric models that avoid these problems are count models, the most common being the Poisson model. However, the Poisson model assumes that the observed distribution's mean and variance are the same. In the presence of over-dispersion, the variance is greater than the mean, so the Poisson model underestimates standard errors of coefficients, leading to spuriously high significance levels (Cameron & Trivedi, 1986)[28]. The summary table shows that the target variables of interest are highly skewed, demonstrating over-dispersion.

Following Fleming (2001)[29], we use the negative binomial regression as our primary model. The negative binomial is the most appropriate underlying distribution to fit highly skewed independent variables and is the common preference in the literature. The Negative binomial regression provides a suitable approach for analysing over-dispersed count data where the conditional variance exceeds the conditional mean. This method generalises the Poisson regression by sharing the same mean structure while introducing an extra parameter for modelling over-dispersion. When the conditional distribution of the outcome variable displays over-dispersion, the Negative binomial regression yields more conservative confidence intervals than those of a Poisson model.

The Negative binomial model has the following formula:

[27] Long, S. (1997). Regression models for categorical and limited dependent variables. In Advanced quantitative techniques in the social sciences (Vol. 7).

[28] Cameron, A. C., & Trivedi, P. K. (1986). Econometric models based on count data. Comparisons and applications of some estimators and tests. Journal of Applied Econometrics, 1(1), 29–53. https://doi.org/10.1002/JAE.3950010104

[29] Fleming, L. (2001). Recombinant Uncertainty in Technological Search. Management Science, 47(1), 117–132. https://doi.org/10.1287/MNSC.47.1.117.10671

$$P(Y = y|X) = \frac{\Gamma\left(y + \frac{1}{\theta}\right)}{\Gamma(y+1)\Gamma\left(\frac{1}{\theta}\right)}\left(\frac{1}{1+\theta/\mu}\right)^{1/\theta}\left(\frac{\mu}{1+\theta/\mu}\right)^{y}$$

Where $P(Y = y|X)$ is the probability of observing y counts of forward citations. X represents a vector of independent variables, including the primary variable of interest – a binary indicator equal to one if the scholarly work is an output of the partnerships and zero otherwise. The remaining control variables account for differences in years, scientific fields and type of scholarly output.

θ is the dispersion parameter, and μ is the mean of the dependent variable. The parameter θ measures the level of overdispersion in the data, with higher values indicating greater dispersion. The gamma function Γ computes probabilities for different values of the count variable Y.[30]

D3.2. Results

The table below presents the results of three Negative Binomial regression models. Each model has a different dependent variable: science citations, non-patent literature (NPL), and policy citations. The unit of observation is always the same set of publications.[31] The key independent variable is a partnership dummy, which indicates whether an output stems from a partnership. The coefficients shown represent the incident rate ratios (IRRs), being exponentiated coefficients typical of Negative Binomial models.

Table D 3. Negative Binomial Regression with exponentiated coefficients (incidence rate ratios)

	(1)	**(2)**	**(3)**
	Science Citations	NPL Citations	Policy Citations
main			
Partnership dummy=1	1.584***	3.743***	4.843***
	(0.0888)	(0.537)	(0.999)
Observations	48623	48543	48623
Year, Field and Type FE	Yes	Yes	Yes

Exponentiated coefficients; Standard errors in parentheses
** p < 0.05, ** p < 0.01, *** p < 0.001*

In the first model, the dependent variable is the count of science citations. The coefficient for the partnership dummy is 1.584, with a standard error of 0.0888. This indicates that outputs from partnerships have 1.584 times the number of science citations compared to non-partnership outputs. Thus, on average, partnerships' publications receive, on average, 58.4% more citations, holding other factors constant. The average marginal effect of the partnership dummy is 13.22 (not displayed). This means that partnership publications receive, on average, 13.22 more citations than the control publications, holding all other covariates constant.

[30] In all the settings, the AIC and BIC values of the Negative Binomial models are systematically below those of the the Poisson regression. Moreover, the confidence interval of alpha parameters of the Negative Binomial are always above zero. These elements further support the need to use the Negative Binomial regression instead of the Poisson.

[31] The differences in the total number of observations across models stem from variability within the Year, Field, and Type fixed effects. STATA18 automatically drops observations from categories with insufficient variation in the dependent variable within these fixed effects.

In the second model, where the dependent variable is the count of patent citations, the partnership dummy has a coefficient of 3.743 with a standard error of 0.537. Outputs from partnerships have 3.743 times more NPL citations than non-partnership outputs, suggesting a 274.3% higher number of citations for those involved in partnerships.

The partnership dummy coefficient in the third model, which assesses policy citations, is 4.843, with a standard error of 0.999. This implies that outputs from the partnerships receive 4.843 times the number of policy citations compared to non-partnership entities, which equates to a 384.3% higher number of policy citations.

All three coefficients are statistically significant at the 0.1% level ($p < 0.001$), as indicated by the triple asterisks. This means that the observed partnership premium is highly significant across all models. The models also control for fixed effects related to year, field, and type, ensuring that the variations due to these factors are accounted for with year, field and publication type dummy variables.

D4. Growth capital and technology performance

The funding and patent activity analysis begins with identifying companies that participated in the partnership using data from the Crunchbase platform. To construct a comparable set of companies, we gathered information on all Portuguese firms on Crunchbase with matching founding years and industry profiles, ensuring alignment with the partnership sample.

We then collected funding and patent data for our entire sample, including partnership and non-partnership companies. Our analysis focuses on four primary outcomes: the probability of raising USD 1M+, the probability of raising USD 10M+, the number of funding rounds, and the total patents filed.

The models account for company-specific characteristics, such as founding year, industry, and industry diversification. Hence, the methodology enables measuring how the partnerships can influence financial performance and innovation outcomes while controlling for external factors that could affect these results.

D4.1. Methodological approach

D4.1.1. The data

The contracting authority and respective partnerships provided the initial list of companies associated with each partnership. Our control group consists of all Portuguese companies registered in Crunchbase with a common founding year and industry classification as the companies associated with the partnerships, hence mirroring the age window and industry composition stemming from the partnership sample. Crunchbase is the largest database of business data focused specifically on dynamic firms raising funds in venture capital deals or engaged with other types of growth capital. Therefore, our intended benchmark is not a representative sample of the overall population of firms in Portugal. Instead, the benchmark goal is of comparable firms in terms of growth and innovation aspirations. The final dataset comprised 7045 control firms and 109 partnership companies identified within Crunchbase, 54.5 % of the total.

We relied on Crunchbase industrial and technological tags to classify companies into industry groups[32]. As showcased in the table below, 45.95% of the companies under the control group

[32] A more granular overview concerning composition of each industry group is provided in the annex of this paper

are in the overall industry groups of Business and Professional Services (25.38%) and Technology and Software (20.57%). Regarding Partnership companies, the Technology and Software industries represent 27.98 % of the sample, followed by Education and Science (17.5%).

Table D 4. Industry groups for the Crunchbase dataset

	Portuguese population of companies	**Partnerships**
Business and Professional Services	3732	35
Community and Lifestyle	1247	14
Consumer Goods and Services	1634	21
Education and Science	1212	47
Energy and Sustainability	435	12
Healthcare and Biotechnology	714	32
Manufacturing	879	15
Media and Entertainment	883	12
Technology and Software	3025	75
Transportation and Travel	665	5

Note: The numbers displayed in this table are the results of the duplications (companies operating in multiple industries, for which in the econometric analysis we add industry-fixed effects)
Source: Technopolis analysis based on Crunchbase

The main goal of this part of the analysis is to evaluate the statistical significance of the programme in growth capital and firm performance. Hence, we selected three dependent variables of interest: the level and number of funding raised and the number of patent fillings.

For the dummy variables of companies raising more than USD 1 million and USD 10 million, the mean values are 0.028 and 0.006, respectively. These values indicate that only 2.8% of the companies have raised over USD 1 million, and an even smaller fraction (0.64%) have secured more than USD 10 million in funding. The low averages, coupled with the zero medians, suggest that the majority of firms do not reach these funding levels.

As showcased in the table below, the continuous variables display a high level of skewness. Most companies within the dataset have low investments, funding rounds or patents, with a minority presenting high values. This is evident from the fact that the 25%, 50% (median), and 75% percentiles are all zero for each variable, confirming that at least 75% of the data points have no recorded values. Additionally, the mean values are significantly higher than the median, suggesting that a small number of entities with exceptionally high values are pulling the average up. The standard deviations are also notably large compared to the means, indicating a high level of variation within the dataset. This variability is further highlighted by the maximum values, 10 for the total number of funding rounds and 124 for the number of patents, suggesting a few outliers with substantially higher values compared to the rest of the observations.

Note that the unit of observation in this analysis is always the same: the 7045 control firms and 109 partnership companies identified within Crunchbase. Therefore, the total N is 7154.

Table D 5. Summary statistics for the main variables of interest

	mean	std	min	25%	50%	75%	max
Indicator for raising over USD 1M+ *	0.028096	0.165259	0	0	0	0	1
Indicator for raising over USD 10M+ **	0.00643	0.079934	0	0	0	0	1
Total number of funding rounds per company ***	0.206458	0.736504	0	0	0	0	10
Number of patents per company ****	0.07059	1.815068	0	0	0	0	124

Source: Technopolis analysis based on Crunchbase
Notes: * Dummy variable =1 if the company raises more than 1M, zero otherwise; ** Dummy variable =1 if the company raises more than 10M, zero otherwise; *** Variable counting the total number of funding rounds per company; **** Variable counting the total number of patent applications per company

D4.1.2. Statistical models

We employ different regression models to account for the distinct characteristics of each dependent variable.

We implement two Logit frameworks for the models evaluating funding raised to assess binary outcomes related to funding thresholds. Specifically, we create two dummy variables: one for companies raising more than USD 1 million in total funding and another for those raising more than USD 10 million. These variables take the value of 1 if a company exceeds the respective funding threshold and 0 otherwise.

The Logit regression model estimates the probability of a binary outcome occurring (e.g., raising more than $1 million). The formula for the Logit model is expressed as:

$$\log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \beta 0 + \beta 1X1 + \beta 2X2 + \cdots + \beta KXk$$

Where $P(Y=1)$ is the probability of the binary outcome being 1 (e.g., raising more than USD 1 million), Xi represents the independent variables, and the coefficients $\beta 0, \beta 1, \ldots, \beta k$ β0 describe how each independent variable affects the log-odds of the outcome occurring. A positive coefficient indicates that an increase in the independent variable raises the probability of surpassing the funding threshold, while a negative coefficient suggests a decrease in this probability.

For the remaining frameworks, we deploy negative binomial regressions to model the total number of funding rounds and patents. These are non-negative count integer variables with high dispersion, so we follow the same approach as explained in the previous section for the modelling of citations.

In this context, the key independent variable is a dummy representing participation in the programme (e.g., being associated with the partnerships vs. benchmark). Additional control variables, such as founding year, industry, and number of industries, are included to account for fixed effects, ensuring that the variations associated with these factors are adequately controlled for in the analysis.

D4.2. Results and findings

The table below showcases the results for the two Logit and two Negative Binomial regression models. The four dependent variables are the probability of raising more than USD 1 M, the probability of raising more than USD 10M, the total number of rounds, and the total number of patents. Similarly to the models presented in the scientometric analysis, the key independent

variable of interest is a partnership dummy, which indicates whether a company is associated with a partnership. The unit of observation is always the same set of companies.[33]

Table D 6. Regression analysis

	(1.1)	(1.2)	(2)	(3)	(4)
	Probability of raising USD 1M+	Probability of raising USD 10M+	Total number of funding rounds	Probability of applying for a patent	Total number of patents
main					
Partnership dummy=1	0.089***	0.03***	6.310***	.029***	12.21***
Standard error	(0.006)	(0.263)	(0.088)	(.003)	(0.105)
Observations	13437	10833	14699	14369	14699
Founding year, Industry and Number of industries	Yes	Yes	Yes		Yes

Models 1.1, 1.2 and 3 display average marginal effects from the logit models, and Models 2 and 4 display exponentiated coefficients representing incidence rate ratios. Standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

The dependent variables in the two logit models 1.1 and 1.2 denote the probability of raising more than USD 1 M and USD 10M. The average marginal effects coefficient of the partnership dummy indicates that partnerships-related companies have, on average, an 8.9 percentage point (pp) higher probability of raising USD 1 million or more compared to the benchmark group after accounting for founding year and industry effects. Similarly, partnerships-related companies have, on average, a 3 percentage point (pp) higher probability of raising USD 10 million compared to companies that do not participate in the partnerships, holding all other variables constant.

In model 2, the dependent variable is the count of funding rounds. The partnership dummy has a coefficient of 6.3 with a standard error of 0.088, meaning that companies related to the partnerships achieve funding events at a rate 6.3 times higher than the benchmark.

Models 3 and 4 assess patenting activities. Model 3 shows that partnerships-related companies have, on average, an 2.9 percentage point (pp) higher probability of applying for patents compared to the benchmark group after accounting for founding year and industry effects. Lastly, in model 4, the partnership dummy coefficient assesses patenting activity with a coefficient of 12.21 and a standard error of 0.105. This implies that companies related to the partnerships file for patents at a rate 12.21 times higher than non-participating companies.

All four coefficients explored are statistically significant at the 0.1% level ($p < 0.001$), as indicated by the triple asterisks. This confirms that the observed partnership premium remains highly significant across all models. The models control for fixed effects associated with dummy variables for the founding year, industry, and the number of industries in which the company operates.

[33] The differences in the total number of observations across models stem from variability within the Founding year and industry fixed effects. STATA18 automatically drops observations from categories with insufficient variation in the dependent variable within these fixed effects. Firms operate under multiple industries, so we duplicate them per industry and add industry fixed effects plus control for the total number of industries under which each company operates.

D5. Conclusion

This evaluation segment presented a quantitative benchmark analysis of the partnership's publications and start-ups. The quantitative results alone cannot provide isolated evidence of the partnership's impact. The nature of the analysis is non-causal; therefore, triangulation with the remaining parts of the evaluation is critical. For example, an element not disentangled by the present benchmark is the selection effect of the partnerships, which can potentially attract the most capable candidates.

Against this backdrop, the results of the quantitative benchmark analysis reveal a statistically significant, sizable and systematic positive premium. After accounting for time, sector and type of output differences, the results show that the publications and start-ups related to the partnerships present exceptionally higher performance levels than the respective national benchmarks across all the dimensions under analysis. The premium scale is substantial and rarely observed in similar benchmark exercises the study team performed in the past for other programme evaluations.

Regarding scientometrics, the analysis consisted of benchmarking partnership publications against a sample of comparable publications funded by FCT. The contracting authority and respective partnerships provided the project team with the list of outputs associated with each partnership (focal outputs). The benchmark group was all the publications acknowledging FCT funding within the same publication years, fields and types of focal outputs. After accounting for scientific field differences, year and type of publication, outputs from the partnerships receive, on average, 58.4% more citations. However, the premium associated with these outputs goes beyond scientific impact, with the partnerships' publications receiving 3+ times more patent citations and 4+ times more citations from public policy documents, demonstrating a relevant role in influencing future technological development and informing public policies. All the results are statistically significant at a 0.1% level stemming from negative binomial regression models appropriate in case of overdispersed count data.

Compared with the benchmark, partnership-related companies present exceptional growth potential proxies. We assessed the amounts of capital raised, number of deals (proxies for company growth potential) and number of patents (proxy for technological activity). As in the case of the scholarly outputs, the contracting authority and respective partnerships provided the list of companies associated with each partnership. The benchmark consisted of all the Portuguese companies in Crunchbase – a database of business data focused specifically on dynamic firms raising funds in venture capital deals or engaged with other types of growth capital. After accounting for sector differences and firm founding years, the results show that firms associated with the partnerships are more likely to reach both USD 1M and 10M fundraising thresholds than the benchmark groups. Moreover, they go through a substantially larger number of deal rounds and present higher patenting rates.

The evaluation's qualitative strands are vital in further probing this quantitative analysis by enabling further evidence on the mechanisms driving these results. Through qualitative exploration, the evaluation can assess whether the observed outcomes are primarily due to the selection of top-tier participants, learning facilitated by the programme or a combination of these elements. Such an approach provides a more nuanced understanding of how the partnerships generate value and foster innovation across scientific, technological, and business domains. In addition, the qualitative review can probe the learning effect within partnerships, exploring how participants gain new knowledge, skills, or networks through their involvement in the programme. Understanding the background context of the observed quantitative premium requires uncovering, for example, how collaboration with other

stakeholders, access to resources, or exposure to new ideas and technologies within the partnerships contributes to the development of their beneficiaries.

Appendix E: Case Studies

E1. Case Study: University of Minho's Participation in the MIT Portugal Flagship Projects

1. Introduction

The University of Minho (UMinho) is a public university in Portugal with campuses in Braga and Guimarães. It has twelve schools, offering a diverse range of higher education programmes in fields including Science, Engineering, Arts and Architecture, Economics and Management, Law, Education, Social Sciences, Medicine, Psychology, and Nursing. It is one of the largest universities in Northern Portugal, with over 19,000 students (42% of which are postgraduate students) and with about 1,300 professors and 600 employees.

This case study explores UMinho's participation in two flagship projects under the MIT Portugal programme—**AEROS Constellation** and **K2D: Knowledge and Data from the Deep to Space**—and highlights the broader impact of this collaboration on the university's and the country's research capabilities and international standing.

2. Participation in the MIT Portugal Programme

UMinho has been closely connected to the MIT Portugal programme since its inception, mainly through its School of Engineering. In phases 1 and 2 of the programme, UMinho has hosted joint MIT Portugal PhDs, such as the Bioengineering Systems Doctoral Programme and the Leaders for Technical Industries (LTI) PhD Programme, as well as the Business Engineering Master's in Technology Management Enterprise (TME). In the third phase, n the third phase, UMinho also assumed the role of host institution for the programme's management.

Throughout the three phases, the School of Engineering of UMinho hosted over 80 MIT Portugal PhD students. UMinho's faculty and researchers also participated in 21 MIT Portugal R&D projects, including two MIT Flagship Projects - AEROS Constellation and K2D.

The MIT Flagship Projects were large-scale collaborative research projects approved under the 2019 call launched by Compete 2020, Agência Nacional de Inovação (ANI) and Fundação para a Ciência e a Tecnologia (FCT). Consortia was led by Portuguese companies in partnership with research institutions and Portuguese universities as well as investigators from MIT. In addition to these initiatives, five other Flagship Projects were approved under MIT Portugal, namely C-Tech: Climate Driven Technologies for Low Carbon Cities; NEWSAT; Operator: Digital Transformation in Industry with a Focus on the Operator 4.0; SNOB-5G: Scalable Network Backhauling for 5G; Transformer 4.0: Digital Revolution of Power Transformers.

The AEROS Constellation project

The AEROS Constellation project was focused on developing nanosatellite technologies to monitor Earth's oceans from space. It aimed to develop and launch into orbit a new nanosatellite platform as a precursor to a future constellation that can leverage the great potential of the study of the Earth, its oceans and atmosphere in liaison with advanced communications technologies to deliver tangible scientific and economic value to society. The objectives of the project were:

- To develop and launch a novel CubeSat platform for ocean monitoring.
- To demonstrate miniaturized and efficient hyperspectral imaging.
- To implement data science techniques for monitoring and forecasting oceanic evolution and generating value-added data.

- To develop flexible software-defined communication modules to support connectivity and network operations of autonomous vehicles and biologging tagging technology (e.g., tagged migratory marine organisms).
- To establish a Data Analysis Centre (DAC) to collect, process, and analyze data acquired by the AEROS payload.

Table E 1. The AEROS Constellation project – Key Figures

Title of the Project:	AEROS Constellation
Start Date:	19/11/2020
End Date:	30/06/2023
Project Budget:	4 538 886 €
Funding:	1 884 426 € (ERDF) 478 563 € (FCT) 1 752 130 € (US)
Partners Involved: • Edisoft, IMAR, CEiiA, AIR CENTRE, SPINWORKS, DSTELECOM, +ATLANTIC, University of Minho, FCUP University of Porto, University of Algarve, Instituto Superior Técnico (University of Lisbon), MIT.	
Main Outputs: • 1 scientific publication • 12 proceedings/ conference papers • 10 PhD candidates and 8 masters students involved	

Source: data from FCT and MIT Portugal 2023 Annual Report

The AEROS project successfully designed, developed, and tested a 3UCubesat satellite for ocean monitoring containing three payloads: a hyperspectral camera, a software-defined radio to receive ARGOS and LoRa tags information, and an RGB camera to better geo-locate the images taken with the hyperspectral camera. The satellite was fully tested and ready to be launched into space in the SpaceXTransporter 10 in February 2024. A Data Analysis Center was also developed to display the AEROS data to the users. A Command Center, in the ground segment, was also developed and ready to communicate with the AEROS from the Portuguese Santa Maria ground station.

The K2D project

The K2D: Knowledge and Data from the Deep to Space project K2D proposed to develop a global- scale monitoring system for oceans, able to tackle all depths, from the deep-sea bottoms and abyssal platforms to the surface. This system is based on the use of smart submarine cables with sensors connected to the optical repeaters.

The objectives of the project were:

- To install a network of sensors supported by subsea cables.
- To develop a signal repeater for submarine communications cables capable of monitoring its surroundings.
- To translate marine noise into actionable information.

- To identify and assess deep-sea animal and microbial communities using DNA barcoding techniques.
- To develop autonomous underwater vehicle (AUV) docking stations to recharge batteries and offload data.
- To develop piezoelectric transducers for sensing and wireless communications.
- To assess the ocean indicators using geostatistical and AI algorithms.

Table E 2. The K2D project – Key Figures

Title of the Project:	K2D: Knowledge and Data from the Deep to Space
Start Date:	01/07/2020
End Date:	30/06/2023
Project Budget:	3 458 643 €
Funding:	995 495 € (ERDF) 282 062 € (FCT) 2 041 310 € (US)
Partners Involved: • DSTelecom, University of Minho, INESC TEC, AIR CENTRE, Alcatel Submarine Networks, Cintal, Azores University, MIT.	
Main Outputs: • 5 scientific publications • 10 proceedings / conference papers • 7 PhD candidates involved	

Source: data from FCT and MIT Portugal 2023 Annual Report

The project successfully led to the installation of a SMART Cable in Troia, during summer 2022 (version 1 prototype), and the installation of a SMART Cable in Sesimbra, during summer 2023 (version 2 prototype).

3. Key Outcomes and Achievements

Portugal's first nanosatellite

The AEROS Constellation project led to the successful launch of a nanosatellite in 2024, the first Portuguese satellite developed and launched as part of a comprehensive research initiative. This achievement marked an important milestone for the country. The satellite's primary mission is to monitor oceanic environments, providing crucial data that can be used for environmental management and conservation efforts.

SMART submarine cables

The K2D project made significant advancements in ocean monitoring technologies. A key result was the deployment of a 2 km submarine cable system for real-time data collection in the Sesimbra region. This cable system enabled the integration of acoustic and DNA-based sensing technologies for comprehensive environmental monitoring. Additionally, the project developed autonomous underwater vehicles (AUVs) capable of extending the range of the cable network by shuttling between underwater nodes and surface stations.

The cable system is installed in the Technological Free Zone (ZLT) Infante D. Henrique, a regulatory sandbox operated by the Portuguese Navy to test unmanned security and defence systems and other underwater technologies. One significant outcome of the project was the involvement of the US Navy, which was facilitated by the MIT, and enabled collaboration between the Portuguese and US Navies.

Although the project officially ended on June 30, the consortium kept actively meeting periodically to ensure the continuity of the project. In the short term, the main goal is to remain fully committed to the installation and operation of the SMART Cable in the Free Technological Zone, including the necessary maintenance. In the long term, the consortium is looking at different available grants to proceed with technological advancement required for larger deployments and addressing new use cases.

Key outcomes for UMinho

UMinho's participation in these flagship projects had several institutional outcomes beyond the technical achievements of the projects themselves. One key outcome was that the collaboration with MIT exposed UMinho researchers to new project management methodologies and research practices that emphasized translating academic research into industrial applications. While UMinho has a long-standing tradition of collaborating with industry, particularly given the industrial context of the region where its campuses are located, researcher Eduardo Pereira found it transformative to experience MIT's unique ecosystem, including the extensive network of companies surrounding the university, and MIT's capacity to effortlessly create spin-off companies based on knowledge.

Moreover, the Flagship Projects were key in strengthening collaboration ties between UMinho and the companies involved in the project. This collaboration extended beyond the immediate scope of the project and often led to the creation of new areas of innovation within the companies, driven by the exchange of ideas and expertise from MIT. In turn, this also opened up new avenues for collaborative research between the companies and UMinho. Additionally, these projects facilitated the integration of talent from both UMinho and MIT Portugal graduates into the companies, helping to embed expertise that eases future collaborations.

4. Challenges and Solutions

The timeline of the projects was disrupted by the COVID-19 pandemic, causing delays in project implementation. Administrative delays in MIT Portugal funding also had some impact on project execution and caused uncertainty. While the flagship projects' funding was not directly affected, delays in some supporting activities to the projects (e.g. planned visits of PhD students involved in the project to MIT) ended up delaying some of the foreseen activities.

However, the main challenge to these projects is ensuring the continuity in funding. While both the AEROS and K2D projects received significant initial funding, the short-term nature of the funding cycles, with 3 years of maximum duration, poses difficulties in maintaining the research momentum once the projects reached their conclusion. This is a particularly significant challenge, as the accomplishments of both projects have the potential to pave the way for new avenues of research.

5. Long-Term Impact

Scientific and Technological Impact

The AEROS Constellation project led to the launch of the first Portuguese nanosatellite, a significant achievement for both the partners involved in the project and the country. This

nanosatellite represents not only a technological leap forward for Portugal's capabilities in space research and environmental monitoring, but also opens up new possibilities for research in Portugal and to the participation of research institutions in international collaborations on Earth observation technologies.

The K2D project has similarly reached very significant lasting achievements in ocean monitoring technologies. The development of integrated sensing systems and real-time data collection capabilities through the submarine cable system has created a platform for future research in ocean conservation and environmental protection. This cable system, installed in the Technological Free Zone (ZLT) in Sesimbra, represents a unique asset for Portugal, facilitating long-term research in collaboration with the Portuguese Navy. It is also noteworthy the involvement of the US Navy in the K2D project, which was a key result of MIT's international network and influence. The project facilitated cooperation and the transfer of best practices between the Portuguese and US navies, with future plans for the prototype cable to serve as a joint testing platform between both navies.

Strengthening International Collaboration Networks

The institutional impact on UMinho from participating in the MIT Portugal Programme has been profound. Collaborating with MIT allowed UMinho to elevate its research practices, exposing its faculty and students to a new standard of international collaboration.

The partnership with MIT has also opened new avenues for ongoing collaboration that extend beyond formal project boundaries. Following the AEROS Constellation and K2D projects, UMinho found it much easier to maintain contact with MIT researchers. The interactions have evolved into a more informal, reciprocal relationship where UMinho's faculty can readily reach out to MIT colleagues and expect prompt responses. This accessibility has fostered a network where researchers on both sides view each other as peers working at the forefront of their fields. As a result, UMinho has been able to sustain a continuous exchange of ideas and research insights with MIT, facilitating long-term collaboration opportunities that were previously less accessible. Furthermore, this ongoing relationship with MIT not only supports UMinho's research activities but also contributes to Portugal's growing reputation as a player in the fields of space and ocean technologies.

6. Conclusion

The University of Minho's involvement in MIT Portugal's flagship projects highlights the impact of large-scale collaborations on advancing scientific and technological capabilities. The launch of Portugal's first nanosatellite under the AEROS Constellation project marked a significant step in the nation's Earth and Space research, while the K2D project innovations enhanced its ocean monitoring capabilities. These achievements were made possible through MIT's contributions in research expertise, methodology, and international visibility. The K2D project also kickstarted partnerships between key players, like the US and Portuguese navies, underscore the strategic value of this collaboration.

Case Study Methodology

Method	**Participant(s)**	**Date**
Interview	Eduardo Pereira, Assistant Professor at University of Minho School of Engineering	01/07/2024

E2. Case Study: TMG Automotive's Participation in the MIT Portugal Programme

1. Company Profile

TMG Automotive, a business unit of the TMG Group, is a leading supplier of flexible polymer interiors to the global automotive industry. Established in 1937, the TMG Group has grown into a key player in premium automotive markets, supplying major original equipment manufacturers (OEMs) such as Volvo, SAAB, and BMW.

TMG Automotive's product portfolio includes materials such as polyvinyl chloride (PVC), thermoplastic elastomers, and polyurethane, which are used in essential car components like door panels and pillars, instrument panels, seats, armrests and gear shift covers. The company's emphasis on quality and innovation has driven its rise to become the second-largest supplier in Europe. TMG Automotive has consistently adapted to the market's evolving needs, integrating environmental standards and adopting advanced manufacturing practices to maintain its competitive edge.

The company operates two factories in Portugal (Guimarães and Vila Nova de Famalicão), and, through international partnerships, in the United States, and China, with plans to open additional facilities in the US and Africa by 2025. Currently, the company employs 750 people, including 145 highly qualified staff, with 7 holding doctoral degrees. TMG Automotive has an annual turnover of around 141 million euros, with a significant portion of its production focused on exports.

2. Participation in the MIT Portugal Programme

Timeline of Involvement and Key Activities

TMG's participation in the MIT Portugal programme began in 2008 (1st phase). At the time, TMG was a traditional manufacturer with significant technical expertise but limited exposure to disruptive innovation. CEO Isabel Furtado, who had experience in international markets and an appreciation for MIT's global reputation, saw the programme as a strategic opportunity to inject fresh ideas into the company and drive it toward innovation-led growth.

TMG Automotive became an affiliated industrial partner of *the Engineering Design and Advanced Manufacturing* (EDAM) area of the programme and would remain so for all three phases[34]. Throughout phases 1 and 2 of MIT Portugal, the EDAM area offered a PhD programme – Leaders for Technical Industries (LTI) – and a Master of Business Engineering – Technology Management Enterprise (TME) – both designed to be in close connection with technically advanced industries, and through which TMG Automotive hosted student internships.

Overall, TMG Automotive was involved with the MIT Portugal in several activities, including:

- Hosting EDAM/LTI PhD students for industry-oriented research projects.
- Development of collaborative R&D projects funded by the programme (e.g. Smart Interiors project).
- Knowledge exchanges with MIT experts, including visits from TMG staff to MIT and MIT experts to TMG.

[34] Later being affilliated with the Digital Transformation in Manufacturing area in Phase 3 of the programme.

- TMG's Product Development Coordinator enrolled and graduated from the MIT Portugal Technology Management and Enterprise (TME) Master's programme in 2010, later becoming the firm's R&D director.

CEO Isabel Furtado is currently the Portuguese Industry Representative in the programme's Governing Committee.

The Smart Interiors Project

From 2009 to 2012, TMG Automotive participated in the "Development of Integrated Systems for Smart Interiors" project, funded through the 2008 Call for Scientific Research and Technological Development Projects under the MIT-Portugal Programme. The project was led by the University of Porto (Faculdade de Engenharia) and involved several universities, as well as three other companies.

The objective of the project was to develop smart devices and materials for automotive interiors that incorporate sensor and actuator capabilities for both conventional and new functions in terms of safety, comfort, performance, aesthetic and information processing, with the aim of saving weight, increasing functions and reducing both the component and assembly costs. In the design of novel integrated systems for smart interiors, the research team developed functional prototypes with integrated optical fibre sensors in polymeric foils. An automated system for the integration of optical fibre sensors in line with the industrial manufacturing of polymeric foils has been achieved. A model to evaluate the cost of the integration process with full cost break-down and sensitivity analysis was also developed.

From the perspective of TMG Automotive, the possibility to embed sensors in traditional polymeric foils for automotive interior trims was an extremely attractive and novel concept, adding relevant value to their product and significant positive outcomes regarding the technological content brought to the company.

Table E 3. Development of Integrated Systems for Smart Interiors project – Key Figures

Title of the Project:	**Development of Integrated Systems for Smart Interiors**
Start Date:	01/07/2009
End Date:	31/12/2012
FCT Funding:	198.167,00€ (145.174,51€ eligible expenditure)
Other Funding:	241.960,00€
Partners Involved: • Principal Investigator: Francisco Pires, FE/UP • MIT Collaborators: R Roth, Qui Holmes, T Wierzbicki • Institutions/Research Centres: IST/UTL, U Minho • Companies: TMG Automotive, Fibersensing, Sunviauto, Iber-Oleff	
Main Outputs: • 7 prototypes • 18 scientific publications • 31 communications • 9 reports • 3 seminars and conferences organized	

Source: data from FCT.

3. Key Outcomes and Achievements

Innovation and Technological Advancement

TMG's participation in the MIT Portugal programme resulted in a number of technical breakthroughs that helped positioned the company at the forefront of innovation in the automotive interiors industry. For example, the development of polymer foils with embedded sensors was a particularly significant achievement, allowing TMG to introduce intelligent systems into car interiors produced by the company for the first time. The partnership with MIT was critical in providing TMG with the expertise needed to execute more complex projects. MIT's technical support and research infrastructure allowed TMG to experiment with novel materials and processes that it would not have been able to develop on its own.

Cultural and Organizational Change

The most profound impact of the partnership with MIT Portugal was the organizational and cultural transformation within TMG Automotive. Before joining the programme, the company's approach to innovation was relatively traditional, focusing on incremental improvements rather than disruptive breakthroughs. However, exposure to MIT's forward-thinking mindset instilled a culture of continuous innovation within TMG, leading directly to the company's first patents.

Another notable organizational outcome of TMG Automotive's participation in the MIT Portugal programme was the creation of a sustainability department. This department was established in response to TMG's involvement in projects focused on sustainable materials, such as biopolymer-based automotive components, which the company explored as part of its collaboration with MIT. By integrating sustainability into its R&D processes, TMG began to align its product development with circular economy principles. This strategic move allowed the company to develop innovative, eco-friendly solutions for the automotive industry and positioned TMG as a leader in sustainable manufacturing. The sustainability department works closely with the innovation team to ensure that new products are designed with both performance and environmental impact in mind. In time, this change has helped TMG secure key contracts, such as becoming a global supplier of interiors for Volvo's Polestar 0 project, which aims at developing a truly climate-neutral car by 2030.

Intellectual Property Growth

This cultural shift had tangible outcomes, especially in what concerns intellectual property. TMG Automotive went from having no patents in 2010 to registering 85 patents by 2023, covering a wide range of innovations, from new materials to manufacturing processes. The strategic focus on patenting has had a direct economic impact on TMG, including individual patents with large profitability, generating annual revenues of up to 14 million euros. The company's improved intellectual property portfolio, as well as the organizational focus on sustainability, also played a critical role in securing favourable financing terms. As an example of this, TMG was able to secure a 40 million euros loan from the European Investment Bank (EIB), thanks in large part to its robust innovation strategy and patent portfolio.

4. Challenges and Solutions

Adapting to New Technologies

Introducing disruptive innovation into a traditional manufacturing company like TMG presented its own challenges, particularly in integrating new R&D initiatives without disrupting existing processes. Often TMG faced challenges with the integration of new technologies and

research results, which did not always lead to commercial value. For instance, on a MIT-affiliated research project involving biodegradable materials for car doors, the company initially struggled with durability issues, where the material degraded too quickly for practical use. Although the project did not lead to immediate commercial success, it provided valuable insights into the properties of biopolymers and the potential for their use in other, less critical automotive components. This experience was crucial in helping TMG refine its approach to sustainable materials. The lessons learned from this project laid the groundwork for future innovations, particularly in the area of circular economy and material reuse.

Collaborative Challenges with Academia

A recurring challenge for the company, when working with universities, was balancing the academic research timelines with the immediate needs of a fast-paced industrial environment. TMG had to navigate the often slower pace of academic research, which did not always align with the company's production cycles and market opportunities. However, the company also credits the partnership with MIT as having helped to bridge this gap. The inclusion of industry-oriented research themes in the EDAM/LTI programme, and the hosting of PhD students for hands-on research helped fostering a mutual understanding of industry needs and academic goals, instilling a more open mindset company-wide.

5. Long-Term Impact

International Expansion and Competitive Positioning

TMG's participation in the MIT Portugal programme played an important role in the company's international expansion. The knowledge, cultural shift and innovation capacity gained through the programme enabled TMG to compete globally, securing contracts with prominent automakers such as BMW and Mercedes. Furthermore, the company sought new pathways for international expansion, establishing a partnership with a similar group in Boston (USA) and a production facility in China, with plans to open a new factory in the United States and one in Africa over the next years.

Intellectual Property and Financial Growth

TMG's enhanced focus on innovation led to a sharp increase in intellectual property in the long term. As already mentioned, TMG went from having no patents in 2010 to holding 85 patents by 2023, an expansion that CEO Isabel Furtado attributes directly to the impact from the participation in MIT Portugal in both creating the conditions for TMG to perform more in-house and collaborative R&D activities and also building the company's capacity in the protection of intellectual property rights. In the long term, this has also brought significant economic benefits to the company who holds high-turnover patents.

Ongoing Collaboration and Continuous Innovation

TMG's long-term collaboration with academia continues to drive its innovation efforts, ensuring a steady flow of new research and ideas. Originally driven by the company's proximity to the University of Minho, the company has also developed new ongoing partnerships with other national academic institutions through MIT Portugal activities, including the University of Porto, University of Coimbra and NOVA (Universidade Nova de Lisboa). This continuous collaboration with academia has helped TMG to stay at the forefront of scientific and technological fields such as new materials and advanced manufacturing, as well as expanding its R&D efforts to new areas of knowledge. An example of this is the participation of TMG Group in five of the Mobilising Agendas approved in Portugal's Recovery and Resilience Plan. These include sectors as diverse as the textile industry, production technologies, two-wheel vehicles, as well

as the Blue Bioeconomy Agenda, where TMG is coordinating a work package on researching the use of marine-derived materials, such as algae and recycled fishing nets, to create innovative, eco-friendly textile products.

6. *Conclusion*

TMG Automotive's participation in the MIT Portugal programme has been transformative for the company, with particular impact on TMG's approach toward continuous innovation, from which the company continues to obtain significant economic benefits. The increased focus on innovation, sustainability and intellectual property has opened new markets and opportunities for TMG, while the ongoing collaboration with MIT and Portuguese universities continues to drive the company's innovation strategy and success, standing as a testament to the importance of industry-academia partnerships in fostering long-term innovation and growth.

Case Study Methodology

Method	**Participant(s)**	**Date**
Interview	Isabel Furtado, CEO TMG Automotive	11/07/2024

E3. Case Study: CRIA's Participation in the UTEN Programme

1. Introduction

CRIA (Divisão de Empreendedorismo e Transferência de Tecnologia) is the Technology Transfer Office (TTO) of the University of Algarve (UAlg), a small to medium-sized public university with approximately 10,000 students.

Founded in 2003/2004, CRIA plays a pivotal role in promoting entrepreneurship and fostering technology transfer between UAlg and industry. Its primary mission is to identify, support, and commercialize the research and innovations generated at UAlg. Initially operating as a small unit, CRIA became an integral part of the university's structure in 2009, the same year it participated in the University Technology Enterprise Network (UTEN) programme.

2. CRIA's Motivation and Participation in the UTEN Programme

The UTEN programme was launched in 2009 by the Fundação para a Ciência e a Tecnologia (FCT) in collaboration with The University of Texas at Austin as part of the Partnerhsip Programme. Its main objective was to elevate Portuguese TTOs to a globally competitive level by providing them with international exposure to best practices in science and technology commercialization. UTEN also focused on building a sustainable network of professionals and institutions that could collaborate to commercialize Portuguese technologies globally.

When CRIA joined the UTEN programme in 2009, it was still in the early stages of developing its technology transfer and commercialization capabilities. CRIA's decision to participate in the UTEN programme stemmed from its desire to accelerate its learning curve in technology transfer and develop stronger international connections. Three people from the CRIA staff were selected to join the first phase of the programme in 2009. A fourth person also participated in the second phase.

CRIA's primary motivations for joining UTEN were:

- To gain international experience in science & technology (S&T) commercialization.
- To bring back best practices that could be adapted to the Portuguese context.
- To strengthen CRIA's international networks, particularly with leading institutions in the United States.
- To help developing advanced technology transfer processes at UAlg.

3. Key Activities

First Stage: Intensive Training at the IC² Institute

In May 2009, staff from CRIA participated in a two-week intensive training at the IC² Institute at The University of Texas at Austin. This training also brought together professionals from various Portuguese universities and TTOs. This first training emphasized the development of skills in technology licensing, commercialization, and entrepreneurship. The IC² Institute provided real-world examples and allowed the participants to engage in case studies that mirrored the challenges faced by TTOs globally. According to Hugo Barros, one of CRIA's participants, these two weeks were not only valuable for gaining specific knowledge but also for fostering a sense of community among the Portuguese participants who had the opportunity to discuss common challenges, share ideas, and develop a network of peers across the country.

Second Stage: Internships in the US

In the second stage, CRIA staff had the opportunity to enrol in longer-term internships in the US, with some being hosted at CMU and one person at Texas A&M University-San Antonio.

Barros took part on a three-month internship at CMU in Pittsburgh, where he worked closely with the Center for Technology Transfer and Enterprise Creation (CTTEC). During this period, Barros focused on developing CRIA's internal processes by working on specific technologies from UAlg and exploring opportunities to apply them in international markets. He also collaborated with CMU's experts on improving CRIA's capabilities in technology assessment and commercialization.

Barros' internship was particularly focused on fostering internationalization. He not only gained insight into CMU's methods of commercialization but also worked on technology transfer projects that involved both UAlg's innovations and those from CMU. This collaboration enabled CRIA to expand its knowledge base in identifying market opportunities and learning how to better structure licensing agreements.

4. Outcomes and Impact

Knowledge Transfer and Best Practices

One of the most significant outcomes of CRIA's participation in UTEN was the direct transfer of knowledge and best practices in technology transfer. According to Hugo Barros, CRIA adopted new frameworks for decision-making in technology licensing, including decision packages that streamlined the process of evaluating technologies for commercialization. CRIA also implemented new licensing strategies, drawing from the expertise gained during its time at CMU and The University of Texas at Austin.

For instance, CRIA learned valuable negotiation and marketing techniques, which helped it structure better licensing deals for technologies emerging from UAlg. Barros noted that through UTEN, CRIA was able to apply advanced tools that helped assess market readiness for various innovations, ultimately contributing to a more robust commercialization strategy at UAlg.

Networking and International Collaborations

CRIA's participation in UTEN also significantly bolstered its international network. Barros pointed out that the relationships formed during the UTEN programme were not limited to the initial training and internship periods. In fact, CRIA continued to maintain close ties with institutions like CMU, which later led to additional collaborations. Barros stated that the networks established through CRIA's participation in the UTEN programme became so dynamic that CRIA later hosted the Center for Technology Transfer and Enterprise Creation (CTTEC) and CMU in the Algarve to conduct training sessions for the University of Algarve and regional stakeholders. Building on the relationships formed during their internships in the US, CRIA played a central role in organizing international technology transfer courses funded by the US Department of State's Bureau of Educational and Cultural Affairs - Cultural and Leadership Development Fund (CLDF). These courses were held in Morocco, Spain, and the Algarve, and were designed for participants from Morocco, Tunisia, and North Africa.

Spin-offs and Start-ups

Since its participation in UTEN, CRIA has contributed significantly to the creation of start-ups and spin-offs in the Algarve region. Barros noted that while CRIA was still relatively new to technology transfer in 2009, the experience gained through UTEN allowed the office to establish

a solid foundation. As of today, CRIA has facilitated the launch of over 200 start-ups, with some reaching global markets and generating revenues between 5 to 7 million euros annually.

5. Challenges Faced

Regional Focus and Programme Limitations

While CRIA gained much from the UTEN programme, Barros pointed out several challenges. One of the main issues was the programme's focus on some of the top higher education institutions in Portugal, which sometimes left smaller institutions with less developed TTOs like UAlg feeling somewhat sidelined. Although CRIA benefited greatly from the programme, it was clear that larger TTOs, such as those at the University of Porto, had more ability to fully exploit the opportunities provided by UTEN.

Another challenge was the relative immaturity of CRIA's technology portfolio at the time. Unlike larger universities with established portfolios of patents and technologies ready for market, CRIA was still building its pipeline. As a result, its participation in UTEN was more focused on gaining foundational knowledge rather than immediately capitalizing on commercialization opportunities.

Lack of Continuity

Hugo Barros also emphasized that after the initial phases, the UTEN programme did not maintain the same level of engagement with all participants. This lack of continuity was felt especially in regions like the Algarve, where institutions like CRIA could have benefited from ongoing support and resources. Despite these limitations, CRIA still managed to leverage its participation in UTEN to make significant advancements.

6. Conclusion

CRIA's participation in the UTEN programme was a transformative experience. For smaller universities like UAlg, UTEN served as a critical catalyst for professionalization and international networking. The structured learning sessions at the IC² Institute and the subsequent internships exposed CRIA's staff to advanced practices in technology licensing, market assessment, and entrepreneurship, which they were able to adapt and implement at UAlg. This hands-on experience helped CRIA overcome some of the typical barriers faced by smaller universities, such as limited resources and a lack of established technology portfolios. Through its involvement, CRIA gained critical knowledge in technology transfer that strengthened its capabilities as a TTO, and allowed it to build a robust international network. The programme not only improved CRIA's internal processes but also contributed to the growth of the start-up ecosystem in the University of Algarve.

Case Study Methodology

Method	**Participant(s)**	**Date**
Interview	Hugo Barros, coordinator of CRIA	24/07/2024

E4. Case Study: Feedzai's Participation in the CMU Portugal Programme

1. Company Profile

Feedzai is a Portuguese fintech company that specialises in the detection and prevention of financial crime through the utilisation of artificial intelligence (AI) and machine learning. The company develops risk management solutions designed to assist financial institutions, payment providers, and merchants in the identification and mitigation of fraud and other financial crimes. Headquartered in Coimbra, the company was founded in 2011 by Nuno Sebastião, Pedro Bizarro and Paulo Marques. Today, Feedzai has a global reach, with offices in the United States, Europe, Latin America, and Asia. Its technology is utilized for transaction monitoring in 190 countries worldwide. As of its most recent funding round, the company has a valuation exceeding USD 1.5 billion and employs over 600 people. The company's platform, designated "RiskOps," is designed to process and analyse substantial quantities of data, thereby assisting financial institutions in the prevention of fraud while simultaneously enhancing operational efficiency.

2. Participation in the CMU Portugal Programme

Involvement of Founders in the Programme

Feedzai's link to the CMU Portugal programme began through two of its co-founders, Paulo Marques and Pedro Bizarro, who were both involved in the programme as faculty members and researchers. In 2006, Paulo Marques, then a researcher at University of Coimbra, became the first Portuguese faculty member certified by CMU in the Professional Master's in Software Engineering. He helped implement the dual-degree system in Portugal and served as an Adjunct Teaching Professor at CMU. Later, after co-founding Feedzai, Marques became Scientific Director of the CMU Portugal programme, also contributing to research and the doctoral programme. He has since participated in collaborative projects and helped establish the CMU Portugal Academy, focusing on product management education.

Paulo Marques emphasized that the early involvement of Feedzai's founders in the CMU Portugal programme was crucial to the company's development. Their participation in the dual-degree system and various research projects enabled them to recruit talented graduates, who became key members of Feedzai's initial team. Marques also noted that their connection to CMU significantly boosted the company's credibility, particularly when raising venture capital in the U.S. He believes that these early links to CMU provided a solid foundation for Feedzai's technological growth and global expansion

Recruitment from the CMU Portugal's dual degree programmes

One of the most significant benefits Feedzai gained from the CMU Portugal programme was access to highly trained talent. The programme's dual-degree system in Software Engineering, in which students split their studies between Portugal and Carnegie Mellon University, produced graduates with advanced technical expertise and practical, industry-relevant experience. Many of these graduates were recruited into Feedzai's early team, playing vital roles in the company's growth. Paulo Marques emphasized that the programme provided a pool of talent that was not only highly skilled but also familiar with cutting-edge software engineering practices from both academic and industry perspectives. These graduates were instrumental in leading various parts of the company's operations, particularly in its engineering and product development departments. For example, some of the key technical leaders at Feedzai today came directly from this programme, and their deep expertise in AI, machine learning, and software engineering contributed to the development of Feedzai's core technologies.

Research Collaborations: The CAMELOT Project

Feedzai also participated in the CMU Portugal programme through collaborative research projects, such as the CAMELOT project. This project, approved in the 2019 Large-Scale Collaborative Research call, is a partnership between Feedzai, CMU, and three Portuguese universities. It aimed to create a machine learning platform capable of training AI models with anonymized data. The goal was to address privacy issues that often hinder AI model training, while optimizing cloud resource usage for improved cost-efficiency and performance.

Table E 4. The CAMELOT project – Key Figures

Title of the Project:	CAMELOT - autonomiC plAtform for MachinE Learning using anOnymized data
Start Date:	01/07/2020
End Date:	30/11/2022
Project Budget:	1 946 611,03 €
Funding:	806 673,97 € (ERDF) 301 306,99 € (FCT) 629 759,09 € (CMU)
Partners Involved: • Feedzai, S.A. • University of Coimbra • University of Lisbon (Faculdade de Ciências) • Instituto Superior Técnico • Carnegie Mellon University (Computer Science Department)	
Main Outputs[1]: • 35 scientific publications accepted in peer-reviewed conferences or journals; • 5 tutorial or keynote presentations at conferences; • 1 book chapter; • 3 provisional patent applications submitted; • 1 patent granted; • 4 awards to Camelot Msc students; • 8 Msc thesis concluded; • 6 Msc thesis on-going; • 5 Phd thesis on-going; • 1 project-wide student presentation day with 4 sessions and 9 technical presentations; • 1 open-source suite of six fraud detection datasets with multiple bias conditions.	

[1]As of 30 september 2022 (current status of ongoing outputs is unknown).
Source: data from FCT and CMU Portugal.

3. Key Outcomes and Achievements

Access to Skilled Talent

One of the most significant outcomes of Feedzai's participation in the CMU Portugal programme was access to a highly skilled talent pool. The dual-degree system in Software Engineering produced graduates with both technical expertise, many of whom were recruited into Feedzai's early team and became integral to the company's operations, especially in engineering and product development. This access to talent continues today, as Feedzai still actively recruits from the CMU Portugal programme, maintaining a pipeline of highly qualified professionals who contribute to the company's ongoing growth and innovation.

Access to Networks through the Faculty Exchange Programme

The Faculty Exchange Programme played a significant role in expanding Feedzai's access to valuable academic and professional networks. The exchange allowed Portuguese faculty members (including those involved in Feedzai) to spend time at CMU, fully participating in teaching, research, and administrative activities. This immersion helped build strong, lasting connections with CMU faculty and researchers that proved crucial in fostering collaboration and trust, which directly benefited Feedzai. The connections established through the exchange programme facilitated further research partnerships, providing Feedzai with access to expertise and insights that supported its technological development and growth. In the long term, the relational capital gained through these networks also enhanced Feedzai's reputation and credibility, particularly when raising capital and establishing partnerships in the U.S. market.

4. Long-term Impacts

Enhanced Credibility and access to financial markets

Feedzai's association with CMU Portugal also played a crucial role in opening doors for the company in U.S. markets, notably in securing venture capital. Paulo Marques underscored that the association with CMU enhanced Feedzai's credibility with U.S. investors, particularly during its initial fundraising endeavors. The endorsement of CMU faculty played a pivotal role in instilling confidence in venture capital firms, which was crucial for the company's ability to raise funds and expand.

Since its foundation, Feedzai has raised a total of USD 277,465,392 in funding over 8 rounds. A total of 12 investors have provided funding for Feedzai, including US-based entities such as Kohlberg Kravis Roberts, Citi Ventures, DCVC, Sapphire Ventures and Oak HC/FT (data sourced from Crunchbase).

Influence on Industry Standards and Development of Local Expertise

One of the long-term impacts that derive from Feedzai's involvement in the CMU Portugal programme has been the sustained recruitment of highly skilled professionals, which has helped to retain talent in Portugal and contributed to the development a stronger local tech ecosystem. By drawing from a pool of graduates with advanced training, Feedzai has facilitated the growth of expertise in the field of artificial intelligence and machine learning, training product managers in-house, through mentorship programmes with CMU-affiliated high-skilled individuals. Over time, this has contributed to raising the standards for technical talent in Portugal.

Feedzai's strong ties to academic research are a key part is the company's DNA. The company's ability to innovate, supported by the collaborative research facilitated by the programme, has allowed it to play a role in shaping industry practices. Feedzai's success has contributed to Portugal's reputation as a hub for innovation in AI and financial technologies. Today, Feedzai has an intellectual property portfolio that includes 23 patents granted and 22 patents pending. The CAMELOT project alone generated four patent requests (1 granted and 3 pending).

5. Conclusion

While Feedzai is not a direct product of the CMU Portugal programme, the programme has played a key role in shaping the company as it exists today. The access to skilled talent, research collaborations, and the credibility gained through connections with CMU were fundamental in Feedzai's growth. These elements contributed to the company's ability to

innovate and raise significant venture capital. This case illustrates the type of impact the partnership programmes can have in fostering startups and spin-offs.

Case Study Methodology

Method	**Participant(s)**	**Date**
Interview	Paulo Marques, co-founder at Feedzai	27/09/2024

E5. Case Study: Unbabel and the CMU Portugal Programme

1. Company Profile

Unbabel is a software company in language operations, dedicated to creating translation solutions powered by artificial intelligence (AI) to provide high-quality, multilingual customer support solutions.

Unbabel's technology is particularly useful for companies with global customer bases, as it helps them overcome language barriers and offer support in multiple languages without the need for large teams of native-speaking agents. By integrating AI-driven translation with human review, Unbabel provides real-time translation services for channels like email, chat, and social media, enabling organizations to scale their multilingual support operations efficiently.

The company was founded in Lisbon, Portugal, in 2013 by CEO, Vasco Pedro, and co-founders João Graça, Sofia Pessanha, Bruno Silva, and Hugo Silva. It has offices in Lisbon, San Franisco, New York, London, Edinburgh, Timisoara and Cebu (Phillipines). Unbabel's platform is widely used by large enterprises, including brands like Microsoft, Netflix, Disney and PayPal.

2. *Participation in the CMU Portugal Programme*

Foundational Links to CMU Portugal

Unbabel's connection to CMU Portugal predates the company's founding, with key figures in its inception having participated in the programme. Unbabel's CEO, Vasco Pedro, completed his PhD at CMU in 2009, fostering a strong link with the university that continued into his professional life. Furthermore, André Martins, Unbabel's Vice President of Research, was an early participant in the CMU Portugal dual degree programme, gaining substantial experience and establishing connections that would later be significant for Unbabel. These early affiliations provided Unbabel with strong ties to CMU, which have influenced the company's development and shaped its research collaborations.

Research Projects

In 2015, Unbabel was involved in two Early Bird Projects carried out in the scope of the CMU Portugal Program: MT4M – Machine Translation For Microblogs and TRATAHI -Bringing Down Language Barriers on the Internet through Human-in-the-Loop JointTranscription and Translation, both involving national PIs from INESC-ID and US Pis from CMU.

During Phase 3 of the programme, Unbabel was the leader of Project MAIA, one of the large-scale collaborative research projects approved under the 2019 call. The MAIA project aimed to develop a multilingual conversational platform, supported by machine translation and dialogue systems, where AI agents assist human agents. Launched in 2020 and completed in 2023, the MAIA project was developed with partners Instituto de Telecomunicações (IT), INESC-ID, and CMU's Language Technologies Institute, with Professor Graham Neubig as a PI from CMU.

The primary goal of the MAIA Project was to develop a sophisticated, AI-powered conversational platform capable of delivering context-aware and culturally nuanced translations. This involved:

- New memory-efficient neural models for context-aware machine translation.
- New answer generation techniques to support the decisions of human agents.
- New techniques for conversational quality estimation and sentiment analysis.
- Integration of the scientific advances above into a full end- to-end product.

Table E 5. The MAIA project – Key Figures

Title of the Project:	MAIA: Multilingual Virtual Agents for Customer Service
Start Date:	01/04/2020
End Date:	30/06/2023
Project Budget:	2.217.253,40 €
Funding:	756.560,14 € (ERDF) 377.714,84 € (FCT) 577.228,18 € (CMU)
Partners Involved: • Unbabel, LDA • INESC ID – Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento em Lisboa • Instituto de Telecomunicações • Language Technologies Institute (Carnegie Mellon University)	
Main Outputs: • 38 scientific publications • 28 conferences • 10 PhD students involved • 5 internships at CMU	

Source: data from FCT and CMU Portugal.

The MAIA Project resulted in significant technological advancements that have greatly enhanced Unbabel's core multilingual translation platform. A primary focus of the project was on the development of memory-efficient neural models for context-aware machine translation. These models were designed to retain essential aspects of a conversation, such as customer preferences and conversational context, which are critical for delivering accurate and relevant translations.

Internships for CMU Portugal PhD Students and Graduates

To further strengthen its ties with the CMU Portugal Programme and enhance its research capabilities, Unbabel actively collaborates and recruits PhD students and recent graduates from the programme. Some of these students have benefited from internships, which are typically three-month placements at CMU. This internship culture has been of great value to Unbabel, providing interns access to CMU's resources and research environment, which are among the most advanced globally in the fields of AI and natural language processing. According to Paulo Dimas, Unbabel's VP of Innovation, these internships allow participants to gain valuable exposure to cutting-edge research methodologies and tools, which they subsequently apply to Unbabel's projects upon returning. This approach enables Unbabel to stay at the forefront of language technology while also fostering talent development within the company.

3. *Key Outcomes and Achievements*

Foundation and growth of the company

The foundation of Unbabel was influenced by the strong ties its founders and key personnel had with CMU, which laid the groundwork for its subsequent collaborations and research focus. Vasco Pedro, Unbabel's co-founder and CEO, and André Martins, the VP of AI Research, both were dual PhD graduates of the CMU Portugal programme, which significantly impacted Unbabel's direction. Paulo Dimas noted that these early ties have become integral to Unbabel's identity, shaping its approach to language technologies and its ongoing relationship with CMU Portugal: "We wouldn't see ourselves as we are now without these connections; it's like a part of who we are."

Talent Development and Recruitment

Unbabel's involvement with the CMU Portugal Programme has facilitated the recruitment and development of skilled talent, particularly dual degree graduates, but also through internships. The MAIA Project played a pivotal role in this by attracting highly qualified Ph.D. students from CMU Portugal to join Unbabel's research efforts. Five doctoral students participated in three-month internships at CMU, where they had access to advanced research facilities and worked alongside leading AI experts. These internships were instrumental in shaping Unbabel's talent pool, as they provided participants with hands-on experience that directly benefited the company's projects. The CMU Portugal programme has not only benefited Unbabel's research and development but has also contributed to building a strong talent pipeline that supports the company's long-term innovation goals. By consistently bringing in new talent with cutting-edge skills, Unbabel has been able to maintain a dynamic and forward-thinking workforce that drives its AI and NLP initiatives.

Academic and Scientific Contributions

The comapny's sustained and close collaboration with researchers and experts from CMU, has provided the company with significant advantages. By working closely with CMU's Language Technologies Institute, Unbabel has been able to access cutting-edge research and technologies, allowing it to incorporate the latest advancements into its own projects. The company has emphasized that the resources and expertise available at CMU are not easily found elsewhere, which has greatly benefited Unbabel's research efforts. The knowledge transfer from CMU researchers to Unbabel's team has been a critical factor in the company's ability to rapidly develop and deploy sophisticated language technologies.

The MAIA Project is a clear example of this collaborative advantage, resulting in key technological advances that directly improved Unbabel's product with direct impact on the competitiveness of the company. The project also resulted in significant academic output that included 38 peer-reviewed research papers and participation in 28 international conferences. This academic work has further reinforced Unbabel's reputation within the research community and as a leading company it its field.

Commercial Success and Market Impact

The collaboration of CMU has sometimes been instrumental in generating direct effects on Unbabel's commercial success. For example, the technological advancements reached with the MAIA project have significantly bolstered Unbabel's competitive position, with the MAIA-powered platform now contributing around 30% of the company's total revenue.

For the company, one of the greatest advantages of working closely with CMU's world-leading researchers has been its ability to maintain a rapid pace of innovation and being at the cutting

edge of technology, which has become a cornerstone of the company's competitive advantage. With Unbabel being able quickly integrate these advanced technologies into its products, this approach has allowed the company to lead the market with groundbreaking features. For example, the development of culturally aware translation capabilities in the MAIA Project positioned the company as the first in the world to offer translation services that account for cultural differences. This capability was leveraged in product marketing, allowing Unbabel to distinguish itself as a pioneer, successfully enhancing its brand, and earning new high-profile clients.

4. *Long Term Impact*

Enhanced Reputation and Attraction of Talent

Unbabel's collaboration with CMU through the CMU Portugal Programme has contributed to an enhanced reputation, especially in markets such as the United States, where affiliations with prominent research institutions can influence client and investor perceptions. According to Paulo Dimas, the connection to CMU has bolstered Unbabel's credibility, which has been beneficial in attracting high-profile clients.

This enhanced credibility has also positively impacted Unbabel's ability to attract skilled professionals. With Unbabel's workforce now exceeding 300 employees, the association with CMU Portugal has helped draw talent interested in working with a company involved in advanced research collaborations. The partnership with CMU has therefore supported Unbabel in building a team equipped to support its AI-driven initiatives and sustain its global operations.

Improved Access to International Markets

Unbabel's strengthened reputation and advanced technological capabilities have also facilitated its expansion into international markets. The company exports well over 90% of its sales, with around 60% of Unbabel's revenue is derived from the US market, where Unbabel serves major clients like Disney, PayPal, and Microsoft. Beyond the impacts in product performance and Unbabel's connection to CMU has also been a valuable asset in winning new business, especially in markets where American institutions are highly regarded. This association has helped Unbabel establish trust with clients globally, enabling the company to expand its reach and solidify its presence in competitive markets.

Improved Access to Funding and Venture Capital

Unbabel has raised a total of USD 91 million in funding over 7 rounds, with their latest funding raised on 2019 from a Series C round (data from Crunchbase). Top investors include Google Ventures, Y Combinator, Salesforce Ventures, Samsung NEXT and FundersClub. The partnership with CMU has been identified by Unbabel as a factor contributing to the company's enhanced capacity to secure funding, particularly from investors based in the United States. Portuguese companies frequently encounter difficulties in obtaining investment from American capital sources, largely due to perceptions about the local market's limitations. Nevertheless, Unbabel's affiliation with CMU has proved pivotal in allaying some of these concerns, through the provision of references and the demonstration of the company's commitment to advanced research and its connection to a leading US university. This connection has made Unbabel more appealing to investors who value strong academic affiliations and cutting-edge technology, conferring an important competitive advantage in funding rounds.

5. Conclusion

The ties between Unbabel and the CMU Portugal programme, including direct participation through research initiatives, have been pivotal in facilitating the company's growth and advancement. The partnership with CMU has not only provided Unbabel with access to advanced research and expertise, but has also reinforced its reputation, particularly in the United States, where these connections are highly regarded. The company's involvement in a large-scale collaborative project (project MAIA) has resulted in the development of a pioneering technology, which has served to enhance its competitive advantage within the language technology market. Unbabel's capacity to incorporate the state-of-the-art solutions developed in collaboration with CMU into its product range has also positioned it as a distinctive player in the global market, enabling it to meet the demands of a global client base that includes industry leaders such as Disney, Microsoft, and PayPal. Moreover, Unbabel's partnership with CMU has enabled the company to gain access to international markets and venture capital, thereby overcoming the difficulties typically encountered by Portuguese businesses in securing American investment.

Case Study Methodology

Method	**Participant(s)**	**Date**
Interview	Paulo Dimas, Vice-President of Innovation at Unbabel	26/09/2024

Appendix F: Programme Affiliates

CMU Portugal Program Affiliates – Phase I

Table F 1.CMU Portugal Program Affiliates (Phase I) - Agreement for International Cooperation in Science and Technology and Higher Education

Agreement for International Cooperation in Science and Technology and Higher Education
• Escola de Engenharia, Universidade do Minho (EE/UM) • Faculdade de Ciências, Universidade de Lisboa (FCT/UL) • Faculdade de Ciências Económicas e Empresariais, Universidade Católica Portuguesa (UCP) • Faculdade de Ciências e Tecnologia, Universidade de Coimbra (FCT/UC) • Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa (FCT/UNL) • Faculdade de Engenharia, Universidade do Porto (FEUP) • Instituto Superior de Engenharia do Porto, Instituto Politécnico do Porto (IPP) • Instituto Superior Técnico, Universidade Técnica de Lisboa (IST) • Universidade de Lisboa (UL) • Universidade do Algarve (UALG) • Universidade de Aveiro (UAV) • Universidade da Beira Interior (UBI) • Universidade da Madeira (UMAD) • Centro de Ciência e Tecnologia da Madeira (by amendment to June 2007) • Instituto de Engenharia de Sistemas e Computadores Investigação e Desenvolvimento em Lisboa (INESC-ID) • Instituto de Engenharia de Sistemas e Computadores do Porto (INESC Porto) • Instituto de Sistemas e Robótica – Lisboa (ISR Lisboa) • Instituto de Telecomunicações (IT) • Instituto de Soldadura e Qualidade (ISQ) • Agência para a Sociedade do Conhecimento (UMIC) • Fundação para a Computação Científica Nacional (FCCN)

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 2. CMU Portugal Program Affiliates (Phase I) - Industrial Affiliate

Industrial Affiliate
• Altitude Software - Sistemas e Serviços, S.A. • Critical Software, S.A. • ISA – Instrumentação e Sistemas de Automação, Lda. • MNI – Médicos na Internet Saúde na Internet, S.A. • Multicert – Serviços de Certificação Electrónica, S.A. • Priberam Informática, S.A. • Skysoft Portugal - Software e Tecnologias de Informação, S.A. Furthermore, the following companies associated with INOVA-RIA: Association of Companies for an Innovation Network in Aveiro: • MAISIS - Sistemas de Informação Lda • MICRO I/O - Serviços de Electrónica, Lda • Mobicomp – Computação Móvel, S.A. • Ponto C - Desenvolvimento de Sistemas De Informação, Lda • Present Technologies - Serviços Informáticos, Lda.

Industrial Affiliate
• Rederia - Redes de Dados, Lda.
• Shortcut - Consultoria e Serviços de Tecnologias de Informação, Lda
• Telbit - Tecnologias de Informação, Lda

Source: Agreements and data submitted by the Programme Managing Bodies

CMU Portugal Program Affiliates – Phase III

Table F 3. CMU Portugal Program Affiliates (Phase III) - Industrial Affiliate

Industrial Affiliate
• Accenture Consultores de Gestão, S.A.
• Altice Portugal, S.A.
• CEIIA – Centro de Engenharia e Desenvolvimento
• Farfetch Portugal Unipessoal, Lda
• Feedzai
• NOS Comunicação S.A.
• Outsystems – Software em Rede, S.A.
• Priberam Informática, S.A.
• Remote Tech Unipessoal, Lda
• Talkdesk inc. Portugal Unipessoal, Lda
• TEKEVER S.A.
• Thales Portugal S.A.
• Unbabel Lda
• UNIPLACES – Universityplace serviços internet Lda
• Veniam Unipessoal Lda.

Source: Agreements and data submitted by the Programme Managing Bodies

MIT Portugal Program Affiliates – Phase I

Table F 4. MIT Portugal Program Affiliates (Phase I) - Agreement for International Cooperation in Science, Technology, and Higher Education

Agreement for International Cooperation in Science, Technology, and Higher Education
• Centro de Neurociências e Biologia Celular, Universidade de Coimbra (CNBC), Laboratório Associado
• Escola de Engenharia da Universidade do Minho
• Faculdade de Ciências da Universidade de Lisboa
• Faculdade de Ciências e Tecnologia da Universidade de Coimbra
• Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa
• Faculdade de Engenharia da Universidade do Porto
• Instituto de Biologia Molecular e Celular, Universidade do Porto (IBMC), Laboratório Associado
• Instituto de Biotecnologia e Bioengenharia (IBB), Laboratório Associado
• Instituto de Engenharia de Sistemas e Computadores do Porto (INESC-Porto), Laboratório Associado
• Instituto de Sistemas e Robótica - Lisboa (ISR), Laboratório Associado
• Instituto de Tecnologia Química e Biológica, Universidade Nova de Lisboa (ITQB), Laboratório Associado
• Instituto Superior de Economia e Gestão da Universidade Técnica de Lisboa
• Instituto Superior Técnico da Universidade Técnica de Lisboa

Agreement for International Cooperation in Science, Technology, and Higher Education
• Laboratório Associado de Química Verde Tecnologias e Processos Limpos (REQUIMTE), Laboratório Associado • Laboratório Nacional de Engenharia Civil (LNEC) • LAETA - Laboratório Associado de Energia, Transportes e Aeronáutica, Laboratório Associado

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 5.MIT Portugal Program Affiliates (Phase I) - Institutional Partnership Agreement

Institutional Partnership Agreement
• Governo Regional dos Açores – Secretaria Regional de Ciência, Tecnologia e Equipamentos

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 6. MIT Portugal Program Affiliates (Phase I) - Cooperation Protocols

Cooperation Protocols
• AREAM – Agência Regional da Energia e Ambiente da Região Autónoma da Madeira • ARENA – Agência Regional da Energia e Ambiente da Região Autónoma dos Açores • Critical Move S.A. • Região Autónoma dos Açores • Universidade dos Açores

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 7. MIT Portugal Program Affiliates (Phase I) - Industrial Affiliates

Industrial Affiliates
• Agni-Inc • Alfama • Altakitin Corp. • Amorim Industrial Solutions • Autoeuropa Lda • Bial • Bioalvo • Biotecnol, S.A. • Biotempo • Biotrend • BRISA • Celoplás, Plásticos para a Indústria, S.A. • CIPAN – Companhia Industrial Produtora de Antibióticos, S.A. • Crioestaminal • Deimos Engenharia, SA • ECBio • EDP Inovação • EDP, SA • Efacec, SA • Eletricidade dos Açores (EDA) • Frulact • GALP Energia

Industrial Affiliates
• Galp Energia, SA • Iber-Oleff, Componentes Técnicos em Plástico S.A. • Inapal Metal S.A. • Inapal Plásticos S.A. • Manuel da Conceição Graça Lda • Martifer, SA • Mota-Engil SGPS, SA • Odebrecht • Plasdan Lda • Rede Ferroviária de Alta Velocidade, S.A. (RAVE) • REN - Redes Energéticas Nacionais, SA • Siemens • SGC Energia, SGPS, S.A. • Simoldes Plásticos Lda • Stemmatters • Sunviauto, Indústria de Componentes de Automóveis S.A. • TMG Automotive • Unicer • WS Energia, S.A.

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 8.MIT Portugal Program Affiliates (Phase I) - Research Affiliates

Research Affiliates
• Alstom • APVE • BAE • Biodevices • Biotempo Lda. • Biotrend – Inovação e Engenharia em Biotecnologia, S.A. • CEIIA - Centro de Engenharia e Desenvolvimento, Associação de Direito Privado • Continental Mabor – Indústria de Pneus, S.A. • Crioestaminal – Saúde e Tecnologia, S.A. • Critical Move, S.A. • Delphi • Delta • Dueto • Easybus • ECBio – I&D em Biotecnologia, S.A. • Edia • EDP Distribuição • EDP Inovação, S.A. • EDP, S.A. • EFACEC, S.A. • Eletricidade dos Açores, S.A. (EDA) • EVIberia

Research Affiliates
• FiberSensing • Galp Energia, S.A. • General Motors • Geotaxis • Hovione S.A. • INAC • INiR • Inteli • Intelligent Sensing Anywhere, S.A. • ISA, S.A. • Life Technologies • MacLaren Electronics • Novabase • Ober-Oleff – Componentes Técnicos de Plásticos, S.A. • Optimus • Petratex • Plus Wireless Biosignals • Portucel Florestal, S.A. • Prio Advanced Fuels • Prio Biocombustíveis • PRP • Quercus • Rede Ferroviária de Alta Velocidade, S.A. (RAVE) • Simoldes Plásticos, Lda. • STCP • Stemmatters, Biotecnologia e Medicina Regenerativa Lda. • Sunviatuo, S.A. • TMG Automotive • Tranquilidade • VW Autoeuropa

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 9. MIT Portugal Program Affiliates (Phase I) - Sustaining Public Member Membership Agreement

Sustaining Public Member Membership Agreement
• Massachusetts Institute of Technology Energy Initiative (MITEI)

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 10. MIT Portugal Program Affiliates (Phase I) - Institutional Affiliates

Institutional Affiliates
• Associação Empresarial de Portugal – Câmara de Comércio e Indústria • Associação Industrial Portuguesa – Confederação Empresarial • Fórum de Administradores de Empresas • Ordem dos Engenheiros • Proforum – Associação para o Desenvolvimento da Engenharia

Source: Agreements and data submitted by the Programme Managing Bodies

MIT Portugal Program Affiliates – Phase II

Table F 11. MIT Portugal Program Affiliates (Phase II) - Industrial Affiliates

Industrial Affiliates
• ADENE • ADIRA • AJC • Alfama, Inc. • Alstom • Altakitin Corp. • ANA • Bioalvo S.A. • Biotecnol, S.A. • Biotempo Lda. • Biotrend - Inovação e Engenharia em Biotecnologia, S.A. • BOSCH Car Multimedia • BRISA • Caetanobus • Câmara Municipal de Lisboa • Carris • CATIM • CEiiA • Celgene Cellular Therapeutics • Cell2B • Celoplás - Plásticos para a Indústria, S.A., • CENTI • CIE Automotive • CIPAN - Companhia Industrial Produtora de Antibióticos, S.A. • Colep • Continental Mabor Indústria de Pneus, S.A. • CP • Crioestaminal - Saúde e Tecnologia, S.A. • ECBio - I&D em Biotecnologia, S.A. • EDP Distribuição • EDP, Energias de Portugal • EFACEC, S.A. • Embraer • Embraer Portugal Compósitos • Embraer Portugal Metálicas • EP • FiberSensing • Ford Research & Advanced Engineering Europe • GM • Grupo AMI - Assistência Médica Integral (Casa de Saúde de Guimarães, SA) • Grupo Bial • Grupo Frulact • Hospital Privado de Guimarães

Industrial Affiliates
• Hovione S.A. • Iber-Oleff - Componentes Técnicos de Plásticos, S.A. • Iberomoldes • IBM • INEGI • Innocore Pharmaceuticals • ITA (Brasil) • ITDS • Laborial • LiquidPiston • Metalsa • Metro • Mobiag • Novabase • OGMA • OLESA • Optimal • Petrotec • Portugal Telecom • R&D Nester • RAVE • REFER • REN, Redes Energéticas Nacionais, S.A. • Rolls-Royce • SAR Robotica • SATA • Simoldes Plásticos, Lda. • Soprefa • Stemmatters, Biotecnologia e Medicina Regenerativa Lda. • TAP • TMG Automotive • Transdev • Unicer Bebidas, S.A. • USA Rail Administration • VW Autoeuropa • Zipcar

Source: Agreements and data submitted by the Programme Managing Bodies

MIT Portugal Program Affiliates – Phase III

Table F 12. MIT Portugal Program Affiliates (Phase III) - Industrial Affiliates

Industrial Affiliates
• Alcatel Submarine Networks • BOSCH Car Multimedia Portugal • CEIIA - Centro de Engenharia e Desenvolvimento, Associação de Direito Privado

Industrial Affiliates
• Cintal • Clarke & Modet • Continental-Mabor • ControlConsul • Domingos da Silva Teixeira S.A. – Grupo DST • dstgroup (dstelecom) • Edisoft – Empresa de Serviços e Desenvolvimento de Software, S.A. • EDP Inovação S.A. • Efacec Power Solutions SGPS, S.A. • GMVIS Skysoft S.A. • Iber-Oleff – Componentes Técnicos em Plástico, S.A. • NOS Comunicações S.A. • Spinworks • Stratosphere • Tekever S.A. • TMG – Tecidos Plastificados e Outros Revestimentos para a Indústria Automóvel, S.A. • Ubiwhere • Wolkswagen AutoEuropa • Zenithwings

Source: Agreements and data submitted by the Programme Managing Bodies

UT Austin Portugal Program Affiliates – Phase I

Table F 13.UT Austin Portugal Program Affiliates (Phase I) - Agreement for International Cooperation in Science, Technology, and Higher Education

Agreement for International Cooperation in Science, Technology, and Higher Education
• Agência de Inovação • Agência para a Sociedade do Conhecimento • Avepark • Escola de Engenharia da Universidade do Minho, • Escola Superior de Biotecnologia da Universidade Católica Portuguesa • Faculdade de Belas Artes da Universidade do Porto, • Faculdade de Ciências da Universidade de Lisboa, • Faculdade de Ciências e Tecnologia da Universidade de Coimbra, • Faculdade de Ciências e Tecnologia da Universidade Nova de Lisboa, • Faculdade de Ciências Sociais e Humanas da Universidade Nova de Lisboa, • Faculdade de Economia da Universidade do Porto, • Faculdade de Economia da Universidade Nova de Lisboa • Faculdade de Engenharia da Universidade do Porto, • Faculdade de Letras da Universidade do Porto • Instituto de Engenharia de Sistemas e Computadores do Porto (INESC Porto) • Instituto Superior de Agronomia da Universidade Técnica de Lisboa • Instituto Superior de Ciências do Trabalho e da Empresa • Instituto Superior Técnico da Universidade Técnica de Lisboa • Laboratório de Instrumentação e Física Experimental de Partículas

Agreement for International Cooperation in Science, Technology, and Higher Education
• LAETA - Laboratório Associado de Energia, Transportes e Aeronáutica, Laboratório Associado • Madan Parque • Parkurbis • Taguspark • Universidade da Beira Interior • Universidade da Madeira • Universidade de Aveiro • Universidade de Coimbra • Universidade de Évora • Universidade de Lisboa • Universidade de Trás-os-Montes e Alto Douro • Universidade do Algarve • Universidade do Minho • Universidade do Porto • Universidade dos Açores • Universidade Nova de Lisboa • Universidade Técnica de Lisboa

Source: Agreements and data submitted by the Programme Managing Bodies

Table F 14. UT Austin Portugal Program Affiliates (Phase I) – Industrial Affiliates

Industrial Affiliates
• Brandia Central, S.A. • Bycom, Serviços de Design e Publicidade, Lda. • Critical Software, S.A. • Duvideo, Profissionais de Imagem CRL • Fundação Casa da Música • Fundação de Serralves • Grupo Porto Editora • Innovagency - Consultoria, Tecnologia e Comunicação, S.A. • Inteli - Inteligência em Inovação - Centro de Inovação • Media Capital Editora Multimédia, S.A. • Público, Comunicação Social, S.A. • YDreams, S.A. • ZON Multimédia SGPS

Source: Agreements and data submitted by the Programme Managing Bodies

UT Austin Portugal Program Affiliates – Phase III

Table F 15.UT Austin Portugal Program Affiliates (Phase III) – Industrial Affiliates

Industrial Affiliates
• 3DXI- Centro de Imagem Médica • A400 • Abyssal S.A. • Abyssal SA

Industrial Affiliates

- Adventech
- AFFIDEA
- Águas de Portugal
- Alliance Healthcare
- AlmaScience
- Altice Labs
- Armis Group
- Atlar Innovation
- Azulfy
- Banco CTT
- BEEVERYCREATIVE
- BGI - Building Global Innovators
- blueOASIS
- Bondalti
- Bosch Braga
- Castros S.A.
- CO2 Diamonds
- Companhia IBM Portuguesa, S.A.
- CONNECT ROBOTICS
- Continental Engineering Services
- CUF
- Deimos
- Deimos Engenharia S.A.
- Didimo
- Edisoft – Empresa de Serviços e Desenvolvimento de Software, S.A.
- Edisoft - Thales Group
- edp
- EDP Renewables
- Efacec
- Eyecon Group
- Farfetch
- FastCompChem, Lda
- FHP
- Flexipol
- Galp
- GMV
- Graphenest
- Graphenest, S.A.
- Grupo Joaquim Chaves Saude
- Hospital da Luz Lisboa
- HPS – High Performance Structures Gestão e Engenharia Lda.
- Huawei
- IBM
- Impetus Portugal
- Increase Time
- Inovatools

Industrial Affiliates

- IPBRICK
- ISQ
- ITGest
- iTrack Solutions
- Joaquim Chaves Saúde
- KEEP SOLUTIONS, LDA
- Libware
- Market Access
- Matereo
- Mercurius Health
- Metablue Solution
- mOceanSense
- Mota-Engil Railway Engineering
- Nanopaint, Lda
- Nav Portugal
- Nelson Azevedo Terapias Globais
- Omnidea
- Omnidea Lda
- Petsys Electronics
- Petsys Electronics – Medical PET Detectors, S.A.
- Portugal Ventures SCR, SA
- QA Value
- Ribadouro
- SICI93 sa and Playvest sa
- Sínese
- SONAE
- Speculum SA and Samsung Healthcare
- Sphere Ultrafast Photonics
- Spin.Works
- STEMMATTERS
- SWORD Health
- TEandM
- Tekever
- Tekever S.A.
- TELCABO
- Têxteis Penedo
- The Loop co.
- Unilabs
- Wavecom
- Wavecom Soluções Rádio, S.A.
- WeMake – Information Technologies
- YAZAKI Saltano

Source: Agreements and data submitted by the Programme Managing Bodies

Appendix G: Full Survey Results

G.1. Survey Summary Beneficiaries

G.1.1 Profile on the Participants in the Survey

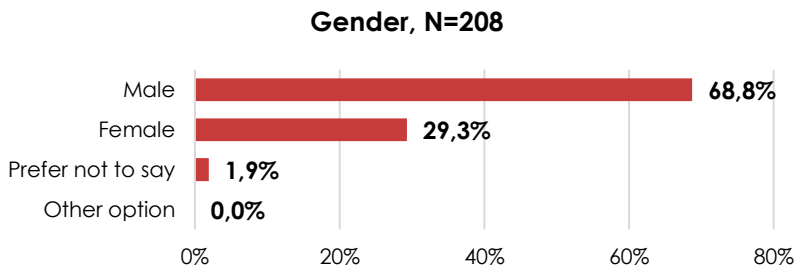

Figure G 1

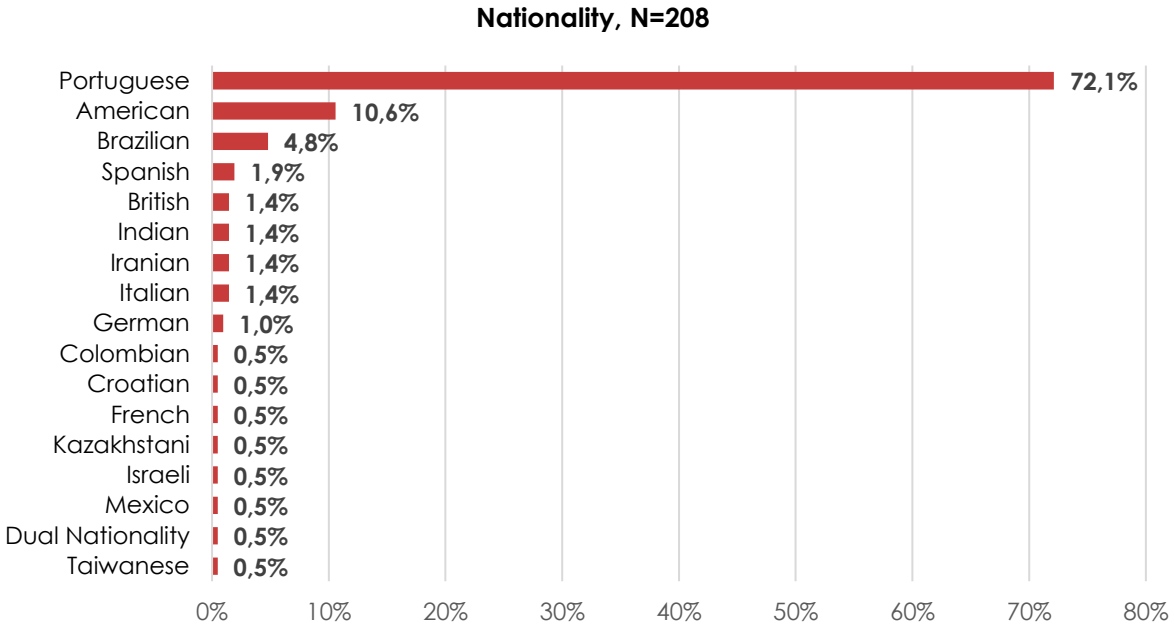

Figure G 2

Note: The 'dual nationality' category refers to a survey participant with both UK and Italian nationalities.

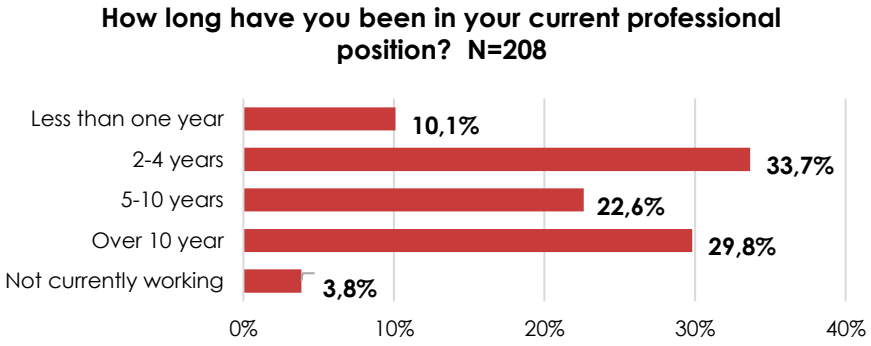

Figure G 3

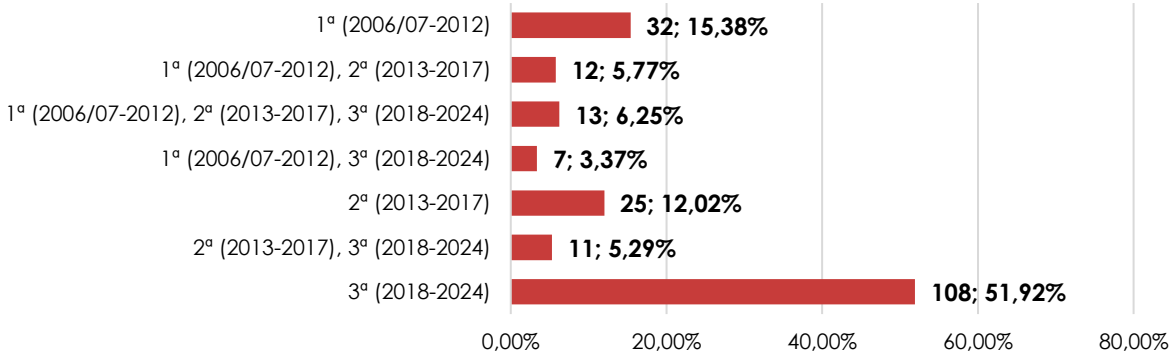

Figure G 4

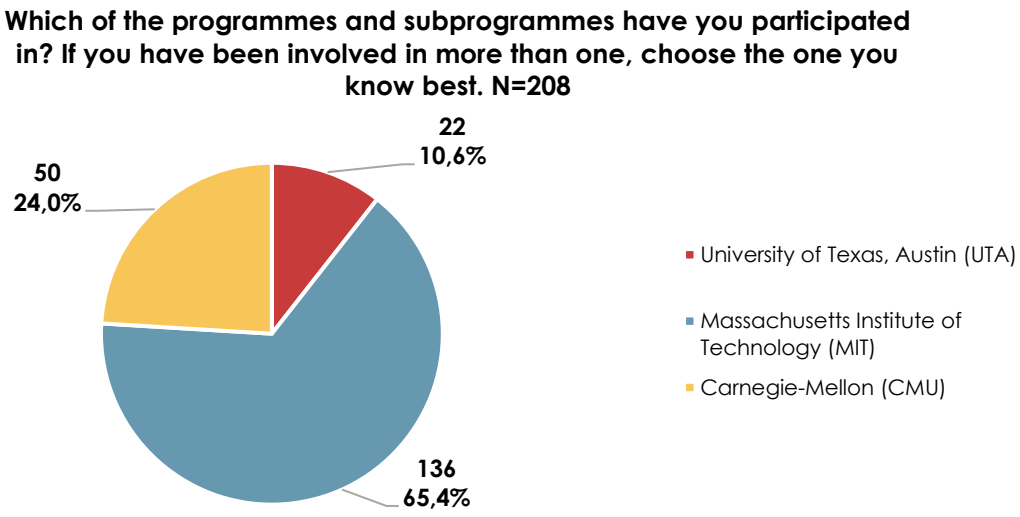

Figure G 5

Table G 1

Which of the programmes and subprogrammes have you participated in? If you have been involved in more than one, choose the one you know best.	Count of Responses	Share of Response
University Technology Transfer Network (UTEN)	0	0,0%
University of Texas, Austin (UTA)	22	10,6%
Massachusetts Institute of Technology (MIT)	136	65,4%
Carnegie-Mellon (CMU)	50	24,0%

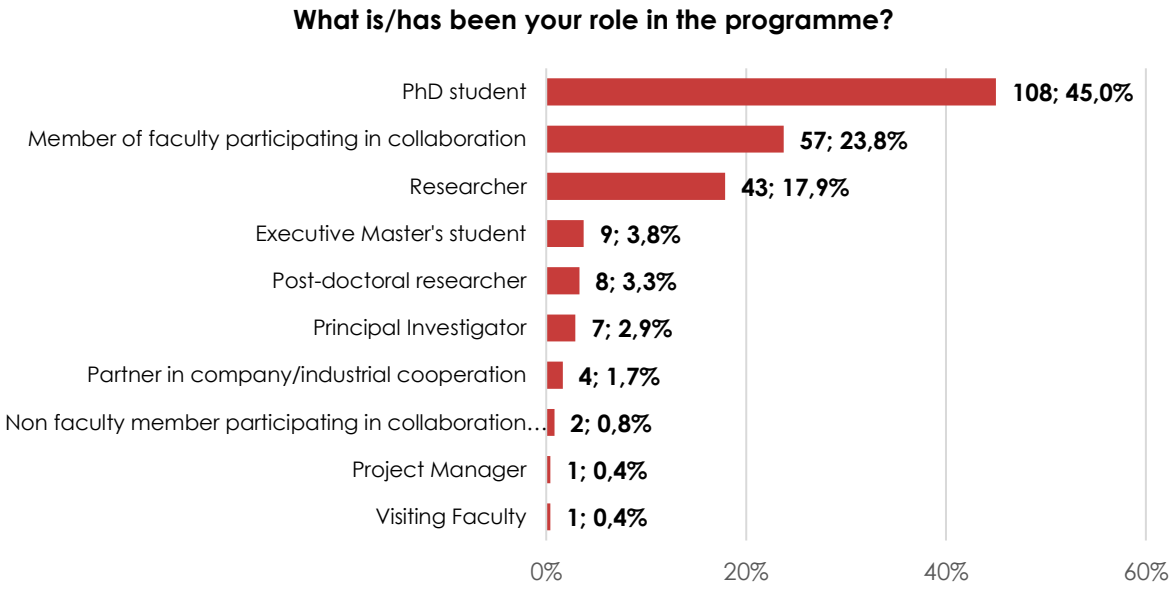

Figure G 6

Note: Survey participants may have been involved in multiple projects or may have held different roles throughout the partnerships programme.

G.1.2 Perception

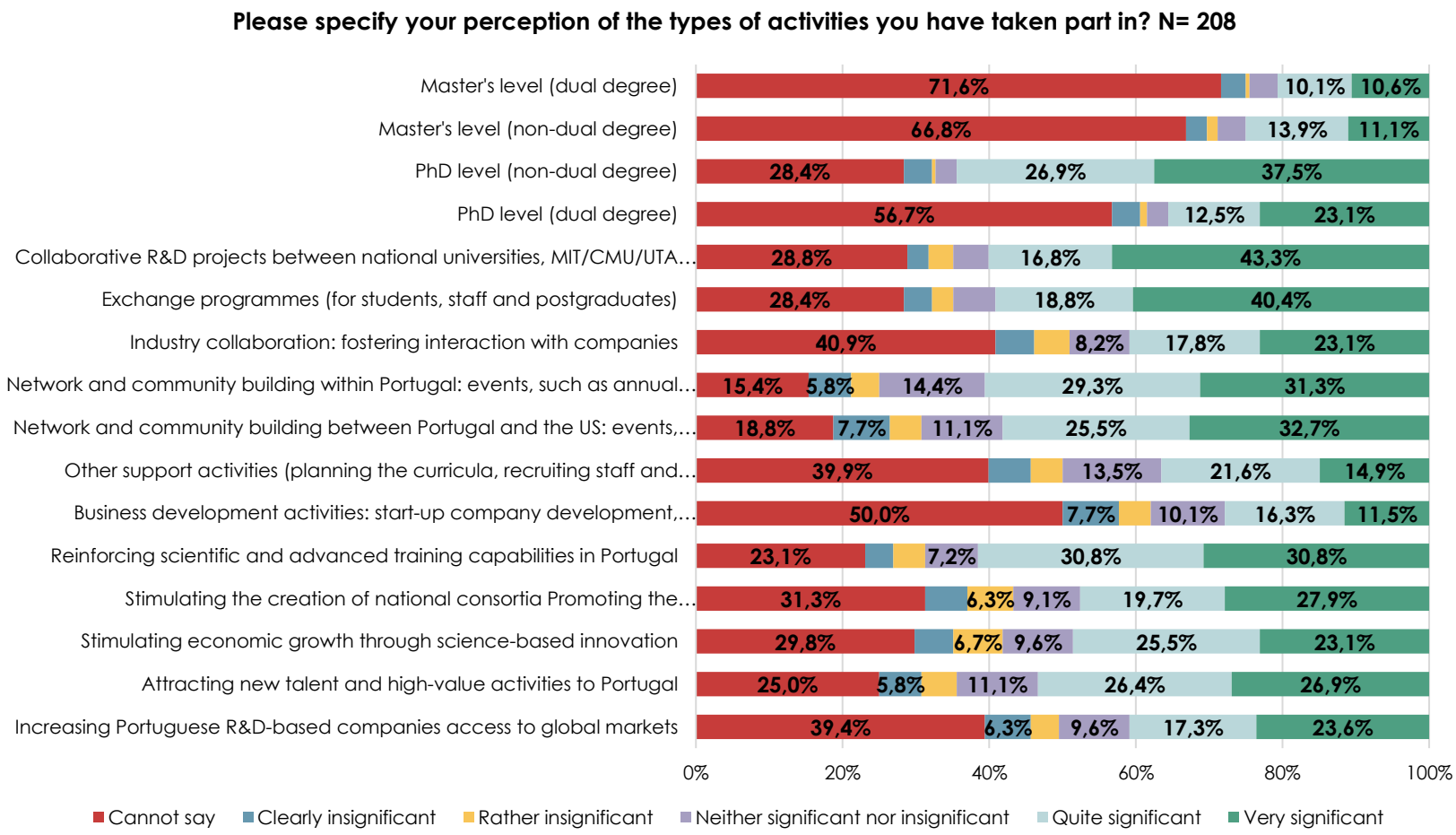

Figure G 7

Table G 2

Types of activites	Cannot say	Clearly insignificant	Rather insignificant	Neither significant nor insignificant	Quite significant	Very significant
Master's level (dual degree)	71,6%	3,4%	0,5%	3,8%	10,1%	10,6%
Master's level (non-dual degree)	66,8%	2,9%	1,4%	3,8%	13,9%	11,1%
PhD level (non-dual degree)	28,4%	3,8%	0,5%	2,9%	26,9%	37,5%
PhD level (dual degree)	56,7%	3,8%	1,0%	2,9%	12,5%	23,1%
Collaborative R&D projects between national universities, MIT/CMU/UTA and companies	28,8%	2,9%	3,4%	4,8%	16,8%	43,3%
Exchange programmes (for students, staff and postgraduates)	28,4%	3,8%	2,9%	5,8%	18,8%	40,4%
Industry collaboration: fostering interaction with companies	40,9%	5,3%	4,8%	8,2%	17,8%	23,1%
Network and community building within Portugal: events, such as annual conferences and thematic workshops	15,4%	5,8%	3,8%	14,4%	29,3%	31,3%
Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops	18,8%	7,7%	4,3%	11,1%	25,5%	32,7%
Other support activities (planning the curricula, recruiting staff and students)	39,9%	5,8%	4,3%	13,5%	21,6%	14,9%
Business development activities: start-up company development, consultancy, improving access to venture capital	50,0%	7,7%	4,3%	10,1%	16,3%	11,5%
Reinforcing scientific and advanced training capabilities in Portugal	23,1%	3,8%	4,3%	7,2%	30,8%	30,8%
Stimulating the creation of national consortia Promoting the internationalisation of national universities and R&D institutes: Strengthening the recruitment of professors and researchers	31,3%	5,8%	6,3%	9,1%	19,7%	27,9%
Stimulating economic growth through science-based innovation	29,8%	5,3%	6,7%	9,6%	25,5%	23,1%
Attracting new talent and high-value activities to Portugal	25,0%	5,8%	4,8%	11,1%	26,4%	26,9%
Increasing Portuguese R&D-based companies access to global markets	39,4%	6,3%	3,8%	9,6%	17,3%	23,6%

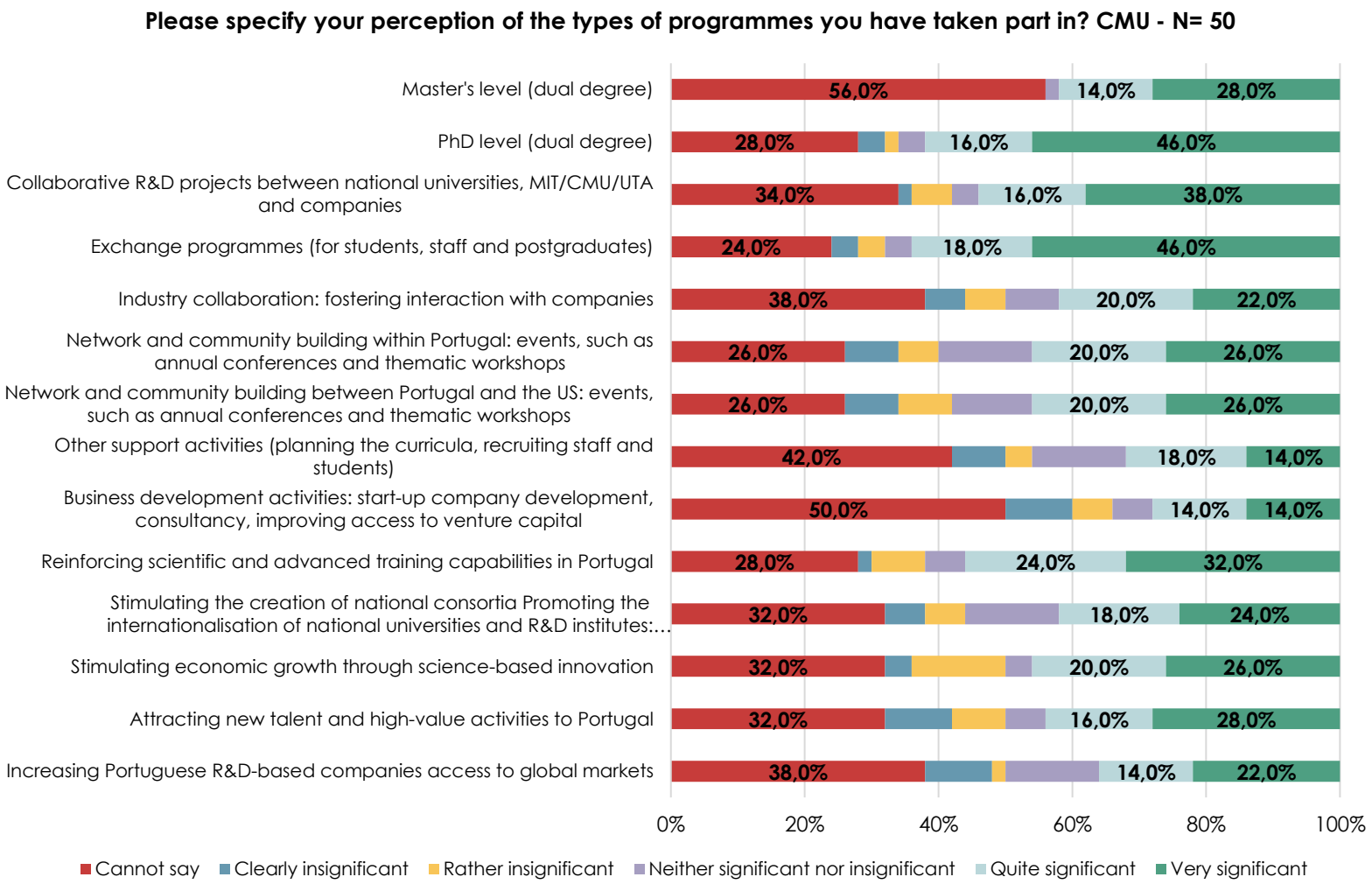
Please specify your perception of the types of programmes you have taken part in? CMU - N= 50
Master's level (dual degree)
56,0%
14,0%
28,0%
PhD level (dual degree)
28,0%
16,0%
46,0%
Collaborative R&D projects between national universities, MIT/CMU/UTA and companies
34,0%
16,0%
38,0%
Exchange programmes (for students, staff and postgraduates)
24,0%
18,0%
46,0%
Industry collaboration: fostering interaction with companies
38,0%
20,0%
22,0%
Network and community building within Portugal: events, such as annual conferences and thematic workshops
26,0%
20,0%
26,0%
Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops
26,0%
20,0%
26,0%
Other support activities (planning the curricula, recruiting staff and students)
42,0%
18,0%
14,0%
Business development activities: start-up company development, consultancy, improving access to venture capital
50,0%
14,0%
14,0%
Reinforcing scientific and advanced training capabilities in Portugal
28,0%
24,0%
32,0%
Stimulating the creation of national consortia Promoting the internationalisation of national universities and R&D institutes:...
32,0%
18,0%
24,0%
Stimulating economic growth through science-based innovation
32,0%
20,0%
26,0%
Attracting new talent and high-value activities to Portugal
32,0%
16,0%
28,0%
Increasing Portuguese R&D-based companies access to global markets
38,0%
14,0%
22,0%
0%
20%
40%
60%
80%
100%
Cannot say
Clearly insignificant
Rather insignificant
Neither significant nor insignificant
Quite significant
Very significant

Figure G 8

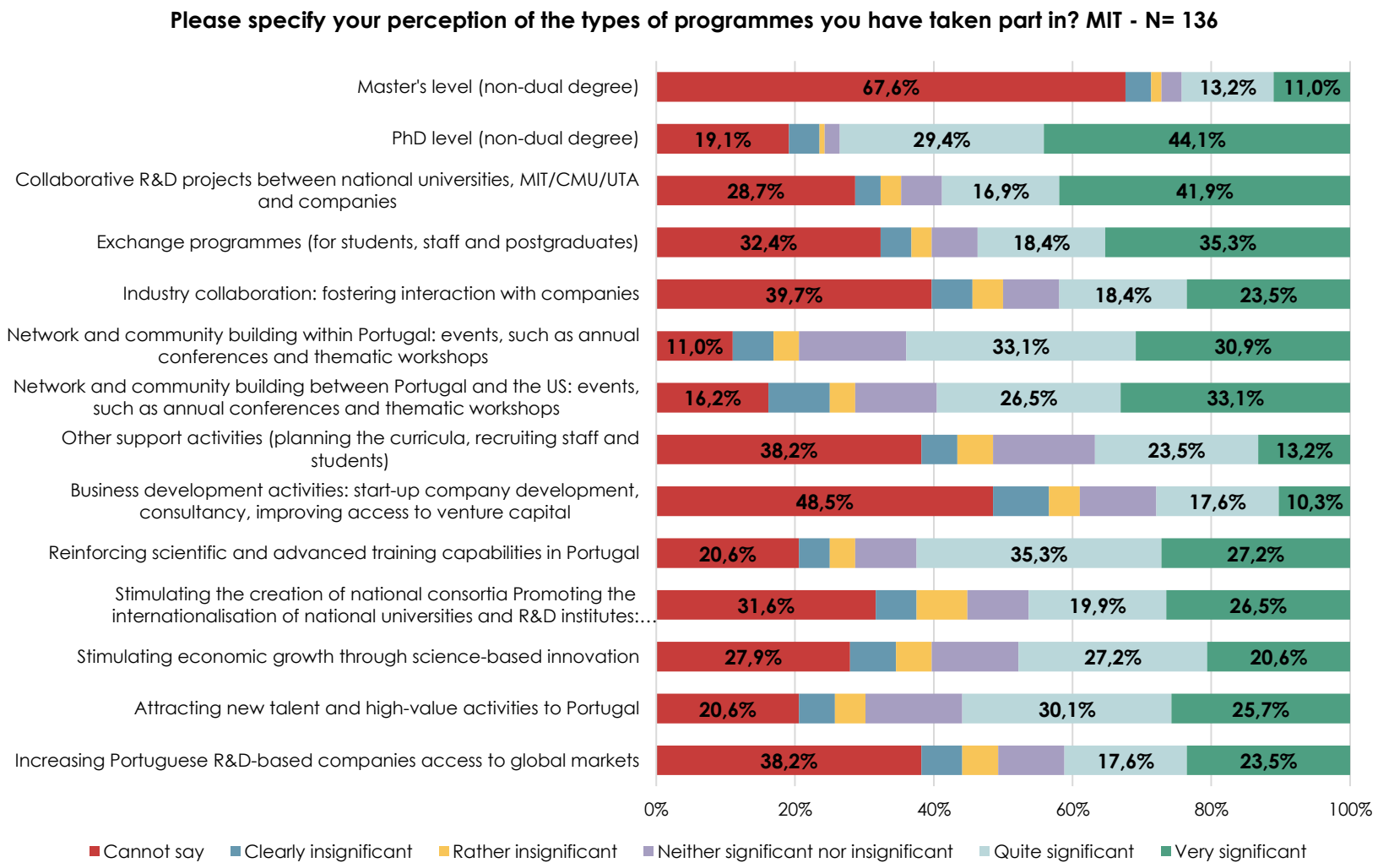
Please specify your perception of the types of programmes you have taken part in? MIT - N= 136
Master's level (non-dual degree)
67,6%
13,2%
11,0%
PhD level (non-dual degree)
19,1%
29,4%
44,1%
Collaborative R&D projects between national universities, MIT/CMU/UTA and companies
28,7%
16,9%
41,9%
Exchange programmes (for students, staff and postgraduates)
32,4%
18,4%
35,3%
Industry collaboration: fostering interaction with companies
39,7%
18,4%
23,5%
Network and community building within Portugal: events, such as annual conferences and thematic workshops
11,0%
33,1%
30,9%
Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops
16,2%
26,5%
33,1%
Other support activities (planning the curricula, recruiting staff and students)
38,2%
23,5%
13,2%
Business development activities: start-up company development, consultancy, improving access to venture capital
48,5%
17,6%
10,3%
Reinforcing scientific and advanced training capabilities in Portugal
20,6%
35,3%
27,2%
Stimulating the creation of national consortia Promoting the internationalisation of national universities and R&D institutes:...
31,6%
19,9%
26,5%
Stimulating economic growth through science-based innovation
27,9%
27,2%
20,6%
Attracting new talent and high-value activities to Portugal
20,6%
30,1%
25,7%
Increasing Portuguese R&D-based companies access to global markets
38,2%
17,6%
23,5%
0%
20%
40%
60%
80%
100%
Cannot say
Clearly insignificant
Rather insignificant
Neither significant nor insignificant
Quite significant
Very significant

Figure G 9

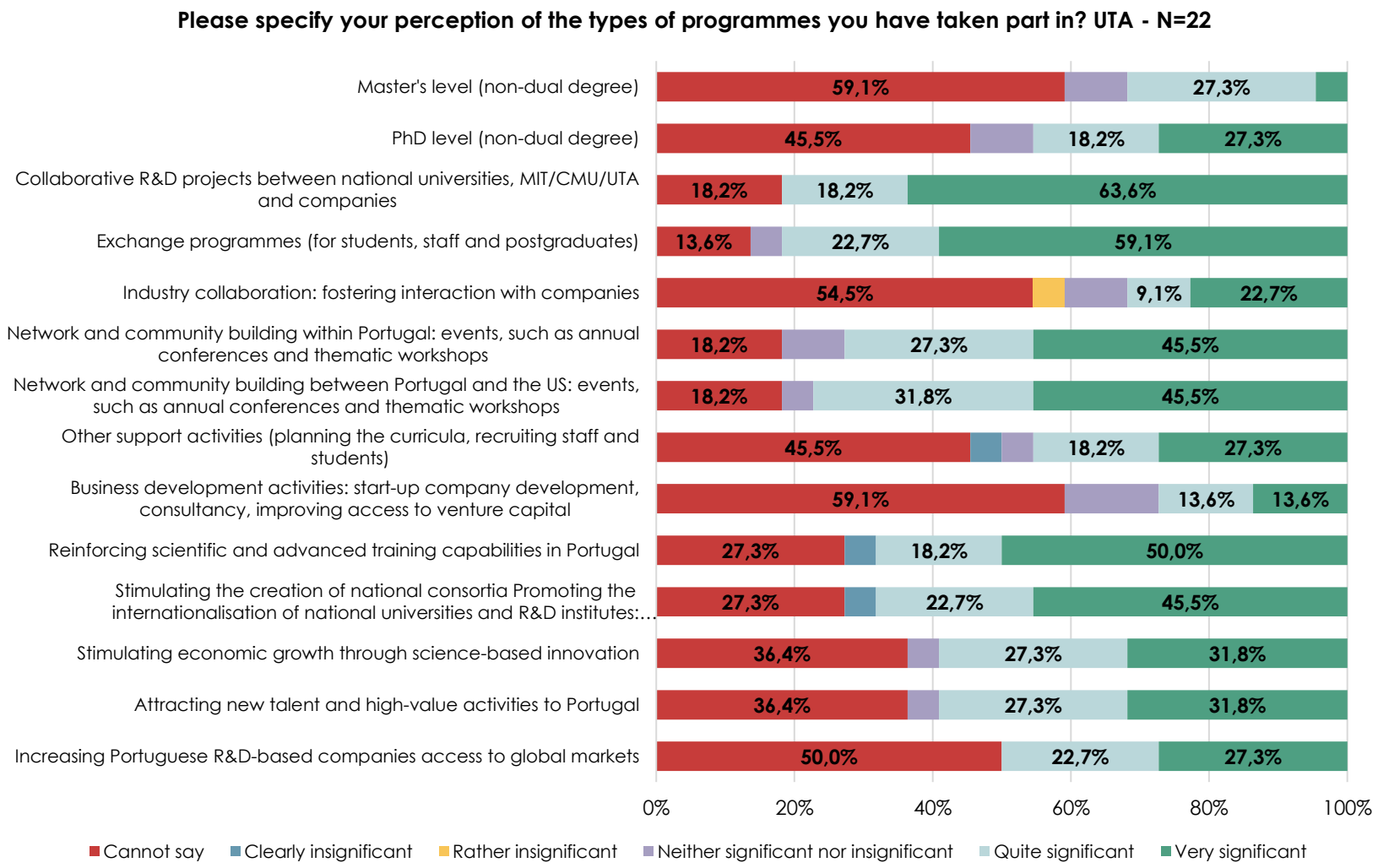
Please specify your perception of the types of programmes you have taken part in? UTA - N=22
Master's level (non-dual degree)
59,1%
27,3%
PhD level (non-dual degree)
45,5%
18,2%
27,3%
Collaborative R&D projects between national universities, MIT/CMU/UTA and companies
18,2%
18,2%
63,6%
Exchange programmes (for students, staff and postgraduates)
13,6%
22,7%
59,1%
Industry collaboration: fostering interaction with companies
54,5%
9,1%
22,7%
Network and community building within Portugal: events, such as annual conferences and thematic workshops
18,2%
27,3%
45,5%
Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops
18,2%
31,8%
45,5%
Other support activities (planning the curricula, recruiting staff and students)
45,5%
18,2%
27,3%
Business development activities: start-up company development, consultancy, improving access to venture capital
59,1%
13,6%
13,6%
Reinforcing scientific and advanced training capabilities in Portugal
27,3%
18,2%
50,0%
Stimulating the creation of national consortia Promoting the internationalisation of national universities and R&D institutes:...
27,3%
22,7%
45,5%
Stimulating economic growth through science-based innovation
36,4%
27,3%
31,8%
Attracting new talent and high-value activities to Portugal
36,4%
27,3%
31,8%
Increasing Portuguese R&D-based companies access to global markets
50,0%
22,7%
27,3%
0%
20%
40%
60%
80%
100%
Cannot say
Clearly insignificant
Rather insignificant
Neither significant nor insignificant
Quite significant
Very significant

Figure G 10

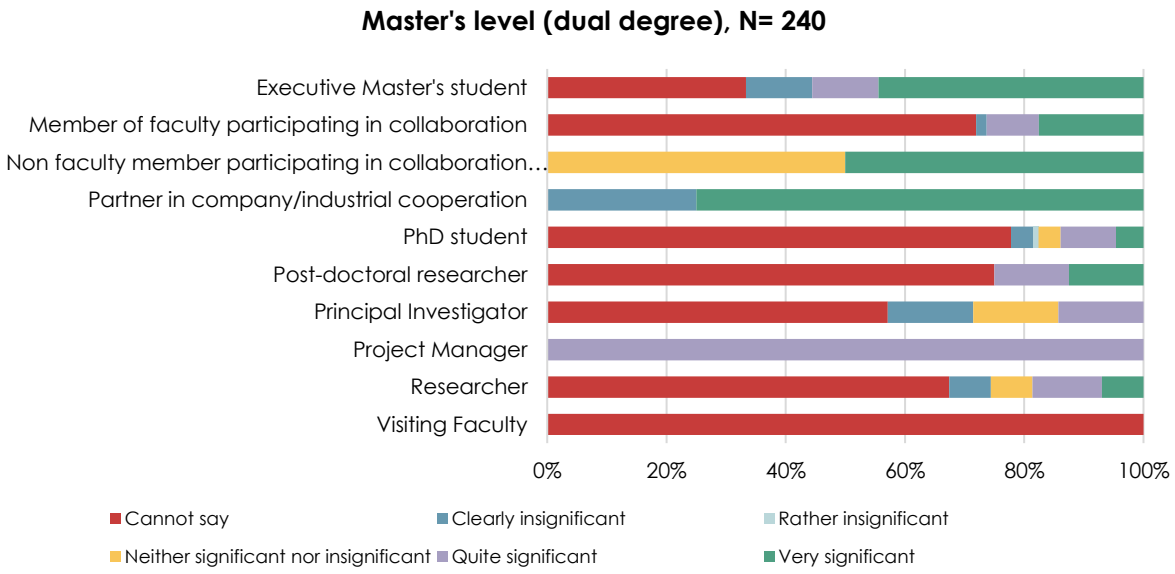

Figure G 11

Table G 3

Role in the Programme	Master's level (dual degree)					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	33,3%	11,1%	0,0%	11,1%	0,0%	44,4%
Member of faculty participating in collaboration	71,9%	1,8%	0,0%	8,8%	0,0%	17,5%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	50,0%	0,0%	0,0%	50,0%
Partner in company/industrial cooperation	0,0%	25,0%	0,0%	0,0%	0,0%	75,0%
PhD student	77,8%	3,7%	3,7%	9,3%	0,9%	4,6%
Post-doctoral researcher	75,0%	0,0%	0,0%	12,5%	0,0%	12,5%
Principal Investigator	57,1%	14,3%	14,3%	14,3%	0,0%	0,0%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	67,4%	7,0%	7,0%	11,6%	0,0%	7,0%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

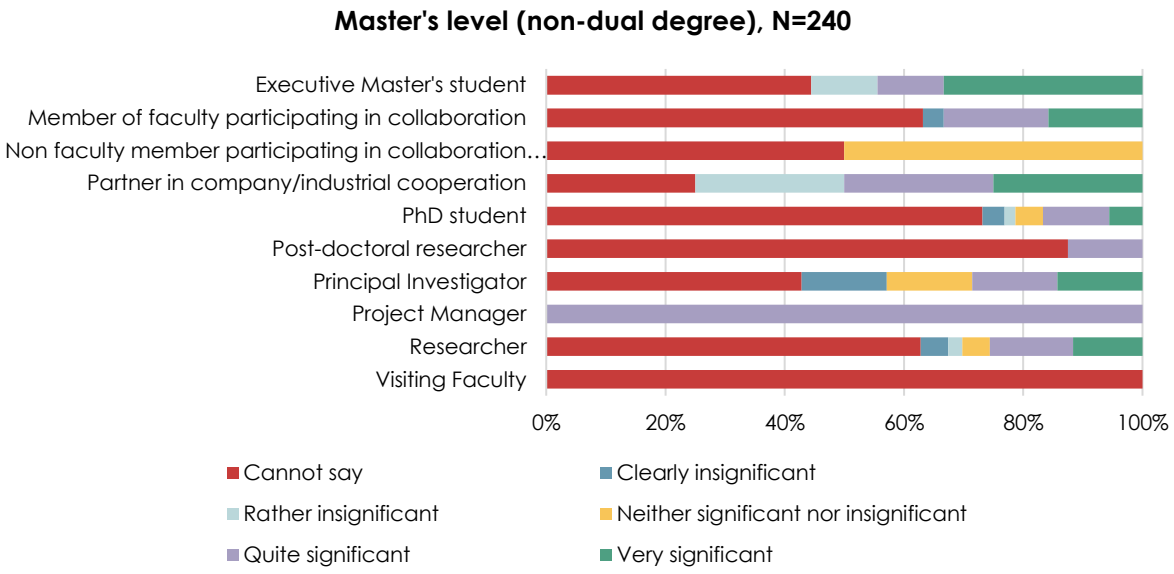

Figure G 12

Table G 4

Role in the Programme	Master's level (non-dual degree)					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	44,4%	0,0%	0,0%	11,1%	11,1%	33,3%
Member of faculty participating in collaboration	63,2%	3,5%	0,0%	17,5%	0,0%	15,8%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	50,0%	0,0%	50,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	25,0%	0,0%	0,0%	25,0%	25,0%	25,0%
PhD student	73,1%	3,7%	4,6%	11,1%	1,9%	5,6%
Post-doctoral researcher	87,5%	0,0%	0,0%	12,5%	0,0%	0,0%
Principal Investigator	42,9%	14,3%	14,3%	14,3%	0,0%	14,3%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	62,8%	4,7%	4,7%	14,0%	2,3%	11,6%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

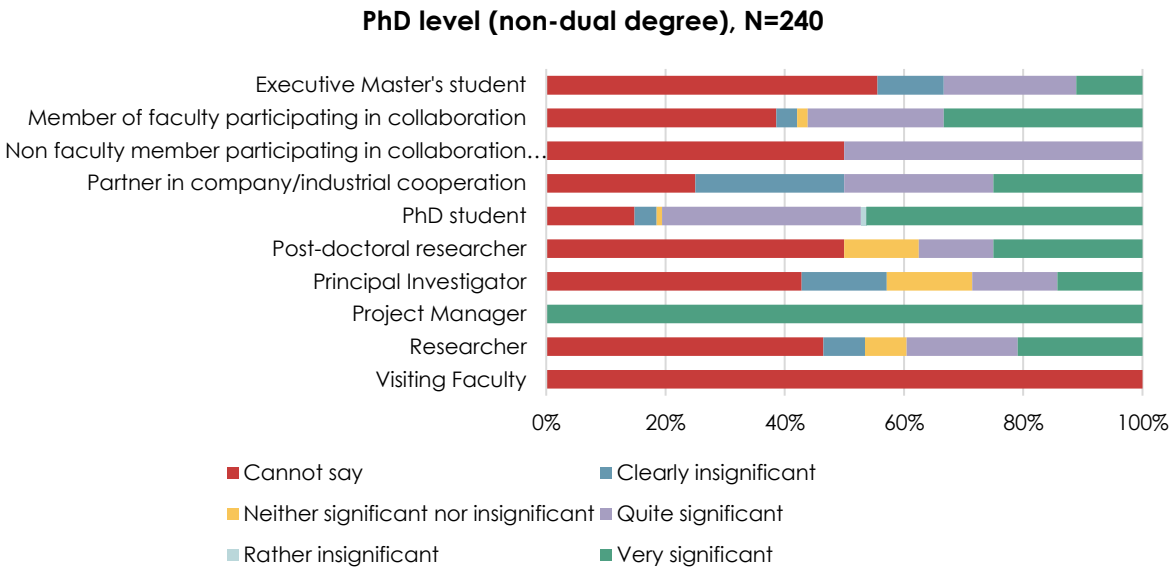

Figure G 13

Table G 5

Role in the Programme	PhD level (non-dual degree)					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	55,6%	11,1%	0,0%	22,2%	0,0%	11,1%
Member of faculty participating in collaboration	38,6%	3,5%	1,8%	22,8%	0,0%	33,3%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	50,0%	0,0%	0,0%	50,0%	0,0%	0,0%
Partner in company/industrial cooperation	25,0%	25,0%	0,0%	25,0%	0,0%	25,0%
PhD student	14,8%	3,7%	0,9%	33,3%	0,9%	46,3%
Post-doctoral researcher	50,0%	0,0%	12,5%	12,5%	0,0%	25,0%
Principal Investigator	42,9%	14,3%	14,3%	14,3%	0,0%	14,3%
Project Manager	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%
Researcher	46,5%	7,0%	7,0%	18,6%	0,0%	20,9%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

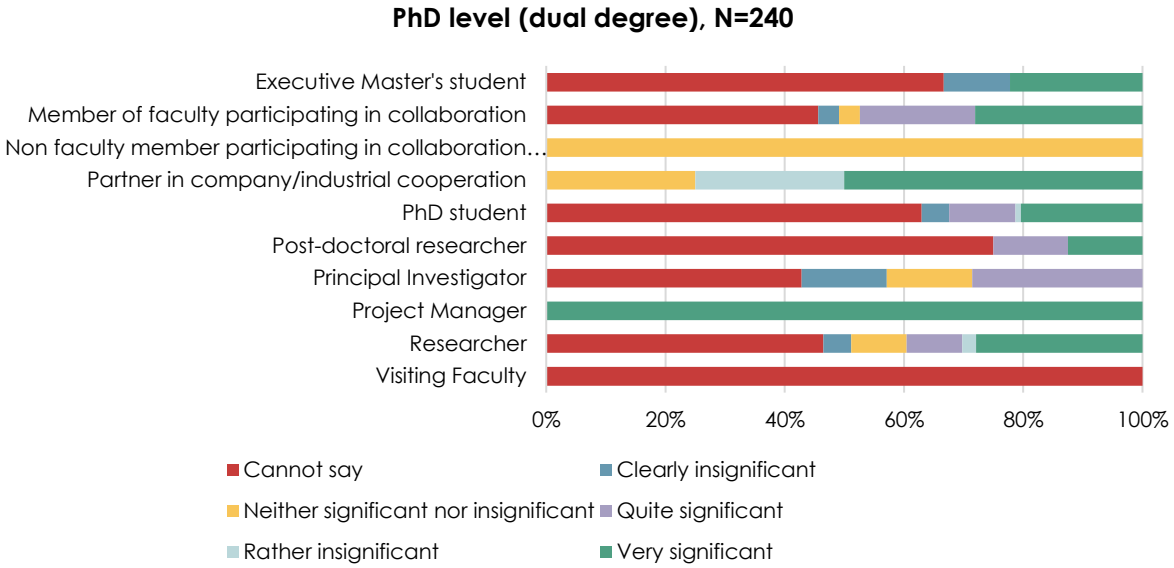

Figure G 14

Table G 6

Role in the Programme	PhD level (dual degree)					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	66,7%	11,1%	0,0%	0,0%	0,0%	22,2%
Member of faculty participating in collaboration	45,6%	3,5%	3,5%	19,3%	0,0%	28,1%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	0,0%	25,0%	0,0%	25,0%	50,0%
PhD student	63,0%	4,6%	0,0%	11,1%	0,9%	20,4%
Post-doctoral researcher	75,0%	0,0%	0,0%	12,5%	0,0%	12,5%
Principal Investigator	42,9%	14,3%	14,3%	28,6%	0,0%	0,0%
Project Manager	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%
Researcher	46,5%	4,7%	9,3%	9,3%	2,3%	27,9%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

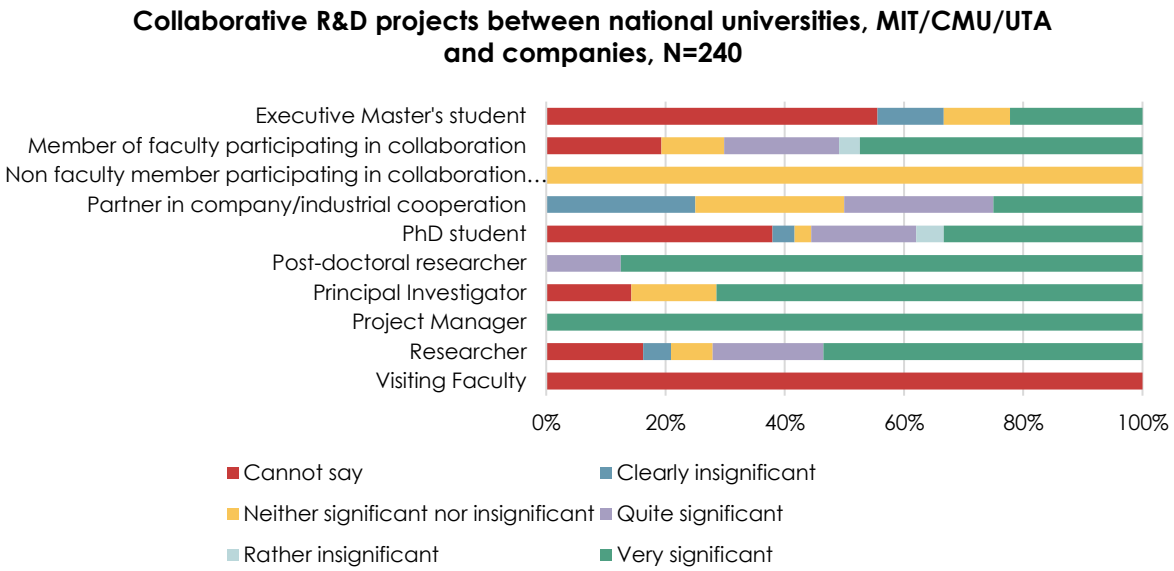

Figure G 15

Table G 7

Role in the Programme	Collaborative R&D projects between national universities, MIT/CMU/UTA and companies					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	55,6%	11,1%	11,1%	0,0%	0,0%	22,2%
Member of faculty participating in collaboration	19,3%	0,0%	10,5%	19,3%	3,5%	47,4%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	25,0%	25,0%	25,0%	0,0%	25,0%
PhD student	38,0%	3,7%	2,8%	17,6%	4,6%	33,3%
Post-doctoral researcher	0,0%	0,0%	0,0%	12,5%	0,0%	87,5%
Principal Investigator	14,3%	0,0%	14,3%	0,0%	0,0%	71,4%
Project Manager	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%
Researcher	16,3%	4,7%	7,0%	18,6%	0,0%	53,5%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

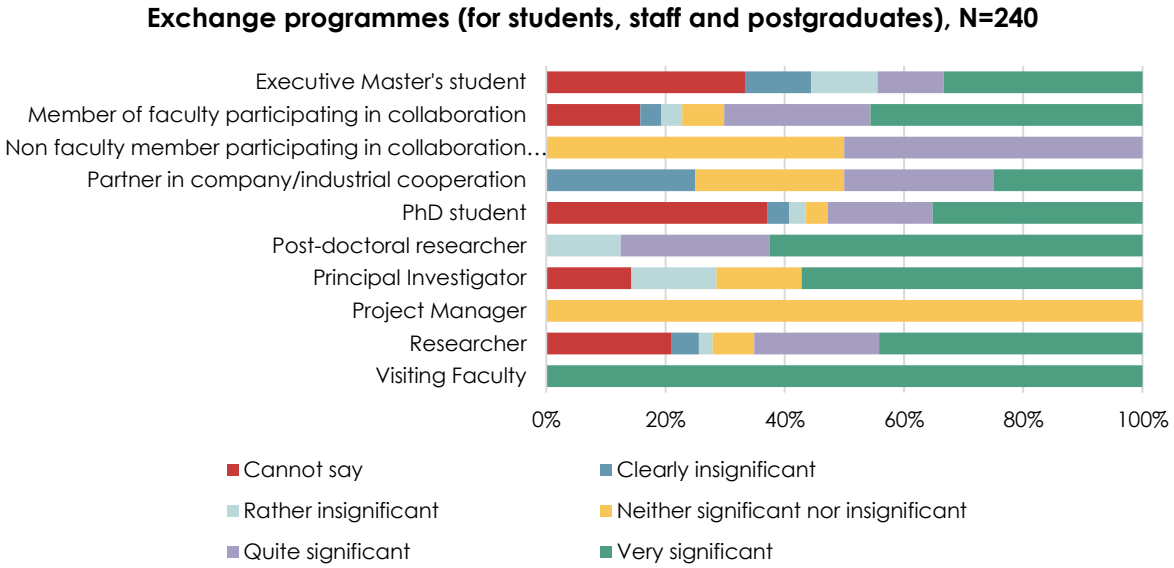

Figure G 16

Table G 8

Role in the Programme	Exchange programmes (for students, staff and postgraduates)					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	33,3%	11,1%	0,0%	11,1%	11,1%	33,3%
Member of faculty participating in collaboration	15,8%	3,5%	7,0%	24,6%	3,5%	45,6%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	50,0%	50,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	25,0%	25,0%	25,0%	0,0%	25,0%
PhD student	37,0%	3,7%	3,7%	17,6%	2,8%	35,2%
Post-doctoral researcher	0,0%	0,0%	0,0%	25,0%	12,5%	62,5%
Principal Investigator	14,3%	0,0%	14,3%	0,0%	14,3%	57,1%
Project Manager	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Researcher	20,9%	4,7%	7,0%	20,9%	2,3%	44,2%
Visiting Faculty	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

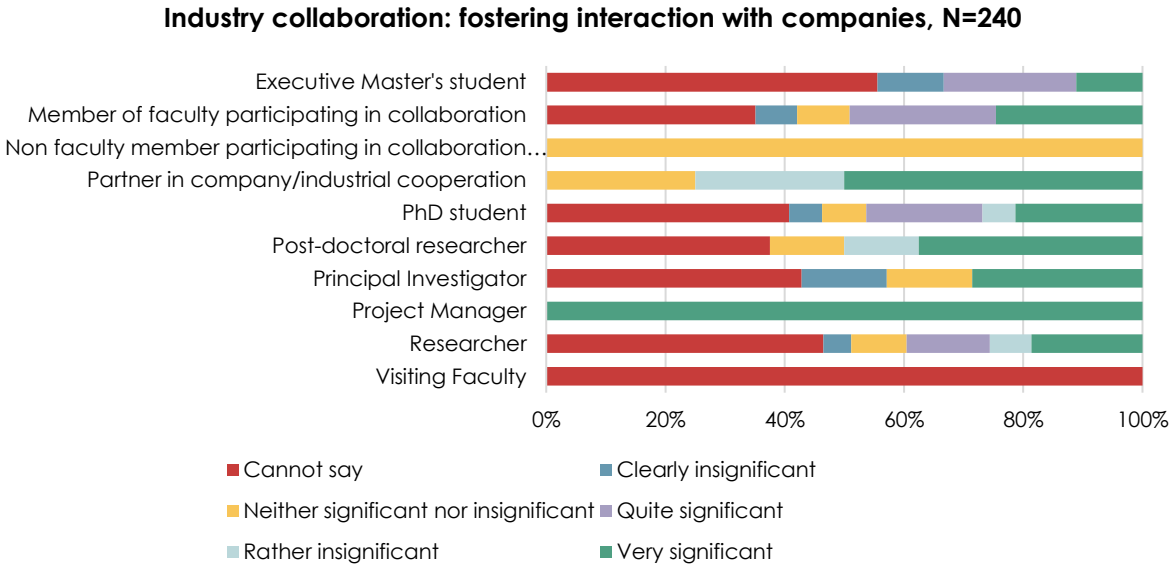

Figure G 17

Table G 9

Role in the Programme	Industry collaboration: fostering interaction with companies					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	55,6%	11,1%	0,0%	22,2%	0,0%	11,1%
Member of faculty participating in collaboration	35,1%	7,0%	8,8%	24,6%	0,0%	24,6%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	0,0%	25,0%	0,0%	25,0%	50,0%
PhD student	40,7%	5,6%	7,4%	19,4%	5,6%	21,3%
Post-doctoral researcher	37,5%	0,0%	12,5%	0,0%	12,5%	37,5%
Principal Investigator	42,9%	14,3%	14,3%	0,0%	0,0%	28,6%
Project Manager	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%
Researcher	46,5%	4,7%	9,3%	14,0%	7,0%	18,6%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

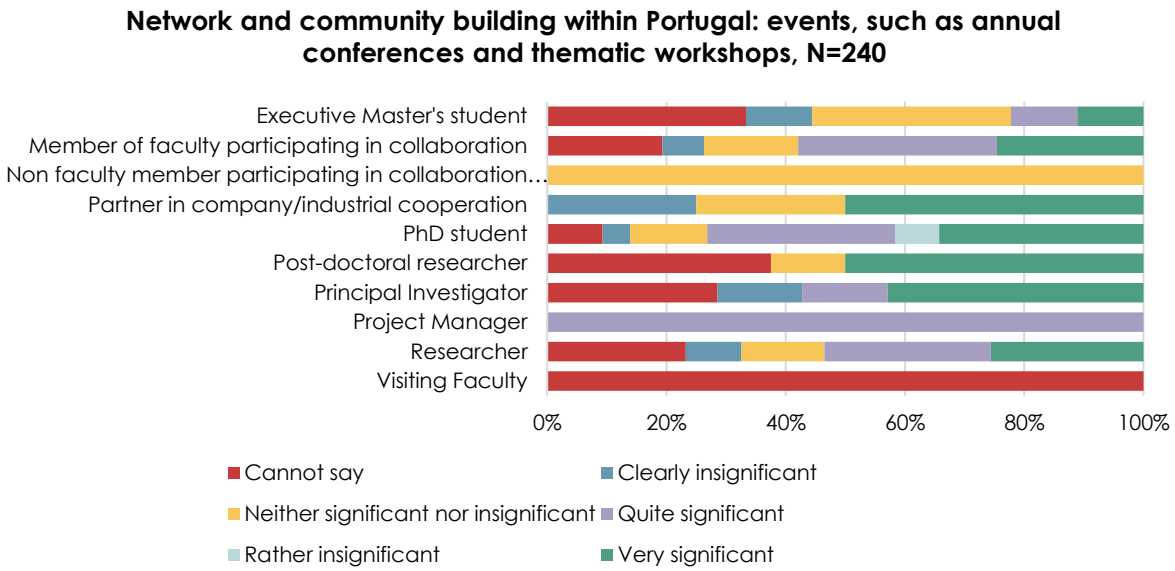

Figure G 18

Table G 10

Role in the Programme	Network and community building within Portugal: events, such as annual conferences and thematic workshops					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive Master's student	33,3%	11,1%	33,3%	11,1%	0,0%	11,1%
Member of faculty participating in collaboration	19,3%	7,0%	15,8%	33,3%	0,0%	24,6%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	25,0%	25,0%	0,0%	0,0%	50,0%
PhD student	9,3%	4,6%	13,0%	31,5%	7,4%	34,3%
Post-doctoral researcher	37,5%	0,0%	12,5%	0,0%	0,0%	50,0%
Principal Investigator	28,6%	14,3%	0,0%	14,3%	0,0%	42,9%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	23,3%	9,3%	14,0%	27,9%	0,0%	25,6%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

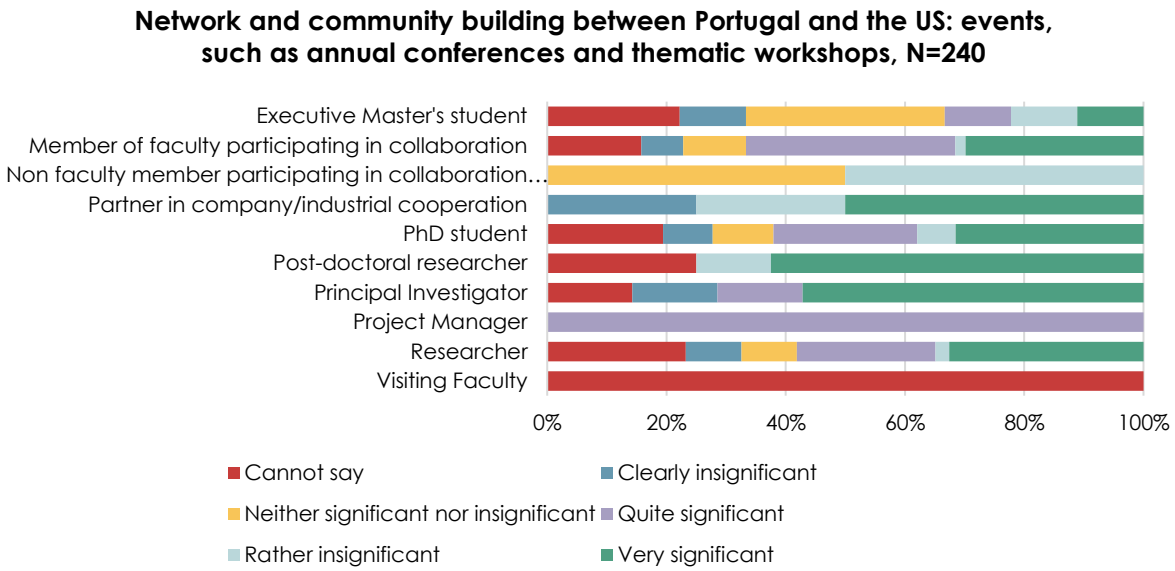

Figure G 19

Table G 11

Role in the Programme	Network and community building between Portugal and the US: events, such as annual conferences and thematic workshops					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive Master's student	22,2%	11,1%	33,3%	11,1%	11,1%	11,1%
Member of faculty participating in collaboration	15,8%	7,0%	10,5%	35,1%	1,8%	29,8%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	50,0%	0,0%	50,0%	0,0%
Partner in company/industrial cooperation	0,0%	25,0%	0,0%	0,0%	25,0%	50,0%
PhD student	19,4%	8,3%	10,2%	24,1%	6,5%	31,5%
Post-doctoral researcher	25,0%	0,0%	0,0%	0,0%	12,5%	62,5%
Principal Investigator	14,3%	14,3%	0,0%	14,3%	0,0%	57,1%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	23,3%	9,3%	9,3%	23,3%	2,3%	32,6%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

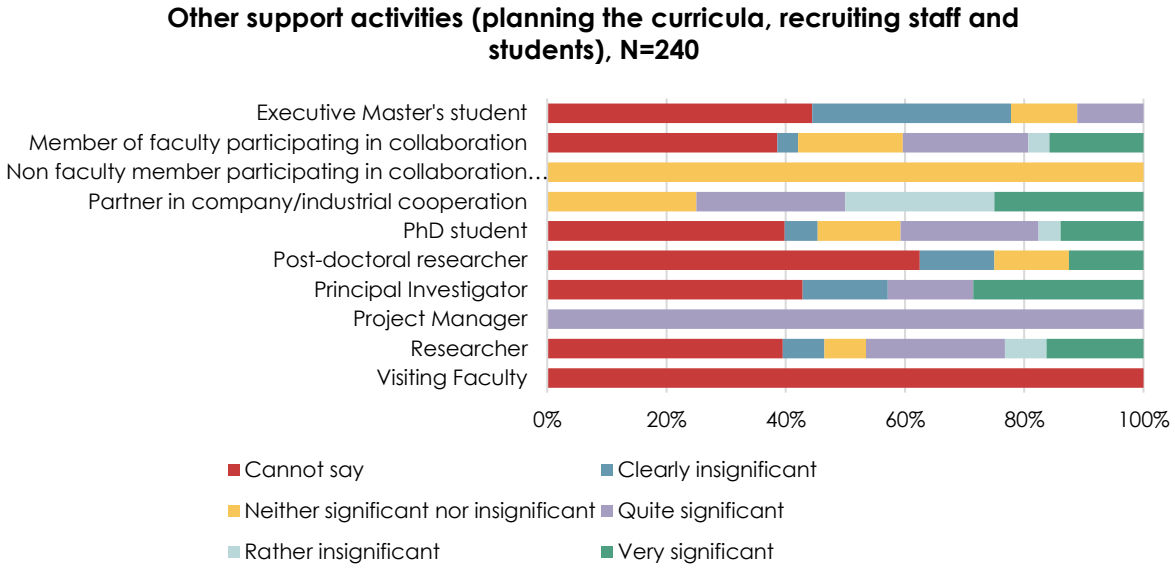

Figure G 20

Table G 12

Role in the Programme	Other support activities (planning the curricula, recruiting staff and students)					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	44,4%	33,3%	11,1%	11,1%	0,0%	0,0%
Member of faculty participating in collaboration	38,6%	3,5%	17,5%	21,1%	3,5%	15,8%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	0,0%	25,0%	25,0%	25,0%	25,0%
PhD student	39,8%	5,6%	13,9%	23,1%	3,7%	13,9%
Post-doctoral researcher	62,5%	12,5%	12,5%	0,0%	0,0%	12,5%
Principal Investigator	42,9%	14,3%	0,0%	14,3%	0,0%	28,6%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	39,5%	7,0%	7,0%	23,3%	7,0%	16,3%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

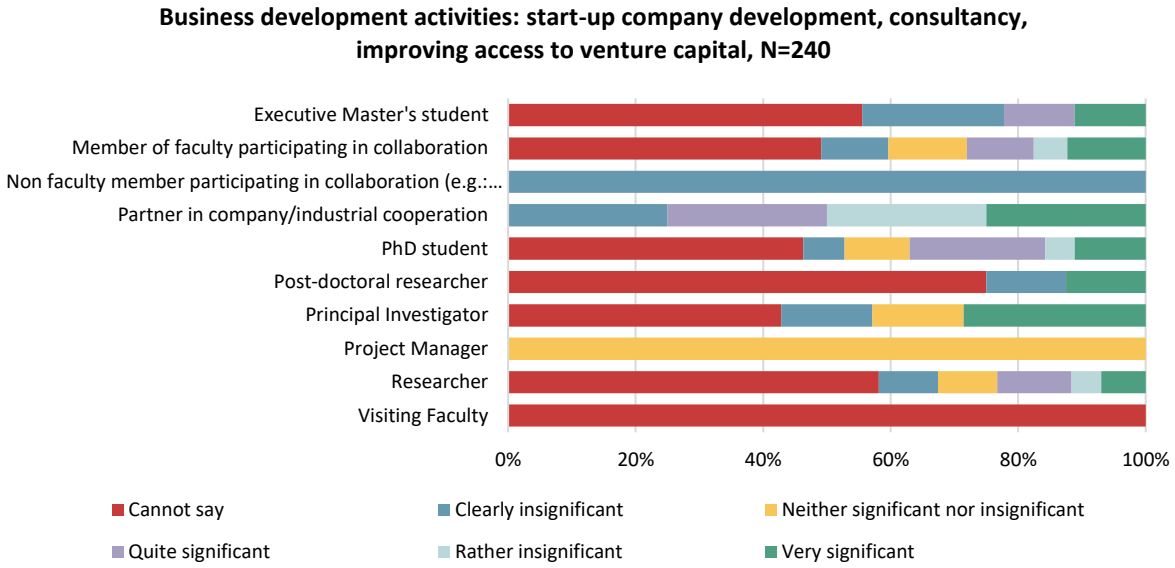

Figure G 21

Table G 13

Role in the Programme	Business development activities: start-up company development, consultancy, improving access to venture capital					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	55,6%	22,2%	0,0%	11,1%	0,0%	11,1%
Member of faculty participating in collaboration	49,1%	10,5%	12,3%	10,5%	5,3%	12,3%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	25,0%	0,0%	25,0%	25,0%	25,0%
PhD student	46,3%	6,5%	10,2%	21,3%	4,6%	11,1%
Post-doctoral researcher	75,0%	12,5%	0,0%	0,0%	0,0%	12,5%
Principal Investigator	42,9%	14,3%	14,3%	0,0%	0,0%	28,6%
Project Manager	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Researcher	58,1%	9,3%	9,3%	11,6%	4,7%	7,0%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

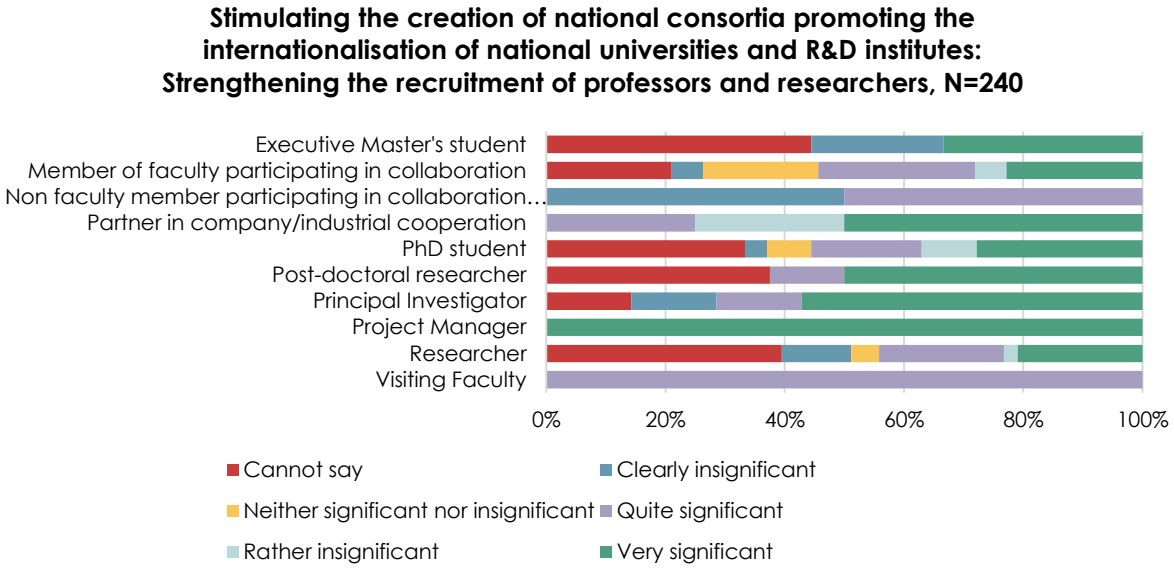

Figure G 22

Table G 14

Role in the Programme	Stimulating the creation of national consortia Promoting the internationalisation of national universities and R&D institutes: Strengthening the recruitment of professors and researchers					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	44,4%	22,2%	0,0%	0,0%	0,0%	33,3%
Member of faculty participating in collaboration	21,1%	5,3%	19,3%	26,3%	5,3%	22,8%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	50,0%	0,0%	50,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	0,0%	0,0%	25,0%	25,0%	50,0%
PhD student	33,3%	3,7%	7,4%	18,5%	9,3%	27,8%
Post-doctoral researcher	37,5%	0,0%	0,0%	12,5%	0,0%	50,0%
Principal Investigator	14,3%	14,3%	0,0%	14,3%	0,0%	57,1%
Project Manager	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%
Researcher	39,5%	11,6%	4,7%	20,9%	2,3%	20,9%
Visiting Faculty	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

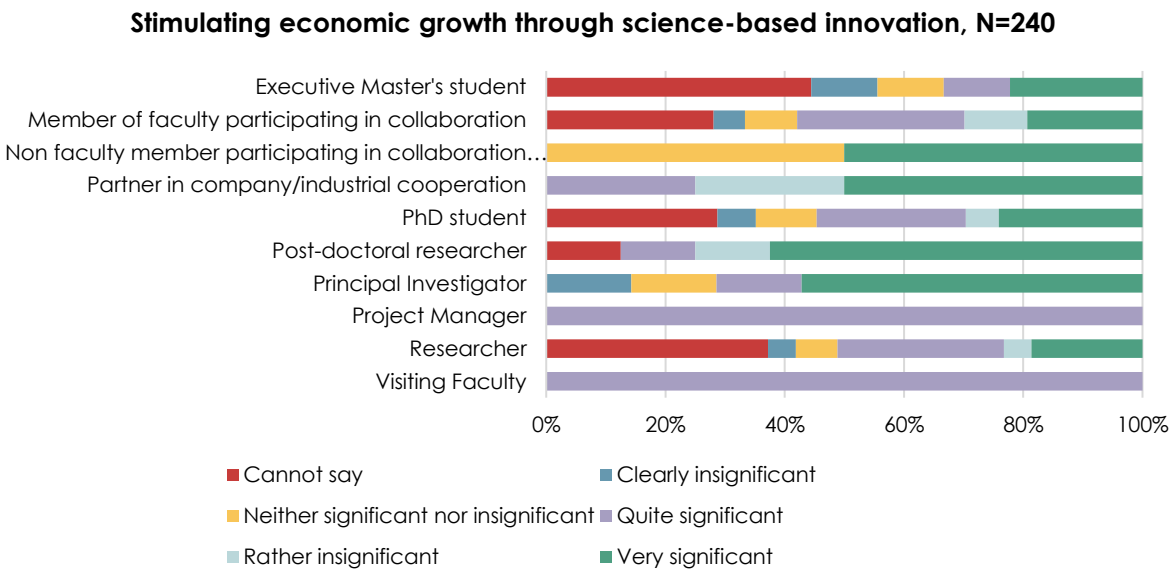

Figure G 23

Table G 15

Role in the Programme	Stimulating economic growth through science-based innovation					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive Master's student	44,4%	11,1%	11,1%	11,1%	0,0%	22,2%
Member of faculty participating in collaboration	28,1%	5,3%	8,8%	28,1%	10,5%	19,3%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	50,0%	0,0%	0,0%	50,0%
Partner in company/industrial cooperation	0,0%	0,0%	0,0%	25,0%	25,0%	50,0%
PhD student	28,7%	6,5%	10,2%	25,0%	5,6%	24,1%
Post-doctoral researcher	12,5%	0,0%	0,0%	12,5%	12,5%	62,5%
Principal Investigator	0,0%	14,3%	14,3%	14,3%	0,0%	57,1%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	37,2%	4,7%	7,0%	27,9%	4,7%	18,6%
Visiting Faculty	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

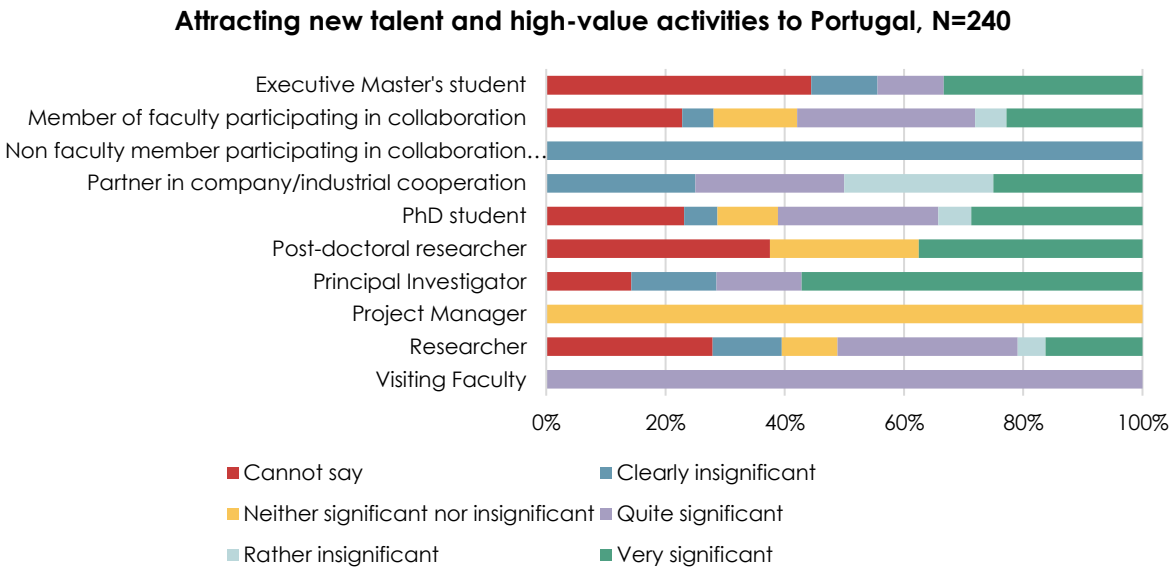

Figure G 24

Table G 16

Role in the Programme	Attracting new talent and high-value activities to Portugal					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	44,4%	11,1%	0,0%	11,1%	0,0%	33,3%
Member of faculty participating in collaboration	22,8%	5,3%	14,0%	29,8%	5,3%	22,8%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	25,0%	0,0%	25,0%	25,0%	25,0%
PhD student	23,1%	5,6%	10,2%	26,9%	5,6%	28,7%
Post-doctoral researcher	37,5%	0,0%	25,0%	0,0%	0,0%	37,5%
Principal Investigator	14,3%	14,3%	0,0%	14,3%	0,0%	57,1%
Project Manager	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Researcher	27,9%	11,6%	9,3%	30,2%	4,7%	16,3%
Visiting Faculty	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

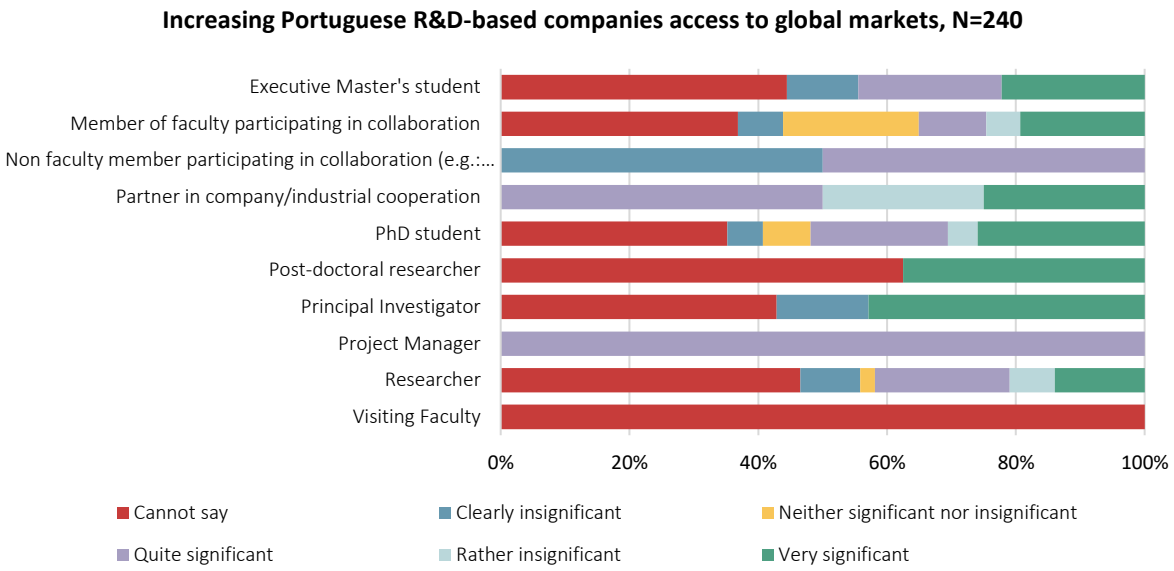

Figure G 25

Table G 17

Role in the Programme	Increasing Portuguese R&D-based companies access to global markets					
	Cannot say	Clearly insignificant	Neither significant nor insignificant	Quite significant	Rather insignificant	Very significant
Executive master's student	44,4%	11,1%	0,0%	22,2%	0,0%	22,2%
Member of faculty participating in collaboration	36,8%	7,0%	21,1%	10,5%	5,3%	19,3%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	50,0%	0,0%	50,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	0,0%	0,0%	50,0%	25,0%	25,0%
PhD student	35,2%	5,6%	7,4%	21,3%	4,6%	25,9%
Post-doctoral researcher	62,5%	0,0%	0,0%	0,0%	0,0%	37,5%
Principal Investigator	42,9%	14,3%	0,0%	0,0%	0,0%	42,9%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	46,5%	9,3%	2,3%	20,9%	7,0%	14,0%
Visiting Faculty	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

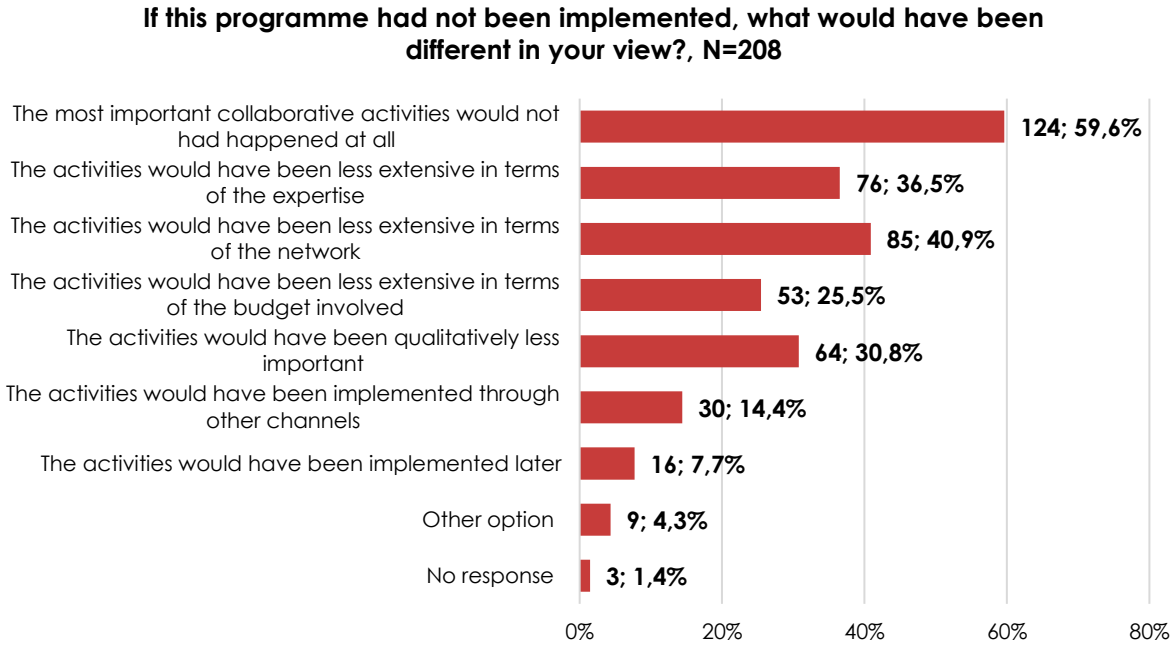

Figure G 26

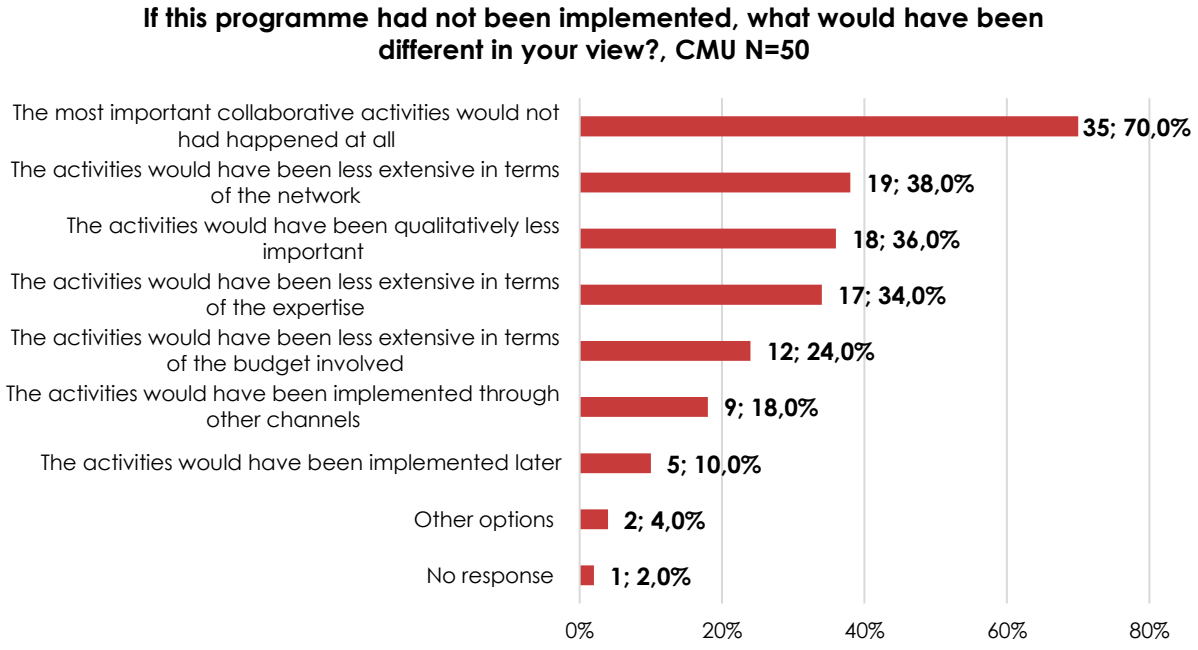

Figure G 27

If this programme had not been implemented, what would have been different in your view?, MIT N=136

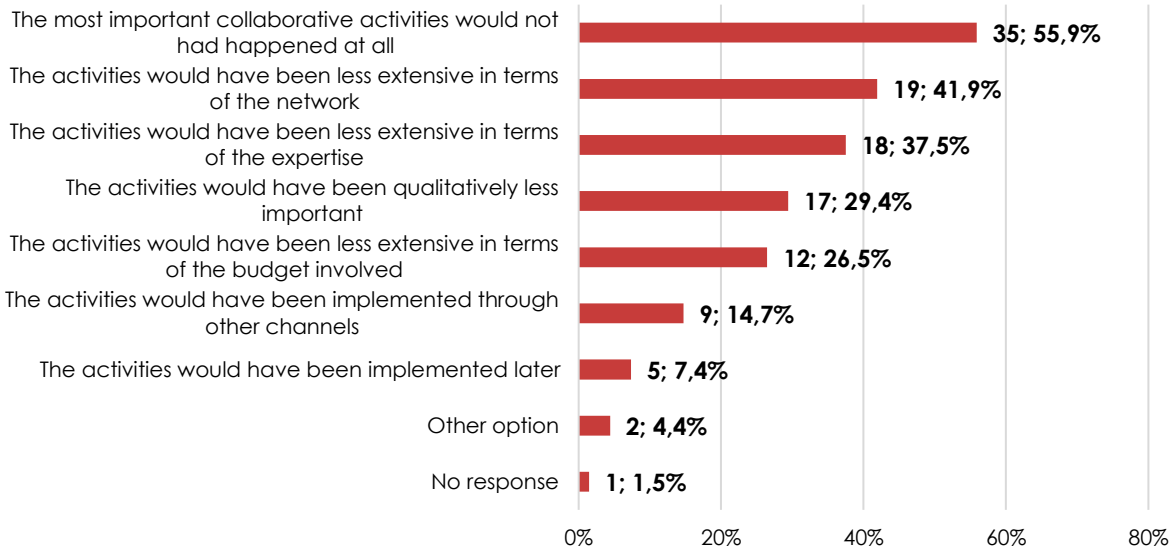

Figure G 28

If this programme had not been implemented, what would have been different in your view?, UTA N=22

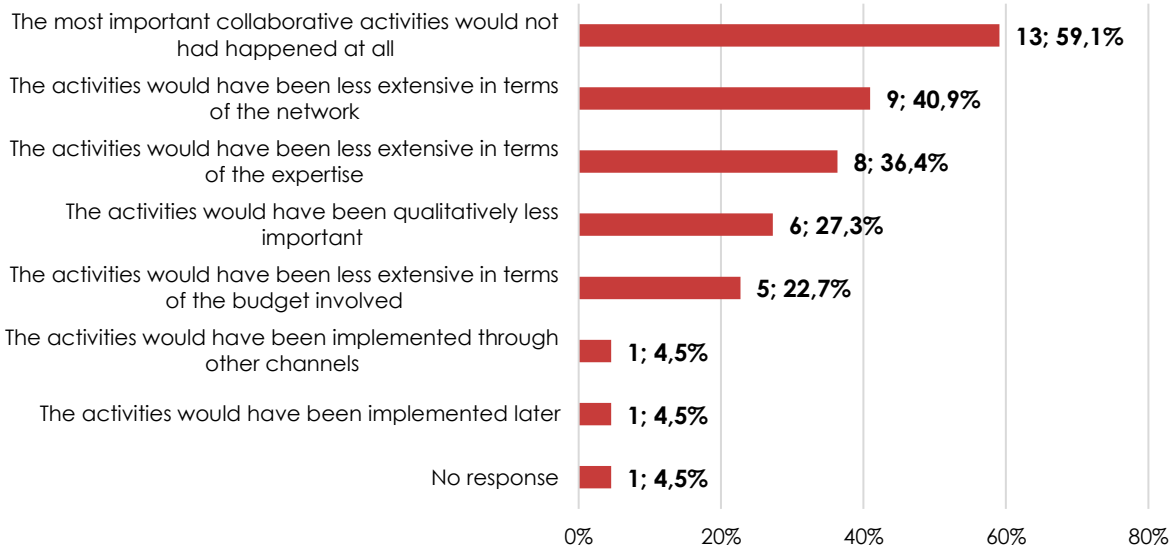

Figure G 29

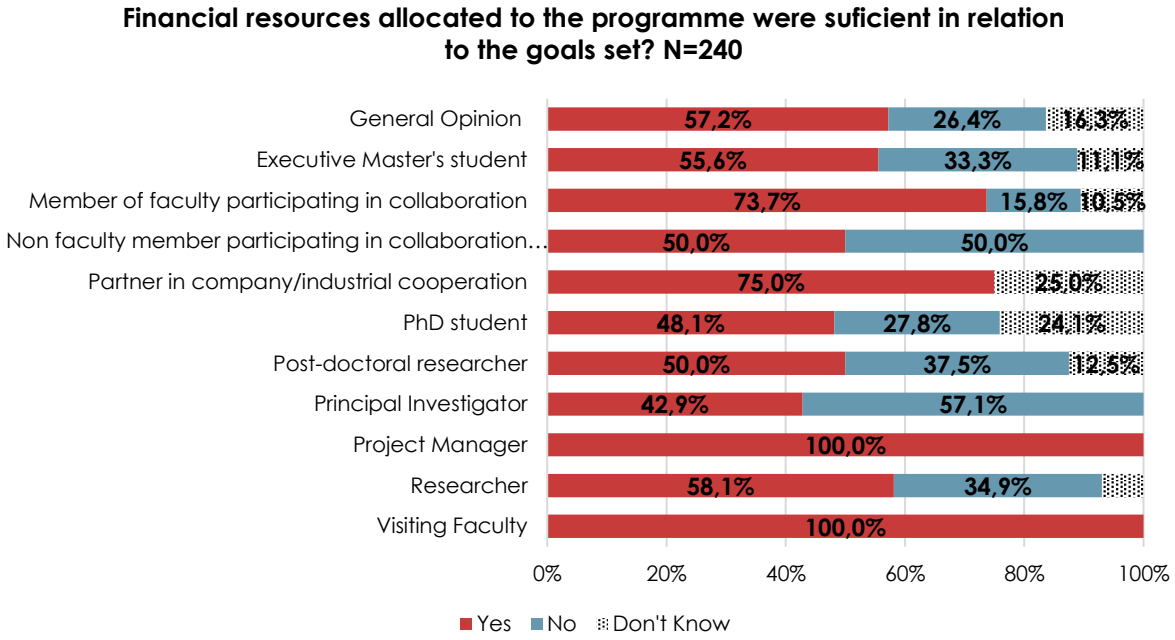

Figure G 30

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

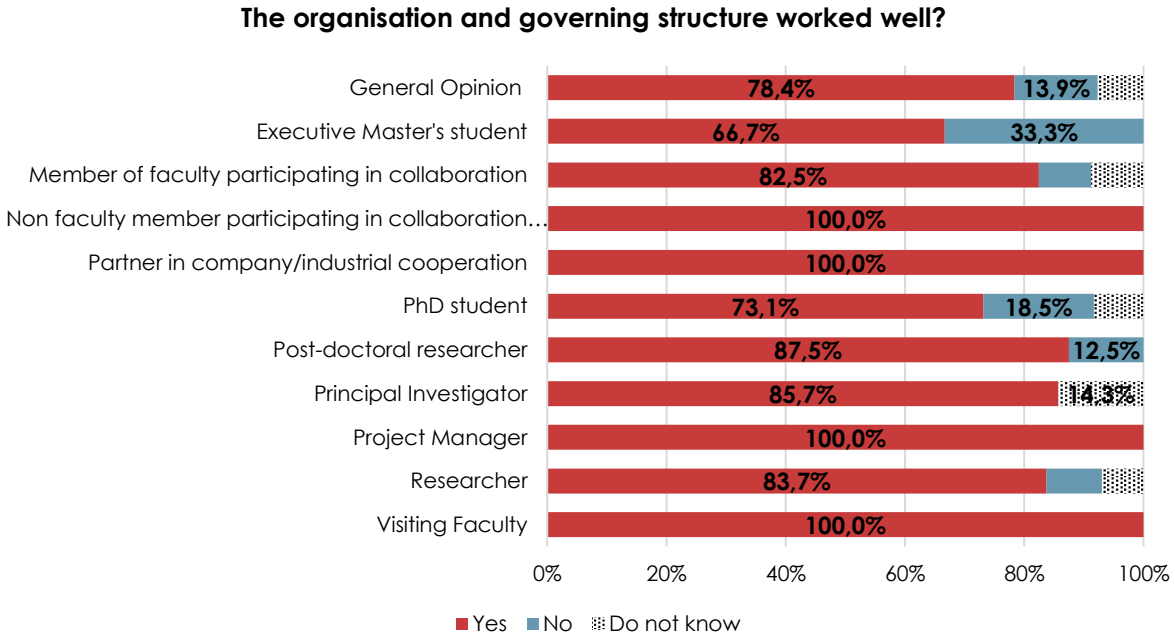

Figure G 31

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

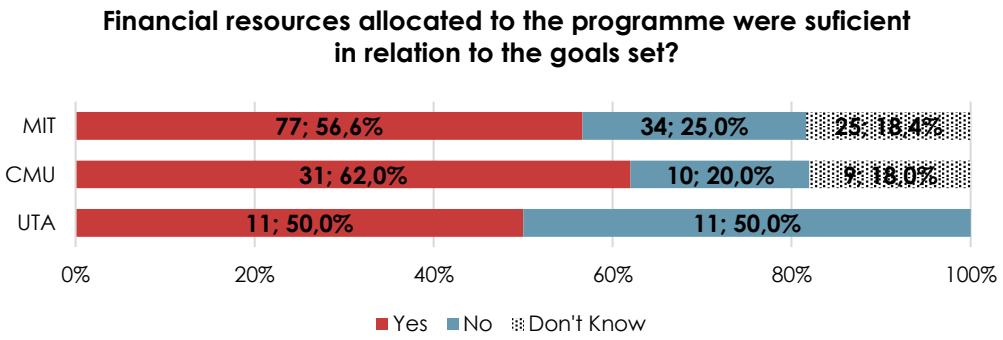

Figure G 32

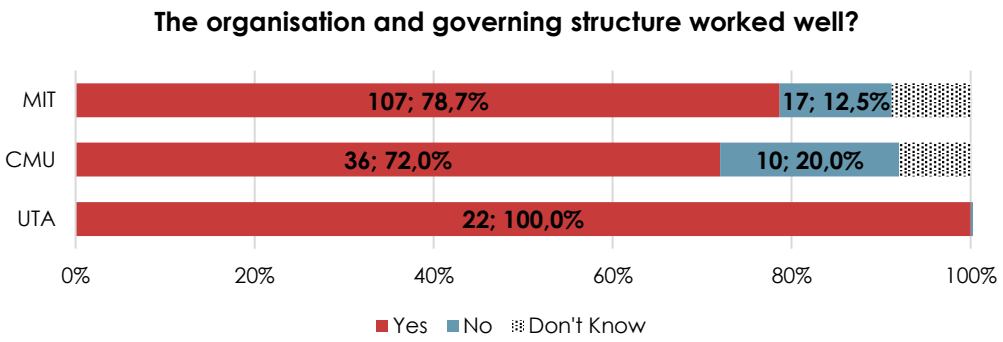

Figure G 33

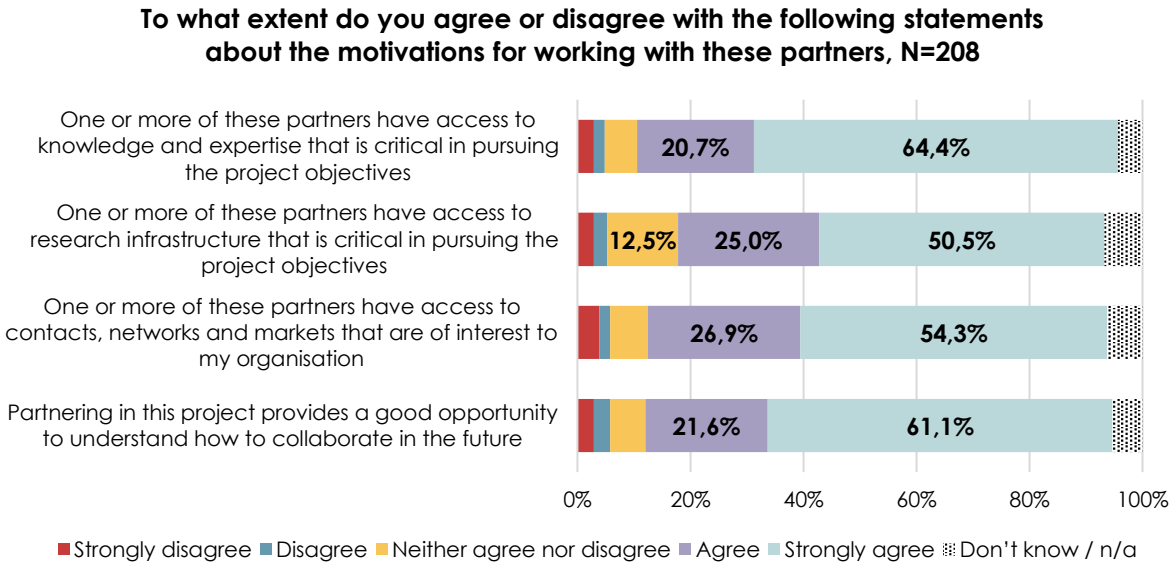

Figure G 34

Table G 18

To what extent do you agree or disagree with the following statements about the motivations for working with these partners	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / n/a
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives	2,9%	1,9%	5,8%	20,7%	64,4%	4,3%
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	2,9%	2,4%	12,5%	25,0%	50,5%	6,7%
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	3,8%	1,9%	6,7%	26,9%	54,3%	6,3%
Partnering in this project provides a good opportunity to understand how to collaborate in the future	2,9%	2,9%	6,3%	21,6%	61,1%	5,3%

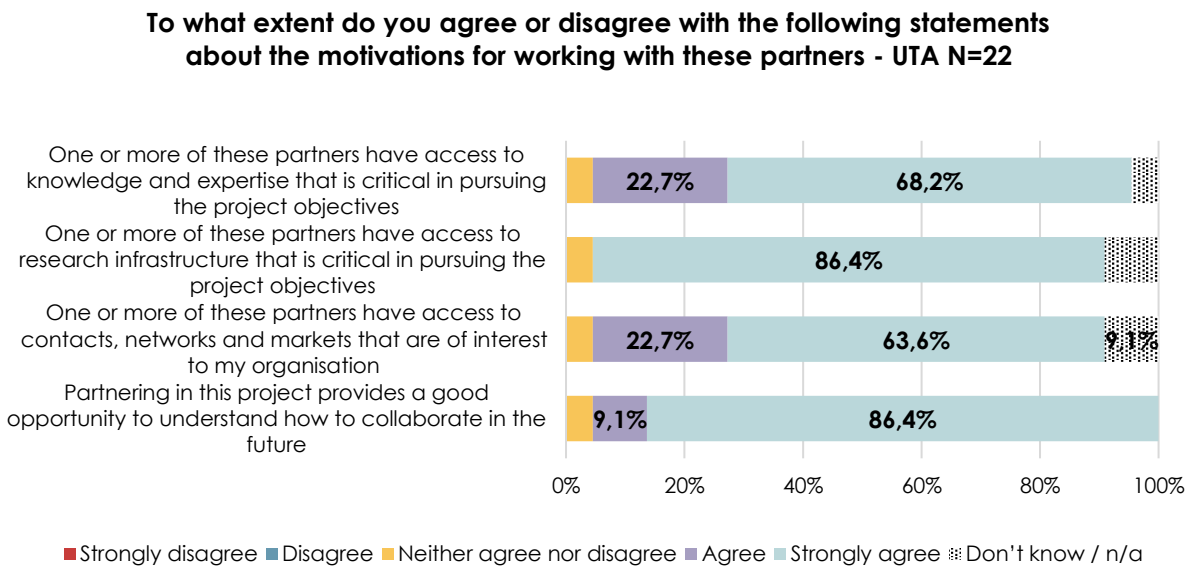

Figure G 35

Table G 19

To what extent do you agree or disagree with the following statements about the motivations for working with these partners – UTA	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / n/a
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives	0,0%	0,0%	4,5%	22,7%	68,2%	4,5%
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	0,0%	0,0%	4,5%	0,0%	86,4%	9,1%

To what extent do you agree or disagree with the following statements about the motivations for working with these partners – UTA	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / n/a
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	0,0%	0,0%	4,5%	22,7%	63,6%	9,1%
Partnering in this project provides a good opportunity to understand how to collaborate in the future	0,0%	0,0%	4,5%	9,1%	86,4%	0,0%

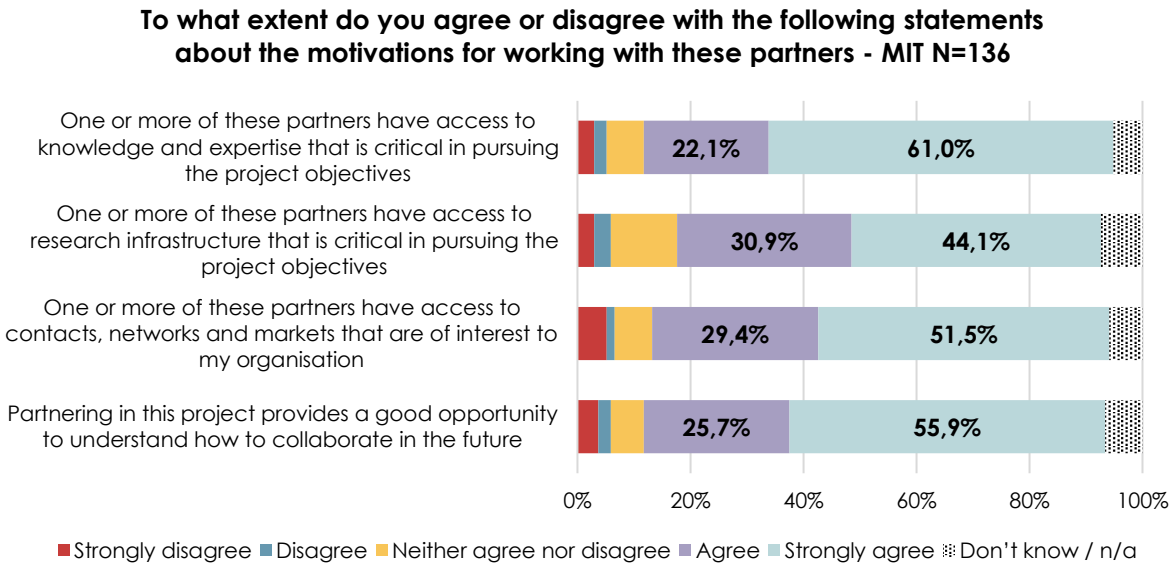

Figure G 36

Table G 20

To what extent do you agree or disagree with the following statements about the motivations for working with these partners – MIT	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / n/a
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives	2,9%	2,2%	6,6%	22,1%	61,0%	5,1%
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	2,9%	2,9%	11,8%	30,9%	44,1%	7,4%
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	5,1%	1,5%	6,6%	29,4%	51,5%	5,9%
Partnering in this project provides a good opportunity to understand how to collaborate in the future	3,7%	2,2%	5,9%	25,7%	55,9%	6,6%

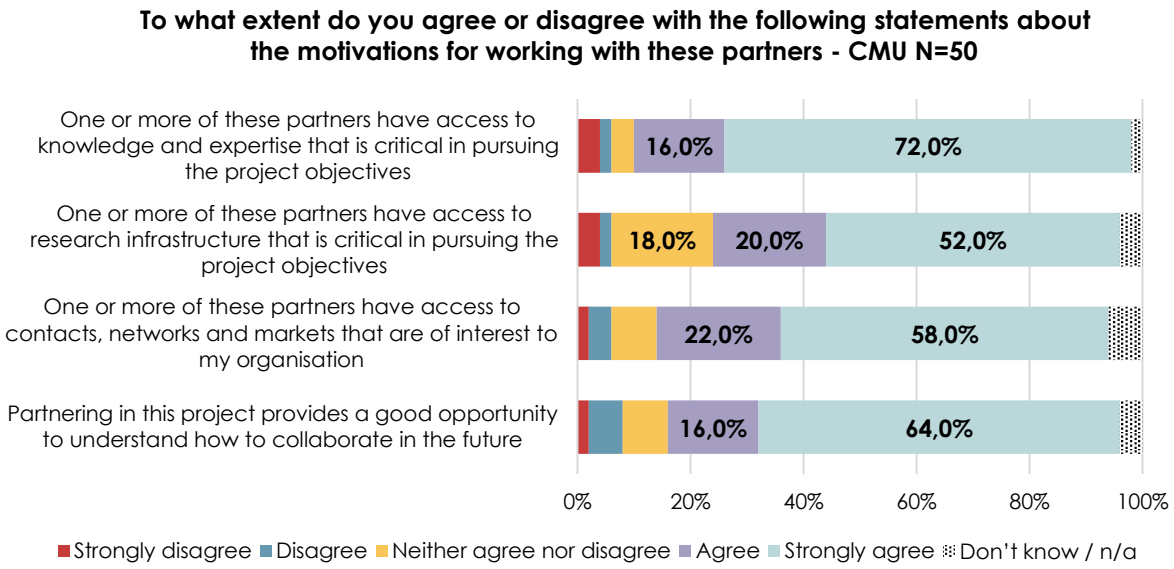

Figure G 37

Table G 21

To what extent do you agree or disagree with the following statements about the motivations for working with these partners – CMU	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Don't know / n/a
One or more of these partners have access to knowledge and expertise that is critical in pursuing the project objectives	4,0%	2,0%	4,0%	16,0%	72,0%	2,0%
One or more of these partners have access to research infrastructure that is critical in pursuing the project objectives	4,0%	2,0%	18,0%	20,0%	52,0%	4,0%
One or more of these partners have access to contacts, networks and markets that are of interest to my organisation	2,0%	4,0%	8,0%	22,0%	58,0%	6,0%
Partnering in this project provides a good opportunity to understand how to collaborate in the future	2,0%	6,0%	8,0%	16,0%	64,0%	4,0%

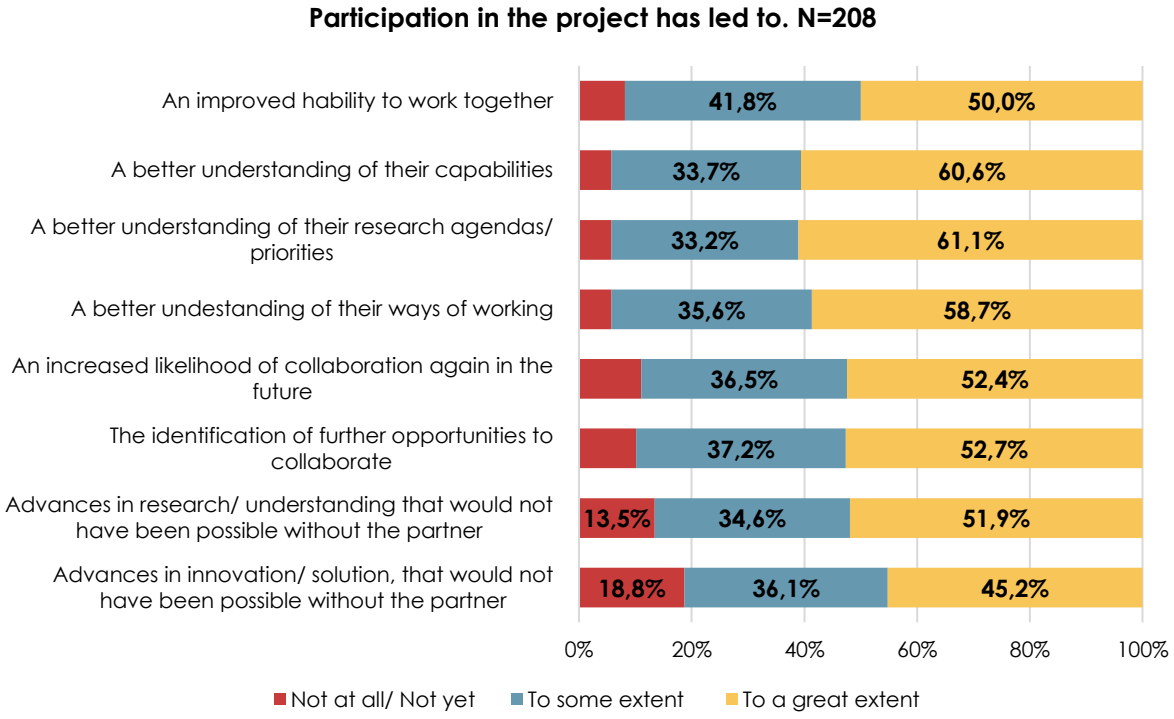

Figure G 38

Table G 22

Participation in the project has led to	Not at all/ Not yet	To some extent	To a great extent
An improved ability to work together	8,2%	41,8%	50,0%
A better understanding of their capabilities	5,8%	33,7%	60,6%
A better understanding of their research agendas/ priorities	5,8%	33,2%	61,1%
A better understanding of their ways of working	5,8%	35,6%	58,7%
An increased likelihood of collaboration again in the future	11,1%	36,5%	52,4%
The identification of further opportunities to collaborate	10,1%	37,2%	52,7%
Advances in research/ understanding that would not have been possible without the partner	13,5%	34,6%	51,9%
Advances in innovation/ solution, that would not have been possible without the partner	18,8%	36,1%	45,2%

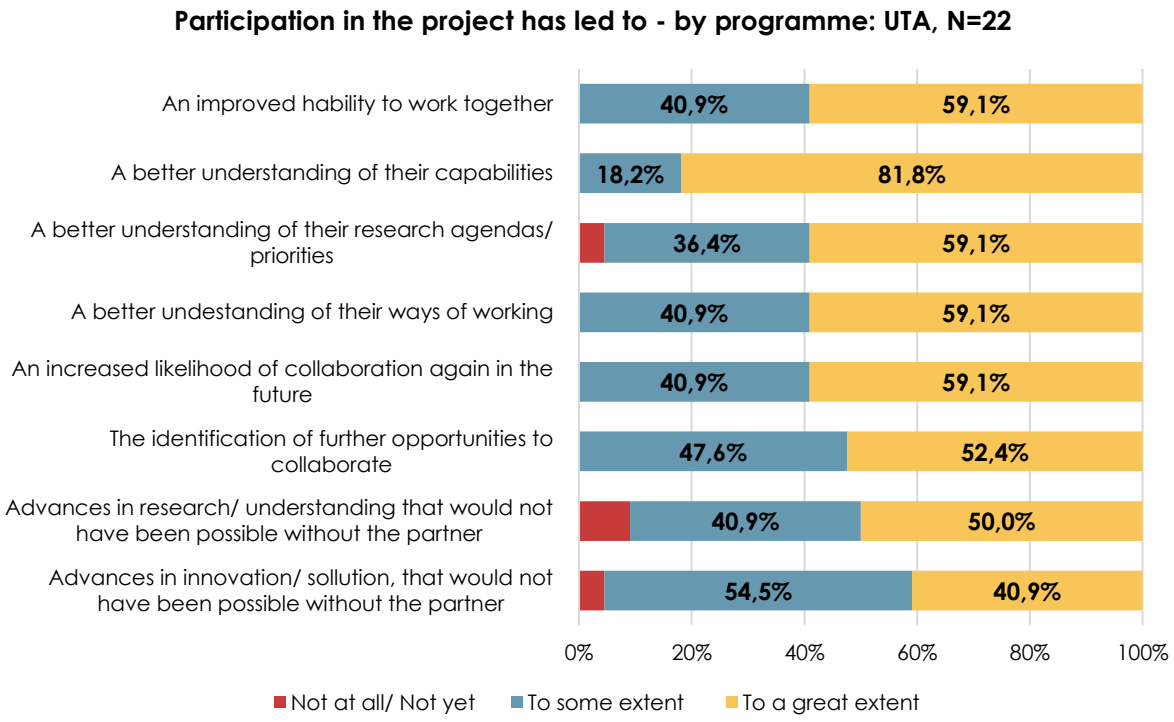

Figure G 39

Table G 23

Participation in the project has led to - by programme and subprogramme - UTA	Not at all/ Not yet	To some extent	To a great extent
An improved ability to work together	0,0%	40,9%	59,1%
A better understanding of their capabilities	0,0%	18,2%	81,8%
A better understanding of their research agendas/ priorities	4,5%	36,4%	59,1%
A better understanding of their ways of working	0,0%	40,9%	59,1%
An increased likelihood of collaboration again in the future	0,0%	40,9%	59,1%
The identification of further opportunities to collaborate	0,0%	47,6%	52,4%
Advances in research/ understanding that would not have been possible without the partner	9,1%	40,9%	50,0%
Advances in innovation/ solution, that would not have been possible without the partner	4,5%	54,5%	40,9%

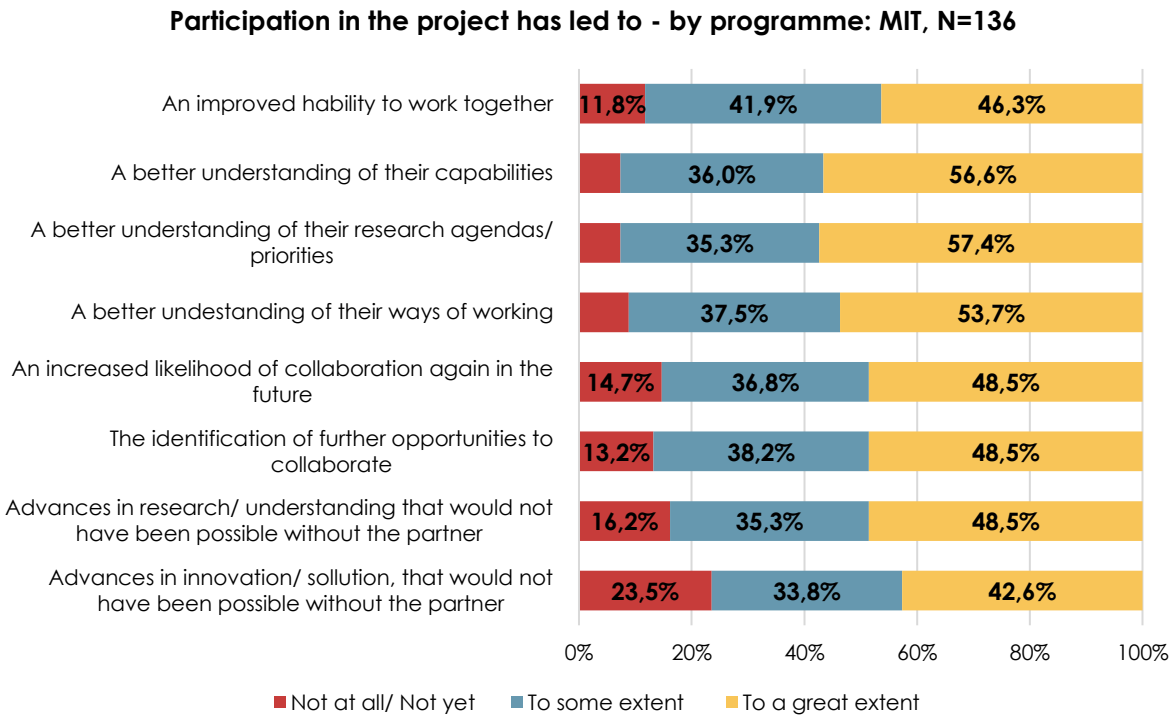

Figure G 40

Table G 24

Participation in the project has led to - by programme and subprogramme - MIT	Not at all/ Not yet	To some extent	To a great extent
An improved ability to work together	11,8%	41,9%	46,3%
A better understanding of their capabilities	7,4%	36,0%	56,6%
A better understanding of their research agendas/ priorities	7,4%	35,3%	57,4%
A better understanding of their ways of working	8,8%	37,5%	53,7%
An increased likelihood of collaboration again in the future	14,7%	36,8%	48,5%
The identification of further opportunities to collaborate	13,2%	38,2%	48,5%
Advances in research/ understanding that would not have been possible without the partner	16,2%	35,3%	48,5%
Advances in innovation/ solution, that would not have been possible without the partner	23,5%	33,8%	42,6%

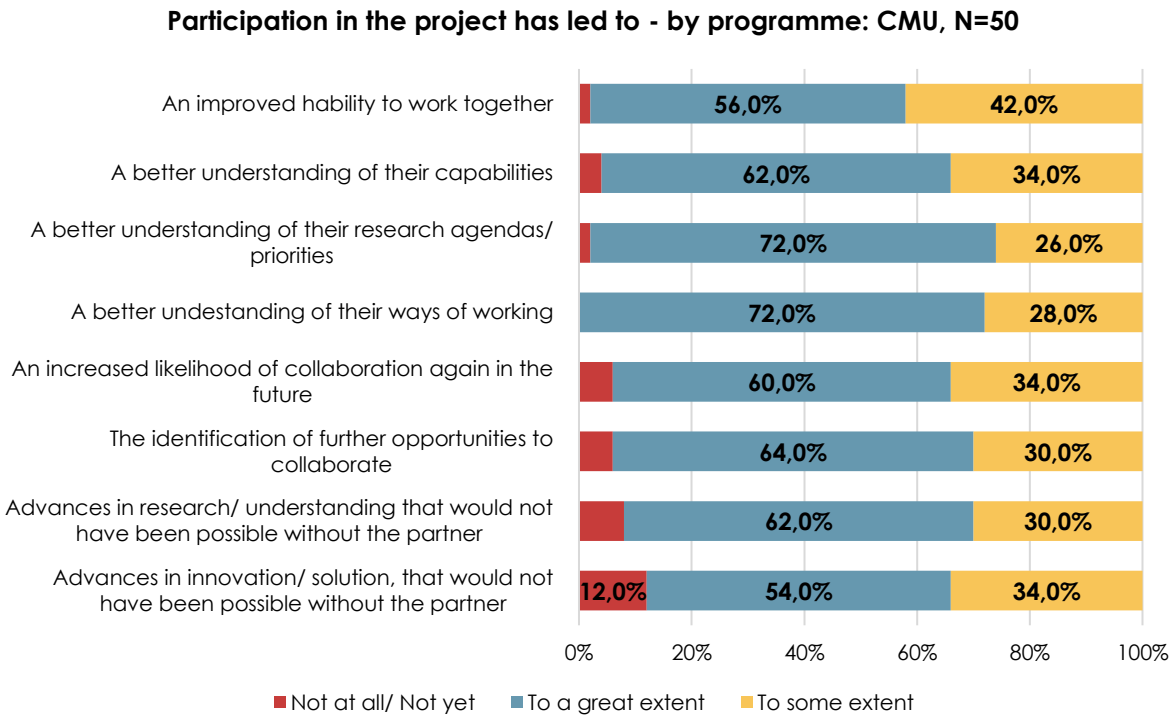

Figure G 41

Table G 25

Participation in the project has led to - by programme and subprogramme - CMU	Not at all/ Not yet	To some extent	To a great extent
An improved ability to work together	2,0%	42,0%	56,0%
A better understanding of their capabilities	4,0%	34,0%	62,0%
A better understanding of their research agendas/ priorities	2,0%	26,0%	72,0%
A better understanding of their ways of working	0,0%	28,0%	72,0%
An increased likelihood of collaboration again in the future	6,0%	34,0%	60,0%
The identification of further opportunities to collaborate	6,0%	30,0%	64,0%
Advances in research/ understanding that would not have been possible without the partner	8,0%	30,0%	62,0%
Advances in innovation/ solution, that would not have been possible without the partner	12,0%	34,0%	54,0%

G.1.3 Relevance and Efficacy

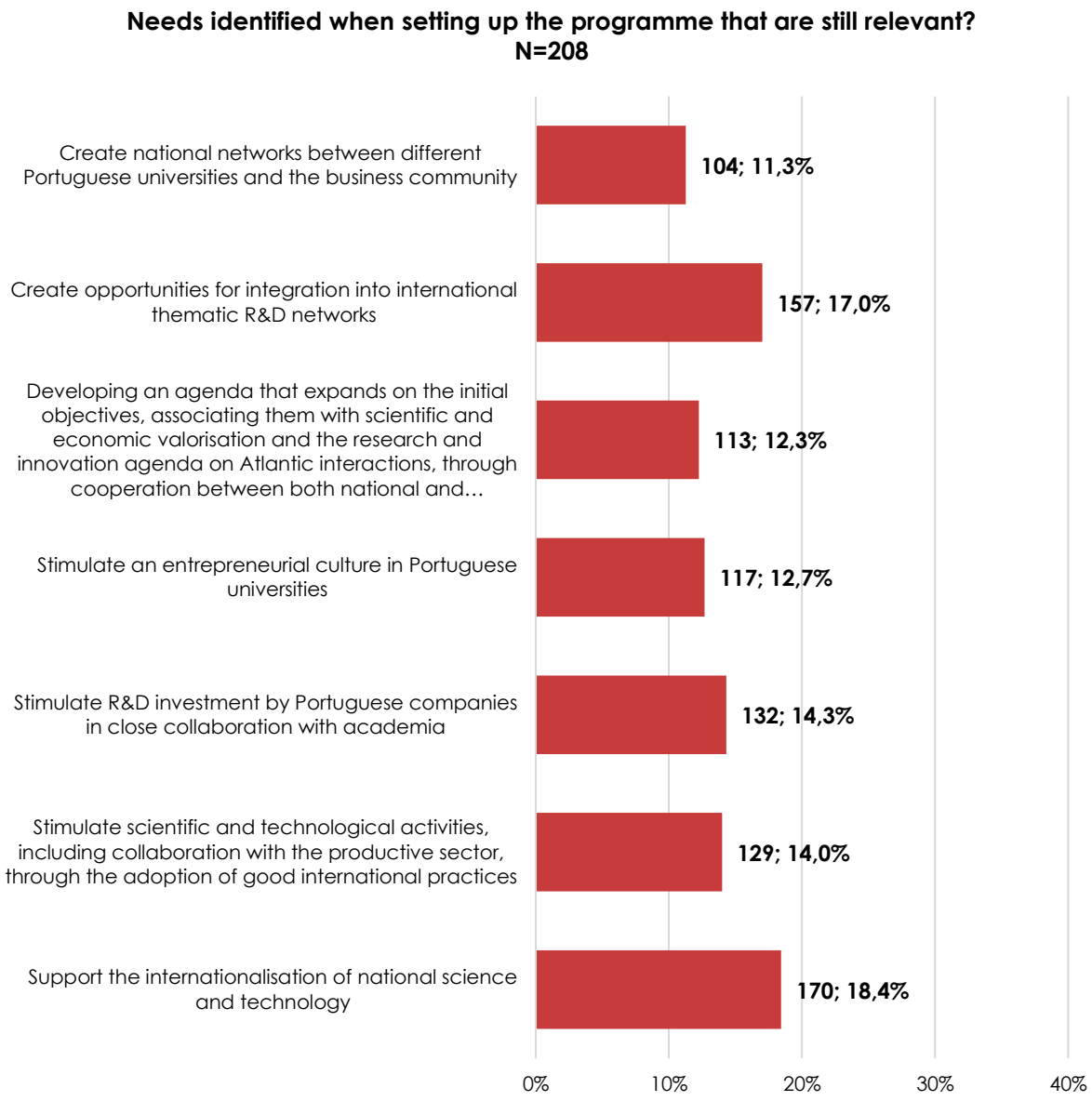

Figure G 42

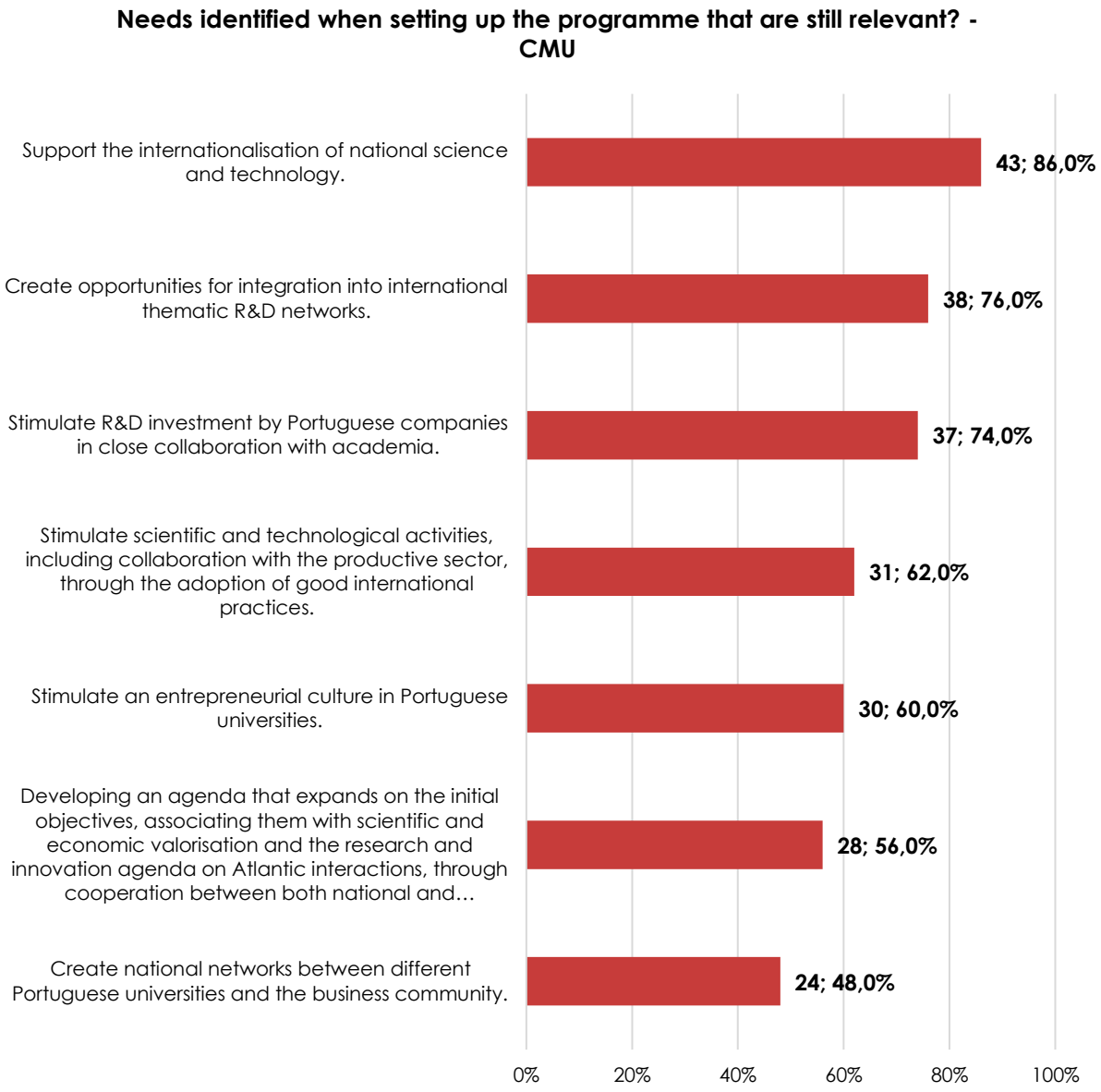
Needs identified when setting up the programme that are still relevant? - CMU
Support the internationalisation of national science and technology.
43; 86,0%
Create opportunities for integration into international thematic R&D networks.
38; 76,0%
Stimulate R&D investment by Portuguese companies in close collaboration with academia.
37; 74,0%
Stimulate scientific and technological activities, including collaboration with the productive sector, through the adoption of good international practices.
31; 62,0%
Stimulate an entrepreneurial culture in Portuguese universities.
30; 60,0%
Developing an agenda that expands on the initial objectives, associating them with scientific and economic valorisation and the research and innovation agenda on Atlantic interactions, through cooperation between both national and…
28; 56,0%
Create national networks between different Portuguese universities and the business community.
24; 48,0%
0%
20%
40%
60%
80%
100%

Figure G 43

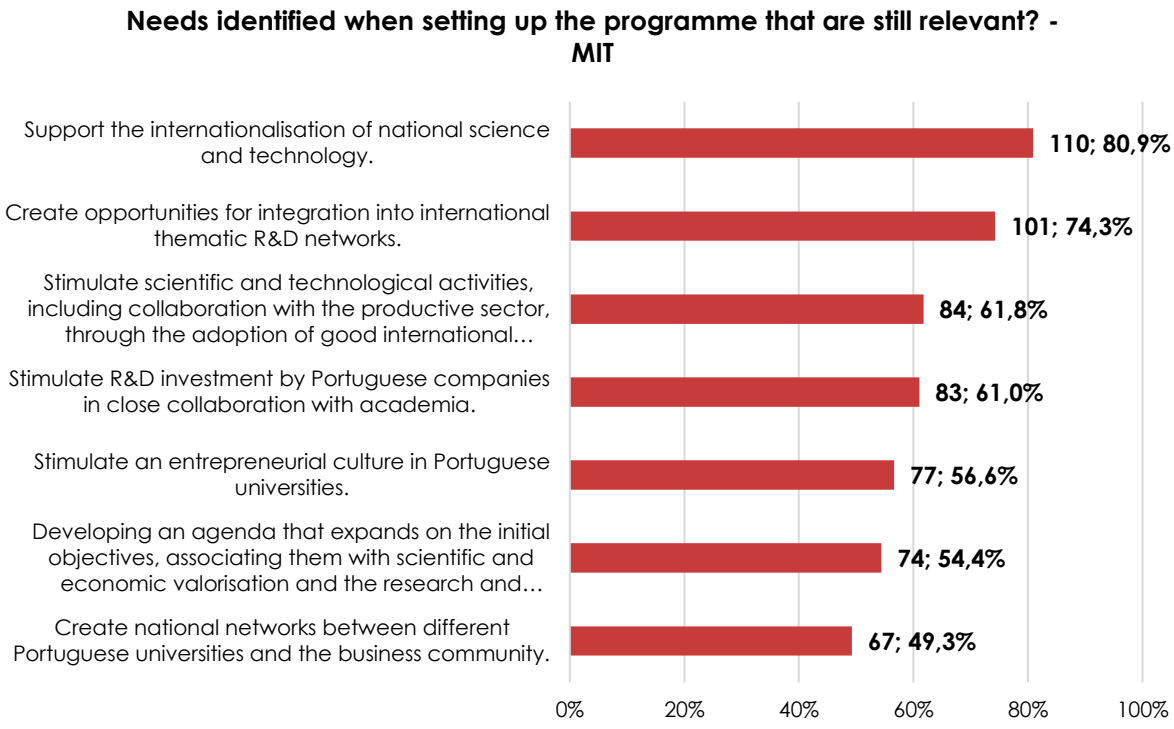

Figure G 44

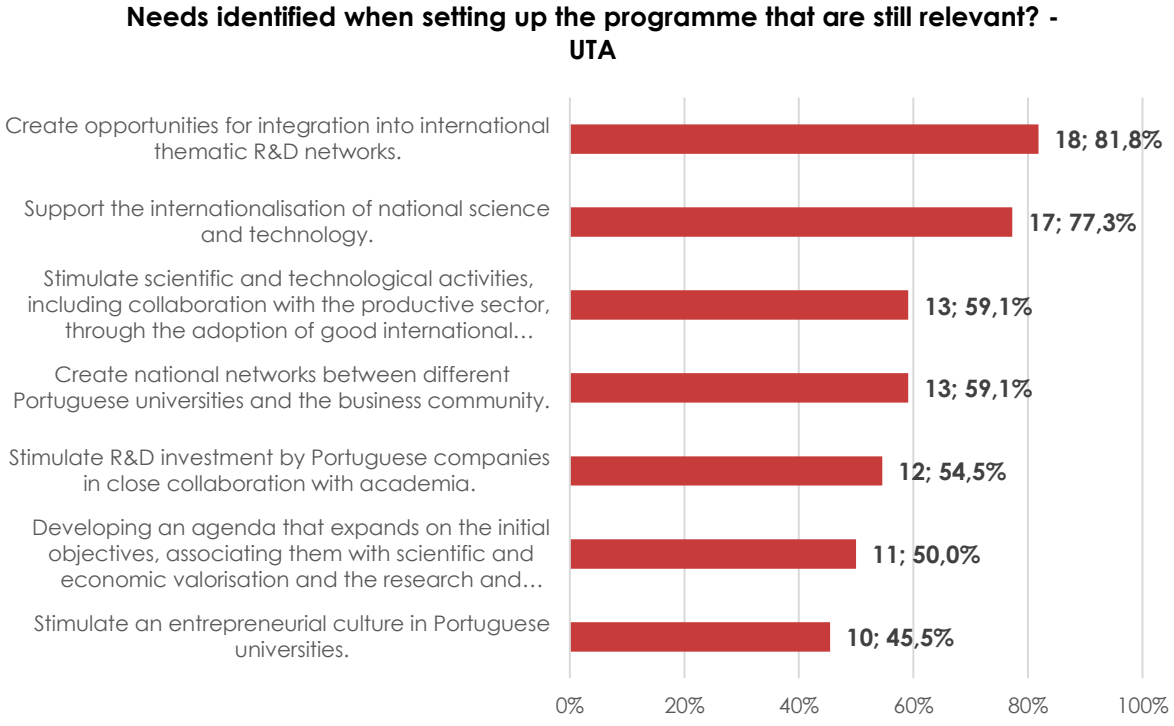

Figure G 45

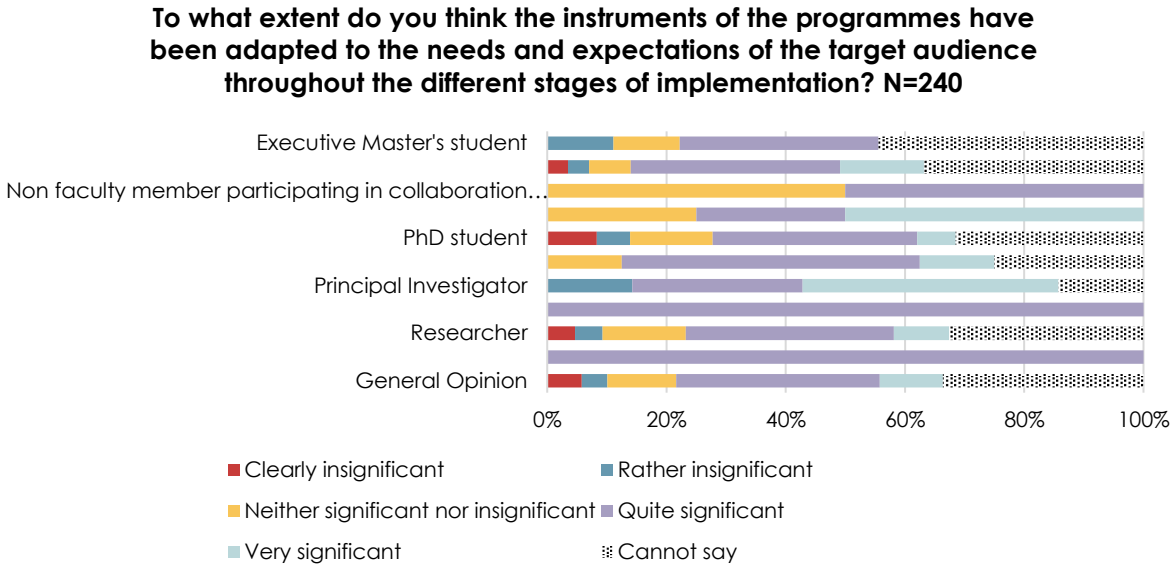

Figure G 46

Table G 26

To what extent do you think the instruments of the programmes have been adapted to the needs and expectations of the target audience throughout the different stages of implementation?						
Role in the programme	**Clearly insignificant**	**Rather insignificant**	**Neither significant nor insignificant**	**Quite significant**	**Very significant**	**Cannot say**
Executive master's student	0,0%	11,1%	11,1%	33,3%	0,0%	44,4%
Member of faculty participating in collaboration	3,5%	3,5%	7,0%	35,1%	14,0%	36,8%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	50,0%	50,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	0,0%	25,0%	25,0%	50,0%	0,0%
PhD student	8,3%	5,6%	13,9%	34,3%	6,5%	31,5%
Post-doctoral researcher	0,0%	0,0%	12,5%	50,0%	12,5%	25,0%
Principal Investigator	0,0%	14,3%	0,0%	28,6%	42,9%	14,3%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	4,7%	4,7%	14,0%	34,9%	9,3%	32,6%
Visiting Faculty	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
General Opinion	5,8%	4,3%	11,5%	34,1%	10,6%	33,7%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity)

To what extent do you think the instruments of the programmes have been adapted to the needs and expectations of the target audience throughout the different stages of implementation?

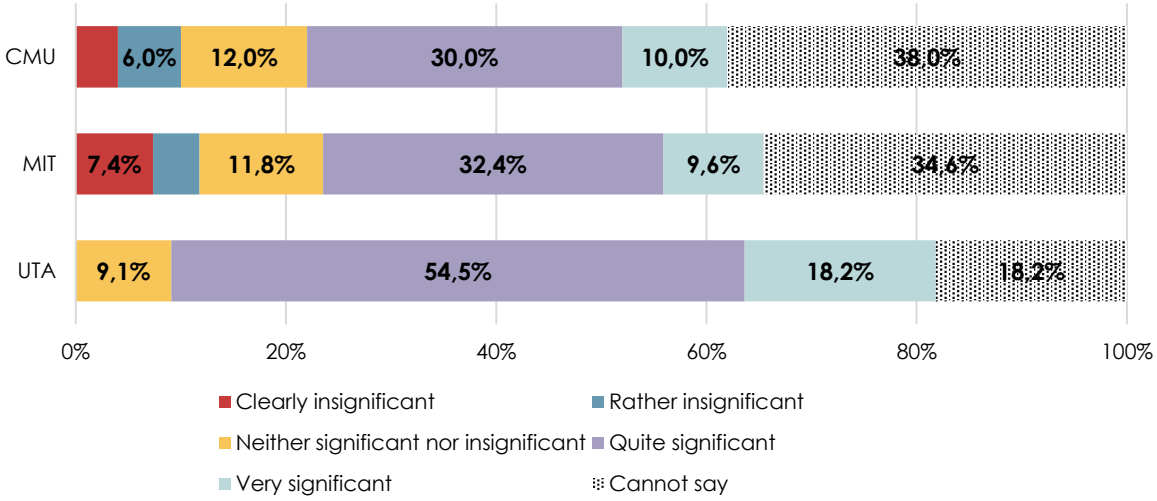

Figure G 47

What is your perception of the current and future relevance of partnership programmes? N=240

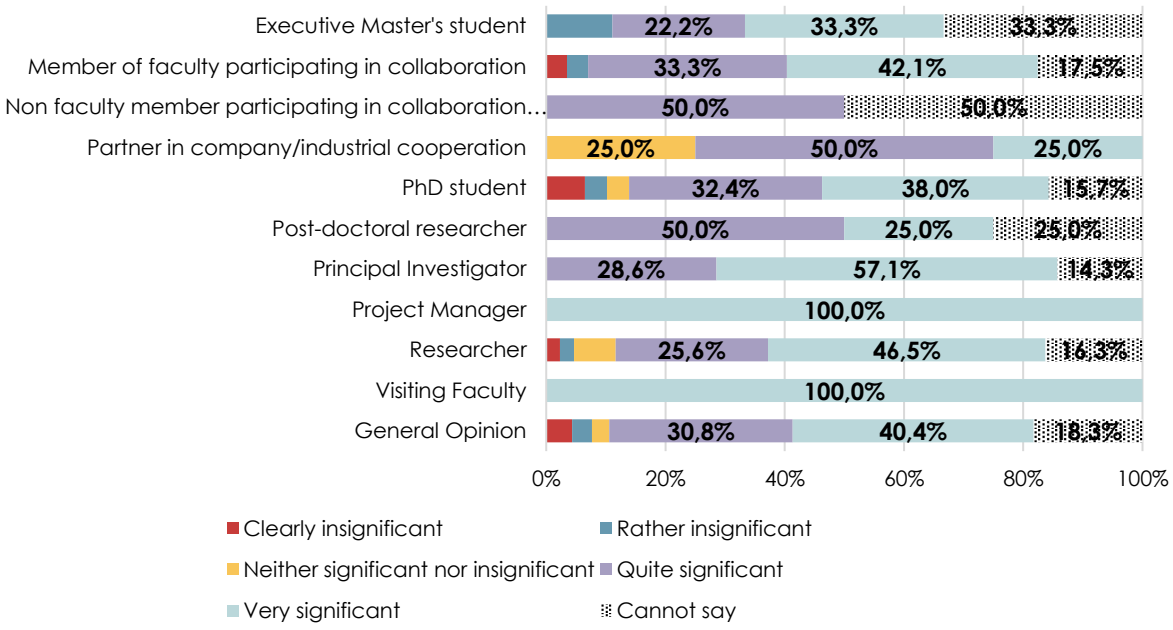

Figure G 48

Table G 27

What is your perception of the current and future relevance of partnership programmes?						
Role in the programme	**Clearly insignificant**	**Rather insignificant**	**Neither significant nor insignificant**	**Quite significant**	**Very significant**	**Cannot say**
Executive master's student	0,0%	11,1%	0,0%	22,2%	33,3%	33,3%
Member of faculty participating in collaboration	3,5%	3,5%	0,0%	33,3%	42,1%	17,5%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	0,0%	50,0%	0,0%	50,0%
Partner in company/industrial cooperation	0,0%	0,0%	25,0%	50,0%	25,0%	0,0%
PhD student	6,5%	3,7%	3,7%	32,4%	38,0%	15,7%
Post-doctoral researcher	0,0%	0,0%	0,0%	50,0%	25,0%	25,0%
Principal Investigator	0,0%	0,0%	0,0%	28,6%	57,1%	14,3%
Project Manager	0,0%	0,0%	0,0%	0,0%	100,0%	0,0%
Researcher	2,3%	2,3%	7,0%	25,6%	46,5%	16,3%
Visiting Faculty	0,0%	0,0%	0,0%	0,0%	100,0%	0,0%
General Opinion	4,3%	3,4%	2,9%	30,8%	40,4%	18,3%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

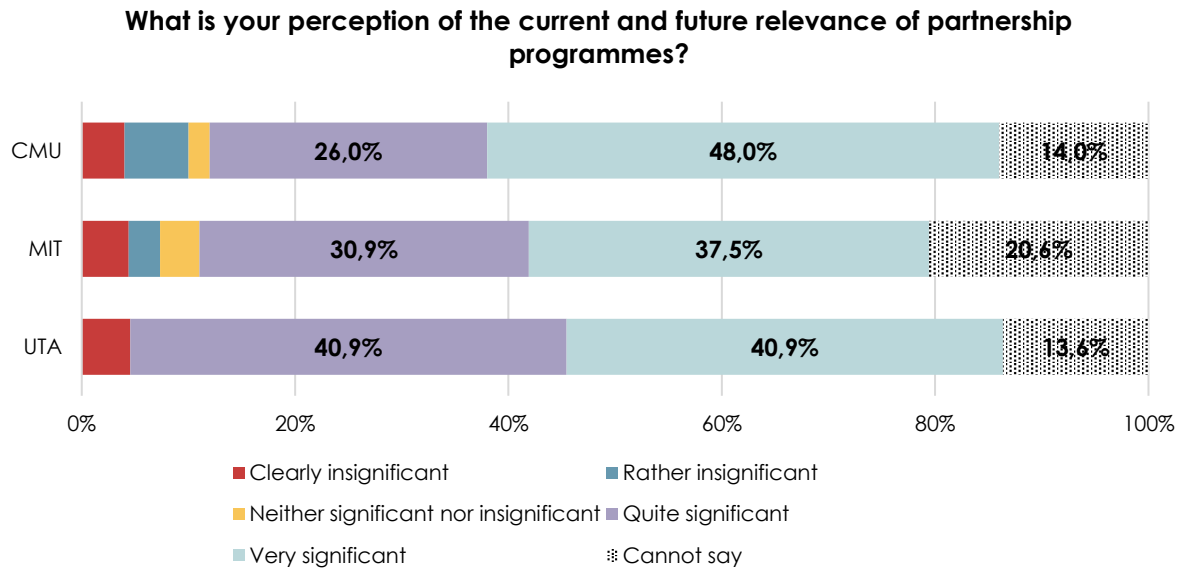

Figure G 49

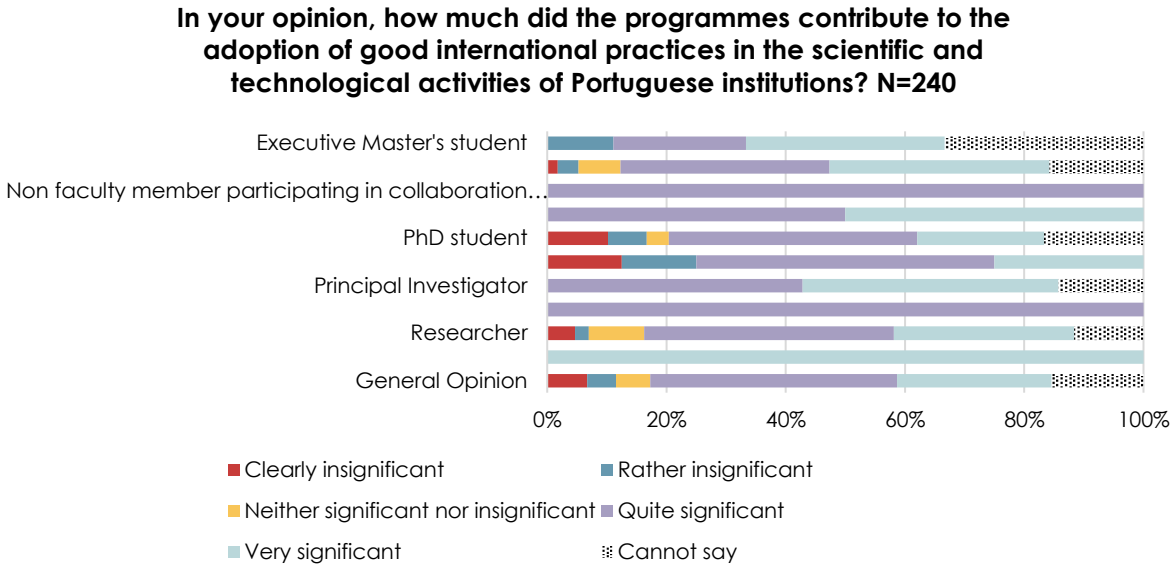

Figure G 50

Table G 28

In your opinion, how much did the programmes contribute to the adoption of good international practices in the scientific and technological activities of Portuguese institutions?						
Role in the programme	**Clearly insignificant**	**Rather insignificant**	**Neither significant nor insignificant**	**Quite significant**	**Very significant**	**Cannot say**
Executive master's student	0,0%	11,1%	0,0%	22,2%	33,3%	33,3%
Member of faculty participating in collaboration	1,8%	3,5%	7,0%	35,1%	36,8%	15,8%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	0,0%	0,0%	50,0%	50,0%	0,0%
PhD student	10,2%	6,5%	3,7%	41,7%	21,3%	16,7%
Post-doctoral researcher	12,5%	12,5%	0,0%	50,0%	25,0%	0,0%
Principal Investigator	0,0%	0,0%	0,0%	42,9%	42,9%	14,3%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	4,7%	2,3%	9,3%	41,9%	30,2%	11,6%

In your opinion, how much did the programmes contribute to the adoption of good international practices in the scientific and technological activities of Portuguese institutions?						
Role in the programme	**Clearly insignificant**	**Rather insignificant**	**Neither significant nor insignificant**	**Quite significant**	**Very significant**	**Cannot say**
Visiting Faculty	0,0%	0,0%	0,0%	0,0%	100,0%	0,0%
General Opinion	6,7%	4,8%	5,8%	41,3%	26,0%	15,4%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

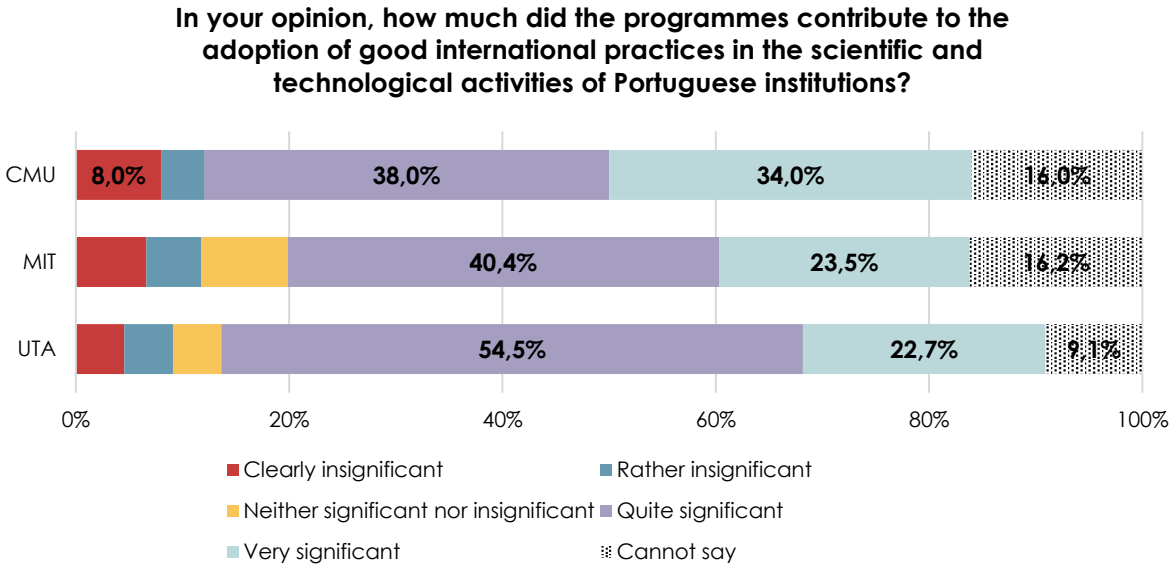

Figure G 51

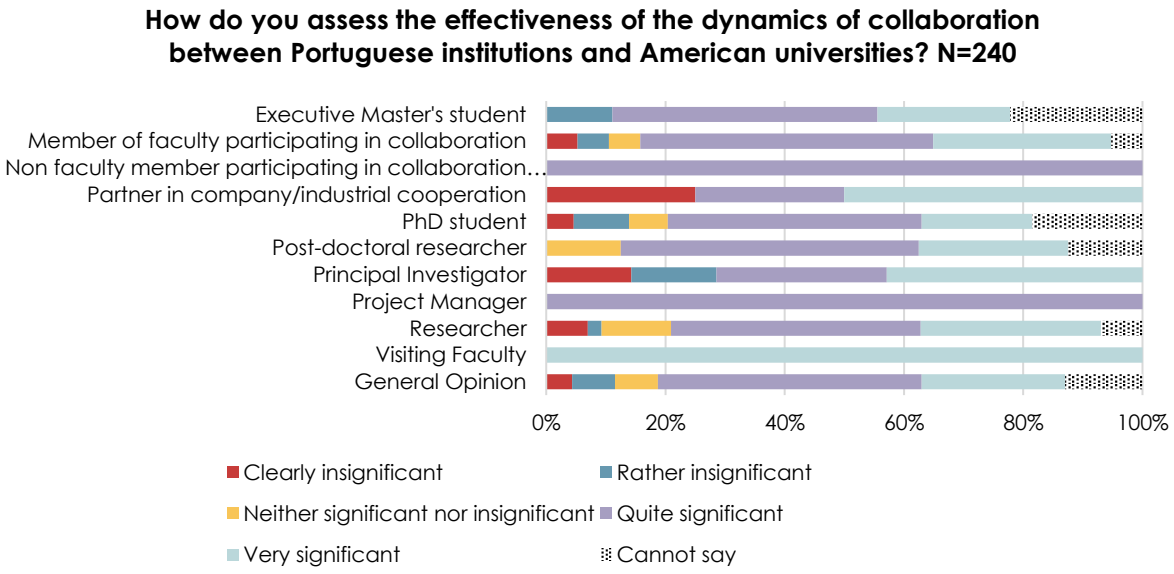

Figure G 52

Table G 29

How do you assess the effectiveness of the dynamics of collaboration between Portuguese institutions and American universities?						
Role in the programme	**Clearly insignificant**	**Rather insignificant**	**Neither significant nor insignificant**	**Quite significant**	**Very significant**	**Cannot say**
Executive master's student	0,0%	11,1%	0,0%	44,4%	22,2%	22,2%
Member of faculty participating in collaboration	5,3%	5,3%	5,3%	49,1%	29,8%	5,3%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Partner in company/industrial cooperation	25,0%	0,0%	0,0%	25,0%	50,0%	0,0%
PhD student	4,6%	9,3%	6,5%	42,6%	18,5%	18,5%
Post-doctoral researcher	0,0%	0,0%	12,5%	50,0%	25,0%	12,5%
Principal Investigator	14,3%	14,3%	0,0%	28,6%	42,9%	0,0%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	7,0%	2,3%	11,6%	41,9%	30,2%	7,0%
Visiting Faculty	0,0%	0,0%	0,0%	0,0%	100,0%	0,0%
General Opinion	4,3%	7,2%	7,2%	44,2%	24,0%	13,0%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

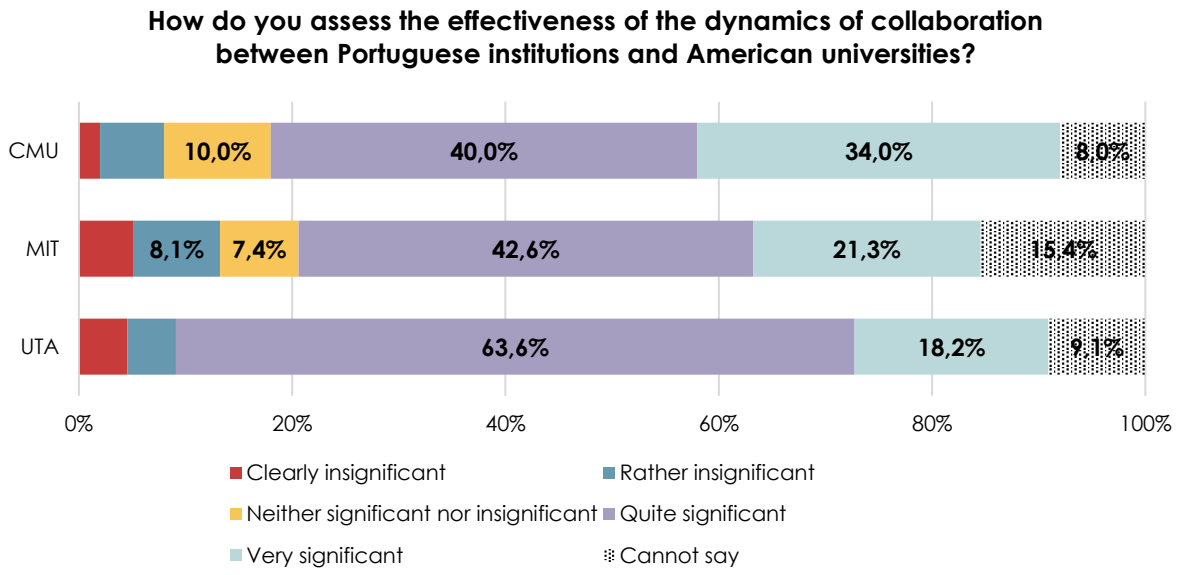

Figure G 53

G.1.4 Impact

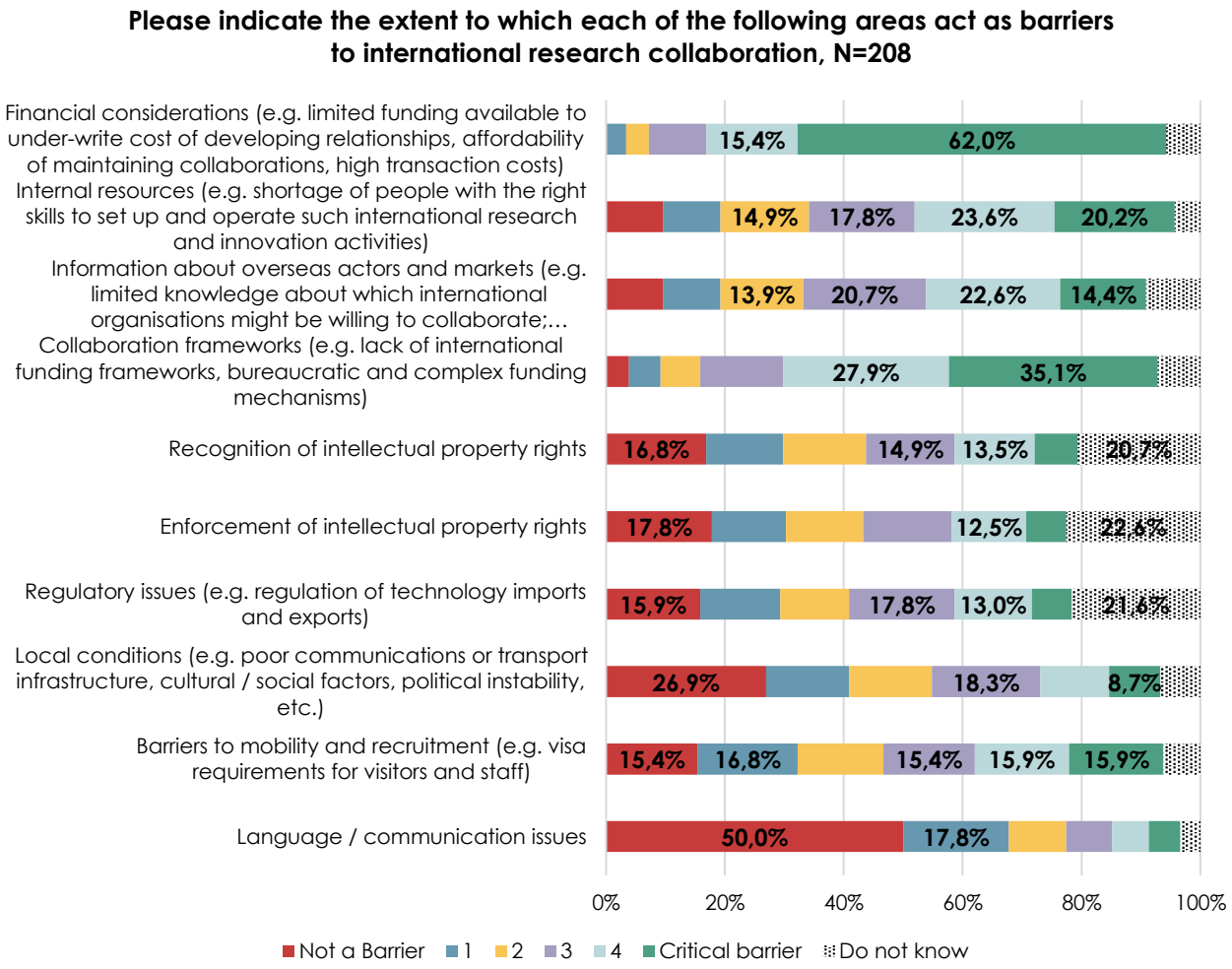

Figure G 54

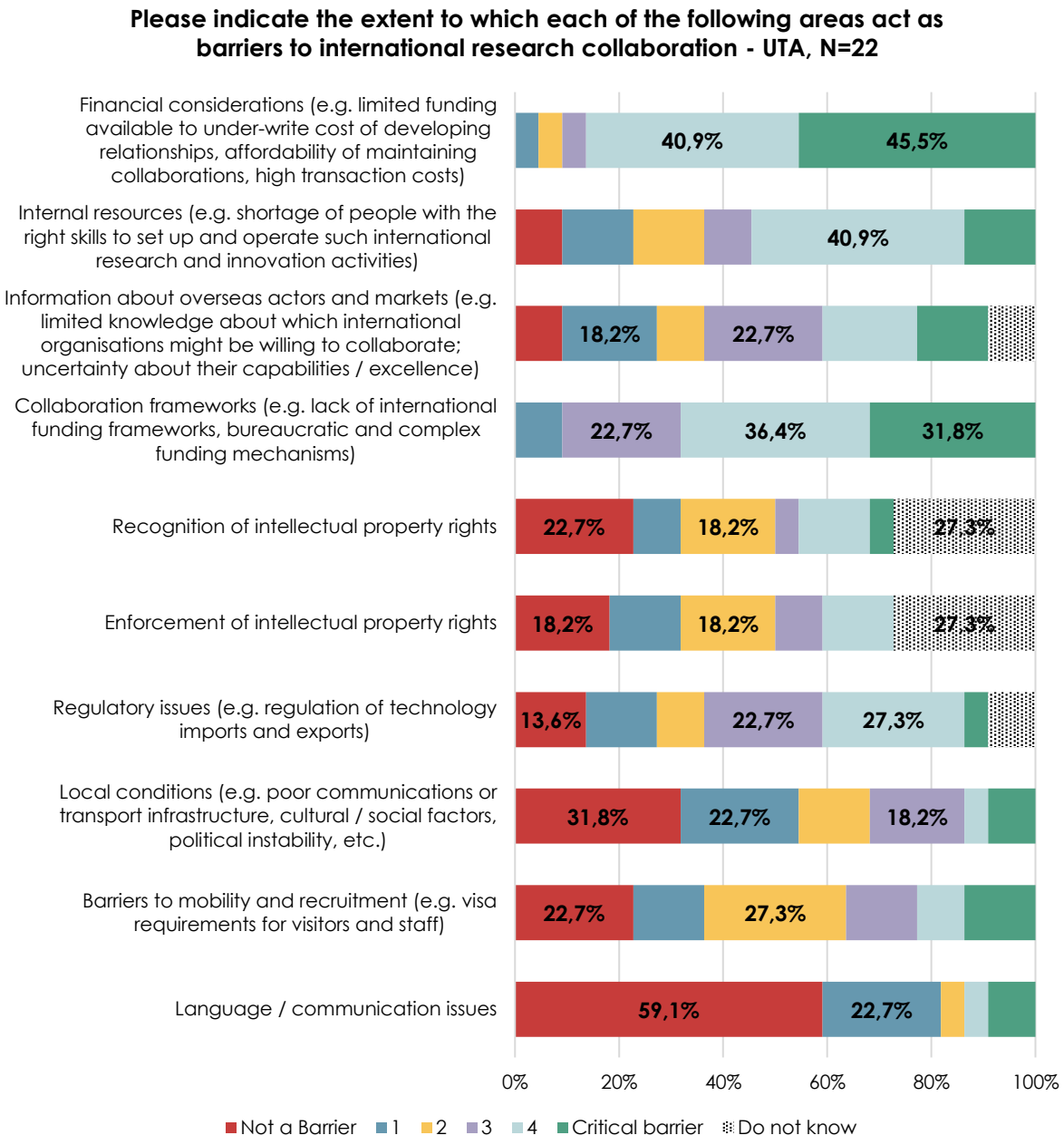
Please indicate the extent to which each of the following areas act as barriers to international research collaboration - UTA, N=22
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)
40,9%
45,5%
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)
40,9%
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)
18,2%
22,7%
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)
22,7%
36,4%
31,8%
Recognition of intellectual property rights
22,7%
18,2%
27,3%
Enforcement of intellectual property rights
18,2%
18,2%
27,3%
Regulatory issues (e.g. regulation of technology imports and exports)
13,6%
22,7%
27,3%
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)
31,8%
22,7%
18,2%
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)
22,7%
27,3%
Language / communication issues
59,1%
22,7%
0%
20%
40%
60%
80%
100%
Not a Barrier
1
2
3
4
Critical barrier
Do not know

Figure G 55

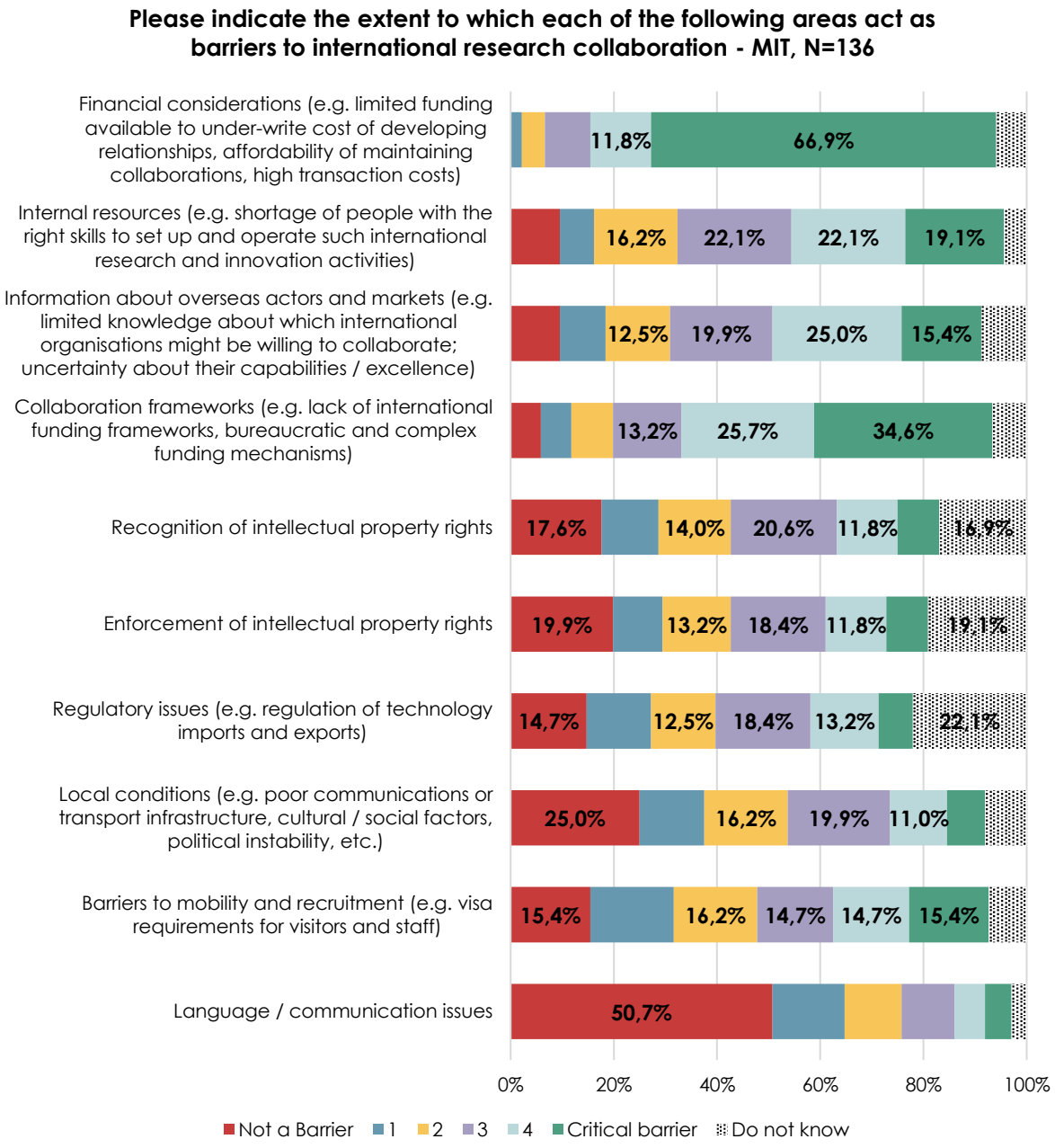
Please indicate the extent to which each of the following areas act as barriers to international research collaboration - MIT, N=136
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)
11,8%
66,9%
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)
16,2%
22,1%
22,1%
19,1%
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)
12,5%
19,9%
25,0%
15,4%
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)
13,2%
25,7%
34,6%
Recognition of intellectual property rights
17,6%
14,0%
20,6%
11,8%
16,9%
Enforcement of intellectual property rights
19,9%
13,2%
18,4%
11,8%
19,1%
Regulatory issues (e.g. regulation of technology imports and exports)
14,7%
12,5%
18,4%
13,2%
22,1%
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)
25,0%
16,2%
19,9%
11,0%
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)
15,4%
16,2%
14,7%
14,7%
15,4%
Language / communication issues
50,7%
0%
20%
40%
60%
80%
100%
Not a Barrier
1
2
3
4
Critical barrier
Do not know

Figure G 56

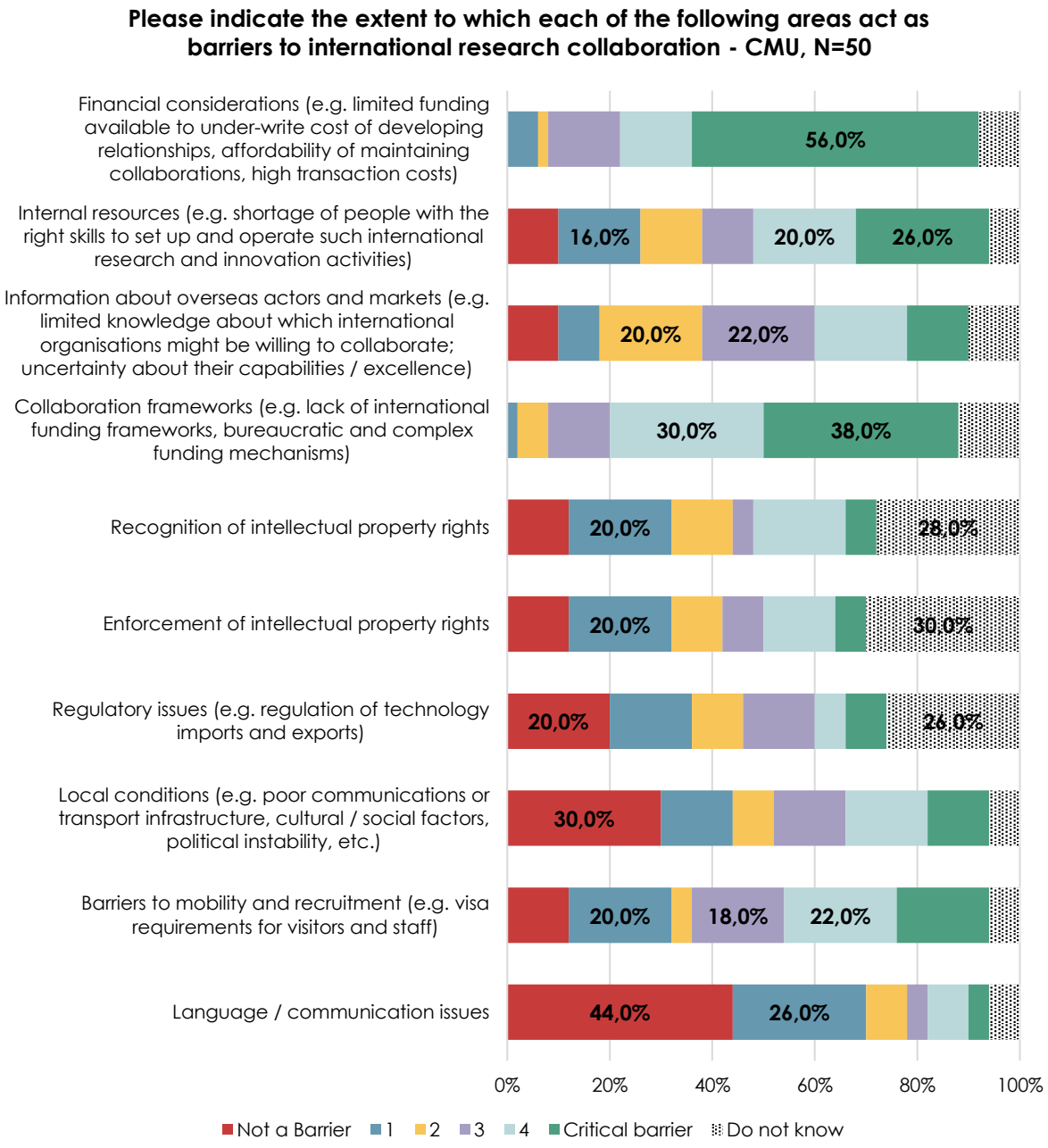
Please indicate the extent to which each of the following areas act as barriers to international research collaboration - CMU, N=50
Financial considerations (e.g. limited funding available to under-write cost of developing relationships, affordability of maintaining collaborations, high transaction costs)
56,0%
Internal resources (e.g. shortage of people with the right skills to set up and operate such international research and innovation activities)
16,0%
20,0%
26,0%
Information about overseas actors and markets (e.g. limited knowledge about which international organisations might be willing to collaborate; uncertainty about their capabilities / excellence)
20,0%
22,0%
Collaboration frameworks (e.g. lack of international funding frameworks, bureaucratic and complex funding mechanisms)
30,0%
38,0%
Recognition of intellectual property rights
20,0%
28,0%
Enforcement of intellectual property rights
20,0%
30,0%
Regulatory issues (e.g. regulation of technology imports and exports)
20,0%
26,0%
Local conditions (e.g. poor communications or transport infrastructure, cultural / social factors, political instability, etc.)
30,0%
Barriers to mobility and recruitment (e.g. visa requirements for visitors and staff)
20,0%
18,0%
22,0%
Language / communication issues
44,0%
26,0%
0%
20%
40%
60%
80%
100%
Not a Barrier
1
2
3
4
Critical barrier
Do not know

Figure G 57

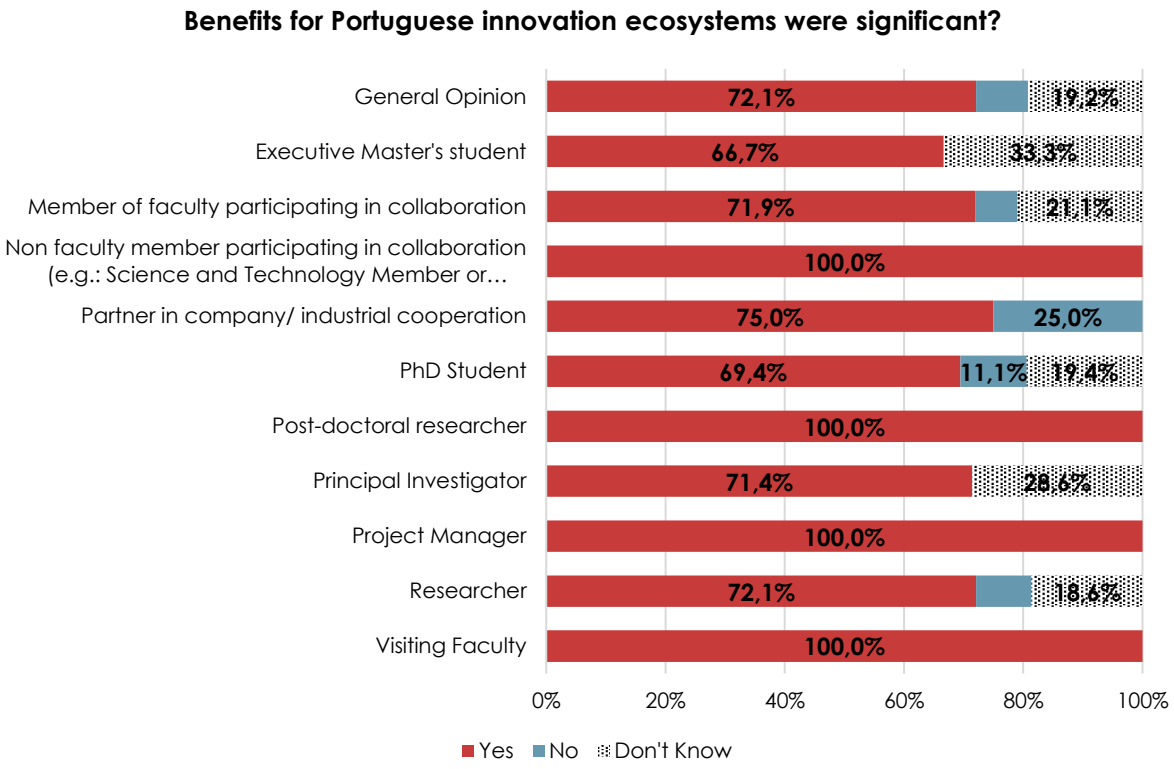

Figure G 58

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

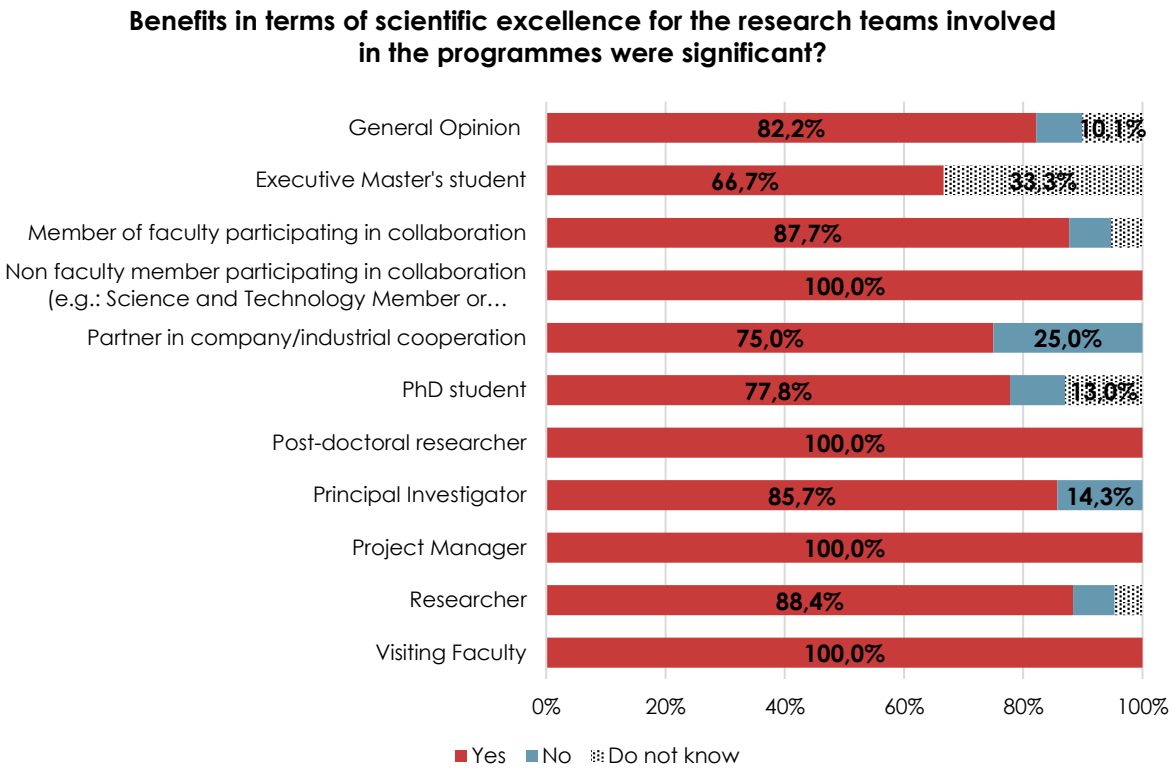

Figure G 59

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

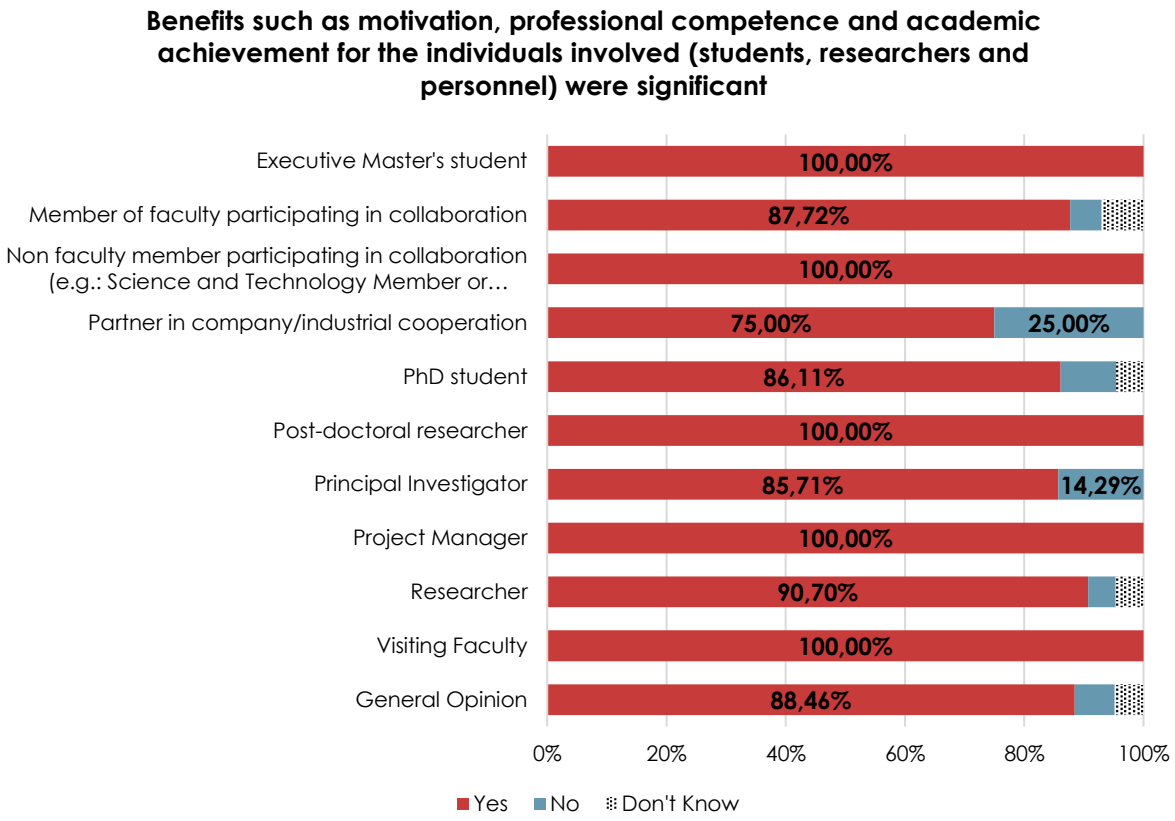

Figure G 60

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

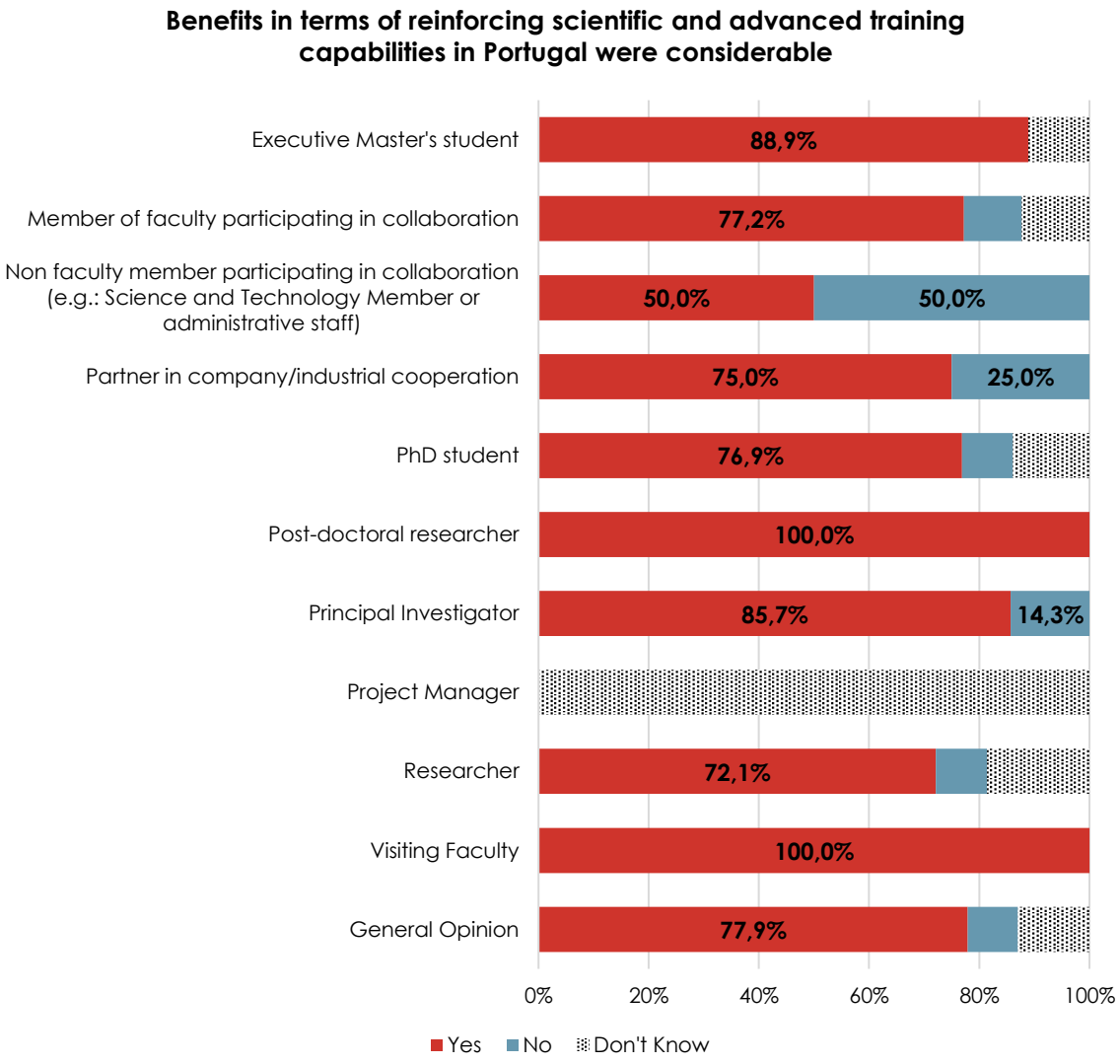

Figure G 61

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

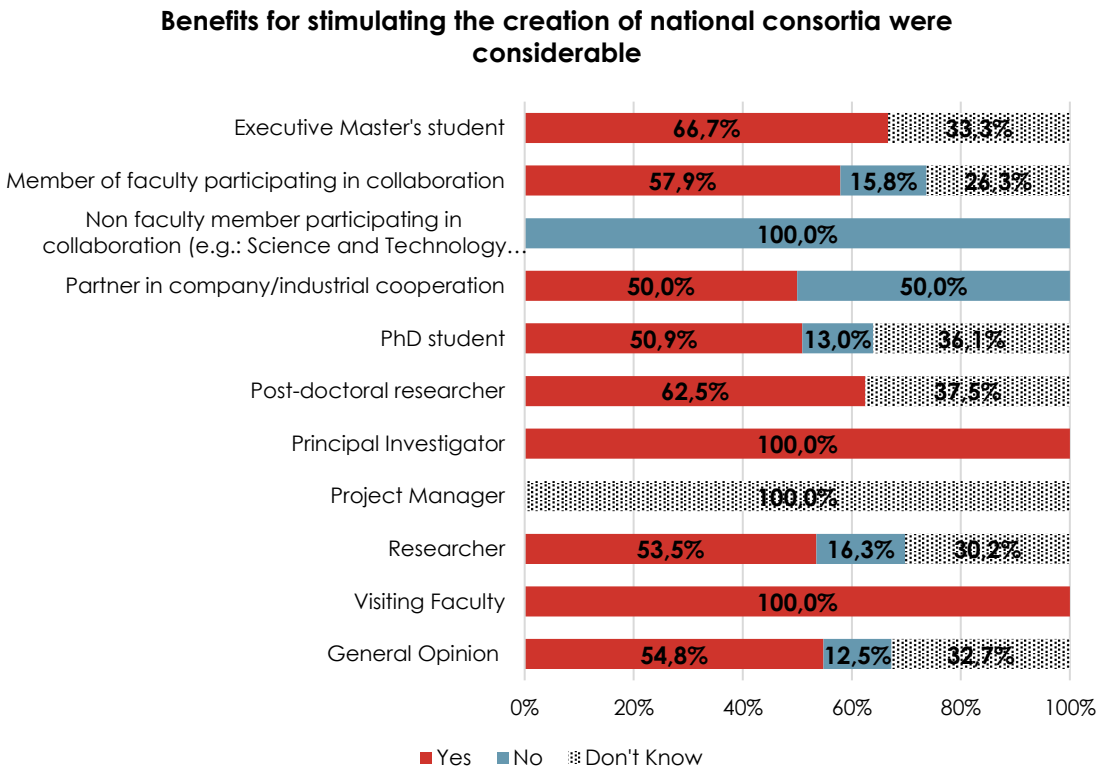

Figure G 62

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

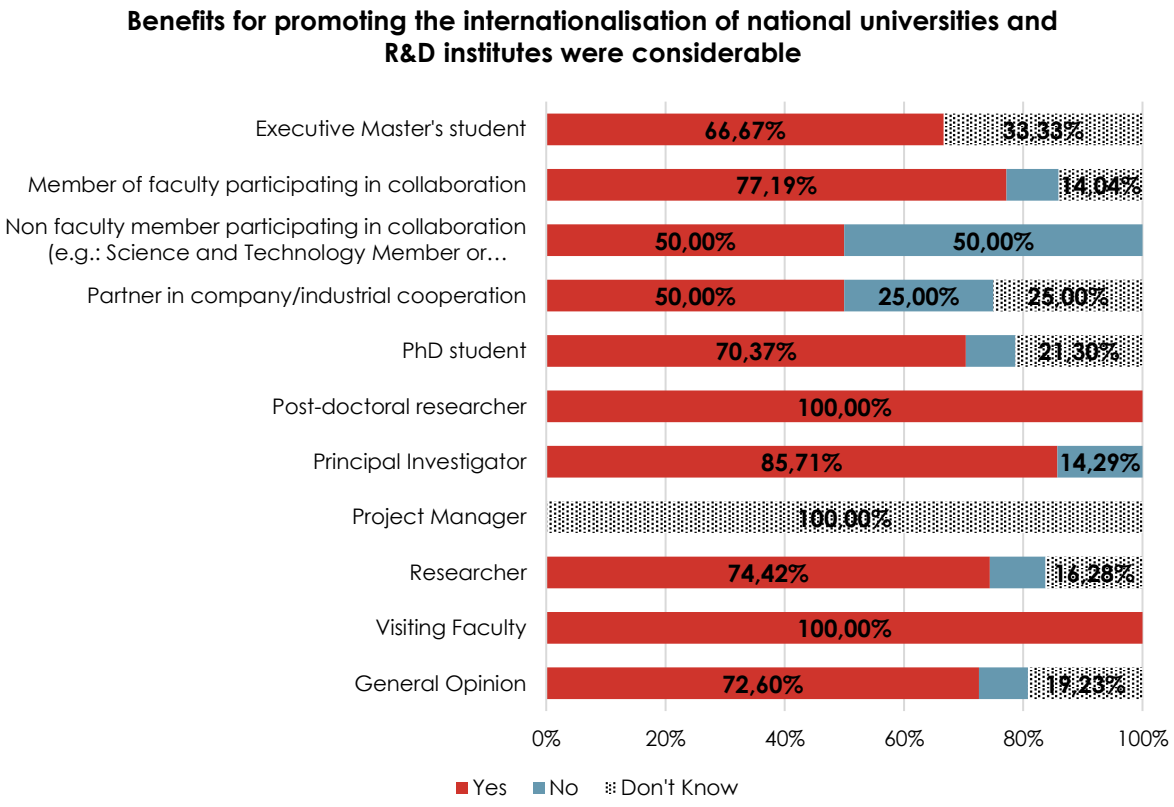

Figure G 63

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

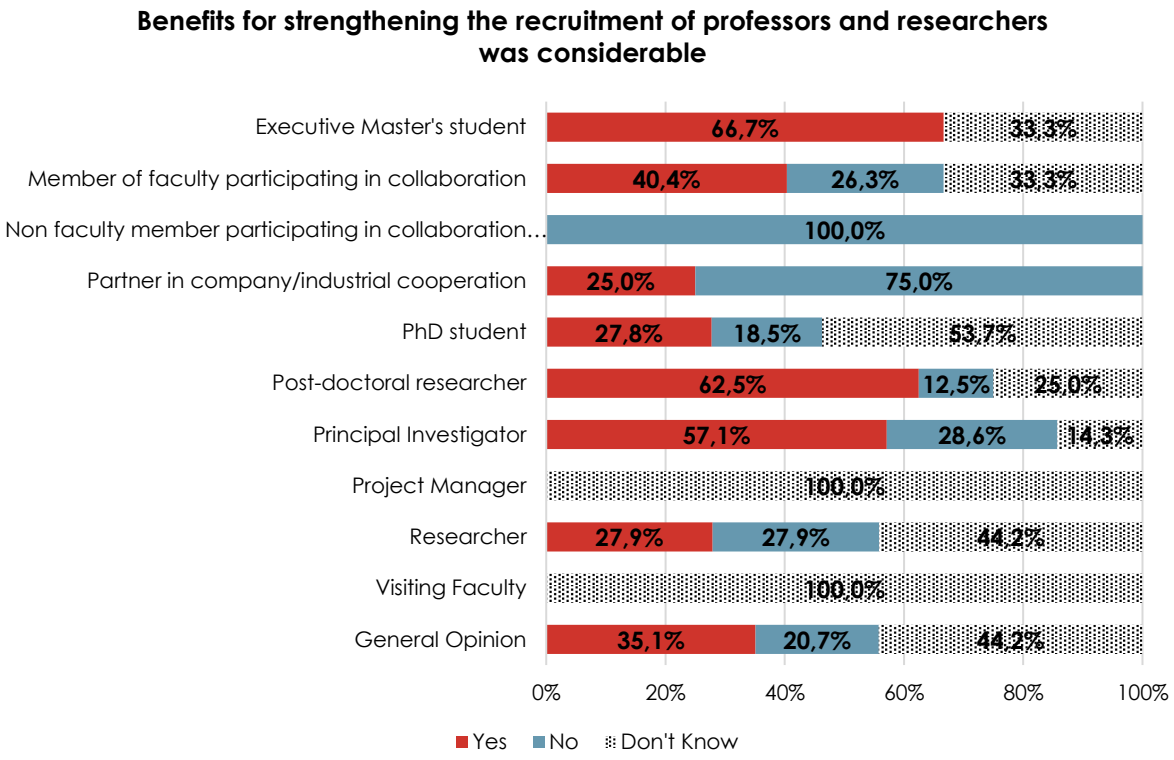

Figure G 64

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

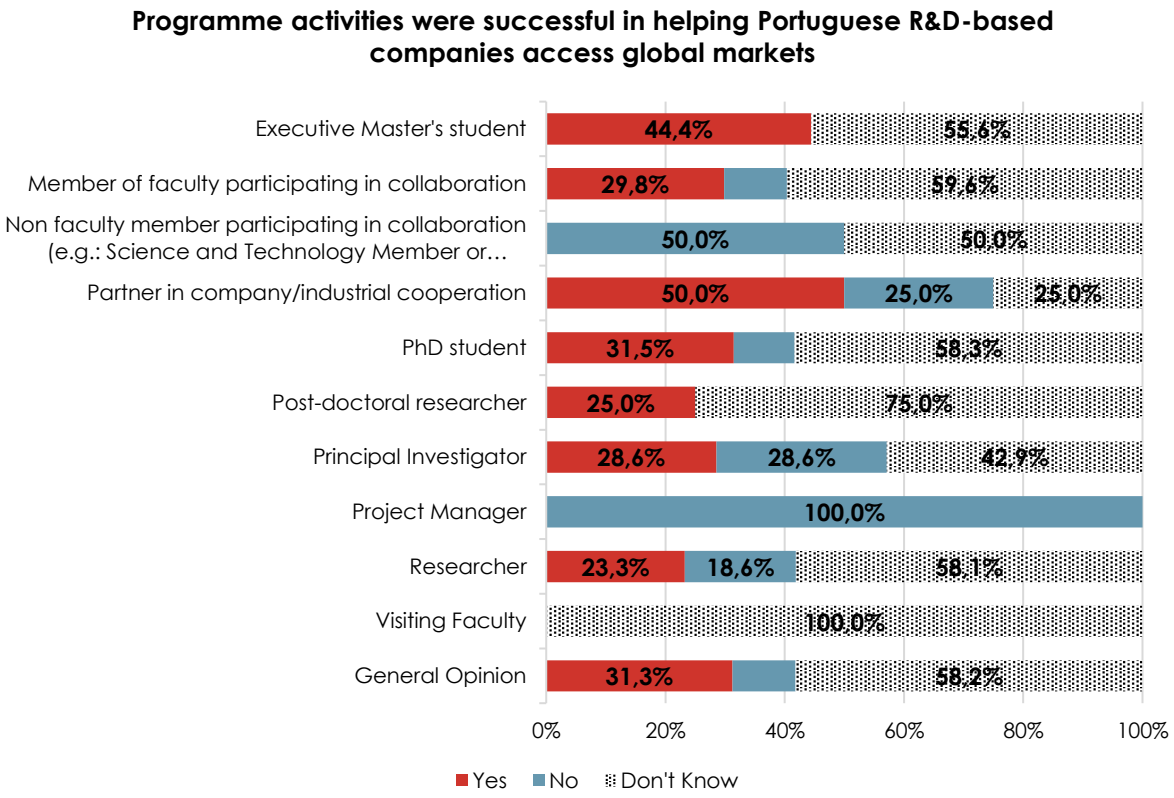

Figure G 65

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

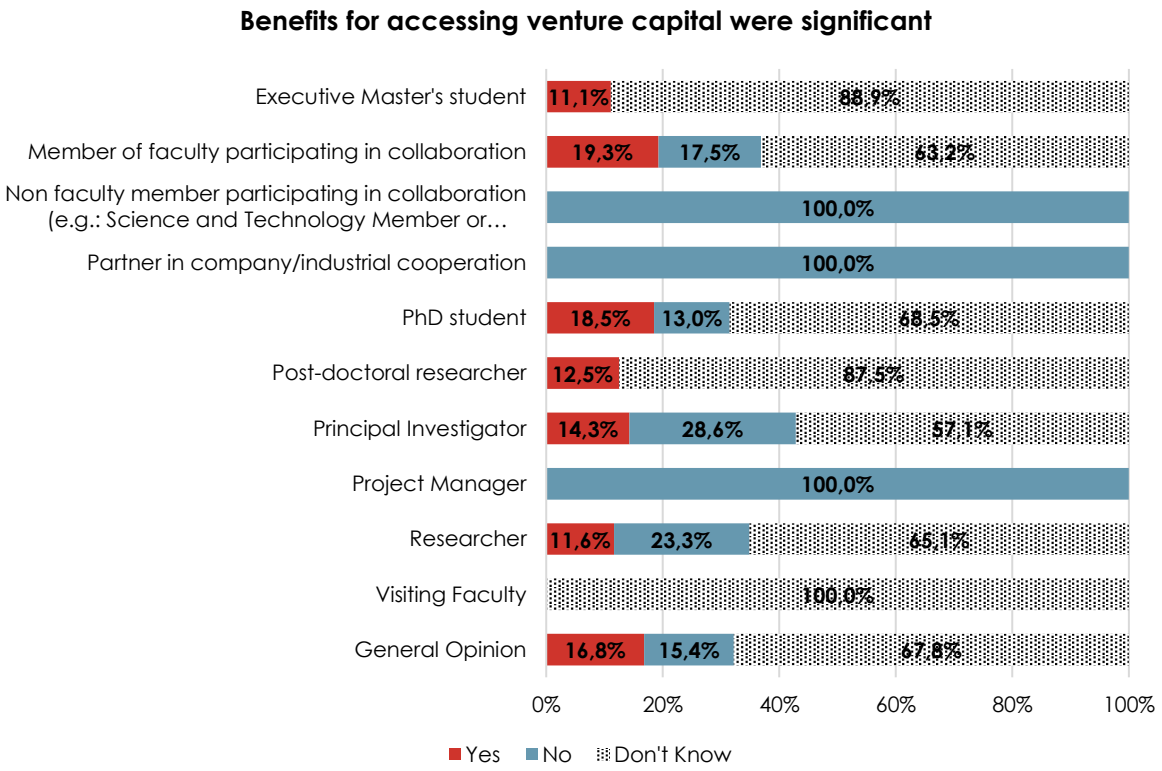

Figure G 66

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

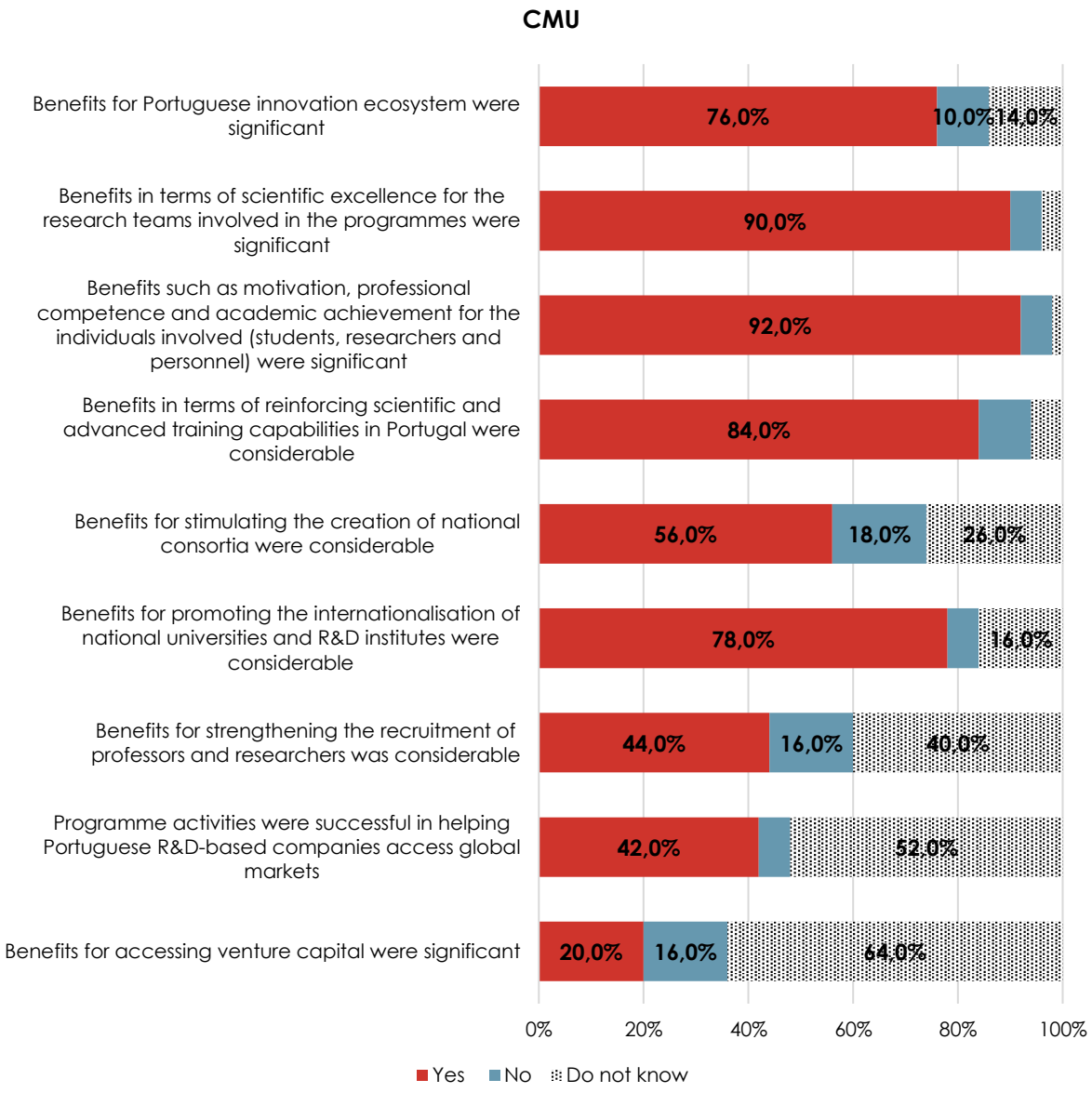
CMU
Benefits for Portuguese innovation ecosystem were significant
76,0%
10,0%
14,0%
Benefits in terms of scientific excellence for the research teams involved in the programmes were significant
90,0%
Benefits such as motivation, professional competence and academic achievement for the individuals involved (students, researchers and personnel) were significant
92,0%
Benefits in terms of reinforcing scientific and advanced training capabilities in Portugal were considerable
84,0%
Benefits for stimulating the creation of national consortia were considerable
56,0%
18,0%
26,0%
Benefits for promoting the internationalisation of national universities and R&D institutes were considerable
78,0%
16,0%
Benefits for strengthening the recruitment of professors and researchers was considerable
44,0%
16,0%
40,0%
Programme activities were successful in helping Portuguese R&D-based companies access global markets
42,0%
52,0%
Benefits for accessing venture capital were significant
20,0%
16,0%
64,0%
0%
20%
40%
60%
80%
100%
Yes
No
Do not know

Figure G 67

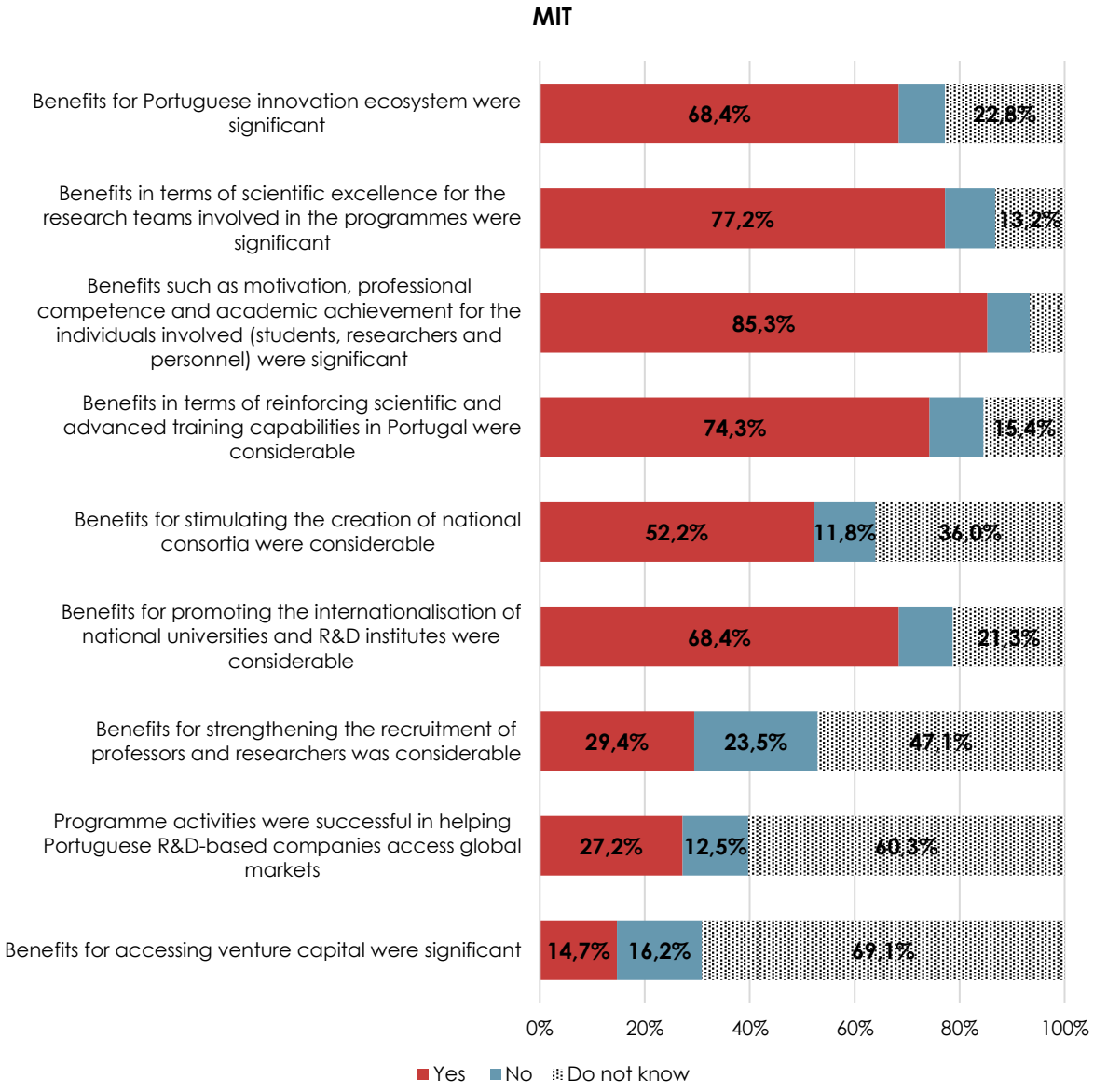
MIT
Benefits for Portuguese innovation ecosystem were significant
68,4%
22,8%
Benefits in terms of scientific excellence for the research teams involved in the programmes were significant
77,2%
13,2%
Benefits such as motivation, professional competence and academic achievement for the individuals involved (students, researchers and personnel) were significant
85,3%
Benefits in terms of reinforcing scientific and advanced training capabilities in Portugal were considerable
74,3%
15,4%
Benefits for stimulating the creation of national consortia were considerable
52,2%
11,8%
36,0%
Benefits for promoting the internationalisation of national universities and R&D institutes were considerable
68,4%
21,3%
Benefits for strengthening the recruitment of professors and researchers was considerable
29,4%
23,5%
47,1%
Programme activities were successful in helping Portuguese R&D-based companies access global markets
27,2%
12,5%
60,3%
Benefits for accessing venture capital were significant
14,7%
16,2%
69,1%
0%
20%
40%
60%
80%
100%
Yes
No
Do not know

Figure G 68

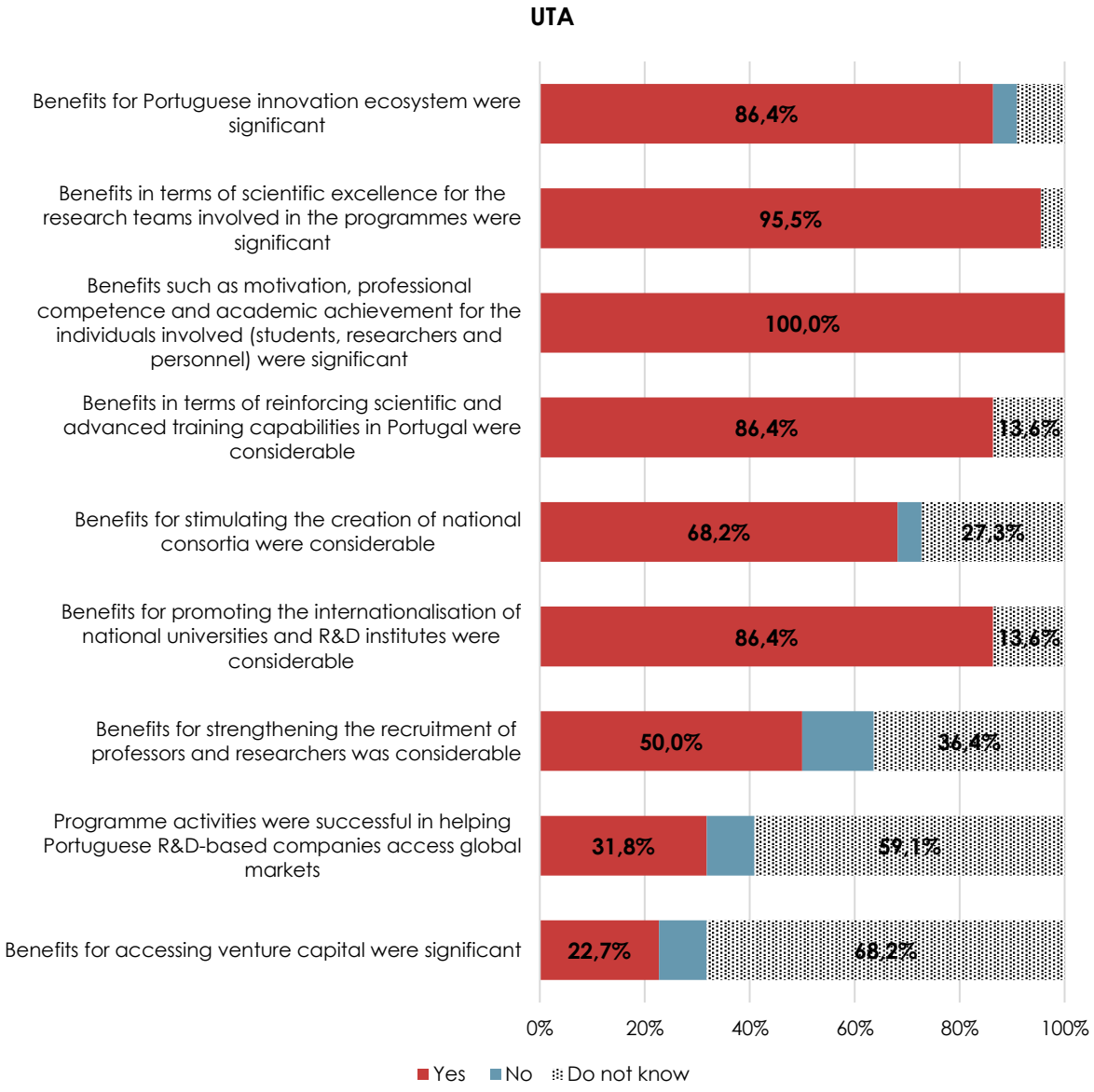
UTA
Benefits for Portuguese innovation ecosystem were significant
86,4%
Benefits in terms of scientific excellence for the research teams involved in the programmes were significant
95,5%
Benefits such as motivation, professional competence and academic achievement for the individuals involved (students, researchers and personnel) were significant
100,0%
Benefits in terms of reinforcing scientific and advanced training capabilities in Portugal were considerable
86,4%
13,6%
Benefits for stimulating the creation of national consortia were considerable
68,2%
27,3%
Benefits for promoting the internationalisation of national universities and R&D institutes were considerable
86,4%
13,6%
Benefits for strengthening the recruitment of professors and researchers was considerable
50,0%
36,4%
Programme activities were successful in helping Portuguese R&D-based companies access global markets
31,8%
59,1%
Benefits for accessing venture capital were significant
22,7%
68,2%
0%
20%
40%
60%
80%
100%
Yes
No
Do not know

Figure G 69

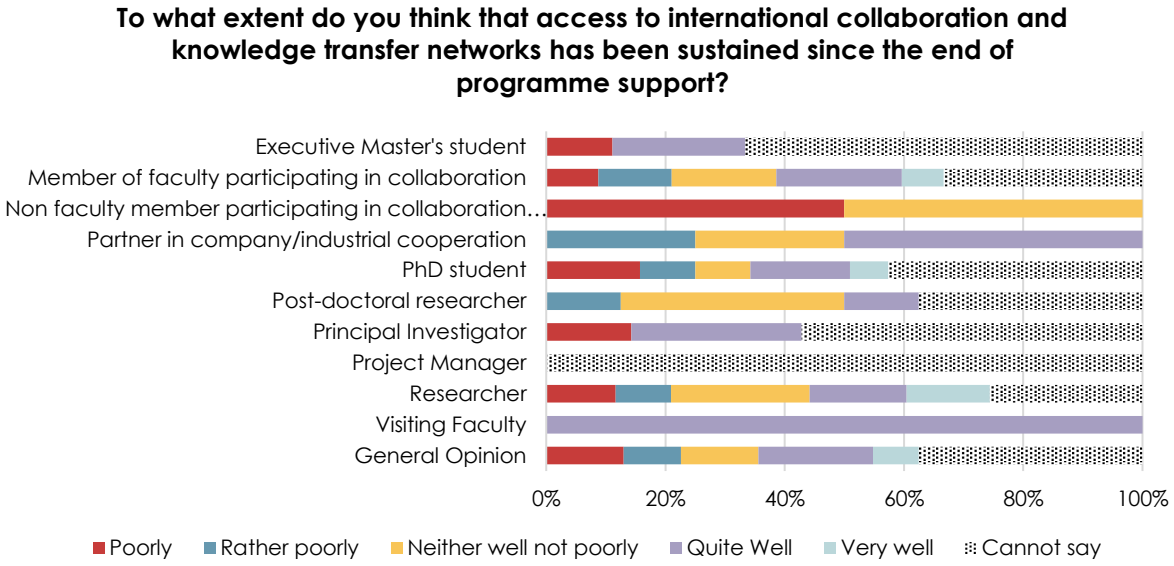

Figure G 70

Table G 30

Role in the programme	**To what extent do you think that access to international collaboration and knowledge transfer networks has been sustained since the end of programme support?**					
	Poorly	**Rather poorly**	**Neither well not poorly**	**Quite Well**	**Very well**	**Cannot say**
Executive master's student	11,1%	0,0%	0,0%	22,2%	0,0%	66,7%
Member of faculty participating in collaboration	8,8%	12,3%	17,5%	21,1%	7,0%	33,3%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	50,0%	0,0%	50,0%	0,0%	0,0%	0,0%
Partner in company/industrial cooperation	0,0%	25,0%	25,0%	50,0%	0,0%	0,0%
PhD student	15,7%	9,3%	9,3%	16,7%	6,5%	42,6%
Post-doctoral researcher	0,0%	12,5%	37,5%	12,5%	0,0%	37,5%
Principal Investigator	14,3%	0,0%	0,0%	28,6%	0,0%	57,1%
Project Manager	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%
Researcher	11,6%	9,3%	23,3%	16,3%	14,0%	25,6%
Visiting Faculty	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
General Opinion	13,0%	9,6%	13,0%	19,2%	7,7%	37,5%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

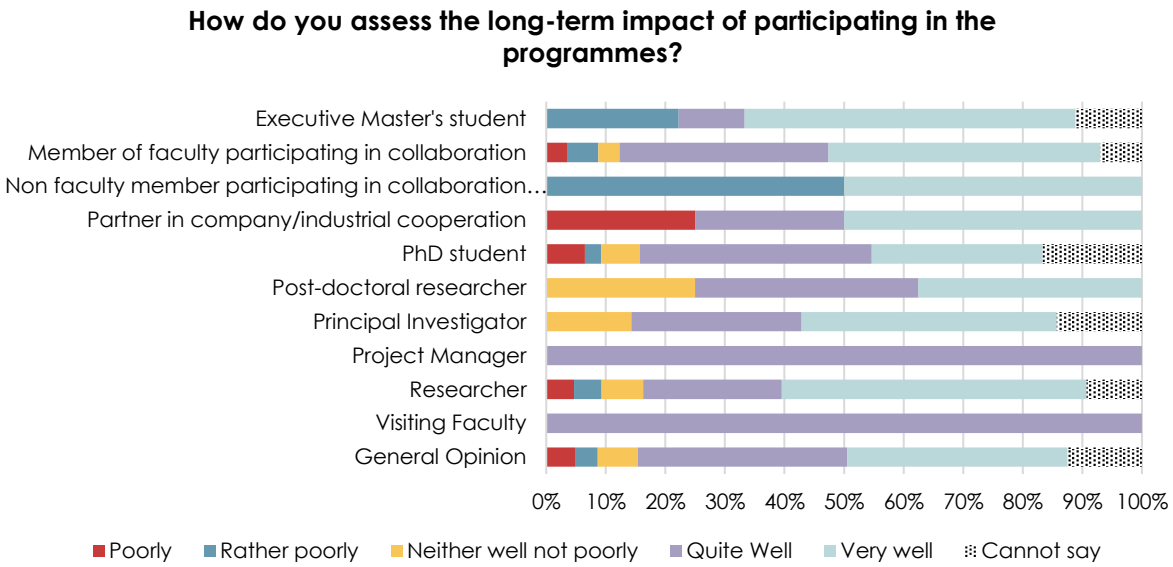

Figure G 71

Table G 31

Role in the programme	**How do you assess the long-term impact of participating in the programmes?**					
	Poorly	**Rather poorly**	**Neither well not poorly**	**Quite Well**	**Very well**	**Cannot say**
Executive master's student	0,0%	22,2%	0,0%	11,1%	55,6%	11,1%
Member of faculty participating in collaboration	3,5%	5,3%	3,5%	35,1%	45,6%	7,0%
Non faculty member participating in collaboration (e.g.: Science and Technology Member or administrative staff)	0,0%	50,0%	0,0%	0,0%	50,0%	0,0%
Partner in company/industrial cooperation	25,0%	0,0%	0,0%	25,0%	50,0%	0,0%
PhD student	6,5%	2,8%	6,5%	38,9%	28,7%	16,7%
Post-doctoral researcher	0,0%	0,0%	25,0%	37,5%	37,5%	0,0%
Principal Investigator	0,0%	0,0%	14,3%	28,6%	42,9%	14,3%
Project Manager	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
Researcher	4,7%	4,7%	7,0%	23,3%	51,2%	9,3%
Visiting Faculty	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%
General Opinion	4,8%	3,8%	6,7%	35,1%	37,0%	12,5%

Note: The same survey participant may have participated in the partnership programmes with different roles (e.g. participation in more than one programme or activity).

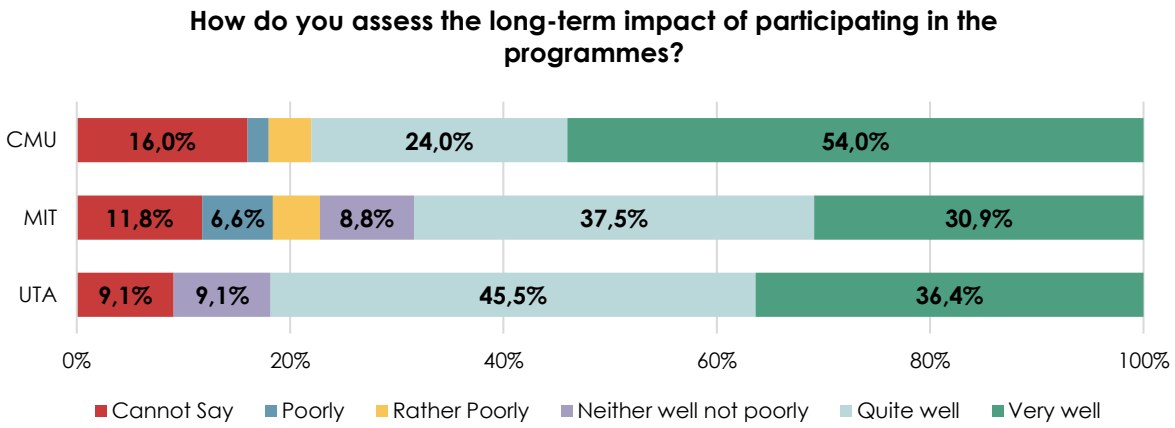
How do you assess the long-term impact of participating in the programmes?
CMU
MIT
UTA
16,0%
24,0%
54,0%
11,8%
6,6%
8,8%
37,5%
30,9%
9,1%
9,1%
45,5%
36,4%
0%
20%
40%
60%
80%
100%
Cannot Say
Poorly
Rather Poorly
Neither well not poorly
Quite well
Very well

Figure G 72

G.2. Survey Summary Non - Beneficiaries

G.2.1 Profile

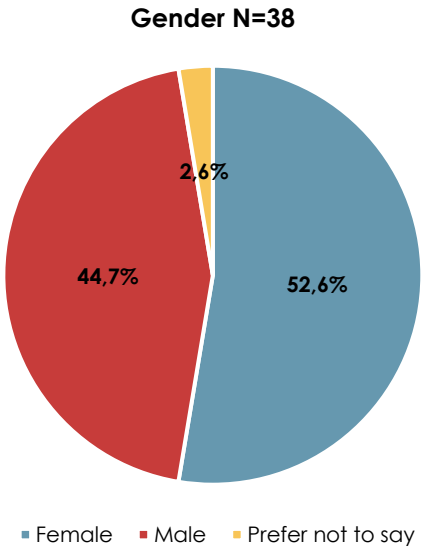

Figure G 73

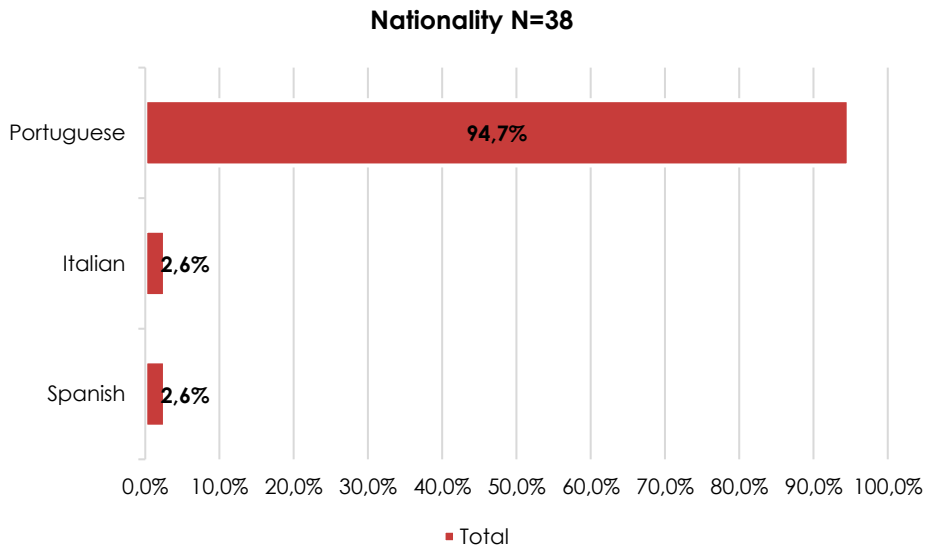

Figure G 74

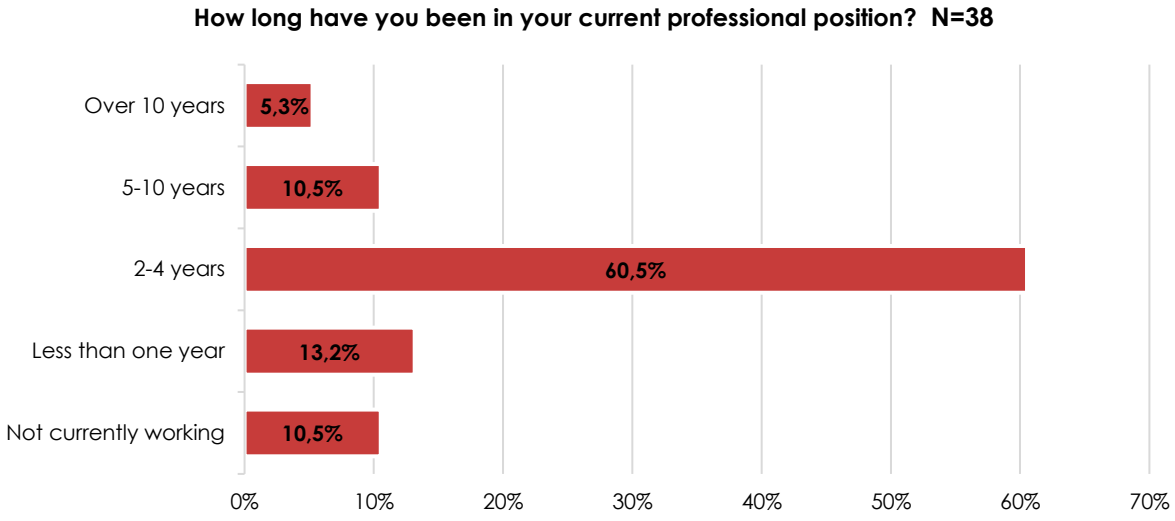

Figure G 75

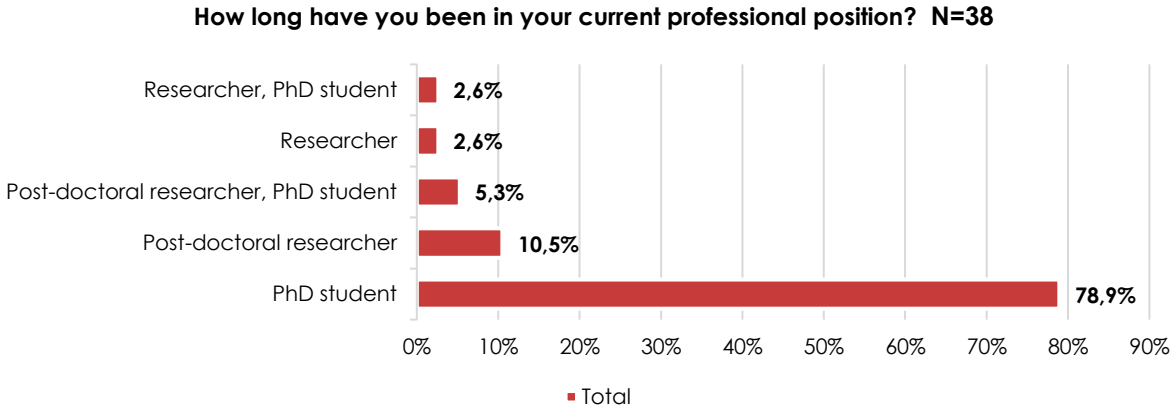

Figure G 76

G.2.2 Perception

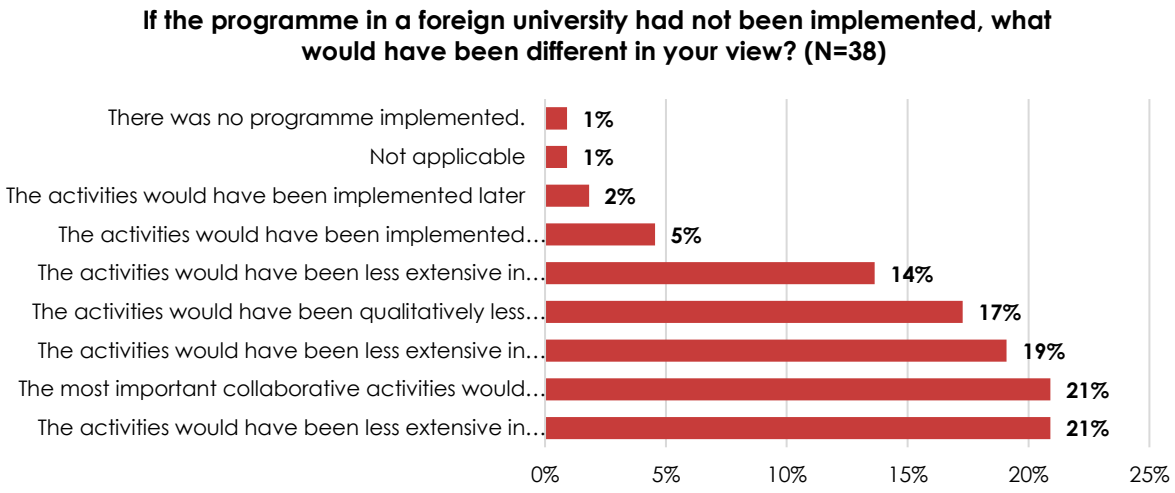

Figure G 77

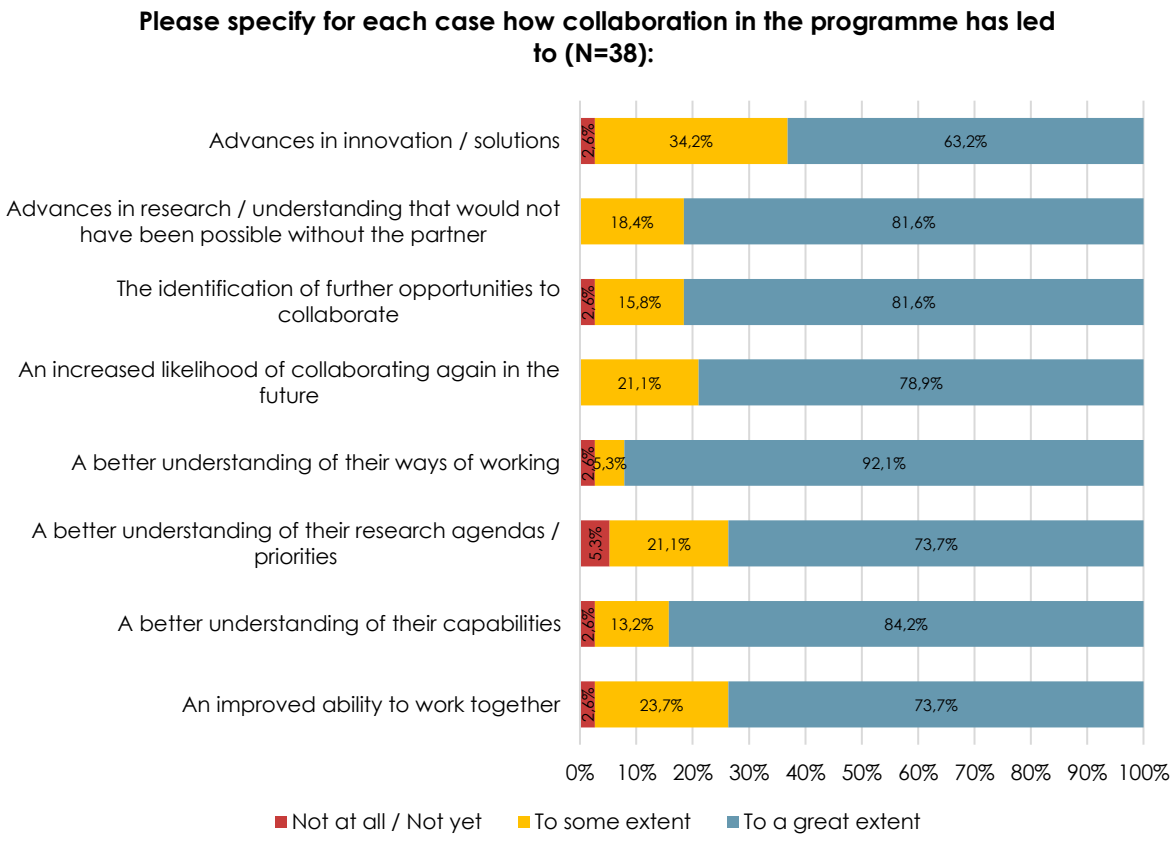

Figure G 78

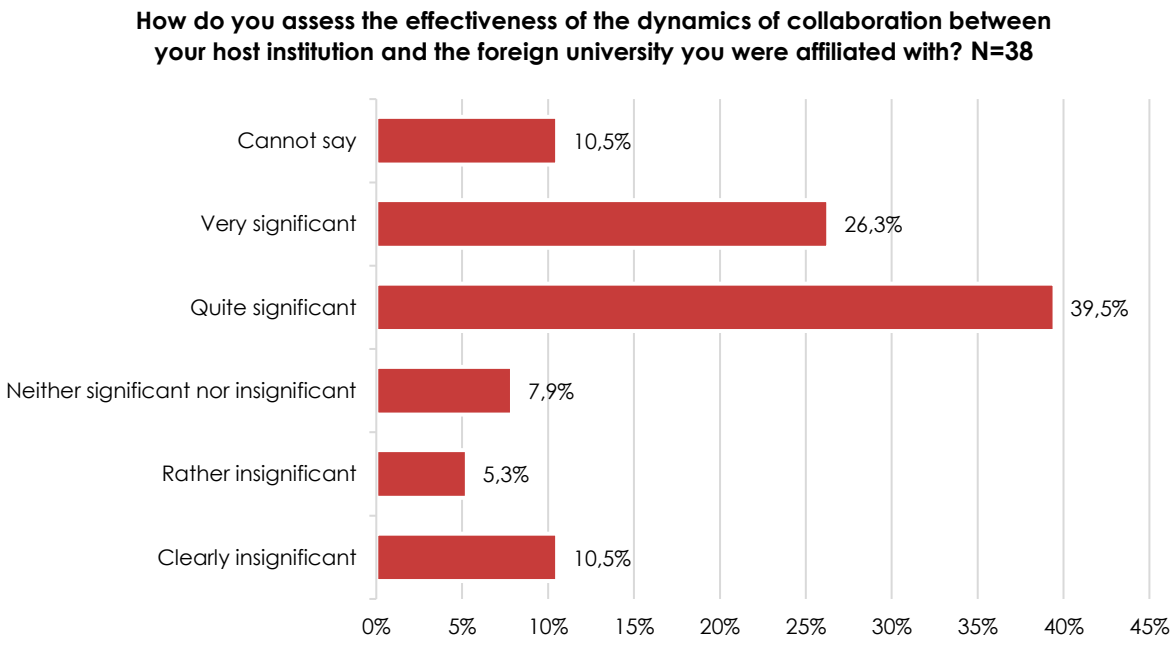
How do you assess the effectiveness of the dynamics of collaboration between your host institution and the foreign university you were affiliated with? N=38
Cannot say
10,5%
Very significant
26,3%
Quite significant
39,5%
Neither significant nor insignificant
7,9%
Rather insignificant
5,3%
Clearly insignificant
10,5%
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%

Figure G 79

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