Technological Forecasting & Social Change 113 (2016) 230–239

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

Setting-up an international science partnership program: A case study between Portuguese and US research universities

Hugo Horta [a,b], Maria Teresa Patrício [c,*]

[a] Division of Policy, Administration and Social Sciences Education, Faculty of Education, The University of Hong Kong, Pokfulam, Hong Kong, China
[b] Center for Technology, Innovation and Policy Research IN+, Instituto Superior Técnico, University of Lisbon, Lisbon, Portugal
[c] School of Sociology and Public Policy, ISCTE – University Institute of Lisbon, Lisbon, Portugal and CIES – Centre for Research and Studies in Sociology, University Institute of Lisbon

ARTICLE INFO

Article history:
Received 21 June 2014
Received in revised form 27 May 2015
Accepted 13 July 2015
Available online 7 September 2015

Keywords:
International partnerships
Research and development
Science policy
Higher education policy
Internationalization
Policymaking

ABSTRACT

International partnerships between universities are expanding and diversifying worldwide. Policymakers have understood that an active strategy of partnering national universities with world-class universities can bring socio-economic returns, and promote change. This article analyzes the background and logic behind the design and early development of an ongoing international partnership program established between a medium-sized European country and three prominent US research universities in 2006. Our findings show that political will, combined with an academic background and experience, have enabled the policymakers to learn from other international partnerships, and shape the involvement with the US universities. The role of "champion" policymakers was critical to the establishment of the partnerships before and during the initial period. Throughout this process the role of previous science policies and networks were found to have leveraged national research groups to collaborate and benefit from the IPPs, and supported long-term research collaboration ties with US universities. Portuguese faculty at US universities mediated the interaction between US and Portuguese academics and policymakers, and promoted the partnerships within their universities. Finally, the policymaker's focus on institutional competition was able to draw on the competitiveness of academics and institutions on both sides of the Atlantic, encouraging individuals and institutions to increase their involvement.

1. Introduction

In an increasingly global competitive environment, universities are diversifying and expanding international collaborations to strengthen the scope and quality of their research and teaching activities (Wilkins and Huisman, 2012). Governments that understand the benefits of having national universities embedded in global knowledge networks usually support this process and take an active role in promoting international collaboration between universities. International collaboration is often motivated by objectives to modernize universities and promote national competitiveness (Gornitzka et al, 2005). Some countries also capitalize on international students who pay higher tuition fees (Turpin et al, 2002) and benefit from brain gain and brain circulation phenomena (Cantwell, 2011; Wildavsky, 2010; Middlehurst, 2001). Collaboration arrangements have been implemented in the drive to internationalize higher education and thereby respond to globalization. These include alliances between universities offering twinning, franchising, dual and joint degree programs, virtual and branch campuses, and the creation of knowledge hubs (Knight, 2011, 2004; Altbach and Knight, 2007).

Countries in developing/intermediate stages of development tend to invest heavily in these collaborations expecting social and economic returns from the research universities' contribution to their science, innovation and education systems (Mok, 2008; Mazzarol et al, 2003). Yet, not all of these collaboration models have been wholly successful and there are several known cases of failures (see Ross, 2008; Healey, 2008). In this framework, policy choices for internationalization matter because expectations, risks and uncertainty are high (Wilkins and Huisman, 2012). For governments of developing/intermediate countries, public resources, i.e., taxpayers' money, need to be allocated carefully and it is often politically problematic to explain their allocation to foreign and already affluent universities. This becomes difficult if the international collaboration fails, and disastrous if it fails in countries where public funding is scarce (Becker, 2009).

Risk and uncertainty also condition the choices of top research universities. They tend to choose partners with judicious assessments and calculations (Wildavsky, 2010). Although the financial drive in these partnerships for these universities is of relevance, other important issues need to be factored in. Collaborations provide privileged access to new pools of student recruitment and give faculty greater access to international exchanges, including opportunities for long-term

* Corresponding author.
E-mail addresses: horta@hku.hk, hugo.horta@ist.utl.pt (H. Horta), teresa.patricio@iscte.pt (M.T. Patrício).

http://dx.doi.org/10.1016/j.techfore.2015.07.027
0040-1625/

collaboration prospects (Ayoubi and Al-Habaibeh, 2006). These represent benefits for many universities but inevitably the faculty needs to support these initiatives (Wilkins and Huisman, 2012). Other selection criteria include training skilled labor and access to national, regional and local markets. However, collaboration failure may lead to a loss of resources and dents in their global prestige (Healey, 2008).

It is in this context that the International Partnership Program (IPP) between Portugal and three top US research universities is relevant. The IPP is a strategic collaboration between the Massachusetts Institute of Technology (MIT), Carnegie Mellon University (CMU), the University of Texas at Austin (UT-Austin), and a medium-size, resource-limited country, located on the geographical and economic periphery of Europe. At the time the international partnerships were being considered the country had low investment in science, a poorly qualified labor force, and a higher education system facing a number of challenges (Heitor and Horta, 2012), albeit with an ambitious agenda for developing its scientific, economic and education systems (Heitor and Bravo, 2010). Portugal also had limited public resources for attracting foreign partners, lacking a priori the financial drive as a major reason for creating a research hub with renowned research universities.

In principle, this scenario made Portugal, and its universities a less attractive option for any major research university seeking to establish partnerships overseas. This raises the question: how did a country in an intermediate stage of development with the aforementioned characteristics convince three leading US research universities to engage in broadly defined international collaboration? We address this main question by analyzing the IPPs concerning: 1) their background and 2) the design and definition of the partnership. This analysis pinpoints salient features in the decision-making process for the IPPs, thereby making a contribution to the literature on how strategies are defined, developed and pursued within the general context of the globalization of higher education.

This article looks at the genesis of the IPPs as a case study, focusing on the period leading up to the establishment of the partnerships in 2006. It is based on extensive interviews with the major policy actors involved in the decision-making process in Portugal and the US. To maintain anonymity we have not disclosed the identity of the 15 interviewees, but they included government policymakers, officials, university managers, program directors, and key faculty involved in the leadership and management of the international partnerships. The interviews were conducted and recorded between September 2010 and May 2011. The focus is on the policymakers' context, motivations, decisions and actions at different stages in the early decision-making process. The story of the process of establishing the IPPs involves probing the micro dynamics and determinisms of specific policy and program decisions. The participants' recollection of pivotal moments in the story of the partnership is crucial in the reconstruction and identification of the fundamental features of the process (Eddy, 2010). How the story is told with regard to the IPP mission, the choice of partners, scientific fields, and actor involvement are the key.

The article provides two main contributions to the literature. The first relates to the social conditions that made it possible to bring the partnerships to fruition. These include political will (the direct involvement of the Prime Minister in highlighting international partnerships as a priority), the history of Portuguese doctoral students abroad (including in the US partnership universities) mostly funded by previous public science policy initiatives, the role of the Portuguese faculty at the US universities, the hybrid "academic-politicians" in the government, and an understanding of the motivations of faculty at the US universities.

The second is an explanation on how certain implicit design features of the partnerships became important. These include the choice of scientific priorities in the IPPs and the fostering of institutional competition within the partnership among the US and Portuguese universities that promoted the networked nature of the partnership. Other features include the rationale behind choosing US rather than leading European universities for the partnership, and the introduction of research projects and faculty exchange programs to foster the dynamism of the partnership, when it became clear that the educational programs alone could not sustain the momentum.

2. The International Partnership Program: background, characteristics, and strategic aims

In November 2005, the Portuguese government, led by José Sócrates, implemented its Technological Plan as a strategic pillar in the knowledge economy. After an initial period of discussion within the government and with civil society stakeholders, the plan, influenced by the Lisbon Strategy, was presented as the backbone of the national program for competitiveness, growth and employment. It had three main goals: 1) increasing formal qualifications of the Portuguese population for the knowledge society, 2) reinforcing national scientific and technological capabilities, including promoting R&D activities and the role of the business sector in the creation of qualified employment, and 3) fostering innovation with policies that would help Portuguese firms adapt to the challenges of globalization (Plano Tecnológico, 2005).

The plan was expected to systemically impact the Portuguese economy and society by helping change an economic structure characterized by low formal qualifications and geared towards low-cost production that was increasingly facing stiff competition from Eastern Europe and Asia (Heitor and Bravo, 2010; Teixeira and Fortuna, 2004). Its objectives were to make for a more sustainable and adaptable economy to cope with a complex and unpredictable global economy. From the government standpoint, these objectives demanded greater investments in intangibles, human capital, and institutional synergies, and promoted a reduction in external energy dependence to foster productivity, added value and flexibility. Social cohesion, employment and environmental quality could be assured for the future with public-led investment policies (Plano Tecnológico, 2005).

The IPP was part of the Technological Plan and headed by the Ministry of Science, Technology and Higher Education (MCTES). The IPP was defined as a development project that included capacity building for institutions, research and graduate education, mobility and brain-circulation, and national engagement with industry. Strong emphases were placed on quality assurance mechanisms with regular external reviews to assess activities undertaken and provide guidance for improvement (e.g., CMU–Portugal Program Final Report 2006–2011; CoLab Annual Reports; MIT–Portugal A strategy Reexamined; External Review Committee Report, 2009).[1] These prospective elements can be seen within the activities of each individual partnership, framed as hubs since they are a "planned effort to build a critical mass of local and international actors strategically engaged in education, training, knowledge production, and innovation initiatives" (Knight, 2011: 233).

In terms of the higher education system, the IPP was to serve as an instrument to promote the internationalization of Portuguese universities (Patrício, 2010; Horta, 2010), and also to sow the seeds of reform in Portuguese universities by: 1) fostering university-based research in national collaboration networks in a country where the cooperation among national universities was limited and 2) encouraging university–industry exchanges by introducing cooperation between the Portuguese universities, firms and local governments. The IPPs with MIT and CMU were signed in October 2006, and the UT at Austin in March 2007, as five-year collaborative agreements with the Portuguese state funding agency (Fundação para a Ciência e a Tecnologia, FCT). Resolution of the Ministry Council, nº 132/200 [RMC] Republic Diary, 1st Series, nº. 198, 13 October 2006.

[1] Final report 2006–2011 http://www.fct.pt/apoios/cooptrans/parcerias/docs/CMUPortugal_External_Review_Committee_Report_2009Sep.pdf.

Table 1
Portugal–MIT/CMU/UTA Partnership Program.
Sources: Coordinating Office of MIT–Portugal; CoLab (2007), FCT (2009, 2008), and Pfotenhauser et al. (2013).

Partnership	Main focus	Main statistics	Main activities
MIT–Portugal	Engineering systems (transportation systems, sustainable energy; engineering design and advanced manufacturing; bioengineering)	6 Portuguese universities, 8 colleges 23 faculty and researchers hired 270 Portuguese and 70 MIT faculty members participating 234 PhD fellowships granted to 371 PhD students PhD students from 35 countries Proportion of international students (23%) 300 MIT students supported 28 HEIs and R&D institutions involved 59 affiliates (including firms) 54 education consortium members (including state laboratories)	Doctoral education and research training (joint degrees); Master programs; "Test beds" and "living laboratories"; Research projects; An international MBA school (the "Lisbon MBA") with the Sloan School of Management
CMU–Portugal	Information and Communication Technologies (ICT), emphasizing information processes and networking, applications to critical infrastructures and risk assessment, including applied mathematics, technology change, and innovation policy	Started with 9 Portuguese universities, 4 associate laboratories, 1 applied research institute and several companies, including the main telecom operator in Portugal. CMU involved faculty, researchers and students from 6 colleges, 8 departments and 6 research institutes and centers For 5 years, more than 100 Portuguese faculty, 70 doctoral students and over 150 masters students were involved Altogether 12 higher education institutions, 6 associate laboratories and 60 industrial affiliates participated in different parts of the partnership	Doctoral education and research training (dual degrees, students spent at least 40% of time in the US); Master programs; Post-doctoral positions; Executive MSc programs (in collaboration with Portuguese universities) to train engineering leaders for industry, mostly to ICT firms; "Test beds" and "living laboratories"; Research projects; Faculty Exchange program
UTA–Portugal or International Collaboratory for Emerging Technologies or CoLab	Transdisciplinary research and education in the fields of Digital Media, Advanced Computing, and Mathematics; build and extend the value chain of enterprises by enabling strategies for new product development practices and high-technology entrepreneurship.	Digital media program: initially included 2 Portuguese universities; the program on advanced computing involved 3 Portuguese universities and a laboratory, and the field of mathematics included 4 Portuguese universities In the last five years this partnership involved 50 university professors and 120 students supported by 105 fellowships and led to the organization of over 100 public events such as summer schools, workshops and festivals.	Doctoral education and research training; Master programs; Research projects; University Technology Enterprise Network (UTEN), initially including 13 Portuguese universities, 4 technology parks and select research organizations

Notes: MIT–Portugal data refers to November 2012.

2.1. The International Partnership Program: a view of the three partnerships

The brief overview of the International Partnership Program in Table 1 shows the range and capacity of a program focusing on thematic networks through development of universities and other participating organizations utilizing a combination of instruments such as advanced training and fellowships, research projects, living-laboratories,[2] and knowledge-building capabilities. Although the aim of this article is not to assess the impact of the IPPS, there is ample evidence from an independent assessment by the Academy of Finland (2012) and by the literature (e.g., Pfotenhauser et al., 2013) that they made significant contributions. These include promotion of internationalization of institutions, people and activities, the formation of national networks to stimulate and develop the creation and transmission of knowledge and cooperation among Portuguese universities and, even if localized, the beginning of institutional change.

The IPP had an initial period of 5 years (2006–2010), renewed for 1 year pending national election results (the government of Mr. Sócrates fell in early 2011, and a coalition of two political parties previously in the opposition formed a new government starting in June 2011). After a new government was elected in 2011, the IPPs were assessed by the Academy of Finland, and renewed for another 5 years in 2012. A closer look at each of the partners reveals some of the specificities of each program with each partner.

2.2. The Massachusetts Institute of Technology–Portugal (MIT–Portugal) partnership

The MIT–Portugal partnership focuses on graduate education and research in four distinct fields of engineering systems: transportation, sustainable energy, bioengineering, and engineering design and advanced manufacturing. Each of these developed PhD programs. In some of these fields, masters, executive masters and other advanced studies programs were also developed in collaboration with consortia of Portuguese universities. To give one example, the executive master's program in bioengineering is offered jointly by MIT and four Portuguese universities (University of Coimbra, University of Minho, Technical University of Lisbon and the New University of Lisbon).

Although the length of stay at MIT and the number of classes given by MIT faculty varied in each program, the students obtained a joint degree. On a regular basis about 270 Portuguese and 70 MIT faculty members taught in the programs by 2010. Also considering the same period, over 600 students enrolled in the program, most of them doctoral students (544 doctoral and 46 master's students), of which 20% were non-Portuguese nationals. The majority of students received publicly funded grants. The MIT–Portugal partnership also created the Lisbon MBA with the Sloan School of Management that brought the Catholic University and the New University of Lisbon into a new partnership. Lastly, in 2010, an initiative called *Building Global Innovators* was created with ISCTE-Lisbon University Institute, to promote young entrepreneurs

[2] The concept of living laboratories refers to research performed in collaborative, open-ended, real-life, sustained and complex arrangements, that allow for embedding new-technologies, prototypes and experiments in real-life contexts, turning users into active collaborators (see Hyysalo and Hakkarainen, 2014).

with innovative ideas. The MIT–Portugal Program had a budget of 65.5 million euros from 2006 to 2011, 32.6 million of which went to Portuguese institutions and the remaining was allocated to MIT.

2.3. The Carnegie Mellon University–Portugal (CMU–Portugal) partnership

The Carnegie Mellon–Portugal partnership focused its activities on the field of Information and Communication Technologies (ICT), technology and public policy, and applied mathematics. Initially expected to create seven doctoral and three master's programs with a network of 10 Portuguese universities, the CMU–Portugal partnership actually created nine doctoral and five master's programs. They conferred dual degrees meaning that students would obtain a degree from Carnegie Mellon University and a Portuguese university (whereas all the degrees conferred in the MIT–Portugal partnership were joint degrees). Over 70 PhD and 150 master's students had enrolled in graduate programs by 2010. During that period, over a hundred Portuguese faculty members participated in the program that involved dozens of research centers and nearly 100 companies.

The CMU–Portugal Program also created the Faculty Exchange Program encouraging Portuguese faculty to experience scientific, academic and social immersion at the Carnegie Mellon University campus. About 60 post-docs or junior faculty participated in the program spending a term at CMU. The total budget of this partnership was 55.6 million euros (2006–2011), 27.8 million of which was allocated to Portuguese research and higher education institutions and the remainder to CMU.

2.4. The University of Texas at Austin (UT-Austin)–Portugal (UTA–Portugal) partnership

The University of Texas at Austin–Portugal partnerships was the smallest of the three. It focused on digital media and mathematics, creating doctoral and master's programs in both. About 120 students enrolled in the graduate programs and over 100 of them received publicly funded grants. Dual degrees are also pursued with UTA. The partnership created a University Technology Enterprise Network (UTEN) with 13 Portuguese universities, four technology parks and selected research centers. The objective of UTEN was to offer specialized technical support through training and learning about technology transfer and commercialization. From 2007 to 2010, more than 50 specialized training sessions were organized with more than 1500 participants. The UTA–Portugal Program had a budget of 20 million euros (2006–2011) divided almost equally between the two main partners (the budget share of the University of Texas at Austin was 10.2 million euros).

Given the size, scope and ambition of the international partnership program it is not surprising that it was a government initiative. Moreover, universities in Portugal still rely heavily on public policies to develop (Horta, 2009, 2010). Yet, the government strategy for the IPPs raised policy questions regarding the selection of the US as opposed to European universities, the formats of the partnerships, and the priority fields of knowledge. To answer these questions it is necessary to understand the background and the initial ideas and rationales of the policymakers that envisaged them.

3. The making of an International Partnership Program: scientific choices and political strategies

In this section, five key factors are highlighted as important background conditions that contributed to the making of the partnerships with the US universities: 1) direct political engagement by the government at the highest level, 2) the expert nature of the policymakers, 3) the contribution of publicly funded science policies promoting brain-circulation, 4) Portuguese "mediators" at US universities, and 5) US faculty and their motivations for collaboration.

3.1. Direct political engagement by the government at the highest level

Even before 2006, as global university league tables were becoming more prominent, the idea of partnerships with world-renowned research universities was considered a form of achieving visibility for Portuguese universities. Recognition of universities was, however, tied to questions of political accountability, such as the cost of financing an international partnership program with one or more foreign universities. The partnerships were to be financially supported by taxpayers' money, and political accountability to taxpaying citizens is a requirement in democratic societies (Behn, 1998). It was in this framework of political accountability that the majority of interviewees recognized that political will at the highest government level was necessary for the IPPs to be implemented.

The IPP had an initial budget of 145.5 million euros for the initial five-year period (Academy of Finland, 2012). This represented 5% of the five-year budget of the main public funding agency for science in Portugal, the Portuguese Science and Technology Foundation (FCT). This suggests that investment in this type of partnership was not necessarily very large, but still required many millions of euros to directly fund already wealthy US universities. This raised concerns and initial objections from opposition political parties in parliament and Portuguese academia, which argued that funding was being allocated to US universities as opposed to Portuguese universities (Financial Times, April 8, 2008). The investment in the IPPs and the associated political backlash needed to be overcome with the direct political engagement and support of the Prime Minister of Portugal. This was considered essential in the initial phases of setting up the program, as shown by the interview excerpt below:

> The partnerships were formed because we had a Prime Minister who had thought about it (…). If the Prime Minister had not wanted to do this, it could never have happened. At this level? Of this size? The partnership could not be implemented without the Prime Minister's support (…). The political will and expression has to be clear.
>
> [*Member of Government, University Professor*]

3.2. The expert nature of policymakers

A second main characteristic in the IPP background was strongly related to the academic experience and scientific networks of the policymakers themselves. Career experiences and expertise inform decision-making (Louis, 2005). Recent research on the social background of political elites in Portugal has identified executive traits as more "technical" or "specialist" rather than "generalist" (Pinto and de Almeida, 2009). Ministers and Cabinet members tend to have academic experience and backgrounds in the fields they are called to oversee as politicians. Ministers of the Economy tend to be faculty in the field of economics and management, while ministers of agriculture tend to be faculty in agriculture sciences, and so on. The policy makers in the Ministry of Science, Technology and Higher Education (MCTES), had academic backgrounds as researchers and university professors. Since 1995, when the first minister of science took office, all ministers and key cabinet members have been recruited from academia with backgrounds in science and engineering. In effect, for the last two decades, all ministers recruited to the science portfolio have been university professors.

The background of these "policymaking professors" in ministerial positions is of importance for the design of the IPPs as our analysis will show. Nonetheless, the fact that other high level decision-makers were also appointed from academia is no less important. An academic background and their likely return to academia after their tenure in politics meant a recurrent "technical" expertise on research activities and a "specialist" understanding of the academic world. Most, if not all, of the Portuguese policymakers at the time of the partnerships had either

obtained their PhD abroad or had spent extended study periods in the United States, Europe, or both. Their career experience provided much of the background to the future design of the IPPs.

This expertise is observed in the policymaker's work with other partnerships. External reviews and evaluations of other international programs helped them define the model of the IPPs, including identifying pitfalls. The partnership between MIT and Cambridge University in the UK, which led to the creation of the Cambridge–MIT Institute in 2000, was one of several existing partnerships examined. It had an initial budget of £65 m to implement research collaboration, educational development and new approaches to knowledge transfer between academic and business sectors (Acworth, 2008; Simmonds and Clark, 2009). Although considered by some as a "mixed success" consisting of an amalgam of disorganized management and too many projects (Simmonds and Clark, 2009), it brought insights that influenced policy options with the IPPs.

> I was involved as an external evaluator in the Cambridge-MIT program, where I recognized the good and the bad of these partnerships, and it made me tremendously aware of how these things can be done.
>
> [*Member of Government, faculty at a Portuguese university*]

Inside knowledge and experience from other international programs were derived from practice as external reviewers. This highlights the relevance of scientific and academic backgrounds, with technical expertise and know-how from activities undertaken before assuming a government position. But it also underlines their integration into international scientific and academic networks. Collaboration in science and technology has been known to open doors, solve problems and build long-life relationships (Melkers and Kiopa, 2010). When these collaborations are grounded in networks of social relations and scientific knowledge they are more likely to generate positive social and professional outcomes (Tortoriello et al, 2012).

Several interviewees highlighted the role of the main policymakers as the drivers of the initiative. They were considered the shapers and sustainers of the partnership process (see Bolman and Deal, 2008). These "champions", due to their personal role in academic and scientific networks and associations, now came to occupy policymaking positions with power and capacity to spearhead the first contacts, and lead the negotiation process.

> I suppose the partnership started some twenty years ago (…) at some level it started when a Portuguese faculty member came to MIT to look for ways to place some of his students. It started a process of sending a sizable number of students to MIT and also led to a series of relationships (…) It is important to understand that that was before the program formally started, at least 10, maybe 15 years of relationships that established a certain level of understanding and trust.
>
> [*MIT Coordinator, faculty at MIT*]

Long established social networks between "champion" policymakers and academics provided the way in and necessary social capital for initiating the partnerships. It was a question of personal and professional trust (Coleman, 1988) and facilitated the negotiation of agreements with multiple agents and institutional agendas, in a relatively timely manner. Established and enduring professional networks relied on relevant personal relationships for the initial development of the partnership idea with peers in US research universities. Importantly, these relationships were based on scientific and academic collaboration and exchanges lasting years.

> This was only possible because I had close, long-term personal contacts (…). Without this it would have been completely impossible. I had personal contacts at MIT, CMU and Austin, friends of mine for many years. The agreements were signed in six months. I have no doubt whatsoever that these partnerships were possible because of deep personal relationships that had nothing to do with political relationships.
>
> [*Member of Government, faculty at a Portuguese university*]

The establishment and the successful continuation of the IPPs were made possible by the fact that they were conceived by academics that trusted one another based on a history of work and research collaboration. This was an essential component in the establishment of the partnerships, as another partnership conceived around the same time with the University of Massachusetts (UMass) at Dartmouth by the same champions that were based only on political relationships was not considered a success. The interviewees stated that a major explanation for this unsuccessful partnership was its strong top-down process, lacking scientific, academic and personal relations between Portuguese and UMass academics.

3.3. The contribution of publicly funded science policies promoting brain-circulation

The third component in the initial stages of the IPPs was the contribution of past science policies, particularly those on graduate training and qualification. The network of relations between US and Portuguese academics and researchers have been developing over the last five decades (Patrício, 2010). Several thousand Portuguese scholars have completed their graduate studies in the US since the 1960s. The Fulbright Program has sent over a thousand Portuguese scholars to study in the United States since the 1960s. The Gulbenkian Foundation has sponsored many graduate students abroad, establishing early links between Portuguese and foreign academics. A major increase occurred in the 1990s, when the FCT, the Portuguese science-funding agency, began to send several thousands of PhD students to study abroad. Between 1994 and 2010 almost 19,000 PhD grants were awarded by the FCT and 43% studied abroad or had a period of study abroad (known as "mixed grants") (FCT, 2011). In the 1990s about 20% of FCT grantees that studied abroad went to the US. Only the UK received more Portuguese PhD students than the United States. Between 1990 and 2010, about 500 Portuguese scholars had their US doctoral diplomas recognized by Portuguese universities.

Portuguese students' mobility to US research universities helped establish networks and longstanding collaborations (Fontes, 2007). This was made possible by science policies centered on advanced education and training of human resources, which have increased since the mid-1990s (Horta, 2010; Horta and Blasi, 2015). The Portuguese doctorates that stayed in the US stayed in touch with their peers in Portugal. Those that returned to Portugal also tend to keep up scientific and academic links with US peers (Delicado, 2010). National policies promote networks and links to Portuguese academics working abroad by inviting them to join evaluation panels, monitor assessment exercises and participate in academic committees and juries. Perhaps equally relevant, however, is that PhD mentoring experiences between Portuguese and US academics have deepened previous scientific and academic relations. This underlines the important role played by years of contact, collaboration and networks based on personal trust and professional exchanges.

> Personal relationships were important because it is not easy to work with these universities. They are strong and difficult colleges to work with. It is important that people get on well. That was why good personal relations were important and this is only possible after many years of working together.
>
> [*Policy analyst, Ministry of Science, Technology and Higher Education*]

The pre-existence of these networks and links was essential. An analysis of the interviews shows that the Portuguese academics that had remained at US universities and the US peers who had already

worked with Portuguese academics were among the most receptive and enthusiastic about the partnerships. They were also more aware of the cultural and behavioral differences and fostered mutual understanding during the negotiation stage. The role of Portuguese academics at US universities is even more important in the US, where faculty decisions to form partnerships carry a lot of weight with the institution's decision to close the deal.

3.4. Portuguese mediators in US universities

Portuguese faculty at the US universities played the role of mediators between Portuguese policymakers and American peers, and were also able to influence agendas and bring to the table ideas that would not be easily accomplished were they not there to drive them forward. This design of the IPPs can therefore be considered a mixed process. It was top-down from the MCTES standpoint, in the sense that policymakers conceived the IPPs. At the same time, bottom-up ideas were being put forward by policymakers and academics with close ties to both countries, between champions and mediators, and driven forward by the mediators at their own universities. This produced a diversified set of programs (see Table 1). The Carnegie Mellon University partnership, for example, went on to implement dual degrees in the partnership despite initial skepticism.

> I remember when I first proposed dual degrees to my colleagues at CMU. The immediate reaction was: it is impossible. CMU will never accept this. I said let's wait and see. I went and spoke directly to the Dean of the Engineering School and he liked my idea. The other colleagues then followed.
>
> [*CMU Coordinator, faculty at CMU*]

> There was a history. It made a lot of things very much easier for everybody to understand what one would do, what one would count on, in terms of the background, the habits of mind and so forth.
>
> [*MIT Coordinator, faculty at MIT*]

The latitude of each university–partner in the IPP depended to a large extent on the existence and articulation of these features (e.g., the coordinator's input and the different ideas put forward by academics and researchers). This also goes back to the motivations that led the US research universities to join the IPPs.

3.5. The US faculty and their motivations for collaborating

Universities enter into partnership agreements for multiple and, often, contradictory reasons (Eddy, 2010; Rumbley et al, 2012). Rationales may be economic, political, social or academic or a combination of some or all (de Wit, 2002). Several interviewees mentioned funding as a main motivation or opportunity, but most devalued it as the most important reason for the US universities to commit to the partnerships. The recruitment of the best students was frequently mentioned as most important. The program was open to students of all nationalities with Portugal having an open recruitment policy. In the MIT–Portugal partnership, for example, over 20% of the students attracted to it were non-Portuguese nationals. Many came from Eastern Europe or Middle Eastern countries.

> I think the US universities gained two things — first, they gained funding and second they benefited from more human resources.
>
> [*Program Coordinator, faculty at a Portuguese university*]

A third important reason for the US faculty to meet the challenge was the opportunity to implement test labs, and do research with local groups in a country that was recognized as having ambitious plans for technological change (Heitor, 2012). The US faculty saw opportunities to apply their research to specific contexts in development projects, and to structure research in a new framework or environment. They had to commit to the partnership in both teaching and research. This was mentioned in interviews with US faculty. One of them said, at one point, "It is not very productive to have the president tell faculty what to do when in fact the energy has to come from the people actually doing the work who have the choice of doing what they want (…) nobody can tell us to go to Portugal or Brazil if we don't want to". This underlines the importance of the US faculty's agreement to collaborate in a process that was expected to last five years and to commit to research and teaching. The partnership would only be possible if the faculty, recognizing its potential, fully participated the program. The IPP required faculty commitment in what started as a top-down process so as to become an accepted bottom-up process.

4. Competition and collaboration in the negotiation process

An analysis of how certain design features of the IPPs come about shows a complex, often overlapping, dynamic process. We identified the following features in the interviews: 1) a choice of priority fields of collaboration, 2) the role of institutional competition, 3) shock-therapy in choosing US research universities, and 4) an interactive process: learning and building the IPPs.

4.1. The choice of priority fields of collaboration

An important aspect of the International Partnership Program was the process leading to the selection of scientific areas or fields of collaboration. Considering previous cooperation between Portuguese and US researchers, one would expect the priorities to be based on previous collaborations. Indeed, the scientific fields of research largely resulted from previous ones. The MIT–Portugal Assessment Report identified bioengineering systems for inclusion in the IPPs "in order to build on the existing collaborations between Portuguese researchers and faculty at MIT." (2006:7). But the choice of fields was also associated with the Portuguese government's strategic interests and Technological Plan, with emphasis on developing entrepreneurial skills and involvement of industry.

Equally important were the existing research capabilities found at Portuguese universities. The IPPs could only be set up in scientific fields that were compatible with fields that existed at the US universities, but also required the presence of international research groups with critical mass recognized for their scientific quality. International scientific collaboration requires levels of competence, resources and expertise. It would be difficult to engage the US universities and commit the time and effort of US faculty without the necessary conditions for ensuring formal collaboration with Portuguese academics. Both parties were to benefit from the new opportunities provided by the IPPs.

> It is obvious to me that these partnerships were made because there was scientific capacity; otherwise there is no point thinking about this. There would not have been a partnership with real scientific capacity.
>
> [*Senior Policymaker, University Professor*]

External evaluations of the various partnerships show that the research groups with greater scientific maturity, critical mass, and internationally recognized research quality were the ones that benefited most from collaborating with their US partners (Academy of Finland, 2012). The previous assessment of research conditions in Portugal helped define scientific fields before the partnership started. This indicates that there was a concern about finding suitable or at least potential partners for collaboration at Portuguese universities. Even after the fields were determined, routine annual monitoring exercises continued to attest to the importance of guaranteeing research quality assessment.

4.2. The role of institutional competition

The initial assessment exercise took place during the negotiation phase where the range and options of teaching and research were being discussed back and forth between Portuguese and US negotiators. Several issues were undecided at that stage, such as the number of participating US universities and the need to include a large number of Portuguese institutions and ensure competition at various phases in the program. As the negotiation phase proceeded, Portuguese policymakers and high-level officials involved in the partnerships began to clarify objectives and goals, as the following interviewee demonstrates:

> At the beginning I did not understand that Portugal could not do this with just one university in the US (…) we could not start one without another and therefore we always negotiated with two at the same time. Today, I am absolutely certain that if we had not done it this way, it would have been a failure just like Cambridge–MIT. We could not negotiate with just one. When we sat down with MIT the first thing they asked was how it was going with CMU. They were always comparing. That is the mentality of that society and therefore it is crucial to ensure its future, so we cannot be dependent on just one university. There has to be an element of comparison. The same is true for Portugal.
>
> [*Member of Government, faculty at a Portuguese university*]

Placing competition at the heart of the negotiation process was essential to ensure a favorable outcome with the US universities. Competition was also important to ensure that Portuguese researchers would have to compete against each other to collaborate with US researchers through open calls for research funding. The need to foster competition among Portuguese universities was critical to engage them in the partnership. One of the main strategic goals of the IPPs was to promote institutional change in universities by enhancing collaboration and promoting competition. The participation of several universities was a key component in the collaboration and an objective of the partnership. One benefit from this national competition was that it led to motivation of faculty at Portuguese universities who wanted to engage in the IPPs from the start. The notion of brokering around a problem and creating a sense of urgency was used to provide the context for partnering (Eddy, 2010).

During the negotiations Portuguese academics, research groups and universities came to recognize that they had to prepare and align themselves to show that they could be valuable partners in the partnerships. Throughout the process Portuguese universities vied for a position in the partnership. This shows that the Portuguese policymakers took on board the drawbacks of the Cambridge–MIT institute that assumedly benefited a single university and not the whole science and higher education system (Technopolis, 2009).

Competition is a normal state of affairs in US research universities and it works very well for them. By playing the competition card among the US universities in the scope of the partnerships during the negotiation stage, the champions encouraged these universities' faculty to commit to the partnership activities. More concretely, the policymakers' use of competition as a bargaining chip resulted in a broader range of activities in each partnership than originally expected by the US universities. If one US university was not interested in pursuing a specific activity deemed critical by the Portuguese policymakers, another university would take up the challenge, and this would place a rival institution in a winning position.

Since each US university involved in the negotiation process knew that the Portuguese government was in a multi-institutional negotiating phase, and that there were competing universities, rejecting certain activities that their competitors could pick up on was not an option. By diversifying strategic partners to more than one US university, the Portuguese champions were using a strategy to reduce the failure of the IPP as a whole. This once again suggests that experience of previous international partnerships served as lessons to the policymakers.

> The initial idea about expanding the partnership with several American universities was so that there would be some competition. But then it became a snowball. From then on there were almost daily discussions for the next three months. In these 3 months we went from a simple professional master's to a higher level of evaluating potential relations with groups of universities and research institutions.
>
> [*Research and Partnership Coordinator, University Professor*]

This, however, was far from being an easy negotiating process, and some features of the partnership encountered strong opposition from some US research universities, such as MIT, which considered that a consortium of Portuguese universities would increase the complexity of interactions. Only after the assessment exercise was concluded did MIT recognize the benefits of "bringing together the best researchers and research groups from the universities and research institutes throughout the country" (MIT–Portugal Assessment Report, 2006). In this context, not only did personal relationships help oil the negotiations, but also of vital importance was the visit of US faculty to Portugal during the assessment exercises to get an idea of the country's research and academic reality. In some cases, it provided the last convincing piece to finally engage the US academics and universities into the partnerships, as they had seen firsthand the Portuguese academics' potential and capabilities and research groups and universities that they were being asked to work with.

> In the beginning they were not even thinking about Portugal, and then they were interested but probably doubted what they were being told. But when they came here they saw it with their own eyes. They were here 6 months and were convinced that we had excellent people and institutions. These people could work with them on challenging problems.
>
> [*Policy analyst, Ministry of Science, Technology and Higher Education*]

4.3. Shock therapy in choosing US universities

According to our analysis of the interviews, the decision to work with leading US research universities rather than leading European ones was multifold. Still, some reasons were mentioned more often than others. Working with US research universities would single out Portuguese researchers and help increase the international credibility and visibility of Portuguese universities, specifically within the European Research Area. Global university league tables have positioned US universities at the top of the rankings and leading European universities look to the leading US universities as a reference. If Portuguese universities were able to develop a strong, longstanding working relationship with world-renowned universities such as MIT, then their quality would be demonstrated, as leading US research universities do not work with anyone. This idea also holds true nationally.

The rationale in the Portuguese policymakers' minds was that if one wants to be recognized, one has worked with the best. Several interviewees added that collaborations with other European universities were already under way as part of the Framework Program and other European programs. Creating IPPs with these universities would just be another program among several in Europe involving Portuguese universities. Finally, it was considered that establishing a program with other European universities would not bring the "seeds of change" that the IPPs were aiming for. European universities were perceived as not different enough in terms of organization and behaviors to trigger the desired institutional changes towards greater proactivity, internationalization, vitality and interactions with society.

> The top policymakers wanted to set up partnerships with leading universities in the United States, and they had already identified some key fields to collaborate with (…) They [the US research universities] are world references and we thought this is going to be a difficult process and it can only be done with the best. In Portugal, people had already heard of MIT, and politically it is much easier to defend partnerships with top universities.
>
> [*Senior policymaker, Ministry of Science, Technology and Higher Education*]

> This was made by academics. Both the minister and the secretary of state are academics. The references of academics are the best universities, and the best references are in the US. They are the world references (…) the European model is the model of our universities. And what we wanted was a radical experience for Portugal, shock therapy, and the best way to give shock therapy is to include people that think very differently in the mix.
>
> [*Policy analyst, Ministry of Science, Technology and Higher Education*]

The shock therapy approach differs from more gradual "sowing the seeds of change". The idea of shock therapy implies a cultural jolt for change to take place. But for this to work, some maturation time is necessary. In terms of the partnership model, it is relevant that the partnerships were set for a five-year period, with the possibility of renewal if the parties were in agreement. The five year period was important because it not only allowed time for the collaborations to take root and for the work to progress, but also for new initiatives and instruments to be included at the suggestions of both participating researchers and the strategic recommendations of the annual external review reports. The individual components of the partnerships were to a large extent varied and not structured in the same way.

4.4. An interactive process: learning and building the IPPs

An analysis of the IPPs design suggested that inspiration for the partnerships derived from an open negotiation process with many ideas and models, previous assessments of other networks and partnerships, the contingencies of the process, general strategic objectives, the policymakers' experience and overall openness to new ideas. The IPP came to include graduate education and training, collaborative research, and entrepreneurship and technology transfer, also including public awareness of science initiatives. The overall program was ambitious, broad and encompassing. The general objectives were defined but the process and the means of getting there were a combination of top-down and bottom-up approaches resulting in an open, incremental model that was refined along the way. In effect, the term partnership model was not entirely consensual.

> There was no model. There was an idea that knowledge networks would guide us.
>
> [*Senior policymaker, faculty at a Portuguese university*]

> We were learning as we went along. We initiated activities with a degree of inexperience. It was relatively easy to start a master's program because classes were well structured but the doctoral program was not so easy because we had to find students and to create programs. (…) Until this program we had never had a program that went beyond the department level. Now we are in a program with 7 colleges and many departments. We are expanding to include another 2 departments.
>
> [*CMU Coordinator, University Professor*]

A main idea of the IPPs was to introduce change in the Portuguese university, which involved introducing outside stimuli into the system (Heitor and Bravo, 2010). In order to achieve this, policymakers focused on masters and doctoral programs as the first inducers of this change. Doctoral programs were the initial strategic motor that offered packages and programs for student exchanges that provided the human resources and opportunities. The strong focus on developing and updating dynamic and collaborative doctoral programs with doctoral students at the heart of the agreements sustained the partnership. The number of Portuguese doctoral students was growing at a rate of 10% a year, one of the highest growth rates in Europe, and this could be a source of incoming graduate students.

Consequently the programs were continuously innovated and adjusted to ensure that doctoral students could benefit from the partnership with US universities. The rationale was that some features of the US universities would be assimilated through the participation of Portuguese and US faculty in graduate programs, engaging a more international set of students and in a novel type of doctoral programs. Through this experience, there was the expectation that Portuguese universities would gradually retain more modern academic models, curricula and programs (Pfotenhauser et al., 2013). Several masters and doctoral programs at Portuguese universities were transformed, and the spillover from the US research universities graduate education model was widely recognized as positive (Academy of Finland, 2012). However, soon into the implementation stage of the IPPs, policymakers realized that this idea had to integrate the faculty with faculty exchange programs and competitive research projects more fully, which would also include industrial partners as a way to foster industry–university relations.

> At the beginning the partnership was designed as student-centred, students from Portugal going to study in the US. The students were the core of the program, as they should be. But then we realised that we had to deal with something else. Our faculty was not as internationalised as we thought they were. They had completed their PhDs abroad but when they came back they had lost some of their networks. They research and collaborate but they never talk about teaching with their international colleagues; they never taught outside of Portugal. When I realised this, I knew we had to introduce a faculty exchange component (…) these academic networks are part of our science policy to ensure the best teaching at Portuguese universities.
>
> [*Senior Policymaker, faculty at a Portuguese university*]

The Carnegie Mellon–Portugal Final Report 2006–2011 refers to the assimilation aspect of the faculty exchange program. "The faculty member from Portugal is exposed to the same environment and working conditions as a colleague at Carnegie Mellon University. The visitor receives a formal appointment as a visiting faculty member, is hosted by a research group, joins the teaching team of a course (undergraduate or graduate level) in a specific area of interest and is invited to participate in various activities. The goal is to accelerate the adoption of best practices through cultural immersion, giving the opportunity to adopt, adapt, propagate, and consolidate" (CM–PT Final Report 2002:28). The faculty exchange programs attracted mainly assistant professors and junior faculty members.

Besides the faculty exchange program, open calls for research funding signaled another major step in the partnership. Research funding through open calls was introduced in the second and third years of the IPP. The objective was to overcome the fragmentation of research teams in Portugal by encouraging the constitution and consolidation of themed networks with the inclusion of US researchers. This could only be done by accepting routine networking practices and the role of scientific leadership.

> (….) how academic networks are created (…) to create groups from different universities we need Americans to act as glue and to lead. Then the Portuguese groups can retrieve and gain, can question, be able to question, to learn, to absorb. (…) the most successful cases were those where the Portuguese had the capacity to question and the Americans to lead.
>
> [*Senior policymaker, University Professor*]

The introduction of open calls strengthened the partnerships through the institutionalization of the competitive peer review process that brought American and Portuguese researchers together into research teams. Open calls highlighted the credibility and robustness of the Portuguese international peer review evaluation process that MIT, CMU and UTA faculty would be subject to. Research conducted by Portuguese and American teams revealed the existence of real scientific capacity.

> The introduction of open calls solved the problem in Portugal. In other words, if we had not introduced open calls into the system, these partnerships would not exist today.
>
> [*Senior policymaker, Program Director, Faculty at a Portuguese university*]

The research component flagged the international partnership program as a multifaceted and interrelated effort, with numerous scientific and academic activities. The IPP structure was sufficiently agile to integrate new activities and organizations without jeopardizing the core of the graduate education programs. In fact, these new programs were built upon the existing ones, thus reinforcing the core and strengthening the overall IPP. The policymakers continued to interact closely within the academic coordinators, guaranteeing the transformation of the partnership into one that offered and launched new programs and new possibilities for international collaboration. Throughout this time each of the partnerships continued to develop their own path. The partnership with the University of Texas at Austin, for example, was developing its technology transfer program with international training internships, reverse internships and in-situ training in international hosts.

5. Conclusions

This article examines the origins of an international partnership program in terms of its background and design, including some features of its early implementation. Our analysis emphasized key features as a continuous process of learning and integration. In the design stage, pre-negotiation was based on background conditions. The negotiations re-influenced ideas of the design, and early implementation were a dynamic, evolving process that involved features of design and negotiation.

Drawing on the analysis of this article, a first conclusion is that internationalization models focused on promoting the modernization and change of science and higher education systems can be pursued with close support from US research universities, without a straightforward "market" rationale from these universities. Although the funding supporting the partnerships mattered for the universities involved, it was not necessarily the most relevant driver for the participation of the US universities. Rather, this article highlights the relevance of other factors that can encourage these universities to be agents of change, contributing to research efforts and the modernization of institutions, especially universities. A major finding is the importance of mobilizing the faculty at these universities through challenging projects for them to participate in collaborations. Institutional partnerships are about people and driven by people and their activities.

The role played by academics throughout this process is critical as all the agents participating in an international partnership have an academic background. Our analysis identifies the role of policymakers as internationally recognized academics with international networks in establishing these partnerships. Their academic background gave them an "insider" perspective of other international partnerships. This allowed them to avoid the pitfalls experienced by other partnerships and design them in novel forms that were adaptable to Portugal. But their role was also fundamental in persuading US universities, through personal contacts based on years of working together that opened the door to negotiations based on mutual trust.

The policymakers paved the way but the partnerships required a support community of faculty members and researchers. The support of national researchers was achieved during the initial assessment exercise conducted by the US universities. The assessment period galvanized interest and led to specific scientific field support from departments at the main universities. It permitted key figures, such as Portuguese nationals working in US universities to act as mediators during the process, bridging the cultural differences between policymakers and academics in the US and Portugal.

In this context, the role that previous public policies had in supporting brain-circulation between Portugal and the participating US universities cannot be dismissed. If it were not for public funding for Portuguese students to go to MIT, CMU or UT at Austin in the past, it is unlikely that some of the personal relationships established long ago would be as strong and decisive as they were. Besides the role played by the Portuguese faculty working at those universities, the US faculty that had years of experience with Portuguese faculty mediated the negotiations, fostered ideas, helped established compromises, and created negotiating bridges. Without them the involvement of the US research universities would have been much more difficult. With the extensive personal and working relations of the IPPs, champions and mediators might never have existed and without public funding to support those past relations things would have been more difficult.

Despite the efforts to modernize Portuguese universities by sowing the seeds of change the outcome is uncertain, as research depends on continuous public funding and the limits of procuring extra funding. In other words, Portuguese universities remain constrained by limited resource strategies. The changes and reforms introduced by the IPPs remain constrained by university dependence on government resources. Support for the partnerships has been affirmed by the new government, in a context of severe financial austerity, agreeing to renew the agreement for another five years (even if operating with a much reduced budget). In 2014 the budget for the IPPs that year was 3% of the overall FCT budget of 436 million euros, i.e., 13 million euros.[3]

Our analysis reaffirms the role of the state in defining, steering and implementing major aspects of partnerships. The policymakers in government designed a type of partnership connecting graduate educational programs with research in fields most suited to innovation and technology transfer. This involved defining priorities and allocating funding to research through publicly funded research objectives. This action also included a role for the administrative research funding agencies. The start-up of the program included the political engagement at the highest levels of government. The motivation and commitment of Portugal's Prime Minister to these partnerships was central. For the US universities, it provided a guarantee of the country's commitment to partnerships. Nationally, it helped to overcome political resistance to the initiative. From our analysis, it is clear that, in dealing with such a politically a sensitive issue, only with strong political support is this type of policy involving allocating resources to universities abroad possible.

During the negotiation of the partnership, different forms of competition were introduced both nationally and internationally. Competition served as a driver for different departments, different people and different mediators in the process. It produced a dynamic context of differentiation and change. Drawing on the competitiveness of academics on both sides of the Atlantic, competition further encouraged individuals, research groups and universities to become involved in more activities and assign them more resources and commitment. This not only increased the number and nature of the activities that these actors were committed to, gradually involving a greater number of people and thus opportunities for change, but also reduced risks. The fact that partnerships were formed with three US universities instead of one not only increased Portugal's bargaining power but also boosted the US research universities' commitment as they viewed themselves as being in

[3] See: https://www.fc.ul.pt/sites/default/files/fcul/investigacao/FCT_Calend%C3%A1rio%20e%20Or%C3%A7amento%202014.pdf [accessed 27th April 2015].

competition with their direct peers. This also provided an "insurance" factor, as the likelihood of one partnership failing would not mean that the entire program would fail. In Portugal, the competitive framework fostered the participation of a range of universities as their strategic aims were focused on the system.

In 2015, even with budget cuts in public expenditure resulting from the 2009 financial crisis, the IPPs are ongoing, engaging research groups, universities, firms, faculty and students in a myriad of activities ranging from graduate education to research projects. Ten years later, the IPPs are still ongoing due to their development but also to the initial conditions that allowed them to be set up in the first place.

Acknowledgments

This study was supported by the *Fundação para a Ciência e a Tecnologia* (Portuguese Science and Technology Foundation, FCT), project grants "The Portuguese International Partnership Programs: assessing the role of scientific networks in the knowledge society" (PTDC/CS-SOC/118487/2010) and 'Career trajectories of doctorates: deepening the knowledge on different types of mobility' (PTDC/IVC-ESCT/3788/2012).

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Hugo Horta is a researcher and deputy-director of the Center for Innovation, Technology and Policy Research IN+ at Instituto Superior Técnico, Portugal, and assistant professor at the Faculty of Education of the University of Hong Kong, Hong Kong SAR, China. His research interest focuses on overlapping issues of science and higher education policy, namely academic mobility, careers and knowledge networks, internationalization of higher education, scientific productivity, and comparative studies. He is Coordinator–editor of Higher Education, a leading journal in higher education research, and serves on the editorial boards of several journals.

Maria Teresa Patrício is Associate Professor in the School of Sociology and Public Policy at ISCTE–Lisbon University Institute and a researcher at CIES-IUL. She was a Fulbright New Century Scholar at the Centre for the Study of Higher Education at Penn State University. She spent two years as a Visiting Researcher at CIRST at the Université du Québec à Montréal. She was vice-president of the Institute for International Cooperation in Science and Technology and in the Ministry of Science, Technology and Higher Education in Portugal. She was also senior policy advisor to the National Science Advisor in Canada.