

# **Evaluation of the Portuguese Foundation for Science and Technology**

**Fundação para Ciência e a Tecnologia (FCT)**

Report of the Evaluation Panel

## Executive Summary

A panel consisting of Alan Bernstein (Canada), Christoph Kratky (Chairman, Austria), Yves Meny (France), and René Schwarzenbach (Switzerland) was mandated to review the operation of FCT. It came to the following conclusions, based on the Terms of References submitted to the panel prior to its commencement.

### **1. How is FCT fulfilling its statutory mission in terms of:**

#### *Furthering the quality of scientific research*

FCT is the lead organization in Portugal for the funding and advancement of scientific research. FCT's operations have led to remarkable progress in the amount and quality of Portuguese scientific research.

Following a period of rapid growth of the Portuguese research system over the past 15 years, the emphasis more recently has shifted from expansion to excellence, impact, and international competitiveness. To that end, FCT has initiated a number of reforms, including the introduction of new programs and changes in existing programs, as well as changes in operational procedures within FCT itself. In spite of minor shortcomings in implementation, the panel strongly approves of these reforms, which align Portugal's research funding instruments with best practices in leading countries in the EU and elsewhere.

#### *Initiating and stimulating new developments in scientific research:*

FCT's goal is to support Portugal's very best researchers as judged by international standards of excellence.

#### *Transferring knowledge of the results of studies it initiates and promotes for the benefit of society:*

The transfer of knowledge from research for the social, economic and health benefits of society has become a widely accepted goal of publicly funded research. The panel supports this goal but also believes that the funding of the very best research is key to successful knowledge translation. The panel also strongly recommends that all of FCT's activities, whether in research or in knowledge transfer, be subject to rigorous and arm's length peer review. Notwithstanding possible priority areas, the panel recommends that FCT continues to strengthen research across all areas of science. Portugal's first priority must be to build up excellence in research in order to benefit from the results of that research.

### **2. Does FCT have the right strategy and structure in place in light of:**

#### *National developments in S&T over the last decade.*

The panel believes that FCT has the right overall strategy for supporting Portugal's S&T strategy. FCT's organizational structure, however, could be improved in a number of ways. The most relevant point is the question of institutional autonomy: the panel strongly recommends that – in agreement with research councils in all leading research countries – FCT should have separate legal status, albeit as an agency of the Portuguese government answerable to the Portuguese government, with full institutional,

administrative and financial autonomy. Like other research agencies, FCT should be provided with rolling multiyear budgets from government so that it can optimally and responsibly plan its multi-year commitments. To develop a country's R&D system is a multiyear project, requiring sustained and stable funding.

*International developments in the context of European and global developments.*

*How does FCT policy measure up to European policy developments such as in Horizon 2020, ERC, ESFRI and Science Europe?*

Alignment with Horizon 2020 and the ERC is manifested by recent successes with both schemes, including 17 ERC grants in 2014. For the first time, Portugal succeeded in receiving more money from Horizon 2020 than it paid in.

FCT is a major player and founding member of Science Europe. FCT's former president Miguel Seabra was elected president of SE prior to his resignation, underpinning FCT's growing presence in European science.

*How does FCT deal with global research developments such as in the emerging economies?*

An evidence-based answer to this question is beyond the competence of this panel.

*How does FCT operate regarding cooperation with stakeholders?*

FCT has many stakeholders, including the research community, universities and the public. The scientific councils, put in place to interact with the research community, could be used more effectively. FCT should ensure that the country's best scientists are represented in the Scientific Councils. The scientific councils advise the board on strategic and important operational issues and should act as a strong transmission between FCT and the scientific community. A role in funding decisions would also improve the feeling of "ownership" of FCT by the scientific community.

The panel heard repeatedly that lack of effective interaction with FCT was an issue. The panel recommends that FCT improve communication with all stakeholders, clarifying and sharing future plans, challenges etc. FCT should also regularly interact with CRUP, in order for both sides to hear and understand. It seems clear that for Portugal to optimize its R&D system, there should be good alignment between FCT and the country's universities, yet FCT has to insist on its autonomy in strategic issues.

### **3. Is FCT properly equipped for its tasks given current and foreseeable developments?**

*Is the current governance structure FCT satisfactory, especially in terms of the management of its divisions and governance committees?*

As noted above, the review panel recommends that FCT be given legal status as a separate agency of the Portuguese government, responsible for its own administrative, organizational and financial operations. As part of this change in status, the panel recommends that FCT make several changes to its structure and senior management positions. These are detailed in the report.

FCT's operational performance could be improved by recruiting staff with a background in research, wherever appropriate. FCT should make a strong effort to streamline internal operations and simplify procedures. FCT should develop a service-oriented culture.

#### **4. How do FCT tools and procedures for awarding grants or funding research institutions compare to those of other countries with a comparable funding system?**

*In general, how are the tools and procedures assessed?*

It is the panel's opinion that FCT has the mayor funding tools in place. Following the reforms initiated in recent years, FCT's programs should be developed further in a number of ways. Specifically:

1. The panel supports the move away from the funding of individual scholarships for PHD students through countrywide calls to the funding of PhD programs, as done by FCT in 2012/13;
2. Project grants should be allowed to include the provision of funding one or two PhD students, which should constitute the second form of funding of PhD students in Portugal;
3. The countrywide call for PhD scholarships should slowly be phased out;
4. The FCT-Investigator program should be strengthened and expanded for the very best young scientists to pursue a career in science;
5. As with PhD scholarships, the Panel recommends that salaries for postdoctoral fellows be eligible expenses on research grants;
6. Tenure of postdoctoral fellowship should not exceed 3-4 years;
7. The countrywide calls for PDF fellowships should be phased out over a number of years. Further, junior post-doc fellowships should be awarded through research grants (see above) and young scientists should apply for career development positions.
8. FCT should develop policies and programs that encourage recent Portuguese PhDs to seek postdoc positions at institutions other than the one at which they received their PhD, preferably outside the country.

*Does FCT have the right mix given past performances and research proposal applications?*

Assessing grant proposals by judging a mix of past performance and future research aims follows international best practice. In Portugal, this mix was specifically criticized in connection with the evaluation of R&D Units, where a 50:50 mix of past performance: future aims was stipulated. While the exact ratio can be debated, the panel accepts the argument that the 50:50 rule would catalyze change and turnover in the research units. The important consideration is only whether the formula was clearly and timely communicated to everyone in a timely manner. The panel is satisfied that this was apparently the case.

*How is FCT dealing with the increasingly lower award percentages?*

FCT has to deal with an excessive number of proposals in several of its programs. While this challenge is not unique to FCT, it is particularly acute in Portugal. FCT has attempted to manage this situation through recruitment of a sufficient number of reviewers. The panel feels this approach, especially in a small country like Portugal, will not be sustainable. Rather, the panel recommends that FCT, advised by the scientific community, reduce the number of applications by e.g. preventing postdocs on fellowships from applying. The scientific community has to understand that everybody loses when everybody applies to every program.

FCT should improve the stability and predictability of its funding instruments. Thus, a calendar of research calls should be published well ahead of time, with predictable deadlines.

## **5. Additional comments**

The panel heard numerous concerns regarding the recent evaluation of R&D units, carried out in cooperation with the European Science Foundation (ESF). While scrutiny of this evaluation exercise was not explicitly mentioned in the Terms of References of the present evaluation, the panel felt that it was important to express our opinion on this highly debated issue. Having studied relevant documents and interviews with numerous stakeholders, the panel came to the following conclusions:

1. The panel endorses the fundamental paradigms of the evaluation of R&D Units, i.e. joint evaluation of Associated Laboratories and other R&D Units, the call that units have freedom to restructure to find their optimum configuration, and giving equal weight to past accomplishments and future strategy. All that was timely communicated to all the players;
2. The decision to outsource part of the evaluation to the European Science Foundation, including the selection of reviewers and panel members, is endorsed;
3. The panel finds some justification to the concern that “rules changed after beginning of the race”, however these changes respected the boundary conditions expressed in the original Evaluation Guide;
4. The panel finds that rules and procedures of the scientific evaluation followed internationally established practices. ESF took the necessary steps to choose competent reviewers, yielding a robust evaluation outcome.
5. There are a few minor procedural points which the panel believes FCT could have followed more closely, although the panel sees little indication that these inconsistencies significantly affected the outcome of the evaluation.
6. Some members of the scientific community expressed concerns regarding the conversion of the scientific evaluation into funding decisions for the Units. The panel agrees that the procedures should have been specified in advance and these procedures should have been followed.

## Foreword

An international review team consisting of Alan Bernstein (Canada), Christoph Kratky (Chairman, Austria), Yves Meny (France), and René Schwarzenbach (Switzerland) was asked by the Portuguese Secretary of State for Science, Prof. Leonor Parreira, to evaluate the operations and impact of the Fundação para Ciência e a Tecnologia (FCT), as required in the legislation that created the FCT. To our knowledge, this is the first external review of the FCT. We met twice in Lisbon, at the end of March and at the end of May, 2015. Prior to these meetings, we were provided with comprehensive material and background information by the FCT staff, led at that time by Prof. Miguel Seabra. During our visits to Portugal, we had the opportunity to meet with a considerable number of individuals and groups representing all important stakeholders. We thank everyone who assisted in the very smooth running of our visits, provided the materials necessary for us to gain an understanding of the context in which the FCT operates, and all the individuals who took the time to meet with us. We especially appreciated the time and openness we received from the previous head of the FCT, Prof. Miguel Seabra, the present head, Prof. Maria Arménia Carrondo and the Secretary of State for Science, Prof. Leonor Parreira. We hope that this report, including our conclusions and recommendations, will help the Portuguese scientific community and the Portuguese government move forward and address problems that, in our opinion, require immediate action, as well as those that are of a more long-term nature. Ultimately, a strong FCT is absolutely critical to the health of the Portuguese scientific enterprise and to the future of the next generation of researchers who aspire to a career in their own country.

## Description of the evaluation process and methodology

This evaluation process, which represents the first statutory external review in FCT's history, started with the Portuguese Secretary of State submitting the Terms of Reference (Appendix 1) to the panel (Appendix 2).

Subsequently, the panel requested and received various documents, which formed the basis for the interviews. The documents included:

- A self-evaluation report compiled by FCT [1];

- The information contained in the English part of FCT's homepage [2];

- A variety of international documents [3-7];

- In addition, and at its own request, the panel received a comprehensive report from ESF about the FCT/ESF evaluation of R&D Units conducted in 2013-14 [8].

The panel convened in Lisbon twice, the first meeting from March 30 to April 1, the second one May 27/ 28. During these visits, the Panel conducted a large number of interviews with a variety of stakeholders (see Appendix 3). Meetings were organized partly by the Secretary of State for Science, partly by FCT, interview partners were invited by the Secretary of State for Science who mandated the review.

In addition to these interviews, the Panel had several email-exchanges with Prof. Miguel Seabra, the former president of FCT (he retired from his position between the two panel meetings for health reasons, but remained available for inquiries and discussions) and with Prof. Maria Arménia Carrondo, the current FCT president. In the course of these exchanges, the Panel requested and received additional pieces of information. The Panel also contacted the European Science Foundation to better understand the ESF's role during the evaluation of the R&D Units. In response, the ESF provided the Panel with extensive documentation, some of which have been included in this report.

## Introduction and Background

During the past 20 years, the Portuguese research system has grown impressively. The number of researchers per thousand labor force, which was 2,4 FTE in 1995, reached a value of 11 FTE in 2012, above the EU and OECD averages; the number of international scientific publications per million population has grown almost ten-fold between 1995 and 2013, and is now around 1200, which is within reach of countries like Germany and the UK. R&D expenses for the Higher Education sector more than tripled between 1995 and 2011; the annual number of doctorate degrees awarded by Portuguese universities almost tripled between 2000 (694) and 2012 (2007) [1].

Portugal has increased its investment in research at a remarkable average annual real growth rate of 7% between 2000 and 2007; however, as a result of the economic crisis, the R&D intensity in Portugal has decreased by 0.16 % from 2008 to 2011, and has remained at a more or less constant value of around 1,5% since then. This is still below the EU target of 3%. Public expenditure on R&D was maintained at a level of around 0.7% of GDP despite the crisis. While Portugal's public R&D expenditure as a share of GDP is at the OECD median, its shares of top-500 universities and scientific publications over GDP exceed it [5].

Recent Portuguese successes include 17 ERC grants (Starting and Consolidator) in 2014. In the same year, Portugal was – for the first time – getting more money back from Horizon 2020 than the country paid into the scheme.

Since its establishment in 1997, FCT has played a decisive role in advancing research in Portugal. Its current budget (expected to be 468 M€ in 2015) accounts for approximately 30% of Portugal's annual public funding for science. Since the lion's share of the remaining 70% are spent for salaries of university personnel, a very significant percentage of the country's public funding for research has to be obtained competitively from FCT by the research performing institutions. FCT's importance in the funding of research is also reflected in the publication output: a bibliometric study from CWTS, carried out in 2012, showed that the percentage of publications of FCT-funded units accounted for 80% of all 32,540 publications between 2007 and 2010 with at least one Portuguese address. The normalized impact of these publications is slightly above 1, indicating that it slightly exceeds the world average.

This impressive increase in research productivity was not only due to a substantial increase in financial expenditures, but also due to institutional reforms mainly triggered by Mariano Gago, who held a variety of key positions (including minister of sciences) in the late 1990s and early 2000s. Before 1990, Portuguese universities were primarily teaching institutions with little aspirations in research. Gago's reforms were inspired by the French model, i.e. a dual university and research system, motivated by the apparent inability of universities to reform. Thus, research units – consisting largely of university staff – received FCT support directly, and in some cases the units were encouraged to set themselves as private associations. Since the system was also fragmented into small units, about 20 centers of excellence (Associated Laboratories) were set up after 2000 to create critical mass. The Associated Laboratories were appointed without competition and funded generously (in 2012 they received 60% of FCT's unit funding), while allowing a remaining large number of Units (in 2012 close to 300) to receive the remaining 40%, which were distributed among them competitively.

In view of the fast growth of the Portuguese R&D system since the beginning of the century, policy emphasis has recently shifted from expansion to excellence, impact, and international competitiveness. When Miguel Seabra took office as president of FCT in 2012, he agreed with the government on a list of reforms, which included the introduction of new (Investigator Program and PhD programs) and the reformation of existing funding instruments (evaluation of R&D Units with the objective to instigate a significant reorganization of existing R&D Units), plus changes in the operational procedures within FCT, such as the creation of a central evaluation office. The implementation of these reforms coincided with two external events: First, the ongoing economic crisis with the external assistance program, which limited the available budget and imposed strict budgetary restrictions and inflexibility. As a consequence, FCT had to switch from a mode of continuously increasing to stagnating budgets, which, due existing multiannual commitments from previous years, severely decreased the money available for new commitments; And second, a new Partnership Agreement for the use of European Structural Funds, i.e. the switch from QREN (2007-2013) to Portugal 2020 (2014-2020), brought new constraints in the use of structural funds, combined with technical complexities for FCT and anxieties within the community.

The agenda of reforms in combination with these external adversities caused an unprecedented level of public debate about science policy and funding in Portugal.

## Interviews with Stakeholders

During our two visits to Portugal, the panel conducted 26 interviews with individuals or groups of stakeholders; in total, we interviewed 77 individuals (see Appendix 3). Each interview took between 45 minutes (for individuals) and up to 2 hours (for groups of stakeholders). Interview partners were selected (where appropriate) and invited by the Secretary of State for Science upon request of the panel. Interviews were performed with members of the following stakeholder groups:

- Minister for Education and Science, Minister for Regional Development, Secretary of State for Science;
- Representatives of CNCT, CNEI, and COTEC;
- Representatives of ABIC and ANICT;
- Present and former presidents of FCT; FCT Board of Directors;
- FCT heads of operational and policy departments;
- Chairs of FCT Scientific Councils;
- Coordinators of FCT-funded doctoral programs;
- Heads of Portuguese R&D Units;
- Rectors of Portuguese universities; representatives of CRUP and CCISP;
- Faculty directors at Portuguese universities;
- Senior researchers working in Portugal;
- PhD students and junior Post-Docs;
- Representatives of Portuguese private foundations.

Detailed accounts of the interviews are given in Appendix 4. In view of the large number of individuals interviewed and the wide range of their professional backgrounds and job situations, the Panel is confident that it received a very complete picture of the political context and of the current situation of science and the University system in Portugal. Below, we briefly summarize – without attributions – all the recurring points we heard about FCT:

### *Positive points*

- FCT plays a crucial role in the Portuguese R&D system – without FCT there would be very little research in Portugal. FCT's commitment to basic sciences and fundamental research is highly appreciated;
- The values represented by FCT, such as a focus on scientific quality and competitive research funding on the basis of international peer review, are held in high esteem in the Portuguese scientific community;
- FCTs' evaluation system is in line with international practice;

- FCT is seen as the only body in Portugal providing financial support directly to researchers on the basis of scientific accomplishments;
- Some of FCT's programs are seen as adequately addressing the needs of the community;
- Since FCT has been the one institution recognizing and funding scientific quality, FCT is widely regarded as the "jewel in the crown" of the Portuguese R&D system;
- Even some critics acknowledge that FCT is doing an extremely difficult job under challenging conditions and that the situation has been improving in recent years.

### *Critical points*

- FCT is viewed as an unstable, unnecessarily bureaucratic and inflexible institution with its administration that is inaccessible, stressed and unenthusiastic in serving the research community;
- FCT is perceived as having neither a clear strategy nor a clear vision;
- Calls are unclear, irregular, and unpredictable, deadlines do not hold, rules change on short notice, sometimes even during open calls;
- FCT has accounting rules which are unclear, arcane, and unpredictable;
- There is poor communication between FCT and the scientific community;
- FCT is a heterogeneous institution which does too many things, some of them far removed from a research council's core activities;
- FCT is not seen as an independent agent acting on behalf of the Portuguese scientific community, but rather as an extended arm of the ministry;
- FCT's recent focus on scientific excellence is criticized as a policy of "Picking-up winners" with the result that many areas of research, key to a national, high quality research enterprise, are underfunded and underprioritized;
- Scientists and scholars from the social sciences and the humanities feel discriminated against;
- Private institutions and associated laboratories with large strategic funding are allowed to apply for money from FCT, which some perceive as unfair;
- The scientific councils, which are seen as the voice of the scientific community, have a marginal role in FCT;
- The PhD programs introduced in 2012 led to a dramatic decrease in the number of studentships for the national call, with concomitantly low success rates;
- FCT has no bridge of communication with universities, resulting in a lack of coordination at the disadvantage of young scientists' research careers;
- The strained relationship between FCT and university management leads to poor "alignment" of FCT's policies with those of universities;
- The recent FCT/ESF evaluation of R&D Units was criticized by many for a variety of reasons (See Appendix 5);

### *Problems*

- FCT's annual budgeting is at variance with its multi-annual commitments, particularly in times of dropping or stagnating budgets;
- As part of the central government, FCT has to comply with very formal accounting rules. The Structural Funds from the EU (about 1/3 of the FCT budget) come with specific utilization rules which have to be aligned with national rules, leading to constant annoyance;
- The staff of FCT consists largely of public employees, whose motivation is impaired after they had to accept salary cuts; FCT is not allowed to hire new staff;
- FCT is faced with a wave of applications (5500 applications for research projects, 6000 applications for fellowships), which has been straining the peer-review system to its limits;
- Universities had to endure heavy budget cuts as a consequence of the economic crisis, forcing them to put a freeze on filling positions of retiring professors;
- Portuguese industry is reluctant to employ university alumni at the PhD level, of which more than 95% attempt to stay in academia;
- The unavailability of permanent jobs at universities and industry has led to several thousands of postdoctoral fellows working on scholarships at Portuguese universities with dim long term prospects as independent investigators

## **Identification of Problem Areas and their Assessment by the Panel**

### **FCT and the Scientific Community: Lack of Trust**

In view of FCT's central role as the only public institution in Portugal funding research, including the support of graduate students and Postdocs, the panel was quite surprised at how critical the community looks at FCT. It got the strong impression that there is a fundamental and widespread lack of trust at the base of most of the criticisms that we heard. Many stakeholders simply do not believe that FCT is an honest agent of their interests.

Public research funding agencies face similar problems to FCT. They are answerable to government who provide the funds, the scientific community who is in need of the money, and research performing institutions who all feel their faculty should receive the bulk of the support and of course also would like direct access to some of the funds directly. With success rates at peer-reviewed competitions falling below 20%, research councils constantly frustrate a large fraction of their stakeholders. This can only be sustainable as long as the community firmly believes that the research council organizes its competitions strictly on the basis of scientific quality and treats all scientific disciplines equally. Institutional independence, predictability, transparency and fairness, including checks and balances for all steps of decision making and strict rules for conflicts of interest for all individuals involved in decisions, equal chances for all applicants irrespective of gender, race, age or position within an institution as well as adherence to ethical standards therefore form the basis of trust within the scientific community.

One important component is communication: FCT has to approach the community proactively, explain why certain grievances are beyond its scope, and what FCT does to improve others that are within its control (Recommendation #14). Because a major criticism of FCT that we heard concerns instability, unpredictability, erratic behavior and sudden policy changes, FCT should avoid modifying the funding portfolio or changing rules and guidelines. Furthermore, FCT should strive for a simple funding portfolio and ensure that calls for programs that are maintained on a regular basis are announced well ahead of time (Recommendation #13). Finally, FCT staff at the "front end" is perceived as inaccessible, and often not very helpful; the actions to be taken here are clear (Recommendation #12).

The scientific community has to take ownership of FCT; scientists have to see FCT as part of the scientific community and not as the business end of the ministry. In order for that to happen, the panel strongly advises FCT to involve the community into its decision making process and not just to inform it about its outcome. Therefore, we advise FCT to strengthen the role of the Scientific Councils, to reach a division of labor similar to other European funding agencies (Recommendation #6).

### **FCT's Mission**

After two decades of quantitative growth of the Portuguese R&D system, the Portuguese Government had set out a program of reforms aimed at enhancing excellence and the impact of public-funded science. FCT's board reacted to this policy change launching new initiatives with special emphasis on enhancing excellence, impact,

and international competitiveness. This policy change has contributed to the current high level of debate about science policy and funding in Portugal; it was criticized as intentionally dehydrating the existing system with its wide base of competencies. To focus scarce resources to few “shining stars” would momentarily liberate scarce resources, but will not lead to a sustainable high-quality research system.

The panel appreciates this as a valid issue, which has no simple answer; in fact, it is much less a question of “scientific excellence versus scientific breadth” than a question of where to draw the line; a country has to do more than to support just a “few shining stars”, yet to support everybody would be equally wrong. Science is an international endeavor; therefore, research only makes sense at an internationally competitive level. Moreover, competitive research funding is very good in identifying and supporting research strengths, but unsuitable for doing away with shortcomings.

At the bottom of this discussion, of course, there is the question whether the complaint is justified in the first place, i.e. whether there are indications that the policy implemented recently with the aim to foster excellence really did lead to undue concentration of funds on a small number of units or individuals. While a full apprehension would obviously require a detailed analysis of all funding decisions of the last decade, a brief glance at the results of the (highly criticized) recent evaluation of R&D Units yields the following picture: 80% of all units with 90% of the scientists received some funding, 52% of the units with 69% of all scientists received funding in round 2. By and large, these figures are comparable to the corresponding figures of the previous evaluation. *Thus, the panel does not see much evidence for a dramatic shift of FCT's policy toward a “cherry picking” mode.*

Compared to research councils in other European countries, FCT has a diverse portfolio of responsibilities with several programs that lie outside a traditional funding council's core business. The most obvious ones are the Department of Information Society (DSI) and the Foundation for National Scientific Computation (FCCN). While the panel appreciates that these are important institutions, it is of the opinion that they do not fit into a research funding agency's mandate. (Recommendation #8).

Much less obvious is FCT's responsibilities regarding innovation. This is an important question, since there is understandable pressure – both European, Portuguese, and even regional – to focus on societal challenges and economic relevance, and there is also considerable financial support available for such activities. The panel recommends that FCT should fund all kinds of research (basic, pre-competitive applied, thematic, ...) as long as the overarching funding principle is scientific excellence as assessed by peer-review. Thus, the major consideration should not be dividing line is not whether research is useful or may contribute to addressing a societal problem (good research does that by definition, the question is when), but rather the funding criteria. FCT-funded research should all be in the public domain, i.e. the main outcomes should be published in international scientific journals, which does not exclude that such research may also lead to patents and economic benefit.

### **FCT's Governance: the Board of Directors**

FCT's highest operational body is its Board of Directors, made up of the President, the Vice-President and two members. The board oversees the administrative Departments and Divisions and can seek advice from the Scientific Councils. It is the top decision

making body, which has to align its decisions with the government member responsible for FCT.

While the board members decided on a division of labor and responsibilities in August 2014, it appears that – at least during Miguel Seabra’s tenure – the board was constructed to reinforce the President leadership, as shown by the experiences and the backgrounds of the other board members. Besides the president there is only one board member with a scientific background; the vice president comes from management, and the fourth member joined the board when FCCN (which has little to do with a science council’s core business) was integrated into FCT. It also appears that Prof. Seabra did not regularly seek the advice of the Scientific Councils, whose heads pointed out that they were never centrally involved in discussions on important strategic issues.

Miguel Seabra had a clear vision about the reforms he planned to bring to FCT and to the Portuguese research system overall. In general, the panel supports this vision and reforms. His strong leadership and the style of governance at FCT ensured rapid, coherent decisions and their swift implementation. However, it also contributed to a growing sense of alienation between the FCT and the scientific community. The panel believes that this growing distrust has the potential to compromise both FCT and Portuguese science.

The panel feels that the governance of FCT should be broadened in a variety of ways. It recommends a volunteer Supervisory Board which would oversee the governance of FCT, including the role and performance of the president, finances, broad directions, and policy. Such boards exist in most other research funding institutions. The board should be made up of representatives of leading scientists, university administrators and heads of research institutes, business people, and other sectors of society. A sufficiently broad representation of different stakeholders would prevent the dominance of individual interests, which could also be minimized by including individuals from outside Portugal (Recommendation #3).

Another recommendation concerns the background of the members of the Board of Directors: the panel recommends that only accomplished, internationally respected scientists be appointed to the Board (not necessarily all of them full-time). Ideally they should be nominated for a 4 year term, renewable once. One of the board members should act as Vice-president for research and oversee (in collaboration with the Scientific Councils) all aspects of evaluation (Recommendation #4). Like other research councils, FCT should have an administrative director, manager or secretary general, who should report to the board and whose term is not in synchrony with that of the board members, e.g. the person could be appointed for 5 years renewable (Recommendation #5).

The panel appreciates that the implementation of these reforms requires constitutional changes and therefore may take time. As a short-term measure, we recommend that FCT establish an informal executive counseling body, which might consist of the heads of the four Scientific Councils plus four other top scientists. This counseling body should meet with the president to discuss crucial decisions and form a link to improve communication with the scientific community (Recommendation #7).

The panel recommends that FCT strengthen and expand the role of its Scientific Councils. In other European countries with well-established funding agencies, the research councils (or their equivalents) form the core of the community’s “ownership” of the agency. The Scientific Councils in these agencies are charged with providing

advice to management on strategic operational issues and also act as transmission lines between the agency and the community. In addition, Scientific Councils have a distinctive role in the evaluation of proposals and in funding decisions. Experience shows that the danger of conflict of interest by members of council can be minimized by two measures: strict and radically enforced conflict-of-interest rules and ensuring that council membership is restricted to the scientific elite of the country. To achieve a well-composed Scientific Council is a multi-dimensional optimization problem, because conflicting criteria have to be met: a Scientific Council should ensure geographic, disciplinary, gender, and age representation, without compromising scientific reputation (Recommendation #6).

It should also be noted that a strong role of the Scientific Council in the evaluation and decision of applications could contribute to the relief of the problem with FCT's administrative staff. In other European countries including Austria, Germany and Switzerland, the equivalents of the Scientific Councils accomplish most of the work of the evaluation office.

### **FCT and the Ministry: the Issue of Autonomy**

Institutional independence is a serious issue for research councils like FCT: on the one hand, the institution has to protect itself from influences on funding decisions from outside, politically motivated or otherwise; on the other hand, it is fully accountable to the public. Every publicly funded research council faces a similar dilemma: to be politically independent without being politically marginalized. It is in its interest to be well connected to political decision makers who should show an interest in the institution, but only to the extent that they participate in the development of its strategy and its programs, and provide sufficient funding without interfering in day-to-day operations. The panel appreciates that there is an understandable requirement for accountability in the expenditure of public funds while at the same time recognizing that scientific research proceeds best when it is removed from political interference. Independence from political influences on funding decisions is crucial both for ensuring the trust of the scientific community in the research council and their funding decisions and to ensure that in the long run the wisest and most far-sighted factors go into scientific funding decisions.

The fact that FCT is essentially a component of the central government is also of immense practical relevance, since it subjects FCT to the very strict, complex, and often dysfunctional accounting rules of the public administration. This is aggravated by the fact that a significant part of FCT's budget comes from EU structural funds, where different (but in no ways less complex) rules and procedures have to be observed. It is evident that this not only constitutes a source of constant annoyance but also an immense waste of time for all parties involved, and thus ultimately results in a substantial and unnecessary waste of money. In addition, it dramatically restricts FCT's ability to recruit staff and organize its operations. Thus, a legal status with financial autonomy is a prerequisite for FCT to become a true research council, comparable to its sister organizations in northern Europe. The panel is aware that this is a delicate issue, which is against the "zeitgeist" in times when accountability for public money is a big issue. However, it should be stressed over and over again that institutional and financial autonomy do not mean less accountability for public money, which in fact can be spent in a much more efficient way by an intermediary organization outside the public

domain. In fact, some of the research-performing recipients of grants from FCT are indeed institutions with a more independent legal status than FCT (see Recommendation #1).

To be at arm's length from the ministry is not only crucial for the proper operation of a research council, but equally relevant for the political decision makers in the responsible ministry, because it shields them from political interventions by frustrated applicants. This buffering is one of the functions of intermediary organizations like research councils. The panel was surprised to be told that several rectors went to the prime minister to complain about the results of the FCT review of R&D Units. The panel feels that it is essential that the FCT and the university system in Portugal work together for common purpose: bringing in any third party, especially the prime minister, threatens to seriously undermine trust between these two sectors of the research enterprise and therefore has the potential to seriously weaken Portuguese science

Independence is, however, not only an issue vis-à-vis the authorities, but also "horizontally" towards other powerful stakeholders, such as universities, research performing organizations, industry, etc. The FCT must have a positive working relationship with all of these stakeholders, engage in regular exchanges of ideas to understand each other's needs and priorities, while respecting the autonomy of each organization at the table. (see Recommendation #14).

### **Administration of FCT**

From interviews with members of the scientific community and with other stakeholders it became apparent that there is a problem with FCT's administrative staff, which was frequently described as overwrought and inaccessible. FCT management pointed out that staff (public employees) had to accept salary cuts during the time of the troika, which adversely affected their motivation. The troika also demanded that the public administration not hire new staff. Thus, departures could not be replaced. New staff were taken aboard through science-management fellowships, which was not very attractive and resulted in considerable turnover. Currently, staff consists of about 260 employees, of which about 200 are involved in funding activities (the rest works for FCCN and DSI). Another 60 staff members are paid through the fellowship programs. Based on FCT's overall budget and mandate and by comparison with other funding agencies, the panel feels that FCT is not under-staffed. However, other agencies do not operate under such complicated rules for employment of staff, and there are few funding agencies which have to deal with similarly complex accounting procedures.

Given the limitations of the current legal situation, management is confined to training activities to improve motivation, efficiency, and customer orientation of staff, combined with efforts toward simplification of instruments and procedures, wherever possible. In the long run, there is no way around a profound reform of FCT (requiring legal changes) with full organizational and administrative independence. This would be in line with similar institutions in most other European countries. The panel appeals to the ministry to put such a reform on track. It is understandable that Portugal, in times of severe economic hardship, cannot afford to invest more money into science and research; in such times it is particularly important, however, that structures are optimized to make the best use of the restricted funds available – particularly when such a reform would be at no significant costs (see Recommendation #1).

Irrespective of its legal status, it is absolutely necessary for FCT to appoint highly qualified staff, starting with an Administrative Manager or Secretary General appointed for 5 years renewable, but not with tenure (recommendation #5). New staff to be appointed should have a scientific background wherever appropriate (Recommendation #10). FCT should embark on a program to train its staff in customer orientation (Recommendation #12), and streamline its procedures and processes to improve efficiency and reduce the pressure on its staff (Recommendation #11).

### **FCT's Budget**

The budget of FCT increased sharply from 2003 onwards. By 2010 it had grown more than a factor of three. As a consequence of the economic situation it decreased between 2010 and 2011 (from 470 M€ to 410 M€) and has been more or less constant since then. The budget is composed of a state component (about two thirds) plus a component from the European Structural Funds; the state component is negotiated annually with the ministry, which is difficult to reconcile with FCT's multiannual commitments. The use of structural funds adds another source of constraints, particularly in transition periods between two EU frameworks. That has led to irritations and frustrations when FCT had to maneuver through these various constraints with a variety of budgetary tricks, including the postponement of payments into the next budgetary year.

As we heard from the FCT president, a specific problem exists with structural funds in Portugal 2020 (see above). While the panel is not in a position to give advice on this issue, the panel trusts that all relevant decision makers in the country will continue collaborating to address the various challenges associated with the use of structural funds for research.

Prima vista, the current budget of about 420 M€ pa compares favorably with the budgets of funding councils of other European countries of similar size. However, one has to consider the range of activities to be financed with this money, and the fact that the universities - the main beneficiaries of FCT's funds - are underfunded and receive no money for research (see footnote 6 on page 42). In fact, the low success rates of almost all FCT programs indicate that it is indeed far too small. The panel is aware that there is hardly any research council in the world which does not complain about too little money, but the data on success rates and the discussions with a substantial number of stakeholders convinced the panel that the financial situation is indeed quite dramatic. The panel also advises that beyond the annual appropriations granted to FCT a system of multi-annual planning and commitments be put in place. A way of doing could be to guarantee that the state contribution be a fixed multiplier of the EU contribution, which should be known for the 6 years ahead (Recommendation #2).

### **FCT as a Funding Body: a Tsunami Wave of Applications**

FCT is flooded with applications in a way which, considering the size of the country, is absolutely unique in the world: the last call for R&D projects resulted in 5500 submissions, requesting a total of 900 M€, with a foreseeable funding budget of 70 M€. For the review, FCT will set up 25 panels of 10-20 members each. Each panel has to rank an average of more than 200 proposals. Several hundred panel members have to be recruited internationally; the success rate for panel-members is around 10%, i.e. FCT has

to approach an average of 10 scientists for each panel vacancy. It is not clear to the evaluation panel how these numbers can be consolidated while maintaining high quality review. For the last countrywide call for PhD and Postdoc fellowships, the figures were no less frightening: 6000 applications, 42 panels (Portuguese scientists), expected success rate 12%.

Such Tsunami-waves of applications are likely due to a combination of causes: a general feeling of insecurity (described by one of our interview partners as "collective hysteria") about whether this may be the last call, intensified by the fact that calls have been irregular in the past; the very low success rates, which may lead to the general feeling of "I have to submit ten applications to get one funded"; the underfunding of research in most R&D Units, which motivates everybody with a PhD degree – including Postdocs on fellowships – to apply for a R&D project. The panel heard of R&D Units which submitted more than 100 applications in one call.

It is clear that there is no simple solution to this problem. Other European funding agencies have tried a variety of schemes in similar situations, including (Recommendation #16):

- 2-phase calls with pre-proposals subject to a first round of simpler pre-selection review followed by proper review of the preselected ones. FCT has already some experience with such a procedure; they have used it for the FCT investigator calls. The problem is that according to Portuguese law, a 2-phase call needs to be considered as 2 separate calls, with the possibility for complaints after round 1 for all those who are not allowed to proceed. This increases inefficiency and costs time;
- A quiet period for rejected applicants. ERC uses this scheme, it is certainly quite efficient and simple, but may create irritation;
- Elongation of the period of funding, possibly with a mid-term review. This increases, however, the accounting-problems for multiannual commitments;
- Restrictions in the eligibility for applications, i.e. preventing Postdocs on fellowships from applying;
- Restricting the number of grants a person can have simultaneously;
- Avoid multiple applications for the same topic through different programs, e.g. PhD students eligible to apply within a PhD program could be prohibited from applying for a national PhD scholarship.

Each of these schemes has its specific pros and cons. At the end, the community will have to understand that everybody loses if everybody competes in every call. An important step toward reducing the "collective hysteria" is to improve the reliability of FCT. Thus, it could be announced that the annual call for R&D projects will always be open during a specified time window, e.g. between September 1 and October 31 (Recommendation #13). FCT might even consider having two calls (again with fixed dates) every year, combined with restricting the number of applications a person can submit.

## **The System of R&D Units within Universities**

There are essentially two distinct streams of public money to finance the operations of universities in Portugal: the state budgets, which should cover the basic costs including the salaries of faculty members going directly to the university administrations; their size is essentially based on the number of students, leading to the general notion that “universities get no money for research”. The second funding stream – explicitly committed for research – comes from FCT and goes to R&D Units and Associated Laboratories, effectively circumventing the university administrations. In addition, scientists at universities – be they associated with an R&D Unit or not – can individually apply for FCT funding from one of the appropriate programs.

It is understandable that university managements are unhappy about this situation and it is obvious that it leads to frictions and tensions between them and FCT.

The parallel system of Associated Laboratories and R&D Units besides the classical university structures was introduced in the late 20<sup>th</sup> century in order to circumvent the universities, which, at that time, were primarily teaching institutions with little aspiration in research. Insofar as it assisted the rapid growth of research capacity at Portuguese universities, the system of Associated Laboratories and R&D Units was a success. However, since it was introduced as a crutch to make up for a deficit of the then existing university system, it has also created significant problems that become more and more pronounced with a growing scientific community and, at the same time, severe economic constraints.

The system of R&D Units itself is very diverse, ranging from rather informal units (better described as research teams) to fully independent separate institutions. On the long run, the panel is strongly of the opinion that R&D Units and Associated Laboratories have to be fully integrated into the governance of the universities – a two-track system is inefficient and expensive. However, the reasons for establishing the two-track system were – among others – lack of trust in the ability of university managements to put enough emphasis on research, which has to fight for its place in the university system against other powerful and important stakeholders. Whether the current management of Portuguese universities is mature for fully taking research under their wings is beyond the judgment of the evaluation panel. We note, however, that efficient and responsible university management calls for a number of boundary conditions, such as full administrative and financial autonomy. It may well be that in this respect the universities are subjected to similar limitations as FCT (“autonomy on paper but not in reality”). In a short to medium perspective, there is probably no alternative to this dual system but steps could be taken in order to favor a “rapprochement” between the two partners. One step could be to include a research component in the concept of university funding, which would put universities in a position to make joint investments with FCT in particularly successful R&D Units.

As concerns the future of R&D Units and Associated Laboratories, the panel envisages a structure in which such units exist as integral parts of the university. They are set up for specific research objectives and they dissolve once the objectives are reached. In order to emphasize their temporary nature, they should rather be called R&D teams. Their funding by FCT should continue contingent on scientific excellence as judged by peer review, evaluating past accomplishments and future research aims. In comparison with similar structures in other European countries, it appears to the panel that the current number of FCT-funded units (257) is much higher than it should be.

The 2013 evaluation of Research Units by FCT in cooperation with the ESF [9] was repeatedly mentioned and criticized by stakeholders interviewed by the panel. The evaluation of the outcome of individual evaluation exercises does not fall within the terms-of-reference of the current evaluation. Therefore, we do not discuss it in the body of this report and we give no formal recommendations relating to this event. However, since it is an issue of considerable interest for many Portuguese scientists and stakeholders, the panel did look into this subject, and also articulated its assessment. The view of the panel on this issue is summarized in Appendix 5.

There is a general point concerning the Portuguese university system, which the panel would like to stress although it is outside its mandate: Portugal should strengthen its universities! A strong university system is essential to a strong R&D enterprise. Universities are the main employers of a nation's scientists and virtually all researchers receive their undergraduate and postgraduate training at universities. Hence, countries like Portugal cannot aspire to a strong research enterprise unless there are at least 2-3 strong research-universities in the country.

### **FCT and PhD Education in Portugal**

One of FCT's core mandates is to "ensure training and recruitment of researchers, via instruments such as PhD programs". To that end, FCT has been organizing annual nationwide competitions for PhD fellowships. In 2012, it was decided to shift to the support through thematic PhD programs, approving 99 programs with a total of about 2700 studentships in 2012 and 2013. For obvious financial reasons, the number of studentships for the national call had to be decreased substantially, from about 1600 in 2011 to 440 in 2013. Since the number of applications remained more or less constant, the success rate plunged (from 42% in 2011 to 12% in 2013).

The decrease in the success rate for the national call for studentships is serious cause for concern. However, without a detailed analysis it is not possible to distinguish a genuine lack of studentships from the distinct possibility that many students routinely apply to both systems in order to maximize their chances. Since the total number of studentships dropped but not dramatically (adding up studentships for the national call plus those through PhD programs)<sup>1</sup>, it is unlikely that there has been such an increase of applicants from one year to the other.

The thematic research-based PhD programs, which largely replaced the national calls for studentships, enable successful institutions to recruit the best PhD students in a way deemed most suitable for the subject and for the involved institution(s). Funding covers the cost of a specified number of studentships per year, plus other costs arising from courses, fieldwork etc. The scientific evaluation requires such programs to be thematically focused. This gave rise to some criticism, since at some universities there were no studentships left for "mainstream" PhD education due to the low success rate

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<sup>1</sup> According to data from the Secretary of State, the total number of approved studentships and Post-Doc fellowships did go down between 2011 and 2014, but not very dramatic: in 2011, the number of approved studentships was 1469, in 2014 this number (now consisting of PhD studentships from the national call and from PhD programs) was 1045. The corresponding numbers for Postdoc fellowships was 688 and 465.

in the nationwide, thematically open competition. All those students who either do not fit into one of the thematic PhD programs or who were not successful in applying to one of them were therefore left behind.

The panel was informed that there will be no general calls for new PhD programs in the foreseeable future. FCT may establish a small number of new industrial PhD programs to align with EU's smart specialization strategy, and it will try to assist existing programs to acquire money for additional fellowships out of structural funds, where appropriate.

#### *Assessment by the panel*

The involvement of research councils in the funding of graduate students has the aim to align excellent students with excellent research in order to (1) strengthen the careers of outstanding young scientists and (2) supply the research system with a workforce of young (i.e. creative, energetic, enthusiastic) scientists. There are essentially three distinct ways how an institution like FCT can organize the funding of graduate students, i.e. (1) by a countrywide competition, such as the one organized annually by FCT; (2) by thematic PhD programs, which then organize the selection of their student according to their own needs and criteria, and (3) by including money for the funding of graduate students into research grants.

Each of these instruments has its specificities. The countrywide competition in principle selects the best students, but it suffers from the drawback that the assessment of undergraduates on the basis of a written application is not without its challenges. Very often the to-be-supervisor will help in drafting the application, blurring the assessment of the student's abilities. Since it is hardly feasible to organize face-to-face interviews with several thousand students, nationwide calls for PhD positions or fellowships have largely come out of fashion.

Presumably, FCT had such arguments in mind when they decided to switch to the funding of thematic programs. Both the scientific objectives and the proposed supervisors in the program can be evaluated by peer review. Once approved, the program organizes the recruitment of graduate students locally, involving face-to-face interviews with shortlisted candidates. There is the added benefit that specific graduate courses can be organized at the expense of the funding agency. The obvious drawback - which was repeatedly brought forward to the panel - is the thematic focus, which means that there will probably be areas of research that go unfunded.

In addition, most research councils in Western Europe offer method (3), i.e. the funding of graduate students (and Postdocs) through research grants, which then of course have to allow for sufficient money. In fact, in some countries it is the predominant source for PhD funding. This scheme guarantees that PhD supervisors have the scientific standing to guarantee excellent research and research environment (otherwise they would not have obtained the grant), and that it is in their own interest to select the best student.

The evaluation panel is of the opinion that the system of countrywide competitions for PhD scholarships is outdated and should eventually be replaced by a combination of schemes (2) and (3). Thus, the decision in 2012 to shift toward a system of PhD programs was well taken, although the panel feels that FCT made a mistake by introducing it so rapidly. Other European countries have a call for a handful of new PhD programs (which are then very prestigious) every year, the bulk of the students are funded through research grants. Since the bulk of studentships has been allocated through two very big calls, the situation is quite constrained at the moment. The

recommendation of the panel would be to gradually allow for the inclusion of studentships into research grants (Recommendation #18), with a concomitant reduction of the number of studentships in the countrywide competition (knowing that for a transition period, this will further strain the situation). The PhD program scheme should be maintained. Once existing programs expire, FCT should aim at a steady state with a reduced number of studentships in PhD Programs and annual calls for new programs (Recommendation #17).

A centralized scheme might be maintained (at a much reduced level) for very specific disciplines with corresponding PhD traditions (such as the humanities). While the panel is moderately excited about this possibility, it strongly advises not to grant individual fellowships without face-to-face interviews of shortlisted students (Recommendation #18).

### **FCT's Instruments for Funding Postdoctoral Fellows**

It appears that the Portuguese economy has no pressing need for young staff with a PhD degree. The vast majority of all PhD alumni (97%) are not absorbed by the non-academic market. Research careers hardly exist at Portuguese universities and teaching staff is recruited only scarcely as a result of serious cuts of the university budgets. Thus, a very substantial number (allegedly several thousand) of Postdocs are stranded at the universities with fix-term contracts or even on Post-doctoral fellowships.

FCT offers several instruments for the support of Post-doctoral fellows. On the one hand, there is one countrywide open call for Post-doctoral fellowships each year. During the last decade, the success rate continuously decreased, it is now around 20%. Research fellowships for Postdocs can also be awarded within research project grants or from the budgets of R&D Units.

On the other hand, the Ciência program and its successor, the FCT investigator program, offer positions with fix-term contracts (5 years) for outstanding Postdocs. The Ciência program has recruited about 1200 Postdocs between 2007 and 2008, the FCT investigator Program plans to secure 1000 positions between 2012 and 2016. FCT Investigator positions are quite prestigious, they come with some money for research, and there is the possibility to extend the contract by re-applying after 5 years.

It is quite surprising that there is a substantial number of postdocs in the Portuguese university system who have been on scholarships or fellowships for up to ten years (4 years PhD scholarships, 3+3 years Postdoc fellowship), often in the same department of the same university. These young men and women are truly in precarious situations. As always under such conditions, the best young people threaten to leave the country, others will have to make do with a job far below their qualification. It appears that FCT is faced with a very severe problem – the reluctance of the market to absorb PhDs – which originates from outside its premises: a wave of non-employable Postdocs accumulated and was pushed ahead by allowing to re-apply for fellowships after the original 3 years. FCT, the ministry, and the universities have to work together to solve this problem, which will on all accounts take time (Recommendation #23).

As for the future, the panel has a number of suggestions which may mitigate the problem, but they are certainly no magic bullets: (1) continue and, if possible, expand the FCT investigator program, which the panel judges to be a very good instrument (Recommendation #20); (2) decrease the number of individual Postdoctoral fellowships

and allow fellowships for Postdocs to be eligible expenses on research grants, analogous to PhD scholarships. Limit Postdoc fellowships to 3 or 4 years. Young people have to be prevented from running into a dead-end road, they have to understand that their employability – nationally and internationally – decreases with every year on a fellowship (Recommendation #21); (3) FCT should strongly discourage PhD alumni from continuing as Postdocs at the same university where they took their PhD; (4) positive incentives should be given to motivate young PhD alumni to spend at least 1 year abroad for foreign exposure to increase their market value (Recommendation #22).

There is a last and obvious point the panel wants to raise: it concerns the support of Postdocs through fellowships rather than contracts. The panel understands that a transformation into a system of contracts is currently unaffordable, and we were also told that fellowship holders pay no taxes and therefore do not earn much less than young people on contracts. Nevertheless, it is very problematic that the state intentionally keeps generations of young people away from most of the benefits of the social security system, denying them such necessities as unemployment protection or inclusion into a pension plan. Not only will this jeopardize the generation contract on the long run, it is also at variance with recommendations by the European Union concerning the status of young researchers [10].

## Conclusions and Recommendations

From our discussions with stakeholders, our own individual experiences in funding research in 4 different countries, and our discussions on the best way for Portugal to move forward, we have come to the following conclusions:

- FCT is an absolutely crucial component of the Portuguese R&D system; a strong and well-performing FCT is in the interest of Portuguese science;
- Research has clearly been a priority area of the Portuguese government since the turn of the century; thus, FCT's budget was increased dramatically between 2003 and 2010, and subsequently suffered less from cuts due to the economic crisis than other publicly funded activities;
- FCT, and the mechanisms which oversee its governance, are closely tied to the ministry and are therefore subject to the rules and regulations of Portugal's public administration. One consequence of this lack of arm's length relationship between FCT and government is that FCT was subject to the same budgetary scrutiny and cuts as a result of the economic crisis with the subsequent external assistance by the troika as any government department. In addition, FCT had to rely on money from two consecutive European programs for Structural Funds with complex and changing rules. This made it hard for FCT to cope with the recent financial challenges and resulted in dissatisfaction by the scientific community;
- Miguel Seabra, the former president of FCT, initiated a number of reforms when he took office in 2012. Implementation of these reforms unfortunately coincided with financial and organizational consequences of the economic crisis. In combination with a number of internal organizational shortcomings during the implementation of the reforms, this led to frustration and confusion in the scientific community.
- Nevertheless, the panel is of the strong opinion that all of the reforms put forward under Prof. Seabra's leadership were in the right direction. They should therefore be continued. It would be unfortunate if shortcomings in their implementation would be taken as justification to undo the modernization changes begun under Miguel Seabra.

As described above, the panel identified a number of problem areas concerning the operation of FCT. Some of the problems originate from within FCT and we recommend that FCT take direct action and implement appropriate steps to improve the situation. Other problems are not entirely within FCT's control and therefore solving these issues will require cooperative actions by FCT and the appropriate ministries. Other problems are homegrown in Portugal but outside FCT's direct sphere of influence; here, our recommendations are directed to the Portuguese government with suggestions on how to improve the framework within which FCT has to perform. Many problems could be alleviated by legal reforms which cost little or no money but require political consensus. Many of these latter recommendations are designed to bring Portugal up to best practice according to international standards, although we appreciate they may sound naïve within the Portuguese context. We make them nevertheless because the task we

were given was to make recommendations on how to improve the FCT and in so doing increase the productivity and impact of Portuguese science.

Here are our recommendations listed according to issues and/or organizations in charge

### *FCT in the Portuguese R&D system*

#### #1 Improve FCT's administrative and financial autonomy.

FCT should become a truly independent funding institution with administrative, organizational, and financial autonomy. The Panel is aware of the fact that this is not a trivial request and would require political consensus to change FCT's legal status. However, it is probably the single most important issue for FCT's future development. Many of the complaints and problems, which the Panel heard, result from FCT's lack of administrative, operational and financial independence. Without knowledge of the legal issues, the panel is unable to suggest a concrete legal status for FCT but we are convinced that – given political determination – possibilities exist. There are many precedents internationally that provide semi-arm's length relationships between a science funding agency and government; e.g. SNF (CH), DFG (DE), FWF (AT), MRC (UK), NIH (US), CIHR (Canada). A new legal framework should permit FCT to (a) determine its own organizational structure, (b) recruit new staff according to market rules, and (c) have financial autonomy without the ties of fiscal accounting.

#### #2 Set up a multi-annual financial program

Ideally, the budget of FCT should be predictable; it should grow slowly but continuously, e.g. with a rate of approximately 5% p.a. Governments in both the developed and developing worlds have increasingly prioritized research and development as they recognize the importance of research to fuel a country's innovation agenda. However, to develop a country's R&D system is a multiyear project, requiring sustained and stable funding and support. Moreover, as is the case with any national funding agency, its multi-annual commitments require FCT to know budgets ahead of time.

### *Governance and Mission of FCT*

#### #3 Set up a Supervisory Board.

Like other organizations, FCT should be overseen by a volunteer board made up of a mixture of leading scientists, university administrators, business people and others from other sectors of society, possibly from within and outside Portugal. The role of the Supervisory Board should be to oversee the governance of FCT, including the role and performance of the president, finances, and broad directions and policy.

#### #4 The Board of Directors should consist of accomplished and highly respected scientists

Led by a president who reports to this Supervisory Board, the FCT senior management team should be made up of a president who is a distinguished scientist and ideally has demonstrated his/her ability to lead a large organization, plus three vice-presidents. The term of the Board of Directors should be 4 years, renewable once. One of the board members should act as Vice-president for research and oversee (in collaboration with the Scientific Councils) all aspects of evaluation.

#### #5 Create a Senior administrative position

This director or manager or secretary general should report to the president; yet his/her mandate should not be synchronized with that of the board members (e.g. appointed for 5 years renewable). This person should have a professional management background and should be in charge of the management and the finances of FCT. Such positions exist in the vast majority of research councils in the western world.

#### #6 Strengthen the role of Scientific Councils

It is essential that the country's best scientists are represented in the Scientific Councils, observing, however, geographic, disciplinary, gender and age representation, yet without compromising on scientific reputation. It should be made clear that members of scientific councils are not nominated to act for the interests of specific disciplines or institutions but to represent the interests of science as a whole. The scientific council advises the board on strategic and important operational issues and should act as a strong transmission between FCT and the scientific community. A role in funding decisions would improve the feeling of "ownership" of FCT by the scientific community; like in many other European countries, the issues around self-service can be reduced by strict conflict-of-interest rules.

#### #7 Establishing an interim advisory board

As an intermediate step of the above changes in its governance, the panel recommends that FCT establish an executive counseling body, which might consist of the heads of the four Scientific Councils plus four other top scientists (from universities, the Gulbenkian or Champalimaud institutes, and possibly from outside Portugal), who regularly meet with the president to discuss and advise on crucial issues. The panel understands that the tenure of the present board will only last for another 6 months, i.e. until the end of 2015. Given this short interim period, the panel recognizes that it might be difficult to initiate such a board on an interim basis. The panel recommends therefore that an interim board be constituted that could potentially evolve into a permanent board once the next president is in place.

#### #8 Restrict FCT's missions to its core competences.

FCT should, in cooperation with the ministry, reconsider its mission and focus on core activities of a research council. Thus, the panel thinks that FCT should find ways to transfer in other administrative settings DSI and FCCN, since they do not fit in a scientific council. The ministry should help to find an organizational structure which better fits to the mission of these two departments, which both offer extremely important services to Portugal.

#### #9 Define the future role of FCT in funding applied research and innovation

The Portuguese government should clarify FCT's mandate and accountability for funding both basic and applied research and innovation. The panel recognizes that FCT's current mandate will extend to applied research as long as FCT depends on funds from the European Union. It may well be that future programs will acknowledge priority themes for the country's Strategies for Smart Specialization, with implicit requirements for knowledge transfer for economic and societal benefit. Nevertheless, the panel strongly recommends that all of FCT's activities, whether in basic or applied research or in knowledge transfer, be subject to rigorous and arm's length peer review. Notwithstanding the priority areas, the panel strongly recommends that FCT strengthen the support of fundamental research across all areas of science for the immediate

future. Portugal first priority must be to build up excellence in fundamental research if it realistically can expect to benefit from the results of that research in the future.

### *Operations of FCT*

#### #10 Improve the staff recruitment policy

The operational performance of FCT is hampered by a lack of qualified staff. To improve the situation, FCT has to be able to recruit new and highly qualified staff under competitive conditions. Specifically, new administrative staff should have a background in research, wherever appropriate, since this ensures mutual understanding between FCT administration and the most relevant group of its stakeholders, the scientists.

#### #11 Streamline processes and procedures

FCT should make a strong effort to streamline internal operations and simplify procedures where possible. It is understood that this would be facilitated by a different legal structure with a more autonomous relationship to government. The Panel recommends that, even without a change in FCT's relationship to government, it should vigorously explore new processes designed to improve efficiency.

#### #12 Build up a "consumer-friendly" organization

FCT should embark on a systematic program to train its staff in customer orientation. Staff has to understand that FCT is, in part, a service organization, not a component of any kind of authority. Specifically, FCT should make sure that there is enough staff at the "customer end", that this staff is stable, accessible, friendly, and helpful.

#### #13 Improve the stability and predictability of financial instruments

FCT should do all within its power to improve stability and predictability of its funding instruments. Thus, a calendar of research calls should be published well ahead of time, ideally FCT should have one call every year for each of its major programs and the deadline of each of them should every year be on the same day.

### *FCT, the Scientific Community and other stakeholders*

#### #14 Improve communication with stakeholders

FCT should improve its communication with the scientific community at all levels. The community of active scientists has to understand what FCT plans, what its problems and impediments are, and why things are not the way they should be; FCT has to ensure that it is not seen as an extended arm of the ministry but rather as a facilitator for research, and that scientists profit from a strong FCT. FCT has to ensure that the research community understands that many of FCT's problems are beyond its own control and that the community has to help FCT in this respect. It should be made clear that FCT is working hard to improve its operations. FCT should listen to the scientific community to understand and appreciate its expectations and problems. Communication has to involve all levels, from roadshows of the president down to open discussions between FCT administrators and applicants.

FCT should also regularly interact with other stakeholders, most notably with CRUP. Regular and close contacts should ensure that both sides hear and understand the other side's problems. FCT and Universities should do the utmost to align their strategies, yet

FCT has to insist on its autonomy in strategic issues, since its interests are similar but not identical with the interests of the universities. This situation is not unique to Portugal, tensions between funding councils and research performers are inherent in the concept of competitive funding, and they exist in every country.

#### #15 Strengthening cooperation with universities

Cooperation with universities in order to improve the situation of research units should be part of future objectives. While it is important that the funding of research – of individual researchers as well as groups of researchers or research units – remains with FCT, a dual system of “teaching universities” plus independent “research institutes” is not optimal for modern research universities. Therefore, integration of all R&D Units into their host universities should be a long-term objective, conditional on assurances that the quality of the research will not be compromised.

#### *FCT as a funding body*

#### #16 Reduce the flood of applications

FCT has to explore ways to reduce the excessive number of proposals, since this eventually will bring quality assessment via peer review to its limits. This is not a problem unique to FCT, but the panel knows of no other country where this problem is so acute. It is a complicated problem, which does not have a simple single solution. FCT is strongly advised to discuss this problem extensively with the scientific community, since otherwise actions by FCT are likely to be misunderstood by the scientific community. Possible suggestions include:

- 2-phase calls with pre-proposals;
- A quiet period for rejected applicants;
- Elongation of the period of funding, possibly with review in the middle;
- Restrict the eligibility for applications, e.g. do not allow postdocs on fellowships to apply;
- Restrict the number of grants a person can have simultaneously;
- Avoid multiple applications for the same topic through different programs, e.g. PhD students eligible to apply within a PhD program could be prohibited from applying for a national PhD scholarship.

#### #17 Pursue and rationalize the policy vis-à-vis the PhD programs and scholarships

The panel supports the move away from the funding of individual scholarships for PHD students through countrywide calls to the funding of PhD programs, as done by FCT in 2012/13. The panel recommends that the FCT sets a steady state goal of about 50% of PhD student fellowships be financed through PhD programs. PhD programs should be eligible for one renewal, subject to review, after 5 years.

#### #18 Link project-funding and PhD fellowships

Grants that are rated good to excellent should be allowed to include the provision of funding one or two PhD students. This would constitute the second form of funding of PhD students, similar to what is done in other European countries.

The countrywide call for PhD scholarships should slowly be phased out. Depending on the disciplinary tradition of PhD education in Portugal (which is beyond the Panel's purview) it may be necessary to reserve a small number of studentships for a few thematically specified areas for a nationwide competition. In any case, no PhD scholarships should be awarded without face-to-face interviews with the candidates.

#### #20- Strengthen the FCT-Investigator program

The FCT-Investigator program should be strengthened and expanded for the very best young scientists who want to become scientifically independent and pursue a career in science.

#### #21 Review the postdoc fellowship program

As with PhD scholarships, the Panel recommends that salaries for postdoctoral fellows be an eligible expense on research grants; however, the length of tenure of the fellowship should not be longer than 3-4 years. Otherwise, the career path for young people becomes blocked and the postdoc becomes a form of inexpensive labor as opposed to a key period of training for a young scientist.

Postdoctoral fellowships awarded through countrywide calls also should be restricted to one term with a maximum of 3-4 years, without the possibility for renewal. Since the status of these fellows is unclear, the panel advocates a slow phasing-out of the program; junior post-doc fellowships should either be awarded through research grants – in which case the Postdoc is not independent – or young scientists apply for a career development position, which would then offer them independence to pursue a scientific career.

#### #22 Strongly encourage mobility both in Portugal and abroad

The Panel recommends that FCT develops policies and programs that strongly encourage recent Portuguese PhDs to seek positions at institutions other than the one at which they received their PhD, preferably outside the country. One way could be by putting a corresponding condition into eligibility for FCT fellowships. Recent PhDs have to understand that the quality of their education and their value on the job market – in academia and in industry – rapidly decreases when they stay at the same place. While there may be good reasons to abstain from mobility – personal, familial or even professional – overall mobility strongly strengthens the training experience and enhances employability.

#### #23 Engage with universities and government in dialogue on strengthening the university system

FCT should begin a discussion with the ministry and universities on how best to open up new academic positions at Portuguese universities. The panel is aware that this is currently difficult for budgetary reasons. However, Portugal risks weakening its investments in university research if young people do not see a future for themselves as the next generation of researchers and teachers.

## Appendix 1

### Terms of Reference for the Evaluation

The evaluation should be focused on the following questions:

1. How is FCT fulfilling its statutory mission in terms of:
  - a. furthering the quality of scientific research ?
  - b. initiating and stimulating new developments in scientific research?
  - c. transferring knowledge of the results of studies it initiates and promotes for the benefit of society?
  
2. Does FCT have the right strategy and structure in place in light of:
  - a. National developments in S&T over the last decades.
  - b. International developments in the context of European and global developments.
    - How does FCT policy measure up to European policy developments such as in Horizon 2020, ERC, ESFRI, and Science Europe?
    - How does FCT deal with global research developments such as in the emerging economies?
  - c. How does FCT operate regarding cooperation with stakeholders?
  
3. Is FCT properly equipped for its tasks given current and foreseeable developments?
  - a. Is the current governance structure of FCT satisfactory, especially in terms of the management of its divisions and governance committees?
  
4. How do FCT tools and procedures for awarding grants or funding research institutions compare to those of other countries with a comparable funding system?
  - a. In general, how are the tools and procedures assessed?
  - b. Does FCT have the right mix given past performances and research proposal applications?
  - c. How is FCT dealing with the increasingly lower award percentages?

In answering these questions, benchmarks should be used in terms of comparable foreign organizations from which data are available.

## Appendix 2

### List of Panel Members

Dr. Alan Bernstein, President of the Canadian Institute for Advanced Research (CIFAR), former founding president of the Canadian Institutes of Health Research, Canada's federal agency for the support of health research.

Dr. Christoph Kratky, Professor at the Institute of Molecular Biosciences at the University of Graz, Former President of the Austrian Science Fund (Chair)

Dr. René Schwarzenbach, emeritus Professor of Environmental Chemistry at the Swiss Federal Institute of Technology (ETH) in Zurich, member of the university council of the University of Konstanz in Germany, former scientific councilor and president of division IV of the Swiss National Science Foundation SNF.

Dr. Yves Meny, emeritus Professor of Political Sciences, President of the Board of the Sant'Anna School of Advanced Studies in Pisa (Italy), former President of the European University Institute in Florence, Italy.

## Appendix 3

### List of Interview-partners of the Evaluation Panel

Isabel Abreu, Institute of Chemical and Biological Technology (ITQB), NOVA University of Lisbon

José Manuel Afonso, Institute of Astrophysics and Space Sciences (IA), Astrophysics Center, University of Porto

Manuel Alves, Faculty of Engineering, University of Porto

Joana Azeredo, Centre of Biological Engineering (CEB), University of Minho

Herlânder Azevedo, INBIO – Research Network in Biodiversity and Evolutionary Biology

Filipa Isabel Cabaço Baptista, Faculdade de Medicina - Universidade de Coimbra

Mário Barbosa, Institute for Research and Innovation in Health Sciences (I3S), University of Porto

João Bento, President of the Board of the Business Association for Innovation COTEC

Rui Bernardes, Director of the Evaluation Office, FCT

Cláudia Botelho, National Association of Science and Technology Researchers (ANICT)

Carla Brazinha, Faculdade de Ciências, Universidade Nova de Lisboa

Adelino Canário, Centre of Marine Sciences, University of Algarve

José Luis Cardoso, Institute of Social Sciences (ICS), University of Lisbon

Pedro Carneiro, Vice-President of FCT

Manuel Carrondo, Chair of the Exact Sciences and Engineering Scientific Council of FCT

Maria Arménia Carrondo, President of FCT

Ana Carvalho, IBMC – Institute for Molecular and Cell Biology, University of Porto

Margarida Amorim Casal, Centre of Molecular and Environmental Biology (CBMA), University of Minho

Maria Manuel Clementino, Center for Mathematics, University of Coimbra

Nuno Crato, Minister for Education and Science

João Costa, Chair of the Social Sciences and Humanities Scientific Council of FCT

António Coutinho, Coordinator of National Advisory Council for Science & Technology CNCT

António Cunha, Rector of the University of Minho, President of the Council of the Portuguese Universities' Rectors (CRUP)

Miguel Pina e Cunha, Faculty of Economics – NOVA University of Lisbon

Nuno Ferrand, CIBIO - Centro de Investigação em Biodiversidade e Recursos Genéticos - Universidade do Porto

João Nuno Ferreira, Vowel to the Board of FCT

Miguel Ferreira, NOVA School of Business and Economics, NOVA University of Lisbon

Carmo Fonseca, Instituto de Medicina Molecular (IMM), University of Lisbon

Elvira Fortunato, Institute of Nanostructures, Nanomodelling and Nanofabrication,  
NOVA University of Lisbon

David Miguel Silveira Gonçalves, Faculdade de Ciências e Tecnologia - Universidade de  
Coimbra

Isabel Gordo, IGC - Instituto Gulbenkian de Ciência

Marta Pereira Lima Mello Sampayo Goulão, Instituto Superior de Ciências do Trabalho e  
da Empresa - Instituto Universitário de Lisboa

Luísa Henriques, Director of the Studies and Strategy Department, FCT

Jonathan Howard, Instituto Gulbenkian de Ciência

André Janeco, Instituto Superior Técnico – Universidade de Lisboa; President of the  
Scientific Research Fellows' Association (ABIC)

Cecília Leão, School of Health Sciences – University of Minho

Pedro Leite, Director of the Department for Scientific Research and Technological  
Development Programs and Projects, FCT

Ricardo Machado, Escola de Engenharia - Universidade do Minho

Poiares Maduro, Minister for Regional Development

Luis Magalhães, former President of FCT

Zach Mainen, Champalimaud Foundation, Neuroscience Programme

Mariana Teixeira Lopes Veloso Martins, Faculdade de Psicologia e de Ciências da  
Educação - Universidade do Porto

João Carlos Marques, Chair of the Natural and Environmental Sciences Scientific Council  
of FCT

José Manuel Mendonça, Institute for Computer Systems and Engineering, University of  
Porto

Paula Elyseu Mesquita, Director of the International Affairs Department, FCT

Ana Lúcia Pereira Neves Messias, Faculdade de Ciências e Tecnologia - Universidade de  
Coimbra

Paula Mira, Director of the Training and Human Resources Department, FCT

Paulo Vargas Moniz, Vice-Reitor para Área da Investigação, University of Beira Interior

Luísa Morgado, Faculty of Psychology and Sciences of Education – University of Coimbra

Ana Cristina Neves, Director of the Information Society Department, FCT

Maria Fernanda Olival, Interdisciplinary Center for History, Cultures and Societies  
(CIDEHUS), University of Évora

Arlindo Oliveira, Instituto Superior Técnico – University of Lisbon

Leonor Parreira Secretary of State for Science

David Patient, Academic Director – Management MSc, Católica Lisbon School of Business and Economics, Universidade Católica Portuguesa

Jorge Pedrosa, Associate Laboratory, Life and Health Sciences Research Institute, University of Minho

Paulo Pereira, Vowel to the Board of FCT

Casimiro Pio, Center for Environmental and Marine Studies (CESAM), University of Aveiro

Catarina Resende, Centre for Neuroscience and Cell Biology (CNC), University of Coimbra

Maria João Romão, Applied Molecular Biosciences Unit (UCiBi), Chemistry and Technology Network (REQUIMTE-P) Association, NOVA University of Lisbon

João Gomes da Rocha, Aveiro Institute of Materials (CICECO), University of Aveiro

Eduardo Rosa, Center for the Research and Technology of Agro-environmental and Biological Sciences, University of Trás-os-Montes and Alto Douro (UTAD)

Carlos Salema, Telecommunications Institute (IT), Technical Institute of Lisbon, University of Lisbon

Ana Cristina Santos, CES – Centre for Social Studies, University of Coimbra

Miguel Seabra, former President of FCT

António Cruz Serra, Rector of the University of Lisbon

Gabriela Silva, Departamento de Ciências Biomédicas e Medicina - Universidade do Algarve

João Gabriel Silva, Rector of the University of Coimbra

Luis Silva, Technical Institute of Lisbon, University of Lisbon

Emir Sirage, Director of the Technology Office, FCT

Nuno Sousa, Chair of the Life and Health Sciences Scientific Council of FCT

Joao Alberto Sobrinho Teixeira, President of the Polytechnic Institute of Bragança (IPB), Vice President of the Portuguese Polytechnics Coordinating Council (CCISP)

Pedro Lopes Teixeira, Centre for Research on Higher Education Policies (CIPES), Universities of Porto and Aveiro

Severiano Teixeira, Faculdade de Ciências Sociais e Humanas - Universidade Nova de Lisboa

José Veiga Fernandes, IMM – Instituto de Medicina Molecular, University of Lisbon

Francisco Veloso, Member of National Advisory Council for Entrepreneurship & Innovation CNEI and National Advisory Council for Science & Technology CNCT

Gonçalo Villas-Boas, Institute for Comparative Literature (ILC), University of Porto

Isabel Vitorino, Director of the Department for the Support to the Scientific and Technological Institutions Network, FCT

## Appendix 4

### Detailed Accounts of the Interviews with Stakeholders

This section summarizes the results of interviews carried out by the Panel with various groups of stakeholders (see appendix 3). Note that the analyses, critiques, and suggestions summarized in the following reflect the views of the individuals that were interviewed. To emphasize that point, *allegations and opinions of stakeholders are highlighted in italics*. The interviews were very useful to the Panel in helping us gain an understanding of the context in which the review was taking place and the structure and history of the research enterprise in Portugal. We were especially interested in hearing their visions of how the situation could be improved in the future.

#### Interviews with Members of the Scientific Community

Presently, the scientific community views FCT rather ambiguously. Without exception, everybody stressed the crucial role of FCT in the Portuguese R&D system – *without FCT there would be practically no basic research in Portugal*. Furthermore, the values represented by FCT, such as an emphasis on scientific quality and competitive research funding on the basis of international peer review, were praised by the vast majority of the researchers we interviewed. FCT is regarded as *the only body in Portugal providing financial support directly to researchers*; some of the programs of FCT are seen as *adequately addressing the needs of the community*. In fact, some scientists went as far as calling FCT *the “jewel in the crown”, since it has always been the one institution recognizing and honoring scientific quality*.

However, there is also criticism by some members of the scientific community about FCT, its strategy, organization, and operations. FCT is regarded by some *as an overly bureaucratic (we even heard the term “kafkaesk”) and inflexible institution with an administration that is un-accessible and unwilling to listen to the concerns of the community*. In addition, FCT is not perceived *to have a clear strategy or a clear vision. Its calls for research proposals are frequently unclear, irregular and unpredictable, deadlines are not respected, rules change on short notice, sometimes even during an open call, and, above all, there is very poor communication between FCT and the scientific community*. Furthermore, while it is felt that FCT should be an independent agency, it is seen by many of the groups we interviewed *as an extended arm of the ministry*. Nevertheless, many scientists acknowledged that *FCT has been charged with a challenging task under difficult circumstances and that the situation has been continuously improving in recent years*.

FCT, however, is not the only reason for apprehensions and uncertainties within the Portuguese scientific community. Some of the junior scientists in the R&D Units feel that they *are in an ambiguous position vis-à-vis the universities*. They feel *like being continuously evaluated* and they look with envy at their tenured colleagues at the university. *Universities give little support* to such junior scientists on fix-term external contracts. The result is poor morale and a deep sense that their future is limited in Portugal (*“we cannot live without the university but we also cannot live with the university”*). On the other hand, those who hold tenured positions often suffer from

heavy teaching loads (*up to 12 contact hours per week*). This seriously compromises the ability of active researchers, especially young ones at the beginning of their careers, from performing at an internationally competitive level. Therefore, many researchers see it positively *that research units are somewhat distinct from the universities*.

A more general point concerns FCT's recent policy of focusing on scientific excellence. Some criticize that *FCT's discontinuation of supporting a wide base of researchers and research institutions at the benefit of a policy of "Picking-up winners" would be disastrous, since a high-quality research system requires a wide basis of competencies. To focus scarce resources to few "shining stars" might momentarily liberate scarce resources but will not lead to a sustainable high-quality research system*, the panel was told.

Critically seen is also the structure of FCT, which was forced to absorb institutions with no relation to the core business of a research council. In fact, one of these institutions (FCCN), which supplies IT-infrastructures, is perceived *to constitute a conflict-of-interest issue for FCT, because FCT runs a research infrastructure and at the same time manages calls for funds for research infrastructure*<sup>2</sup>. *The inclusion of FCCN into FCT was strongly opposed by the scientific community*, the panel was told. FCT is blamed of *having ignored that opposition, which contributed to the lack of trust from the side of Portuguese scientists in FCT*. In fact, the president of FCT is seen as being *under constant scrutiny of the ministry, which is considered to be at variance with him representing the interests of the scientific community in Portugal*.

Finally, researchers and scholars from the social sciences and humanities believe *that their disciplines are not valued and hence have a fragile position in Portugal*. They point to the priorities outlined in the Smart Specialization Strategy, drafted by FCT on behalf of the Portuguese government [11]. The focus of the Strategy *is on market value*, which, they feel, *discriminates against their fields*.

### **Interview with Postdocs on FCT Scholarships**

There is low morale and a sense of being in a dead-end situation amongst the young generation of Portuguese scientists supported by FCT Postdoctoral scholarships. If they do not succeed in securing a faculty position (which are extremely scarce as universities have not been recruiting new staff for many years), then *they have no prospects in Portugal*. Many Postdoctoral fellows apparently *take on teaching responsibilities, often without pay*, because they feel *that they must show they have teaching experience to be eligible for a position in academia*. At the same time, teaching also detracts from time doing research. They feel that universities *are taking advantage of their desperate situation; many faculties – which have not replenished their teaching staff for many years – could not maintain their curricula* without these people. The universities, however, *do not honor these efforts*. Many of the Postdocs look with envy at faculty members and *feel that these faculty hold permanent positions, are well-protected, and do not have to perform in a competitive research environment*.

Some of the Postdocs we interviewed have lived on FCT fellowships for almost 10 years: after 4 years of PhD scholarships, FCT granted these alumni up to 3+3 years of

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<sup>2</sup> The Secretary of state pointed out that this in fact is not true, since FCCN has its own budget and is not eligible to apply for funds from FCT.

Postdoctoral fellowships. The social implications are obvious. Many have remained at the same university or institution for their entire graduate and postgraduate career; when asked why they did not move, the panel heard a variety of reasons, *from family obligations to a specifically Portuguese attachment to their home*. In addition, some argue that *rumors that FCT would give lower priority to applications for international fellowships prevented them from applying*.

For their research, the Postdoctoral fellows who have held that position for close to 6 years often *depend on the support from heads of laboratories, who then wish to be co-authors of their publications*. They believe that *this has a negative effect on their standing as independent researchers and thus further reduces their chances for a faculty position*. Previously, *a minority of fellows received limited financial support from their university, which helped them to gain some independence*. However, *this practice has more or less disappeared in recent years due to the economic situation*. The panel was surprised to learn that *Postdocs are allowed to submit applications for research grants to FCT, which many of them do*.

Although most of the young researchers we interviewed appreciated how important FCT is for their research, they are also quite critical about some aspects. *FCT does not have a bridge of communication with faculties*, therefore there is practically no such thing as a research-career at Portuguese universities. Similar to the more senior scientists, *they also feel considerable uncertainty and even confusion at FCT: calls for applications are late, deadlines unclear, scientific criteria unstable, accounting rules unpredictable and inconsistent. It is unclear when contracts for approved proposals are delivered (which may take as long as one year)*. These young scientists also feel that *there is a general problem with the perception of science in Portugal; science is seen as a cost rather than as an investment in the future of the country*.

### **Interviews with Heads of R&D Units**

R&D Units have very diverse geometries and legal constitutions: their size ranges from a few dozen scientists to several hundred, their legal structures from independent private foundations to fully embedded units of the respective university. Some of them exist only on paper to be eligible for funding. The majority of scientists working at R&D Units are employed by the respective university.

Particularly smaller R&D Units feel *they are in a rather uncomfortable position vis-à-vis their university*. As active researchers they feel like *belonging to a minority within the university, the traditional schools – which organize university teaching – have always been dominating university politics*.

Irrespective of whether the unit was a winner or a loser, the panel heard *bitter complaints about the recent FCT/ESF evaluation of R&D Units; while not all R&D Unit heads were unhappy with the part ESF played in the evaluation, most of them complained heavily about the funding scheme*.

Apart from the complaints about the review, there appears to be some discussion in the community about fairness in the distribution of funds: according to some interviewees, *private institutions – which are anyway in a financially privileged position – should not be allowed to apply for public research money; the same holds for some of the Associated Laboratories, which receive ample basic and strategic funding and should therefore not be allowed to apply for research projects*.

## Interviews with the Management of FCT

The board of FCT – consisting of a president, a vice-president and two additional members (all of them full time employed) – is FCT’s central decision body. Formally, its members are nominated by the government, but the present board (which started early 2012) was hand-picked by the former president Miguel Seabra. He chose Pedro Carneiro as vice president, who has a management background, in order to rely on somebody capable to handle the complex financial issues. Paulo Pereira, a biochemist from Coimbra, was nominated as third board member. The fourth board member is Joao Nuno Ferreira, a networking engineer, who heads the unit on scientific computation (FCCN), which was merged into FCT when the Troika requested to do away with private foundations that relied on public money for operation. Following Miguel Seabra’s recent resignation for health reasons, his successor – Maria Arménia Carrondo – took over the other three board members.

The FCT board is faced with a number of key issues. One of them concerns the annual budgeting of FCT, *which constitutes a very serious issue, since FCT has to make multi-annual commitments. This was particularly problematic in recent years, when there was a constant threat of budget cuts, which would have compromised these commitments.*

Accounting rules are another matter of concern: *as far as accounting is concerned, FCT is part of the central government and has to comply with very formal rules. Moreover, FCT also obtains Structural Funds from the EU, whose accounting follows a different set of rules. In everyday life, this leads to constant annoyance and the obvious desire on the side of the FCT board to obtain financial autonomy.*

Very recently, a specific problem arose concerning structural funds related to Portugal 2020. *In the new framework program, these funds are assigned to regions.* Since FCT is a national institution, the regional assignment of funds creates complex technical problems. It appears that they can be resolved within Portugal by a close cooperation between several ministries. In the past, *FCT was used to run all the structural funds for science. That is no longer possible given the current European rules.* Therefore, balanced solutions have to be found and FCT has to cope with this change of paradigm.

The politically motivated integration of two “alien bodies” (the Knowledge Society Agency which was integrated as Department of Information Society (DSI) in 2012 and the Foundation for National Scientific Computation (FCCN) which was integrated as a department with the same name in 2013), which have very little or nothing to do with the core business of FCT has put additional burdens and stress on FCT. *As a small compensation, the FCT management obtained slightly more leeway with its staff.* Here, management had to cope with the fact that *the staff (consisting of public employees) had to accept salary cuts, which had no positive impact on its motivation.* As a result of rules enforced by the troika, *FCT was not allowed to hire new staff. As a loophole, new staff was taken aboard on the basis of science-management fellowships, which was not very attractive and resulted in considerable rotation.* In view of all of that, management admitted *that the organization of FCT has been “sub-optimal”.*

According to Miguel Seabra, the former president, *FCT was not an institution with clear strategies and objectives before 2012. When he took office, he was confronted with a strict task-list of reforms, which had to be executed in very short time. This and the economic situation of the country created many levels of anxieties and insecurities.* FCT’s

management is also aware of the fact *that there has been a severe lack of communication*. There is the expectation that *at least these aspects will improve from 2015 onwards*.

On the longer run, the FCT board would like to see *FCT develop into a “proper” research council, as is the case in most countries in the EU*. Presently, the Scientific Councils are seen by the management as *pure advisory bodies*. In previous years, Scientific Councils were also involved in funding decisions but *this was abandoned as a result of complaints of self-service*. When Miguel Seabra took office, *the Scientific Councils were ostensibly full of vested interests and there were no regular replacements*. Currently, council members serve for 1-year periods up to 4 years. They were appointed de novo in 2013, following a call requesting nominations for Scientific Councils and for the national review panels for studentships. A year later, councils were renovated, when about 10-15% of inactive members were replaced. Council members are formally appointed by the government; the criteria for appointing new members are not formally put in writing.

### **Interviews with Program Administrators of FCT**

There are essentially 3 departments in charge of managing FCT’s funding activities: The Department of R&D Programs and Projects (DPP), which is in charge of Research Projects; the Graduate Education and Training Department (DFRH) in charge of PhD programs and the national contest for PhD fellowships; and the Department of R&D Units and Research Infrastructures (DSRICT), which looks after R&D Units, infrastructures, and FCT investigator grants.

In order to streamline the procedures applied for the evaluation of different programs, FCT established an evaluation office, consisting of a head (who is part-time at FCT and who is also a Professor at the University of Coimbra) and 11 staff members, most of them at the PhD level. This office manages all aspects related to scientific evaluations of proposals received by the three operational departments, with the exception of the recent evaluation of R&D Units; here, the scientific evaluation was organized by the European Science Foundation. The panel got the impression that the heads of the operational departments were not very excited that the evaluation procedures were taken away from them and handed over to the evaluation office.

Currently, the evaluation office is processing the last call for research projects, which resulted in 5500 applications requesting a total of 900 Million Euros (with about 70 Million Euros available). For the evaluation, they are about to set up 25 panels, each with 10-20 members, all of them from outside Portugal. To identify potential panel members, standard tools are applied, such as bibliographic data bases (Scopus) and other internet-based resources. It is clear that this task is quite formidable – FCT has to approach an average of 8-10 scientists to fill one panel vacancy. The fact that each panel has to rank an average of more than 200 applications probably does not help in finding panel members.

Similar numbers of applications had to be handled for the last national call for PhD and Postdoc fellowships, where FCT received about 6000 applications (with a success-rate of 12%). These were evaluated by 42 panels consisting of domestic experts.

The results of the evaluation by the panels are forwarded to the department-in-charge in the form of ranked lists of proposals. On the basis of these lists, the departments

generate a proposal for funding decisions which is forwarded to the board. The crucial step of “calibration” between panels is done strictly on the basis of the requested amount of money for each panel, thus the success rate is the same for each panel (this is similar to the procedure applied by e.g. the European Research Council). Eventually, it is up to the board to make the final funding decisions.

The time-line is also quite challenging: the last call for research projects closed in February, evaluation will take until July, and projects can then start in September provided FCT has been able to process the administrative and financial consequences of the panel decisions.

### **Interviews with Heads and Members of Scientific Councils of FCT**

The role of Scientific Councils is intended *to represent the scientific community within FCT with the goal to mediate conflicts, identify problems, and express expectations*. In contrast to most other European countries, Scientific Councils in Portugal are just advisory bodies, which should help to define the institution’s strategy but which have otherwise a rather passive role; *as advisory bodies, they act upon solicitation by the board*. However, some council members would like to play a more active role in FCT. Many of the interviewed individuals *feel that the FCT board does not exactly know what they expect from the Scientific Councils and, consequently, the board does not sufficiently involve the councils in their strategic decisions, nor do they discuss with them actual burning problems*. Their perceived marginal role frustrates many members of Scientific Councils. As an example, *they mention the document specifying Portugal’s smart specialization strategy [11] drafted by FCT on behalf of the Portuguese government. The draft was forwarded to the Scientific Councils for comments. However, this happened only one week before the deadline. One council nevertheless analyzed the document carefully and commented extensively, but their comments were completely ignored in the final document without giving any feedback to the council*. This led to frustration.

The alleged lack of strategic thinking within FCT is attributed to historical reasons: *the former minister Mariano Gago, the main driving force of building-up science in Portugal, had decided everything himself. FCT presidents preceding Seabra were actually the right hands of the minister. There was no generic policy except that of the minister. This political top-down approach still permeates the FCT policy-style and it severely impacts on the role of Scientific Councils*.

### **Interview with Coordinators of FCT-Funded Doctoral Programs**

Not surprisingly, coordinators find the idea behind the FCT-funded doctoral programs a good one, since they promote interdisciplinary research. Moreover, *since the programs offer a variety of courses and lectures, often including people from outside the university, PhD students outside the program also benefit from existing doctoral programs*. Some of the programs span several universities, some involve the industry, altogether fostering diversity. Coordinators criticize, however, that *budgets are too low to cover the high running costs of these programs (organization of classes and courses)*. Coordinators also noted that *the nationwide competitions for PhD scholarships are rapidly declining, which requires to find ways to guarantee a smooth transition*.

The panel got mixed feedback on the perceived quality of the evaluation of the programs. While some coordinators found the procedures reasonable (not surprising from a successful applicant), others found the evaluation inconsistent, since, for example, *an identical proposal was rejected in the first round and accepted in the second one.*

There was also a discussion about the situation of Postdocs, *many of whom are integrated into PhD programs.* There was the widespread opinion that *it is better to keep young people in science with Postdoctoral grants or fellowships than to lose them altogether.* Eventually, they will have to be absorbed by the university system. The panel was told that *sudden growth waves in the eighties are about to produce a sliding window of retirement, which should generate opportunities at least for some of these Postdocs.*

Regarding FCT, the panel heard the usual complaints about *the disconnection between universities and FCT, about erratic behavior, changing rules, instability, and a lack of communication on the side of FCT.*

### **Interviews with the Management of Universities (Rectors)**

Universities are formally independent, yet they have to obey the public administration rules, which impede their day-to-day operation. *They went through very hard times in recent years, with heavy budget cuts (reportedly up to 50% of the state budget!)*<sup>3</sup>. *This forced them to completely abstain from filling the positions of retiring professors with obvious consequences for the scientific offspring. In Coimbra, the average age of the faculty is above 50 years, the chemistry department of Lisbon has an average faculty age over 60, etc.*<sup>4</sup> *Moreover, universities could not afford to spend any money for renovations or maintenance of buildings and equipment.*<sup>5</sup>

The relationships between FCT and the universities appear strained. *Universities do not receive any state money for research, their budget is based exclusively on the number of students and thus on their teaching obligations.*<sup>6</sup> *Therefore, FCT is the only source of research money in the system.* Two decades ago, when FCT started its operation, it may have been sensible to circumvent the universities and start a parallel system. Today, however, *while rectors are more and more aware of the importance of the close links between research and teaching, FCT still maintains the parallel system.* Rectors wish for

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<sup>3</sup> The Ministry told the panel that during the budget correction achieved in 2011-2014, the reduction of the effective public budget to the higher education institutions (excluding the three foundation universities) was 12%

<sup>4</sup> According to the Ministry, the average age of academic staff in Portuguese higher education institutions (universities and polytechnics) is 45,5 years..

<sup>5</sup> The Ministry informed the panel that the average investment spending by higher education institutions per year in 2012-2014 was 88% of that made in 2011.

<sup>6</sup> According to the Ministry, this is not formally true as the state annual budget for each university is a “general pot” that can be used freely by universities. Universities (autonomous by Portuguese law) can use part of their state budget for research if they so wish

FCT to “align with universities”, which includes their wish to get more involved in the selection of FCT’s evaluation criteria and in the rules for the composition of panels. In addition, they would like to attend the briefing of FCT panel members. It appears that there is a profound lack of communication and trust between university leaders and FCT. This is, however, *not a new development but has been inherited from previous FCT managements*. In any case, rectors expressed their wish for *more and closer dialogue with the management of FCT*.

With regard to activities of the FCT management under Miguel Seabra, rectors criticized essentially two decisions: *the policy concerning the funding of PhD scholarships and the evaluation of research units*.

PhD studentships in Portugal were traditionally awarded in the form of an annual centralized competition. In 2012, FCT decided to shift to the support through thematic PhD programs, *which caused a dramatic decrease in the number of studentships for the national call*. Since the number of applications remained more or less constant, *this resulted in a significant decline in the success rate (from 42% in 2011 to 12% in 2013)*. This radical policy change was severely criticized by rectors with the argument *that the PhD programs have a rather narrow thematic focus, not leaving a sufficient number of studentships for larger research areas, such as electrical engineering or informatics*. They complain that *there are faculties with a large capacity for PhD education but not enough students to recruit*.

Rectors also criticized the evaluation of research units: *there were too few panels (allegedly for financial reasons)<sup>7</sup>, and panel members, in their view, were frequently insufficiently qualified*. Moreover, *the strategic decision of FCT for a 50/50 weight of past versus future performance (which FCT deliberately made in order to emphasize that units have a project- rather than institution-like nature) had been opposed by the rectors right from the beginning but this was ignored by FCT*. *By way of consequence, many good units dropped out of the race already in round one*. *There is the allegation that the 50/50 rule was introduced to favor a recently established private institute, which could not look upon past achievements*. Another allegation concerns a bias intentionally introduced into the review process to favor biomedical research: *it can be no coincidence, according to one Rector, that biomedical research came out so well in the evaluation when the two FCT board members with a scientific background (including the president) and the secretary of state are all from biomedical sciences*.

The dissatisfaction with the results of the evaluation resulted *in an intervention by the rectors with the prime minister*, as a result of which, the rectors emphasize, *a new panel will review several decisions of the recent round of evaluations<sup>8</sup>*.

Not surprisingly, heads of polytechnics are also unhappy with FCT. There were 8 R&D Units located at the polytechnics, none of them made it into the second round. Seven units will receive short-financing for 2 years and will then be re-evaluated. Polytechnics are mostly involved in applied research; many of them feel *they have a crucial role for regional development*. *They wish for more emphasis on applied research from the side of*

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<sup>7</sup> The Secretary of State stressed that the number of panels had nothing to do with financial reasons, and that the mission of the panels is explained in the regulations of the evaluation.

<sup>8</sup> Secretary of State pointed out that the regulations of the evaluation indicate that reclamations have to be addressed by a new panel, according to Portuguese law. Therefore, this was not a result of “the intervention of the rectors with the prime minister”.

*FCT and request a special set of rules for institutions in the interior of the country as opposed to institutions near the Atlantic coast.*

### **Interview with Faculty Directors (Deans)**

The main issue discussed with faculty directors concerned the R&D Units and their integration into university structures. It appears that there are large differences between universities and between different types of R&D Units. On the one hand, *Associated Laboratories are typically very autonomous: some of them have the status of private foundations, some span several universities.* On the other hand, *the majority of non-Associated-Laboratory R&D Units is well integrated into faculty structures. Many have no financial autonomy and they have to report to the dean, others are autonomous sub-units of the faculty with a similar status as the departments* (which are organizational structures for teaching). The diversity of structures also includes virtual units, which were established only to compete for money.

The primary function of R&D Units is to secure money which is channeled directly into research. Ideally, all tenured professors should be members of a unit but this is not necessarily the case, since *units accept only active scientists as members. Conversely, there are also members of the units who are not members of the faculty, such as FCT investigators.* Some faculties have some money for research in the units, some had it only previously. Most units have to live on money coming from the outside; *failure to get funded in the recent evaluation had obvious negative effects, primarily for young people.* However, since the units pay only a small fraction of their staff – most of the members get their salary from the university or from other sources – *it did not automatically mean that the unit had to close and that, as a consequence, a large number of researchers lost their jobs.*

The situation of Postdocs was also discussed with faculty directors. In this respect, *there are enormous differences between universities.* In some places, Postdocs have a contract when they are teaching, in other places the situation is quite informal, i.e., there is no pay, in still other places there are no Postdocs at all, since, after graduation, alumni are not allowed to stay but are immediately released to the free market.

The view upon FCT from the side of faculty directors is quite ambiguous: *while the meritocracy of FCT is highly appreciated, the institution is seen as unstable, unpredictable and bureaucratic; it communicates poorly with the scientific community. FCT lacks operating abilities and does too many different things. Scientific Councils, which should be the voice of the scientific community within FCT, try to do their job but are not heard by the board of FCT.*

Faculty directors had a similar critique on the PhD program policy of FCT as the university rectors and they shared some of their skepticism about the evaluation of R&D Units but with a different flavor: to them, *the evaluation incentivized small units, which increases fragmentation.* In addition, some had the impression that *there was a bias in favor of Associated Laboratories, which received more money per capita than normal R&D Units.*

### **Interviews with National Stakeholders from Industry, CNCT and CNEI**

Lack of competitiveness of the R&D system and insufficient cooperation between industry and academia are seen as mayor national challenges. *Portuguese industry invests little in research*, thus there is a need for public support for applied research, which is not really a task for FCT. Recently, an agency responsible for applied research (National Agency for Innovation) has been established, of which FCT is a stakeholder. There are several state laboratories run by ministries, however, *they are not very successful, partly because there is a lack of coordination between ministries. Universities are seen very critically as having no quality orientation and no serious tradition of self-assessment. In fact, the university system of Portugal does not have the tradition of research universities; for a long time, universities were mere teaching units with little research of poor quality* (described by one of the stakeholders as “me-too research”). *It was Mariano Gago’s coup to introduce a CNRS-like structure by establishing a relatively small number of independent, private non-profit institutions affiliated with the universities. These Associated Laboratories were funded independently of the universities.*

Some stakeholders see it as conceptual problem that market concerns are far away from scientific work. They complain that *42% of all PhD students are in social sciences and humanities who, in their opinion, contribute little to the economic development of the country. They also think that Industry should participate stronger in FCT.*

Although the panel interviewed only a limited number of stakeholders, it became evident that *there is no such thing as a consensus opinion about FCT. In view of the history of the Portuguese R&D system, the importance of such an institution is recognized*, but various stakeholders criticize the current organization and its operation in various ways. Specifically, *FCT is not really a research council (there is unanimous feeling that it should become one in the long run), it is not independent, and constantly exposed to political pressure from various sides.*

A relatively big issue was the recent assessment of R&D Units, *which was judged poor (quality of panels, competence of reviewers) by some but not by all interviewed stakeholders.*

### **Interview with Heads of Private Research Institutes**

The two private biomedical research institutes (Instituto Gulbenkian, Champalimaud foundation) both have a very international profile but also engage with Portuguese universities through joint PhD students (who graduate at Portuguese universities) and shared infrastructure. Both are generously (at least when compared to the Portuguese universities) funded by the respective foundation but still *depend heavily on money from outside sources*. Both have been quite successful in attracting external grants, *each of them “won” 6 ERC grants and they also receive substantial funding from FCT*. They view FCT quite positively, although there are also points of concern. On the positive side, they acknowledge *FCT’s commitment to basic sciences and blue-sky research, an evaluation system following international standards, and several quite imaginative programs*. On the negative side are *administrative issues and an overall erratic behavior of FCT (“they manage to damage the good things they did”).*

## Appendix 5

### The Recent FCT/ESF Evaluation of R&D Units

The *one* issue which came up in almost every interview was the evaluation of R&D Units, which was harshly criticized by the vast majority of our interview partners. Much of this criticism is refuted by those in charge of the evaluation (FCT management, ESF). The review committee is neither willing nor capable to act as a judge in this case but nevertheless feels that it should not shy away from expressing its view on this issue.

The critique of stakeholders included conceptual as well as operational aspects:

#### *Conceptual Issues*

According to the former FCT president Miguel Seabra, principles of the recent evaluation were relatively simple and were exhaustively communicated by him to the scientific community in the course of roadshows throughout the country in 2012 and 2013. These principles included [12]

1. Everybody is evaluated together, Units and Associated Laboratories competed at the national level;
2. Everybody had total freedom to restructure and is encouraged to find the most competitive structure, including mergers, fissions, new units, closing of existing units;
3. For the final grade, about 50% should be track record (past) and 50% strategy (future).

The panel heard little open criticism about Points 1 and 2, although it could have been expected that the loss of a privileged position would generate unhappiness on the side of the Associated Laboratories, which previously had received the lion's share of funding without having to enter into a competition with the less-privileged R&D Units. As for point 2, one might have expected criticism concerning the timing, since restructuring research units is a far-from-trivial process, which may take years of negotiations and considerations among scientists and administrators.

About point 3, however, there was a lot of harsh criticism, specifically concerning the large weight given to the proposed research strategy. Heads of universities and heads of laboratories complained that past achievements are "hard" facts, whereas strategic plans are much "softer". Such "promises" of future research should have no or at least a much lower impact on the outcome. This issue was deemed very severe in view of the fact that universities receive no basic funding earmarked for research. It may be particularly problematic for large units with a broad scientific profile, some of which are employing more than hundred scientists at the PhD level. For such units, "project-type" basic funding is deemed questionable. FCT management strongly defended their approach, indicating that the review was never intended to be an English REA-type of exercise regarding only the track record. In the eyes of FCT, this would have been totally wrong as it would be promoting crystallization of the system. The main problem with previous evaluations was that a unit had to pre-exist in order to be evaluated, because only the track record was judged. So there would have been no incentive for new configurations to emerge and old ones to vanish. FCT considered this aspect crucial for the evaluation and stressed that eventually one third of the whole system changed configuration. There is evidence that some of the mergers were successful.

While Point 1 of the above principles was hardly criticized directly, it indirectly created a conceptual problem whose remedy did lead to disapproval: While previous Unit assessments were organized nationally, typically coordinated by a respected scientist from an Associated Laboratory who established committees and invited international reviewers, such a procedure was now impossible for reasons of conflicts of interest: with all Units and Associated Laboratories in the race, every active scientist in the country had a generic conflict of interest. Therefore, it was decided to outsource the selection of panel members to the European Science Foundation (ESF).

Both, the concept of outsourcing and the choice of the ESF as the external institution generated criticism. FCT management countered by pointing at the conflicts-of-interest issue and defended the choice of ESF with ESF's experience and reputation, resulting from a diverse range of activities: ESF published key documents about best practices in peer review [13-15] and has a long record in implementing peer review processes for its own instruments and for third parties, including ERA-Nets, Large European programs, national funding organizations, private foundations, and philanthropic organizations. In addition, ESF has experience in assessing research institutes and organizations [16].

### *Issues of Implementation*

Concerning the implementation of the evaluation of R&D Units, the panel heard numerous complaints, including the following:

1. Rules were not clear from the beginning and they changed during the process;
2. ESF has chosen reviewers with non-matching competence;
3. ESF has chosen reviewers with weak track records;
4. FCT and ESF have agreed to "kill" 50% of all units, which should not survive round 1;
5. It was not clear to everybody that 50% of the rating should be based on past performance and 50% on future projects;
6. The time allocated for site visits was independent of the size of the R&D Unit. Thus, units with several hundred scientists were visited by a panel of three members for only two hours;
7. There was a discipline bias in funding decisions, i.e. some disciplines systematically and intentionally got less money per scientist than others;
8. FCT changed the rules which it applied to calculate the money granted. Specifically, funding was promised to consist of a core component and a strategic component. At the end, the core funding disappeared for all units which made it into round 2. No rules existed for the strategic component, which (from the perspective of applicants) was eventually computed in an arbitrary fashion. It appeared that the amount depended very much on the amount requested; as a consequence, groups with inflated requests received much more money than those with realistic requests.

In order to assess the validity of some of these complaints, the panel contacted the European Science Foundation and it received extensive documentation addressing these points regarding the task of the ESF [8].

With regard to point 1 it is instructive to look at the timeline of events: in preparing for the evaluation, FCT had launched a public consultation to hear the views of the scientific community on the proposed regulations for evaluation and funding of R&D institutions,

following a public consultation [17]. The document “Regulation for Evaluation and Funding of Research Units” [18] was ratified by the Secretary of State of Science on July 5, 2013. Detailed written accounts of the planned evaluation process were released on July 31, 2013 [19] and were updated on April 29, 2014 [20]. Applicants had to register R&D Units before October 31, 2013 and they had to submit their proposals before December 30, 2013. It is therefore correct that the update from April 29, 2014 was published after the deadline for submitting applications.

Discussions to involve ESF in the process started in September/October 2013, during the period R&D Units registered for evaluation to the FCT portal, before the deadline for submission of applications. The involvement of ESF as implementing the first stage of the evaluation was announced by FCT on April 29, 2014 (after the deadline for applications) with the update to the evaluation guide. In fact, this update implemented a number of changes to the structure and processes laid out in the Evaluation Guide, including stronger interactions with the research units at both stages, and it specified adaptations necessary as a result of the number and nature of incoming applications (i.e. seven instead of four panels). It was stressed by ESF, however, that these changes fully respected the boundary conditions expressed in the original version of the Evaluation Guide. Indeed, a comparison of the original Evaluation Guide with the update did convince this panel that most changes affected the “internal” operation of the evaluation, those which did affect applicants had the effect of strengthening their position (i.e. the rebuttal phase of stage 1 was implemented before the first panel meeting and deliberations, allowing research units to provide their feedbacks and clarifications on assessments before any discussion was made).

In response to points 2 and 3 above, i.e. the allegation that reviewers had non-matching competence and weak track records, ESF provided an extensive description of the nomination process, stressing that review panel members (senior enough to allow a broad view of the domains covered by their panel, strong experience in research management) have a fundamentally different profile than remote experts (targeted specialists sometimes with unique and/or complementary expertise).

The main driver in identifying review panel members was to provide an adequate disciplinary coverage for each panel. The ESF eventually appointed 74 panel members; to do so, it identified and invited 205 potential members. One of the challenges was to adapt to eight very late drop outs. In identifying the 646 targeted remote reviewers, the ESF identified and invited 2,799 potential referees. The average success ratio for FCT was slightly over 1/4 – i.e. 4.35 reviewers had to be contacted to secure one review.

The ESF stressed that they also checked the quality of the outputs from reviewers before these were circulated to the panels. Each review was checked by ESF staff for substantiation (are marks supported by meaningful comments), coherence (between marks and comments), completeness (are all sections/criteria addressed), and language (is it respectful and understandable). In this context, ESF rejected a round dozen of reviews as definitely below expectations. For another approx. 10%, reviewers were requested to further clarify and substantiate their assessments before these were accepted. While it cannot be expected that any screening process is 100%, such measures reduce the risks of inappropriate assessments. Moreover, the risk arising from inappropriate reviews was further reduced by the fact that applicants could comment on the assessments plus there were two remote reviews per application.

With regard to the allegation that reviewers had weak track records (point 3 above), ESF produced a very thorough bibliometric analysis for the four panels (Exact Sciences, Engineering Sciences, Health & Life Sciences, and Natural & Environmental Sciences) for which bibliometry yields meaningful results. These four panels represent 41% of all research units evaluated (133), which can be considered as being a reliable proxy of the standard applied by ESF in the FCT evaluation.

On average, the 41 members of review panels 1 to 4 had an h-index of 28.<sup>9</sup> On average, the coordinators of the units assessed by these panel members had an h-index of 17.3. In fact, even when broken down to the level of disciplines and sub disciplines, it can be shown that panel members consistently have a higher h-index than the average of unit coordinators. A similar analysis for remote reviewers shows the same picture, i.e. on average, the 266 remote reviewers involved in assessing proposals from panel 1 to 4 had an h-index of 24.9, whereas the coordinators of the units assessed by these reviewers had an h-index of 17.3. Again, this picture persists when broken down to the level of disciplines and sub-disciplines.

ESF strongly denies that they have ever agreed with FCT that only 50% of all units should survive round 1 (Point 4 above). The 50% figure was actually an estimate based on the previous (2007) evaluation exercise, when 53% of the 378 units were classified as 'very good' or better. In fact, in the 2013 evaluation, 55% of all units eventually proceeded to stage 2 [21].

With regard to the critique that it was not clear to everybody that the rating should be equally based on past performance and on future projects, ESF and FCT note that this information was explicitly and consistently given in the Evaluation Guide. It appears that applicants did not take this point sufficiently seriously, since some units with very good outcome but a poor strategic plan did not proceed to stage 2, whereas others with more modest outcomes but a very convincing strategic plan succeeded.

As concerns the criticism that the time allocated for site visits was independent of the size of the R&D Unit (Point 6), FCT notes that given the massive evaluation at hand and the time constraints, it was decided that only applicants passing the 2nd phase would be visited, and that site visits were a complement of the review. In the previous evaluations, site visits were the main form of review. As such, the visits were therefore only intended to clear any doubts or issues that arose during the prior panel discussions. In fact, the panels went to the trouble of writing down in advance what were the issues they were mostly interested in discussing. According to FCT, everybody was fully informed about that but some labs did not take notice and wanted to discuss issues that the reviewers were not interested in, which then led to frustrations.

The issue with the discipline bias in funding decisions (Point 7) was strongly denied by FCT and in fact also by the Secretary of State for Science, who would have been the only one that could have instructed FCT this way.

With regard to point 7, i.e. the way how the results of the scientific evaluation was converted into funding decisions, the former president of FCT admits that there is reasonable ground for complaining, as the rules had to be adapted after the panels submitted their grades. The situation is complex. Originally in 2013, FCT proposed that funding would be strategic and based on a plan included in the application, with no

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<sup>9</sup> All bibliometric data are based on SCOPUS

ceiling for funding given that FCT did not want to discourage big fusions to occur. These original regulations were subject to public discussion, many criticisms were received, and the regulations were adjusted accordingly. On the point of funding, people feared that this gave complete arbitrariness to FCT. Upon intervention of the Ministry, FCT came up with a double funding model, consisting of a base component using a published table that established amounts based on size, lab intensity, and final grade plus a strategic component. In fact, from the figures it is clear that the major bit was always strategic funding based on the requested amounts. FCT viewed the basic component mainly as an underwriting of funding to decrease the margin of arbitrariness and not a different type of funding.

The decision on the funding scheme came a year and half later and was taken in December 2014. After analyzing the results of grading by the panels, FCT modeled different scenarios and came to the conclusion that the best model would be to distribute funding based on requested amounts, taking into account the strategic part. The main reasons were:

1. Structural funds: Only recently the new package was negotiated and under new rules, the base funding, calculated to be around €20million, could not be allocated to structural funds;
2. The funding does not change significantly whether one allocates 20 M€ in base plus dividing the rest or take the whole funding pot (75 M€) and divide according to requested amount. The difference between the two models affected only 5% of the money, with only the best and lowest funded experiencing significant differences. So for the vast majority, the end result would have been the same;
3. Two types of funding mean two separate accounting and funding systems for FCT to deal with in the future.

Finally, FCT notes that they find the public outcry somewhat ostentatious in view of the fact that there is a 30% increase in the total pot (75 M€ compared to currently 56 M€), with the vast majority of Units receiving more money than before. According to Seabra "it is a cynic attempt to get more money because the main argument is that one component is missing". FCT had to rush through funding decisions without explaining them properly, because Units were without funding for 2015 and needed money urgently. The previous outcry before announcing the results was "uncertainty" and that everybody would get into deep trouble in 2015 for lack of funding.

### *Assessment by the panel*

The panel understands that the situation is complex and the evaluation of R&D Units, its framework conditions, and its outcome, created strong emotions, which led to complaints and accusations. There are good reasons for dissatisfaction on the side of all parties, part of which can be clearly attributed to various negative consequences of Portugal's economic situation during recent years, leading to instability, uncertainty, and anxieties.

Concerning the fundamental paradigms of the evaluation of R&D Units, the panel explicitly endorses the general approach of FCT; the joint evaluation of Associated Laboratories and other R&D Units (Point 1 above) is a bold and very well founded concept and so is the call that units have freedom to restructure to find their optimum configuration (Point 2). The concept of equal weight to past accomplishments and

future strategy (Point 3) is slightly less obvious, although the argument by FCT that they wanted to encourage changes in the configuration of the research units is a valid one. At the end, this is an issue of research policy, whose rational can always be debated. Here, the important aspect is not whether the arguments were “right” or “wrong”, but whether the rules of the game were clearly and timely communicated to all the players. Considering all available evidence, the panel got the impression that this was by and large the case. After a kick-start in the first half of 2012 (when the principles were revealed and units were urged to find the most competitive configuration), regulations (published in July 2013, about 6 months before the deadline for applications) were explicit about the weight to be given to the strategic program.

Also, the panel goes along with the decision of FCT in outsource crucial steps of the evaluation to the European Science Foundation, specifically the choice of reviewers and panel members. In view of the ESF’s experience and reputation, it does not agree with the general critique of choosing the ESF as external partner. The panel does find, however, some justification to the complaint that “rules changed after beginning of the race” insofar, as the document “Evaluation Guide Additional Information” was indeed published (April 29, 2014) after the deadline of applications. This document – which was apparently drafted as a result of discussions with the ESF – changed some of the procedures but these changes indeed respected the boundary conditions expressed in the original version of the Evaluation Guide. Nevertheless, inclusion of the ESF at an earlier stage of the process with the possibility of influencing the guidelines would have been appropriate.

Concerning the conduct of the scientific evaluation, the panel has the impression that rules and procedures followed internationally established practices. Although such evaluations can never be perfect, ESF did convince the panel that it took the necessary steps to choose competent reviewers, yielding a robust evaluation outcome. The panel can therefore not agree to accusations that the evaluation of R&D Units was scientifically flawed. There are a few minor points of the procedures, which FCT should have followed more closely in order not to expose itself to criticism, such as the issue with the time allocated for site visits. The document “Evaluation Guide Additional Information” specifies on Page 5 a list of activities of the visiting panel which cannot be accomplished for a large R&D Unit within a few hours. However, the panel sees little indication that such inconsistencies crucially affected the outcome of the evaluation.

The one issue where the panel goes along with criticism from the side of the scientific community concerns the conversion of the scientific outcome of the evaluation into funding allocation of the Units. The panel is aware of the various constraints, which went along with the funding decision, and it also appreciates that a model conforming to the original one put forward in the Evaluation Guide, i.e. one consisting of a basic component plus a strategic component, might have made only a marginal difference moneywise for the majority of applicants. Nevertheless, given the emotional situation of the community, FCT would have been well advised to rigidly stick to its own rules. Moreover, the conditions for assessing the amount to be allocated to the funding of the strategic components were not clearly specified in the Evaluation Guide. Specifically, it was not clear to the reader of this document that eventually the amount granted would be a fraction of the amount requested in the application. FCT could have spared itself a lot of criticism and troubles had it set down the funding model with the same scrutiny which was applied to set down rules and criteria for the assessment of the scientific part of the application.

A last point concerns the statement by one rector that “it can be no coincidence that biomedical research came out so well in the evaluation when the two FCT board members with a scientific background (including the president) and the secretary of state are all from biomedical sciences”. Since there was no evidence given for this allegation of favoritism except for a correlation, the panel was quite puzzled and considered it primarily as an illustration for the atmosphere of mistrust in the Portuguese scientific community. We did not follow up on this issue but want to point out that a selection process which involved several hundred international scientists could not be easily manipulated in the way implied.

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