

Key messages

The Panel of experts thanks the Minister and State Secretary for the privilege of being invited to review the Spanish research and innovation system. During our review we have received excellent cooperation from a wide range of senior stakeholders and valuable support from the secretariat and from the European Commission. This summary sets out our key findings and recommendations. These are elaborated in the full report.

We recognise the levels of excellence that exist in the Spanish system. However, if we take the system as a whole rather than the islands of excellence that are present, we found that its functioning has been inhibited by fragmentation in governance, both vertical and horizontal. The system has been subject to institutional rigidities preventing effective flow of people and knowledge. There is also a lack of an effective system of evaluation at policy, institutional or research quality levels and only a partial existence of a policy intelligence system.

The Law and Strategy both contain many positive factors and to a significant degree offer an agenda to go forward but key areas remain without convincing paths to implementation:

- In the domain of **science** we find what has been called a dualised system with high quality peak performance but a low average.
- In the domain of **business** the economic structure itself is challenging. There are very few large firms able to act as the anchors of an innovation ecosystem. Conversely there is a large number of micro-firms and significantly smaller number per capita of businesses with R&D or innovation capability than in comparable EU member states. These firms experience low levels of internationalisation and weak domestic markets for innovation;
- Among the **regions**, insufficient levels of coordination lead to a high risk of duplication at strategic level between national and community agents. There is a consequent lack of exploitation of economies of scale and scope. This situation creates difficulty in exercising policies for system improvement in areas with divided governance (notably for the university system).

In the light of this diagnosis our key recommendations are:

1. **It is clear that Spain's R&I system needs increased resources but these must go hand in hand with structural reform for a more efficient and effective use of public investment. This will ensure a faster and more sustainable recovery for the Spanish economy. The additional resources should be used exclusively to incentivise reform**

Research and innovation are core to Spain's success and need to be at the heart of economic policy. An increase in resources is needed but this should be based on a strategic framework which maps expenditure over a 10 year period with broad political agreement. Stability of finance is necessary for success in research and innovation. The forward strategy should be based on a **sustainable growth package** in which the R&I System develops and commits itself to the established roadmap for delivering results including the adoption of structural reforms. The implementation of this roadmap will be systematically rewarded with increased resources to raise the public sector contribution to GERD to a peak in three years of 0.7% of GDP as a means to initiate a growth path for business R&D spend to reach the target established in the Spanish Strategy for Science, Technology and Innovation (2013-2020).

2. **Human resources are the most pressing problem and rapid action is needed.**

The demography of the research system is a major cause for concern as a result of the virtual freeze on recruitment through the mandate on 'rate of substitution'. It is critical to restore a career path for young talent to enter the system, beginning, as a short-term measure, with the specific group in receipt of Ramon y Cajal fellowships. New positions can in part be paid for by incentivising the retirement of higher paid researchers near the end of their careers. This could include use of 'Late-career fellowships' which offer a 20% part-time appointment and the right to use research facilities if they are active in approved projects.

At the same time the structure of research careers needs to change. Throughout the system (institutes and universities) an alternative path is needed to move research careers away from the standard civil service model. This could include immediate use of the Access Contract (as set out in the Science, Technology and Innovation Act, 2011) as the basis for a tenure-track. Beyond this further scope for structural reform should be explored. There are several examples across Europe where researchers remain technically part of the civil service but operate in an environment conducive to flexibility, mobility and reward for excellence.

A radical change in the management of scientific careers is also needed. This should allow accelerated promotion to positions of research leadership and autonomy for the most talented and establish mobility as the norm, both between research institutions and between research and the private sector.

3. **Institutional reform is critical**

The panel was impressed with the high achievements of institutes operating under private contractual law but also concluded that this could in part be ascribed to a 'creaming-off' of talent from the system as researchers sought a working environment that matched leading

international standards. Hence, while we support the continuation of such institutes, the main focus should be on reform of the great majority of the system.

At the core of our suggestions is that for each public research organisation (OPI), university and for the laboratories and departments within them, much greater autonomy is needed. This autonomy needs in turn to be matched by a strategic approach and by greater managerial accountability (including regular independent evaluation and assessment). We note that the institutes nominally have autonomous status (or in the case of CSIC, that of an agency) but this is far from the common international understanding of the level of managerial freedom that research organisations should enjoy.

Spain should also undertake a programme of reorganisation of its public research organisations. There is scope to merge some OPIs with related CSIC institutes and for dispersal of some CSIC institutes to universities. Others could migrate to become foundations under private contractual law. These proposals have merit but there is no one-size-fits-all solution and in-depth analysis is needed to identify where the most beneficial changes are to be obtained.

4. Research institutes and universities need to be subject to an assessment system that influences resource allocation both directly and indirectly. There is also a need to increase the proportion of competitive funding

Most successful research systems are driven by higher degrees of evaluation and accountability than are found in Spain. A common feature is the presence of institutional assessment, normally associated with the allocation of at least a proportion of core funding. It is a major cultural change to introduce such systems and most have been implemented progressively through multiple cycles of increasing influence rather than in one step. We suggest that Spain proceeds in the first stage by allocating a fixed proportion (say 10%) of national funding on the basis of institutional assessment. The easiest way forward is to base the assessment on indicators (bibliometric, funding etc.) but attaching peer review with a strong international component would make the incentive stronger. Some weighting should be reserved for production of convincing research strategies. Criteria should include both excellence and impact on the economy, society and culture. We consider the introduction of assessment to be a ‘viral reform’ which could mobilise change beyond the relatively small resource allocated directly and also cascade to individual incentives. While university funding is the responsibility of Autonomous Communities we would expect that when confronted with performance ratings (and comparisons), regional governments will be incentivised to invest more in research and reform.

At the same time funding should focus on competitive grants to ensure that resources are focussed upon the most excellent research and researchers.

5. A new level of coordination between actors is required for effective innovation. We propose national consortia, termed Strategic Innovation Arenas.

We had a strong impression that the norm was for actors in the research and innovation system to work in silos which keep separate the public research system and the business sector. There were exceptions, including the CENIT programme (described by most witnesses as successful) and its recent successor, the CIEN programme. The broader point is that there is a need for nation-wide public-private partnerships geared towards innovation and gathering the best resources from both private and public sectors, with the addition of government partners (for example regulators and procurers in the relevant sector). We also foresee that these initiatives should encompass cooperation between the national agencies and the Autonomous Communities. Spain is lacking critical mass and needs to maximise the benefits from concentrating its resources. **The step that is needed now is to establish business-led initiatives in key areas of focus and targeting global competitive environments.** We refer to these initiatives as Strategic Innovation Arenas. Only a limited number of such initiatives are feasible and hence there is a need for government to work with the community to establish strategic priorities reflecting market opportunity, existing strength and future potential. Public institutions should regard participation as a core part of their mission.

6. Bringing more business actors into the innovation system is critical

The absence of a sufficient number of small and especially medium-sized players is a major weakness of the innovation system. This comes from problems of capability which also block absorptive capacity for externally generated knowledge. Without employees possessing at least basic knowledge of R&D it is very unlikely that such companies can make effective use of R&D and innovation support schemes either at national or European level. There are examples of fiscal incentives to engage R&D staff but our preference is to build on pro-active initiatives to engage these companies. This would reflect the successful experience of several countries in putting supervised early career researchers and research managers into a company to work on a specific innovation for product development or process improvement. A long-standing success is the UK's Knowledge Transfer Partnerships scheme. The researcher should be supervised by a senior scientist in an institute or university, both to give assurance to the company and to build future links. The scheme can be applied to both masters and doctoral level graduates and has the important added benefit of creating employment paths. The expectation is that the company will retain the employees after the subsidised period (say 18 months). Existing Spanish initiatives such as such as Torres Quevedo and EMPLEA form a basis but there is a need to accelerate the process. The most challenging aspect of this proposal is one of scale. Spain will not progress unless several thousand companies enter the innovation ecosystem. This scheme alone cannot achieve this but measures need to match the problem. The cost of this scheme and of support for the Strategic Innovation Areas can be met by reduction of the fiscal incentives for R&D. Our judgement was that focussed direct measures are more effective.

7. A market and a culture for innovation

The low engagement of business with research and innovation can partly be ascribed to the lack of innovation-friendly framework conditions and to a culture which does not value

innovation sufficiently. This hampers the competitiveness and subsequent internationalisation of Spanish firms. The success cases we saw were good examples of the benefits of competing in international markets where a premium for innovation and the forces of competition were operating. This suggests that explicit assistance and incentives for international cooperation and for technological exports are needed. Strengthening of instruments in this area is a priority.

In parallel, it is urgent to foster domestic markets for innovative products and services. Framework conditions for business innovation include competition law, education and training, availability of finance, infrastructure and services and conditions for entrepreneurship. All need work but the area of most immediate potential is on the demand side and the creation of a market friendly to innovation. These seem to be well embedded in the strategy and in public documents. The two key challenges are to accelerate the implementation of this agenda and to ensure that the goal is shared by the ministries with procurement budgets and their equivalents in the Autonomous Communities. Fostering innovation should be a part of the formal mission statement of all ministries. The revised European procurement directives provide further opportunities in the direction of incentivising innovation.

8. The need for an autonomous agency to implement the reform programme

There is an urgent need to implement the national Research Agency as foreseen in the Law and Strategy. Things will not change simply by the designation or re-labelling of existing administrative units as an agency but with the right powers and modes of operation this creates a real opportunity to address many of the deficiencies already identified including:

- a. Provision of stability in terms of funding and procedures. It is important to move quickly to a situation where research and business communities are able to plan ahead in terms of knowing which level of resources and policy instruments will be available.
- b. We have noted a plethora of policy instruments, some of which appear to exist only on paper and others which operate with sub-critical budget levels. We recommend strongly that the Agency should have a minimum of instruments but that these should be broad and include a degree of flexibility to allow their evolution in the light of experiment and experience.
- c. We foresee two main functions for the Agency. The first is promotion of excellence through grants and fellowships. Funding should only be provided on a competitive basis assured by substantially greater use of independent peer review which includes making use of international experts. The second function is Knowledge Exchange to promote contribution of the research system to the economy and to societal challenges. We deliberately use the term exchange to emphasise that instruments under this programme should not be based on linear model assumptions but rather be based on engaging research, business and other stakeholders in co-creation around strategic agendas (see Recommendation 6). To be clear, this does not mean compromising on excellence but will involve more proactive measures to facilitate impact.

Substantial coordination between the CDTI and the Research Agency will be needed, including joint programmes (see for example Finland's SHOK programme).

The Ministry itself should retain the core functions of allocation of resources across the agencies, setting national strategic priorities and operating accountability for performance, including again monitoring and evaluation. Some hard choices may be needed here including a review of international commitments (which have greatly increased their share of the budget) and accepting that funding may concentrate in the best performing institutions. However, two bigger challenges are to work to engage the whole of government such that research and innovation are seen as part of the mainstream economic agenda, and to be drivers of reform, preparing the necessary legislation for this agenda.

9. Incentivising regional synergies in support of business and business creation

There is a wide variety of innovation support actors including technological centres, science and technology parks, incubators and accelerators. These need to be integrated into more strategic approaches so that they can achieve sufficient entrepreneurial energy, scale and scope to act as world-class competitive innovation clusters. Such an approach needs to be driven by more rigorous interpretation and application of smart specialisation strategies operated in a complementary manner between national agencies and agents of the autonomous communities.

The policy mix for R&I in firms needs to be fine-tuned in several ways but most important is to significantly reduce the hurdles and time needed for companies to gain innovation support. A national scheme for innovation vouchers to supplement regional versions would be a useful addition to the mix.

10. Effective monitoring and evaluation to support evidence-based policy

We recommend the introduction of a strong evaluation culture shaping R&I policy and decisions. The panel has been impressed by the quality of information provided to us by the Secretariat and by FECYT. However, we have noted significant gaps, notably at regional level and a certain fragmentation of evidence. No initiative should be launched without a clear statement of rationale and measurable objectives (normally informed by *ex ante* evaluation and or foresight) and all should be regularly monitored for performance and delivery and periodically evaluated with a view to testing the rationale, the quality of implementation and the impact. Such evaluations should be independent of those managing the programmes, regularly involve international experts and be published and publicly debated. Engagement with and capability-building in the Spanish community of R&I policy analysts is also desirable. This effectively completes the policy cycle and allows a learning system.