

Response to the consultation process on the  
Successor to the Strategy for Science Technology and Innovation

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Please find below a series of responses to the questions presented in the Consultation Process for the Successor to the Strategy for Science, Technology and Innovation.

1. What should Ireland's ambition be in STI?

The SSTI for Ireland should be orientated towards realistic goals of scientific advancement and the overall goals of Irish society.

The current SSTI 2 orientation suffers from a series of key failings:

1. Evidence. Evidence of inputs are widely discussed. Evidence of multinational activity is widely discussed. There is no discussion of causal links between research and development policies pursued under SSTI 1 and the modifications and continuations proposed under SSTI 2. Precious few outputs are presented for analysis or with appropriate benchmarks.
2. It is myopic. It only concerns itself with immediate returns to research. This will skew activities in research and force the higher education sector to vocationalize research as well as teaching.
3. It provides no role for the humanities. It is clear that much of the academic prowess of the Irish higher education sector exists due to the humanities.
4. Though the document does discuss the relative performance in terms of expenditure metrics there is limited use of output metrics. The previous SSTI confused policies aimed at input goals with outputs in terms of social, education and economic achievements. This review seems to suffer from similar problems.
5. Flexibility. This document lacks in the necessary flexibility to apply support to areas and projects that may emerge as important for future economic development or areas that are deemed to be of vital importance to social cohesion.
6. Aspects of the policy framework

2. Ireland is currently an innovation follower and lags other small developed countries in R&D intensity. Should we have more ambitious targets for investment?

Ireland has progressed rapidly in these terms. The situation is that Ireland is showing signs that it is not able to maintain this progress. The advancement of science and technology research over the past was largely facilitated by the expansion of expenditure in the area of scientific research and higher education. This was in keeping with contemporary policy of the 1998-2008 period and EU objectives.

The setting of targets should be made with reference to national capabilities. At present the system is financially compromised and will remain so for the life of the SSTI 2 due to the various European fiscal limitations. Policies that are being developed for the purposes of advancing the objectives of the research environment need to be dual purpose. This is the approach taken in Finland and Iceland where research infrastructures are orientated towards national engagement (i.e. schools and public libraries have access to the same digital materials as universities). A policy that is parochial towards research institutes or universities will be divisive in terms of budgetary priorities and will act effectively as corporate welfare for firms that benefit from this work without actively contributing resources.

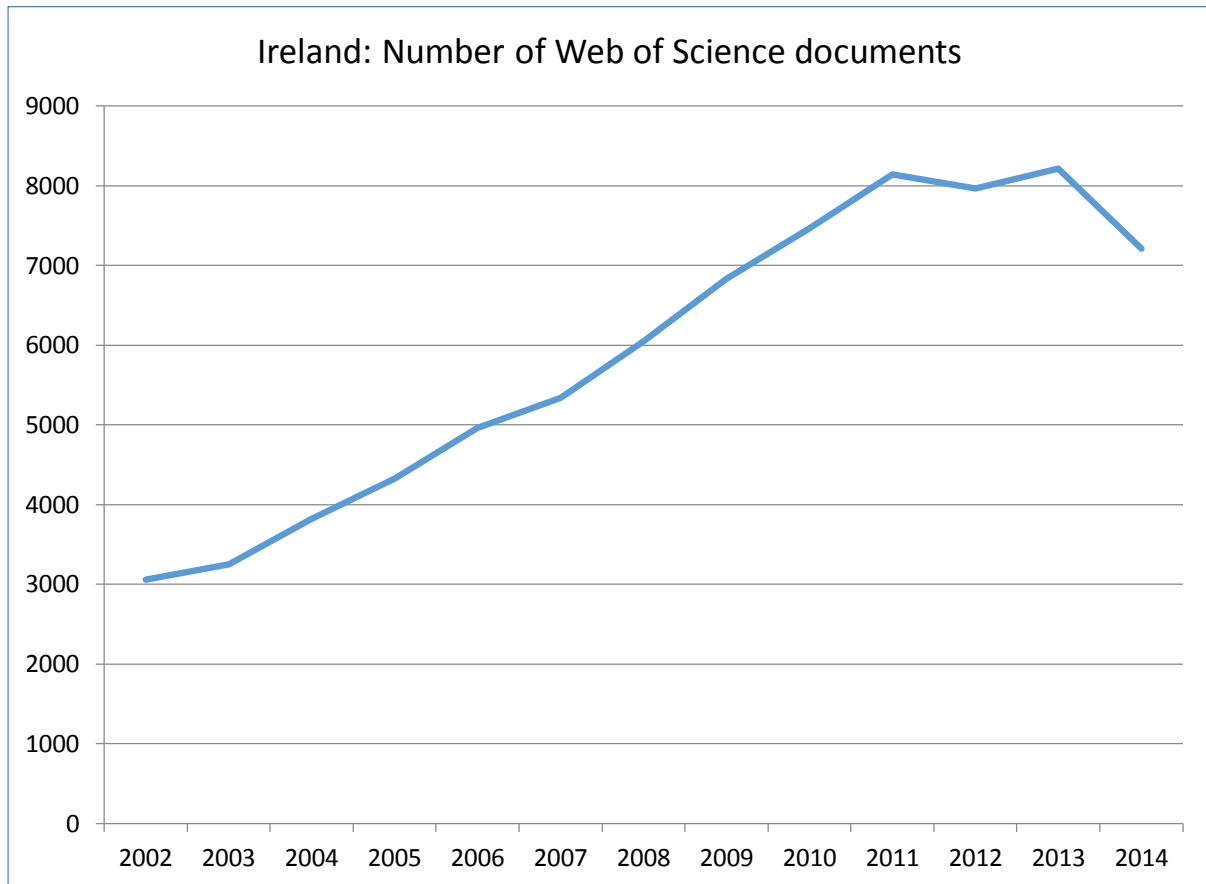
- Ireland remains in the top 20 countries in the world in terms of its research impact.
- Irish higher education institutions are (cumulatively) in the top 1% in the world in 19 of the 22 Essential Science Indicator fields.
- Ireland is 1st in the world in Immunology, 2<sup>nd</sup> in the world in Nanoscience & Nanotechnology, 4<sup>th</sup> in the world in Computer Science, 7<sup>th</sup> in the world in Materials Science, 7<sup>th</sup> in the world in Neuroscience & Behaviour, 9<sup>th</sup> in the world in Pharmacy & Toxicology, 11<sup>th</sup> in the world in Biology & Biochemistry, 11<sup>th</sup> in the world in Molecular Biology & Genetics, 11<sup>th</sup> in the world in Chemistry, 15<sup>th</sup> in the world in Psychiatry/Psychology, 19<sup>th</sup> in the world in Physics - in terms of citation impact (Thomson Reuters InCites2, 2003-2013)\*.

*However...*

- In 2011-2012, for the first time in a decade the increase in the number of documents published by Irish researchers stalled. A subsequent increase in 2012-2013 was proportionately lower than in previous years.
- Between 2011 and 2012, for the first time in over a decade, Ireland's percentage of world papers fell sharply and currently remains at that lower level (2012-2013).
- At the same time, Ireland's overall impact relative to the world declined.
- Based on year-by-year data, Ireland's impact relative to the world in certain leading subjects such as Neuroscience & Behaviour shows a decline during this period.

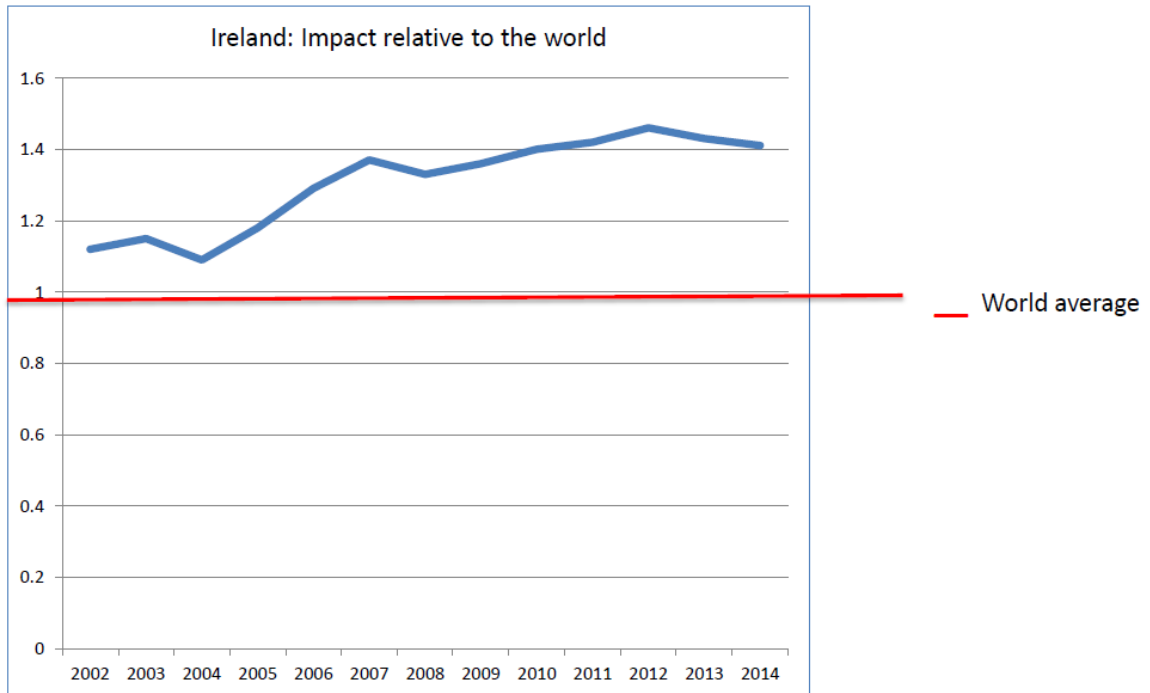
- A decline in impact similar to Ireland's is also seen in Greece and Portugal during the same period (2011-2013) but is not seen in France, Germany or the United Kingdom (or in selected comparator small countries).

### Ireland: No. of papers (2002-2014)



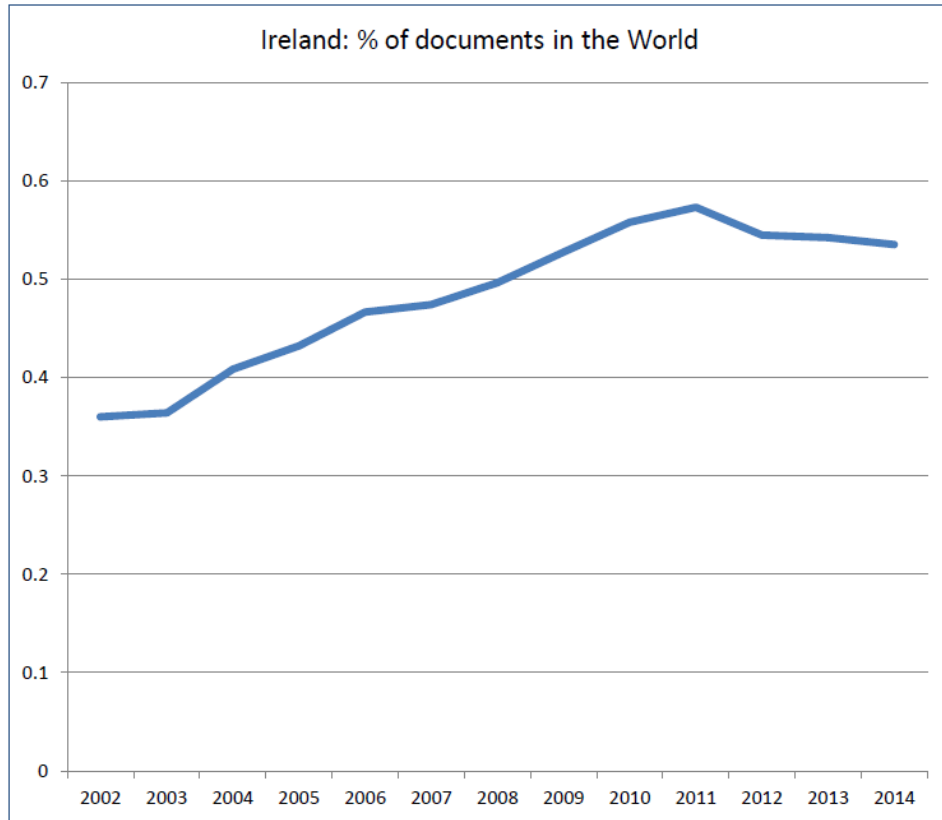
Source: Thomson Reuters Backend Database, supplied 18-3-2015

## Ireland: Impact relative to the world (2002-2014)



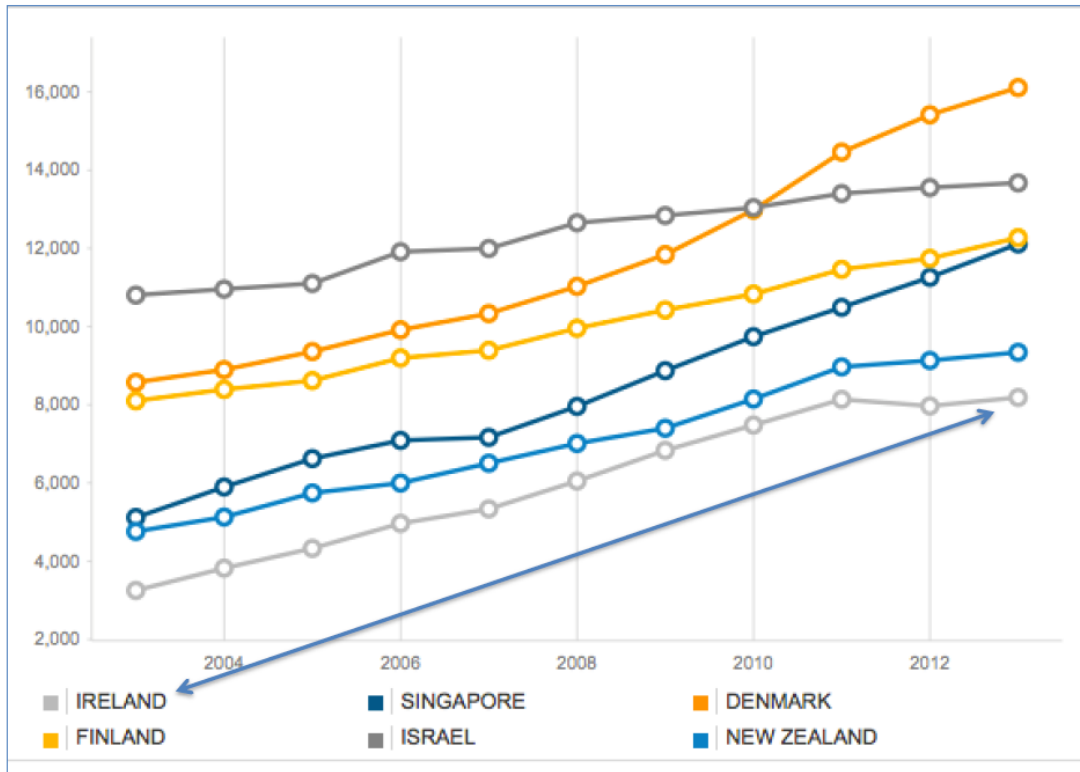
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### Ireland: percentage of documents in the World (2002-2014)



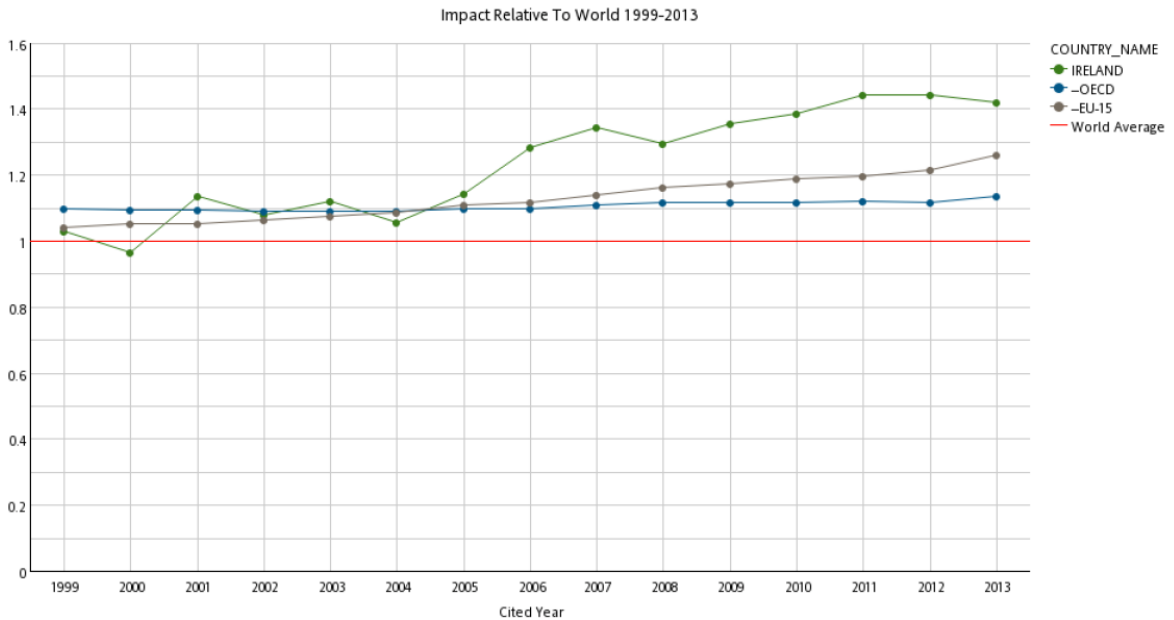
Source: Thomson Reuters Backend Database, supplied 18-3-2015

Small Nations Comparison: Number of papers (to 2013, 2014 data pending)\*



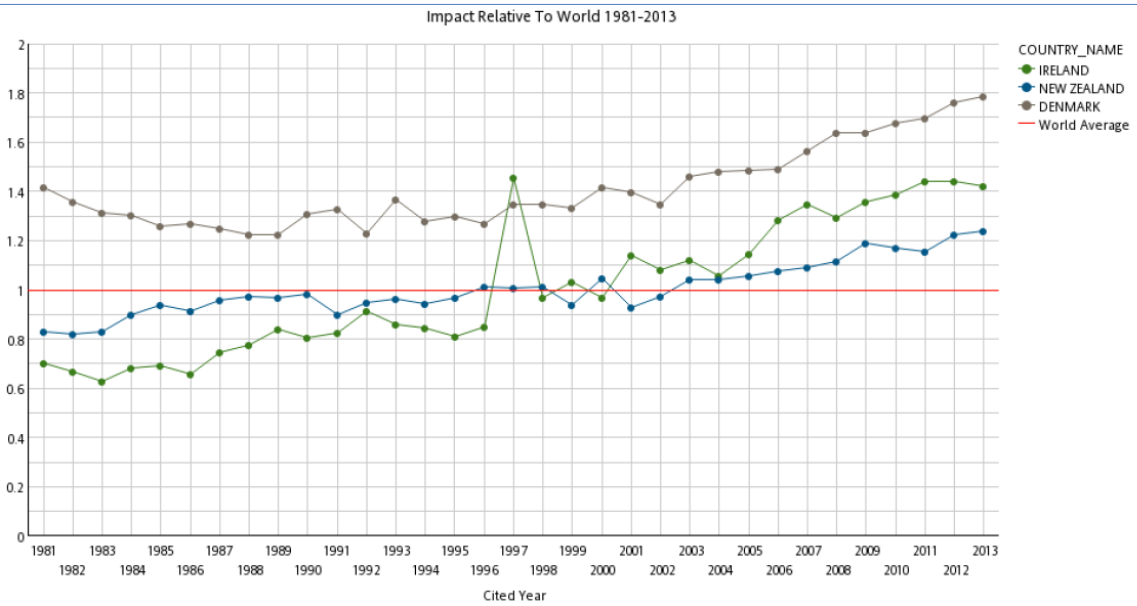
Source: Thomson Reuters InCites2, accessed 18-3-2015

Ireland, OECD, EU 15: Impact relative to the World\*



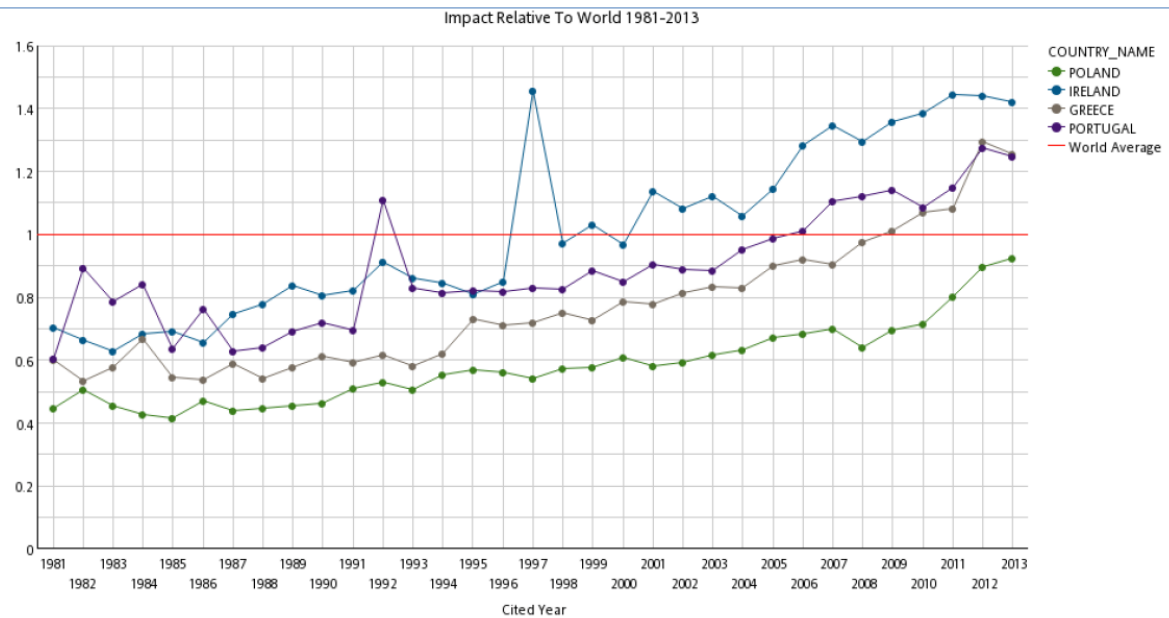
Source: Thomson Reuters InCites1, accessed 18-3-2015

## Small Nations (Ireland, Denmark, New Zealand): Impact relative to world\*



Source: Thomson Reuters InCites1, accessed 18-3-2015

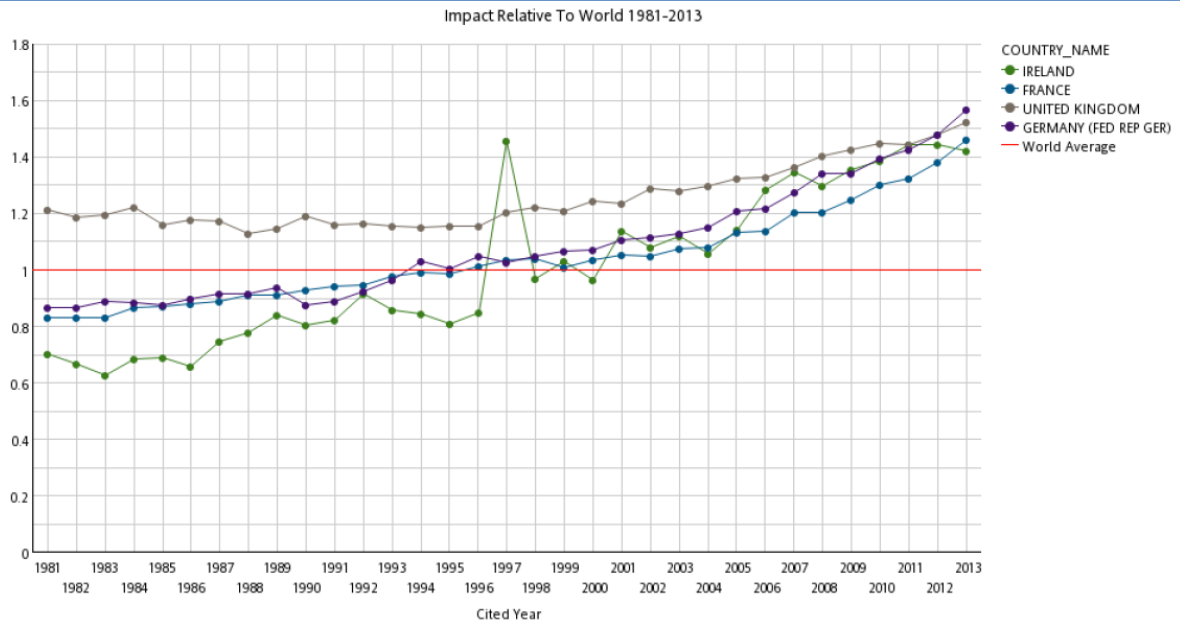
## Ireland, Greece, Portugal, Poland: Impact relative to the World\*



Source: Thomson Reuters InCites1, accessed 18-3-2015

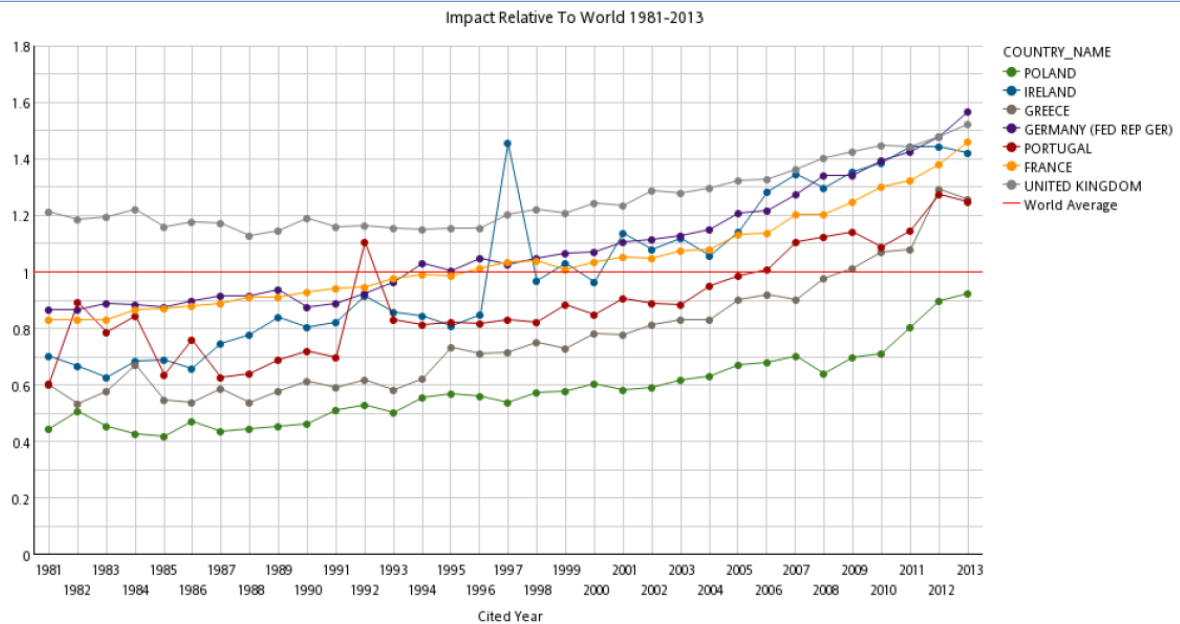


## Ireland, France, Germany, UK: Impact relative to the World\*



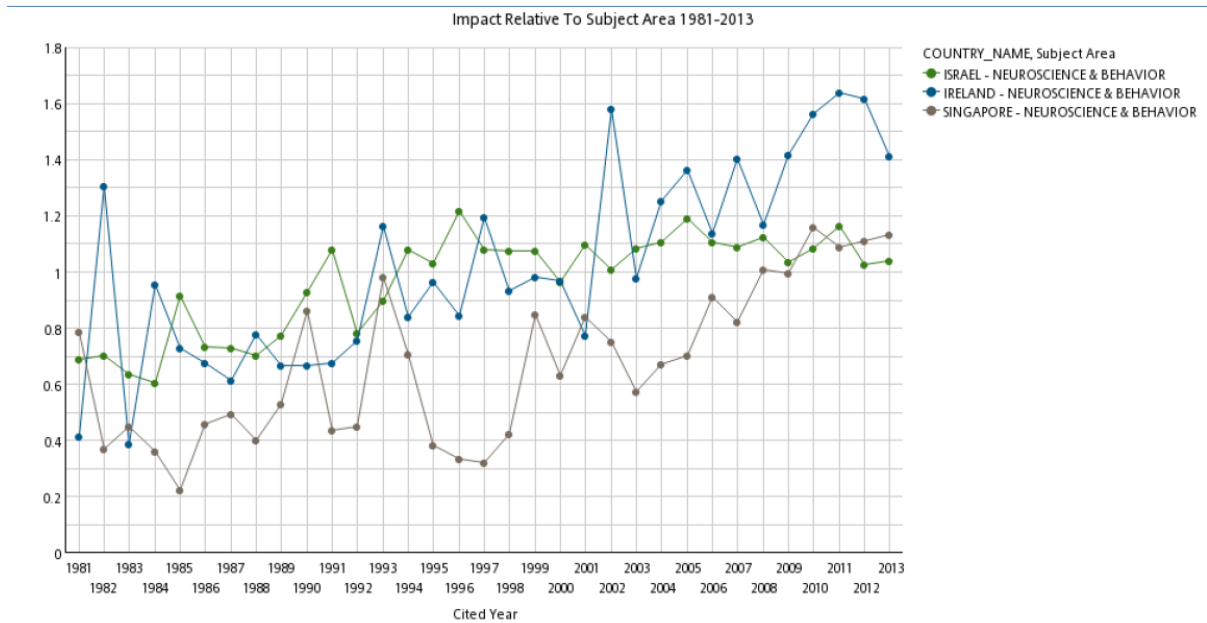
Source: Thomson Reuters InCites1, accessed 18-3-2015

## Where we came from, where we are now: Impact relative to the World\*



Source: Thomson Reuters InCites1, accessed 18-3-2015

## Neuroscience & Behaviour: Ireland, Israel, Singapore: Impact relative to the World\*



Source: Thomson Reuters InCites1, accessed 18-3-2015

3. How can that level of ambition be justified? Where would we target increased funding and how could this be justified?

All resource allocation needs to be informed by some analysis of data. We need to identify areas of strength but also areas of weakness. While certain applied aspects of medical and physics research have been highlighted there remains a research area that is deeply lacking in Irish higher education institutions: mathematics. The maths departments in Ireland are not performing well, nor have they been considered a priority since they do not, *per se*, directly generate jobs with their research. Again this a myopic policy since all sciences have at their core mathematics. The problem from the point of view of policymakers thus far is that mathematics departments behave in a similar fashion to humanities departments. They do not generate papers at the same pace and they tend to have low sunk costs, mostly in the form of personnel.

The level of ambition should be tempered by fiscal circumstances. A clear failure of this consultation document is that it is completely divorced from the obligations that Ireland has undertaken as part of the Excessive Deficit Procedure, 2 Pack and 6 Pack arrangements and the Fiscal Compact Treaty. Budgets will not be increasing. Budgets will at best maintain current value and in the higher education space be prepared to accommodate a significant increase in the overall quantum of students (even when percentages remain constant or fall slightly) due to demographic pressures.

4. How can research prioritisation better serve our national objectives of a strong sustainable economy and a better society?

The 14 items highlighted in the consultation document does not constitute a prioritisation policy.

As an economist I have deep scepticism at the ability of agencies at picking winners. At the same time I am aware that we have to make resource allocation decisions. In the Irish context these decisions appear to be made more on the matter of existing projects, regional requirements and a very limited pool of outputs-based data. The Irish environment is exceptionally small and decisions, even following extensive peer review tend to follow regional lines and line up to “expected” recipients. Economists Prof. Morgan Kelly and Colm McCarthy, both of UCD has highlighted the wastefulness of this process in terms of manpower and direct and indirect costs.

As it stands the consultation document presents a slightly worrying approach to the problem, one that was highlighted by Prof. Mariana Mazzucato in *The Entrepreneurial State* (2013) that governments are now paying with taxes for research and development for firms. Those firms then privatise the profits generated from those innovations while also asking for lower tax rates. The taxpayer winds up paying twice. Once up front and second from lost tax revenues.

I would be concerned that decisions that are made in the name of scientific investigation are actually nothing more than small fig leaves coving bald rent seeking.

5. How best do we identify emerging areas of opportunity and challenge i.e. horizon scanning?

I would recommend that the authors of the report consult two seminal documents on the matter of prediction and the limitations of human capacity:

J. M. Keynes. *Treatise on Probability*. London: MacMillan & Co., 1921.

Frank Knight. *Risk, Uncertainty, and Profit*. Boston: Houghton Mifflin, 1921.

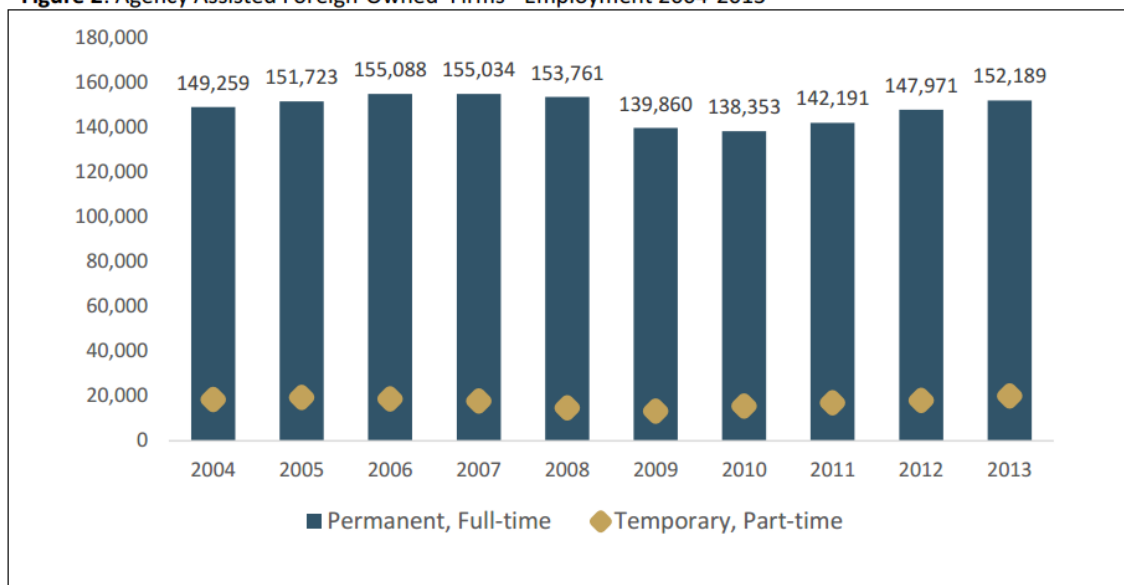
As is typical of all persons, they overestimate the power of their predictive capacity. It would be crucial to allow a large degree of flexibility in this area and not set up hostages to fortune.

6. A review of the outcomes of SSTI 2006-2013 shows that targets for the public research base were largely achieved or exceeded. Opportunities exist for further progress in regard to enterprise RD&I activity. How can public policy best support and more effectively optimise the impacts of enterprise RD&I investment - what actions could be taken to:
  - a. strengthen the number of innovation performers in the multinational sector?
  - b. broaden RD&I activity in the indigenous sector and build absorptive capacity?

On the matter of MNCs it is important to note that while much is said of the importance of a highly educated workforce and of the abilities of the Irish population in pharmaceuticals, medical devices and emerging competencies in the areas of ICT the Irish taxation regime has been crucial for the current and continued success of the MNC sector.

Taken from page 3 of the Department of Finance's *Economic Impact of the Foreign-Owned Sector in Ireland* (2014) the amount of jobs directly linked to MNCs are small relative to a 2m person workforce. There is a concern that while 57% of Gross Value Added to the Irish economy comes from this sector if that is tempered by a view of their employment impact it may be over dominating the policy discussion.

**Figure 2: Agency Assisted Foreign-Owned Firms - Employment 2004-2013**



Source: Forfás, Annual Employment Survey 2013

The issue is not is SSTI 2 would ensure an expansion of MNCs or MNC employment in Ireland. The issue is would SSTI 2 matter is changes were made to the tax regime in Ireland such that the CCTB was implemented, modifications under BEPS were no in Ireland's favour and the Knowledge Box did not provide sufficient loopholes to get around CCTB and BEPS. This of course assumes that the US taxation regime situation remains constant, which is the origin of the effectiveness of most of this tax avoidance engineering.

7. Do we need to enhance the suite of enterprise support programmes to further drive innovation in industry and/or is there scope for consolidation of the existing range of support programmes?

The issue is that we need to enhance the maintaining of firms in Ireland. The IDA has been very good at gross job creation but poor at net job creation. What needs to be examined within the current suite of agencies, activities and support programmes that exist under the Department of Jobs, Enterprise and Innovation is how to make them better at *net job creation*.

I fear that this economic objective has overshadowed part of the important educational role of the higher education sector. It is true that there are linkages to improved economic growth and personal income opportunities as a result of higher levels of human capital. It is at the core of the endogenous growth model in economics but it can occlude the wider non-economic and indirect benefits accrued from higher education. It is important to note that Irish higher education has valued the scholar-teacher and to fully separate research into a small class of individuals within the academy or not in the academy at all would have a detrimental effect on undergraduate and postgraduate student quality.

8. How can we incentivise firms that are R&D active to scale their research efforts?

It will depend in part on the firm in question. MNCs tend to keep their most sensitive R&D located near their headquarters for trade secret purposes. In Ireland operational and process R&D have been housed with Irish-located MNCs. As Ireland moves from a manufacturing environment to a services environment in MNC companies it becomes more important to look at interactions between firms and the research community. Recent research by the TIONCHAR project at Trinity College Dublin looked at this engagement and found that it was not as internationally orientated as would be found in England. Part of scaling will involve engagement – both on the part of the MNCs and on the part of the research community.



9. How can we further increase/strengthen the effectiveness of our international collaboration and engagement across all areas of STI investment in pursuit of economic and societal goals?

As stated in the above question collaborations and engagement tend to be more local in orientation. Though Ireland has a base of scholars that are internationally collaborative it is a small pool of individuals. Pressures that exist in terms of expanding student numbers and administrative responsibilities limit the possibilities for new relationships to be formed with local and international collaborators.

Part of what is essential to international collaboration is a policy that is more open to the acceptance of foreign talent. The regulatory responses in the UK and the US have made them less attractive as places for non-EU researchers. Ireland could develop a comparative advantage in that area.

Societal goals are mentioned but only in passing. I would ask the D/JEI provide more and clearer details on what they intend to achieve in this area and what stakeholders they consulted in the process.

10. What additional measures can be taken to maximise the engagement of industry as a partner in this regard?

I would direct the authors to the work of Dr. Michael Kitson of the UK-Innovation Research Centre. He is a fellow of St. Catharine's College, Cambridge.

11. What additional measures could be taken to enhance Ireland's participation in Horizon 2020 and other EU Programmes – industry, academia, SMEs and MNCs?

It would be important to note that current staffing numbers have declined significantly placing more work on the remainder as student numbers have risen. Since 2008 over 2,000 staff have left the system. This has implications for the ability to perform and organise research at a level competitive with H2020.

Importantly the career structure goals outlined in the 2006 SSTI (page 32) were never achieved for researchers on short-term contracts (i.e. postdocs) that would make a research career attractive.

12. Are there research policy or programme developments taking place at EU level where enhanced engagement by Ireland could provide opportunities for research collaboration and ultimate economic or societal benefit?

Since a large part of the flexibility in the area of Irish policy will originate from the work of the ECOFIN Council and the Eurogroup on accommodating changes to the medium term fiscal policy path. That will be essential for research policy, higher education policy and any matter that draws public funds.

13. What could we do to further enhance our landscape and institutional arrangements to maximise the impact of research excellence and deliver jobs?

Jobs are created by firms, not governments. There exists a series of pre-existing problems. Agriculture continues to be a small employer. MNCs as stated above take up a small and what appears to be maximized number of employees from the labour force. That leaves options that become attractive, such as stoking property bubbles. The public sector will be constrained by the continued fiscal limits. The problem is that much of the higher education and research sector is directly connected to the practices of the public sector, even if its income is less than 50% drawn from the public exchequer. This creates constraints on employment and capacity building within the higher education and research sector. More flexibility in this area could enable that sector to be better able to compete.

In addition, what needs to be done is to provide an alternative to a property and construction sector for job growth. Much of the discussion in SSTI 2 is limited to a small pool of employment. Now that Ireland is emerging from the recession jobs will be desired and they will need to be broad-based.

At the same time there are considerable problems with the small firms in Ireland. They tend to be micro-firms and not generate more than 3 jobs at a time. Sometimes these firms fall into a “lifestyle company” category where they essentially will be nothing more than a vehicle for a sole trader. This was even acknowledged in the latest Companies Act 2014.

Overall I would recommend that this strategy be conducted in a fashion that would link it to a wider review of industrial policy of the sort I was involved with in the early 1990s, namely the Culliton Report of 1992.

14. Is there a need for a complementary market focused research centre structure in Ireland and how should that be organised?

No.

15. How can Ireland optimise its strategic advantages of location, scale and environmental quality as a fundamental component of its research infrastructure?

As stated above research infrastructure needs to be maintained and made dual purpose, for public use and for research and higher education. At the moment key elements, such as access to journals, are about to disappear. That will be a general disadvantage to Ireland and its institutions. I would also look closely at the idea of sunk costs. Ireland should look to embrace research areas that have low sunk costs. The current state of the public capital programme will necessitate that response but it is important to highlight. The days of the “Bob the Builder” university should stop.

16. How can we further increase/strengthen the effectiveness of our national collaboration and engagement across all areas of STI investment in pursuit of economic and societal goals?

See above responses.



17. The establishment of Knowledge Transfer Ireland has seen an important evolution in our knowledge transfer system but what more can we do to enhance further the transfer of knowledge into jobs?

See above responses.

18. In terms of Intellectual Property policy, are there specific interventions or supports of a legislative or non-legislative nature that would improve the business environment and act as an incentive to create and sustain an innovative culture?

Moving ahead with modifications to the recommendations of Copyright Review Group and their model legislation would be recommended.

I would also note that more should be consideration given to how effective the Knowledge Box will be with changing IP definitions and constraints in the EU and the US.

Have considerations been given to the effects of Transatlantic Trade and Investment Partnership on current Irish IP policy?

19. What steps need to be taken to further the translation of investments in STI into the achievement of stated public policy goals? How can the Strategy enable research programmes to optimally support policy development and actions to address key national challenges in areas such as environment, health, etc.

Part of this can be achieved by more data collection and analysis. At the moment policies are formed on the basis of very limited data.

Overall part of the problem with the approach to innovation policy since 2010 has been due to it being a “faith-based policy” as Colm McCarthy described it at one point in his review of expenditure. There is limited evidence of linkages and until evidence is presented and causation can be determined than policies should be deferred.

20. What are the synergies between Government's goals in building a better society and the goal of creating jobs and economic growth?

It has been clear since the writings of Adam Smith that society's lot is improved when persons that are able and desire work have it. There are many facets to society's goal of bettering itself. Part of these are revealed by the electorate at the ballot box and the rest require more contemplative individuals to articulate. Some, such as philosophers, find no reference in this document. Pity that.

21. How can we address national challenges and also provide economic opportunities through development of new products, processes, systems?

I would reference again to a wider and more evidence-based discussion along the lines of the Culliton Report. Ireland needs a new industrial policy. Fiddling at the edges will not work. It is myopic and causes policymakers to flirt with bubble-generating policies as opposed to long term growth.

22. How can we address local and national challenges that are also regional and global challenges? How can Ireland through its research turn national challenges into global opportunities in areas such as sustainable land use, urban and rural development, and vulnerabilities to global trends and changes?

Regional strategies require growth and the recovery to spread beyond Dublin. Dublin is booming again and house prices and rental rates are increasing rapidly, some would say to bubble levels. These factors act as a deterrent to MNCs and to potential researchers as it places Ireland out of competitive price range with other EU cities. At the same time the Ireland outside Dublin continues to see very slow growth.

Global trends that matter to Ireland, such as climate change, the role of changing centres of political and economic power, geopolitical events and the changing role of people in the labour market need to be evaluated but in a careful sense. SSTI 2 most likely is not the place to begin this important discussion.

23. How can Ireland harness the opportunities presented by the major developments on observation systems, including the analysis and use of Earth Observation data by a wide array of sectors and users?

No comment.

24. What more can we do to best harness the potential of our knowledge base for sustainable economic and social well-being?

It is important that as part of this consultation that Ireland identify its strengths and the rapid travel it has made over the past 15 years in terms of research activity. At the moment there is the potential to lose what has been gained by short-term policies related to employment and exogenous factors, such as accommodation costs.

As it stands more needs to be done to ensure MNC engagement with researchers in the higher education sector.

Improvements to copyright (as already recommended) and developing open access publications via OpenAIRE would also be important to improve Ireland's global engagement.



25. What additional steps can government take to ensure the development of human capital across the population to ensure the success of the new Strategy?

Policies on human capital need to look at the entire education system, not just higher education. Discussions of 1<sup>st</sup> and 2<sup>nd</sup> level and especially mathematics education are necessary.

I would also say that vocational and technical education needs to be discussed more openly as part of a healthy 3<sup>rd</sup> level education systems. Ireland lacks apprenticeships and this is an important failure of our human capital policy.

26. How can we ensure that the requisite links between research and scholarship are maintained across all RPOs?

Such links should be monitored by the HEA and allowed to develop, as much as possible, organically.

Policies that mix divergent objectives, such as mergers with institutional status result in confusion and conflict and place both objectives in doubt. Policy approaches of that nature should be avoided in future.

27. In order to achieve a sustainable research capacity, are the outputs of our research system at doctoral and postdoctoral level the right ones in terms of volume, quality and relevant discipline?

Postdoctoral scholars require a career path and structure in order to attract people and to provide boundaries and the rules of engagement.

Doctoral numbers are falling. That in part reflects the changing funding environment but also employment prospects. US data shows falling wage levels for doctoral graduates, even in areas associated with STEM. Further labour market investigations need to be made in this area before any policy actions are taken to expand doctoral student numbers in Ireland.

28. How can the new Strategy support and strengthen the reforms taking place under the Higher Education Strategy and align with the new National Skills Strategy and develop capacity to enable Ireland to deal with new and emerging challenges across the full breadth of government strategies?

At present I would feel that the current consultation document outlines a far too utilitarian view of higher education which provides no room for the humanities and social sciences and limited accommodation for subjects such as mathematics. I would state at the moment that SSTI 2 does not approach from the position of education or even research but that of training and industrial development. On the matter of industrial development I would say that the overarching strategy of the Department of Jobs, Enterprise and Innovation should be reviewed.

I would state, as I did above, that SSTI 2 needs to incorporate more of the objectives of the higher education strategy as well as objectives for 2<sup>nd</sup> and 1<sup>st</sup> level education.

29. How can we better leverage our research talent into the economy? How can those individuals active in research (and those seeking to be), both in the public and private sectors, be best supported to perform and progress including through optimum researchers' careers, recognition and mobility mechanisms.

Part of leveraging talent is to keep it in the country. That means not destroying the economy on a regular basis.

Researchers need careers. That needs to be addressed at the general level.

In the particular one has to look at where researchers fit into the national industrial policy as it exists at present, not as desired by policymakers. Given the structure of MNC employment does the Irish economy need that many researchers? Some have questioned the approach to mass higher education on the same grounds.

As in most questions presented in this discussion document, the conversation needs to be wide ranging and involve other departments and crucially more evidence.

30. How can gender equality in publicly funded research activity be further enhanced?

Prof. Grimson of Trinity College is currently investigating this issue. I would defer to her judgement.

31. How can the Action Plan for Jobs 2015 objective to increase the number of researchers in enterprise be fulfilled?

I would question this target as being effective for employment or growth objectives.

32. Should research and innovation performers be supported to engage citizens more actively in the innovation process to achieve optimal outreach to the public?

I believe that our professoriate do an excellent job of bringing all our academic disciplines to the public. They should be encouraged and praised.