Ten Years On: Confirming Impacts from Research Investment

A case study focusing on the direct commercial and economic impacts from exchequer investment into centres and initiatives supported by the Programme for Research in Third Level Institutions (PRTLI) 2000-2006

An independent report to the Higher Education Authority (HEA) by PA Consulting

August 2011
Foreword

Demonstrating the impacts from public investment in research, particularly in quantitative terms, is a challenge faced by many funders and research performers worldwide. The fact that much of the impact is in terms of public good, whether educational, societal or economic, makes it particularly difficult to directly link cause and effect. Additional complexity arises when one considers the multiple factors that play into economic success and, in the Irish context; further challenges are presented by the fact that we are an open economy.

However, in spite of these challenges, in the early summer of 2010, after a competitive tendering process, the Higher Education Authority (HEA) commissioned an independent assessment of commercial and economic impacts arising from those centres/initiatives established or expanded by the Programme for Research in Third Level Institutions (PRTLI) in the period 2000-2006. Other centres established by the PRTLI or in the process of being established and other funders since that time, did not form part of the study as it would be too soon to assess impact from those investments. This approach has been endorsed by the fact that in this study the vast majority of impact has been found in the last three years.

By 2010, centres/initiatives established or expanded by the PRTLI had evolved and were being supported by other private and public funders - indeed the report shows that over the timeframe examined the majority of public funding was channelled to these centres through Science Foundation Ireland, the Health Research Board, Enterprise Ireland, the Environment Protection Agency and the Irish Research Council for the Humanities and Social Sciences and the Irish Research Council for Science, Engineering and Technology. As is set out in the study it was not possible to separate out the impacts from each of these streams of investment so the report presents a snapshot of the impacts from the entirety of that public investment up to 2010.

In understanding the report, the reader needs to be aware that whilst the many impacts of the investment are summarised, this report presents a detailed quantitative picture only vis-à-vis particular impacts. A decision was taken within the study to focus purely on measuring the impact that could be directly validated by beneficiaries. Important and all as it is, the main quantitative component of this study – direct commercial impact - represents only one component of the broader economic impact and dividend. To illustrate this point, the economic dividend arising from attraction and retention of foreign direct investment due in part to our ever increasing reputation for research and enhanced skills base has not been quantified. Nor indeed has the economic impact from the multiplier effect of this investment in terms of indirect and induced expenditure been quantified. It is of course broadly acknowledged by the companies themselves and by government agencies that the presence of a quality public performing R&D system, matched with quality human capital, are key factors in attracting companies to Ireland. Other economic impacts not quantified in this study are –

- the employment generated through construction in the significant infrastructure projects;
- income ‘dividends’ realised by individuals due to the increasing supply of PhDs;
• additional international student income generated due to the improvement in global institutional reputation arising from enhanced research capability;

• visitor impacts arising from the holding of high profile conferences and events based on new facilities and international research reputation;

• multiplier effects of the investment in higher education in terms of indirect and induced expenditure

So to be clear this study focused on the area – direct commercial impact for companies - where benefit could be quantified and verified by those who have directly benefited. On this basis the outcome from the study is indeed very encouraging particularly when one considers the value placed on the return on investment by companies to date and the value placed on the potential for the next five years.

As such, the study presents a minimum valuation of impact at this stage.

In presenting this work to the public, the HEA wishes to thank PA Consulting for its contribution and for contributing to the broader understanding of impacts from investment in research. The methodology of assessing direct commercial impact on the basis of the determinations from the private sector is, as far as we are aware a novel approach in the Irish context, and we are encouraged by the results to date when one considers that many of the international studies conduct assessments of this nature up to 15 years post investment. The HEA also wishes to thank members of the independent steering committee for the review, Martin Cronin, Mark Dynarski and David Hegarty.

Finally it is the case that these impacts are but one component of economic dividend and societal impact. This clearly means that further work is needed to capture and quantify all economic impacts and the systems need to be established to do so. A comprehensive study of the impacts of the research investment in health and well being, the improvements to our environment, the enrichment of our heritage and culture and our better quality of life is also required. These latter impacts are equally, if not more important for the economy and society, and cannot be overlooked or discounted.

Mr. John Hennessy
HEA Chairman
August 2011
Executive Summary

Introduction

This report, commissioned by the Higher Education Authority (HEA), presents PA Consulting's independent assessment of the commercial and economic impacts arising from exchequer investment in the centres and initiatives initially funded via the Programme for Research in Third Level Institutions (PRTLI) over its first three investment cycles. The programme was established in 1998 to strengthen national research capabilities through investment in physical infrastructure and human capital, channelled through 45 specific specialist research centres and initiatives within and across institutions. It worked with other research support interventions (most notably via Science Foundation Ireland, the Health Research Board, Research Councils and Enterprise Ireland programmes) to deliver research outcomes from these centres and initiatives and this study has set out to validate impacts which have arisen as a result.

PRTLI is part of an overall solution to address a research deficit...

The situation with regard to research infrastructure and investment prior to establishment of the PRTLI was markedly different to that at present. Despite a range of positive wider socio-economic indicators between 1991 and 1999, there was less evidence of progress with regard to research, development and innovation performance. Expenditure on R&D and numbers of researchers in Ireland lagged behind international peers, while a Circa Group study in 1996 identified undercapitalisation of higher education research as a major problem. Weaknesses were also identified in the organisation and management of research activities within the institutions with limited strategic focus overall.

The decision to establish the PRTLI represents a key milestone in development of Ireland’s research capability and one which allowed substantial additional funding to be leveraged. A particular benefit of the programme was the injection of €178mn from Atlantic Philanthropies over the first three Cycles, accounting for around 30% of total programme investment over this period (€605mn). The PRTLI was not intended to fund specific research activities or defined research projects, but rather to put in place the conditions that would allow the right type of activities and projects to subsequently proceed. The success of the centres and initiatives supported by the PRTLI in generating commercial and economic impacts was therefore interdependent on many other supports and interventions. All of these interventions work together to generate a funding and support model for higher education research in Ireland as illustrated in the following diagram.
The Support Model for Higher Education Research in Ireland

The human capital developed secures higher value added employment than would otherwise be the case while the commercialisation of research supports generation of turnover, efficiency savings and employment. Research also informs realisation of other economic impacts (e.g. health, environment).

From the research activities undertaken, potential is identified for commercialisation of research outcomes and Enterprise Ireland supports industry collaboration and commercial activity to help realise such benefits of research.

Other national funding via the SFI, Research Councils, HRB and other exchequer sources to fund specific research activities within priority areas. EU funding also available to fund specific research programmes.

The PRTLI providing foundation for research performance by embedding more strategic approach to research in institutions, funding facilitating infrastructure and supporting development of basic capabilities.

Overall Funding Profile

Exchequer Funding Inputs

It provided a platform for other funding inputs to support research activities...

In assessing the commercial and economic impacts that emerged from the centres and initiatives supported by the PRTLI investment, it is essential that all other subsequent funding inputs to sustain their research activities are taken into account. Our analysis revealed a multi-faceted funding profile underpinning the work of these centres and initiatives as shown in the diagram opposite. Overall funding of the centres and initiatives since initiation of the PRTLI support was recorded at €1.661bn, with Exchequer inputs in this regard amounting to €1.173bn.
Commercial impacts from research are critical within a broader landscape...

Measuring the impact of investment in knowledge creation, research and innovation is complex. It is in itself the subject of considerable research and there remains a lack of consensus on best practice approaches to deal with issues including:

- the long-term nature of the realisation of impacts from initial infrastructure development;
- dealing with the unpredictable nature of ‘breakthrough’ moments in research (making it difficult to predict the value of continuing to invest or timing of returns);
- the interdependency with and complexity of other funding streams (as is the case in the Irish support model above) to support research activity, and;
- isolating and attributing commercial benefits and increased employment to the PRTLI when they depend on so many other business and wider market variables.

This study deployed a comprehensive methodology that set out to map the intricate relationships between the inputs, outputs, outcomes and impacts of the PRTLI supported centres and initiatives, and we have been able to produce and validate robust evidence of the commercial and economic dividends that have resulted. Given the lack of a pre-defined monitoring framework or commercial objectives and metrics, there was a need to define a methodology which could offer insight and value while recognising constraints on available data. In this regard we considered the wider stakeholder interest in the study from parties including the HEA itself, the Department of Finance, the Department of Education and Skills, the Department for Jobs, Enterprise and Innovation, Forfás and IDA Ireland.

We determined that the assessment would be of the greatest practical use to such stakeholders if it could demonstrate clearly the extent to which initial funding stimulated private sector commercial activity. This approach was consistent with other impact studies internationally (particularly in the US and UK) and the validation of such impacts in companies thus became a key focus of our methodology, with other economic impacts also tracked as far as possible. We focused on establishing a clear logical relationship between the PRTLI and other exchequer funding inputs the outputs, outcomes and impacts which emerged from the centres and initiatives since programme support was initiated. The assessment has been built around an evaluation framework that establishes this relationship chain.

**Economic Impact Assessment Framework for the PRTLI**

![Image of the Economic Impact Assessment Framework for the PRTLI](image-url)
There has been progress in delivering commercial and wider economic impacts…

The PRTLI investment over its first three cycles provided a foundation from which significant research activity was progressed with the support of other exchequer funded interventions and further philanthropic, EU and industry investment. The funding inputs detailed stimulated a chain of outputs, outcomes and impacts via centres and initiatives as follows:

- **45 centres and initiatives** were supported across five thematic research areas. These were the direct outputs of the investment in the development of infrastructure, equipment, collaboration and increased numbers of PhDs.

- There are marked increases in the research outcomes from the work of these 45 centres and initiatives. Indicators such as publications, citations, inventive disclosures and PhDs graduated have risen significantly in the period since the initial PRTLI investment.

- There is a significant human capital impact with a threefold increase in the human capital research base and support for 1,661 research jobs through their ongoing activities. The expertise is becoming dispersed within industry and the public sector at senior levels.

- There are wider impacts in shaping policy and realising minor public health and environmental improvements but there must be focus on targeting such impacts and monitoring achievement by relevant centres.

- Commercial impacts have been established in tracking and attributing investment, savings, turnover and employment to the products of particular research activities. This has resulted in 50 companies where impact has been validated, a commercial impact of €753.7mn, and an employment impact of 1,255 jobs.

- There has been a ramp up in the level of commercial impacts realised in recent years, and this is also reflected in the significant potential future commercial impact identified by industry. This amounts to €1.108bn, and although realisation of this impact will be dependent on many variables, it underlines the fact that the study has been undertaken as a snapshot at a point only part of the way along the journey to realise the full benefits of the research investment.

- **Not all of the centres or initiatives had the potential for generating commercial impacts** and this must be recognised in considering any return on investment. The 16 centres and initiatives within the social sciences and humanities and environment and marine thematic areas fall into this bracket and considering success in terms of human capital, reputational, policy-related and wider economic impacts is more appropriate. However from the €952mn recorded as flowing through the other 29 centres in biosciences and biomedical; platform technologies and materials; and ICT and advanced communications; a return in terms of commercial impact could be expected (although it should also be acknowledged that this was not a specific objective of the initial PRTLI funding). This is borne out by the fact that 99.9% of all impacts validated emerged from the work of these 29 centres and initiatives.

- **These commercial impacts do not represent the overall economic impact in terms of these centres.** The focus of the study was only on identifying impact which could be directly validated by industry. While important impacts have been measured from multi-national companies investing or continuing to invest in Ireland as a result of research and development activities progressed by the centres or initiatives, it was also found that there are significant wider, but unquantifiable, Foreign Direct Investment benefits as a result of the strong research system put in place. This will provide associated knock on and ripple effects in the economy, while other impacts, such as those related to the construction of projects and human capital and institutional reputational benefits, are similarly not included in this figure. There will also inevitably be commercial impacts which exist which could not be confirmed by industry as part of this study, although this is countered somewhat by the fact that impacts realised by multi-national companies will result in some leakage.
Nonetheless it is reasonable to take the impact calculation as a **minimum estimate**. It is also a figure which compares well with the limited international comparative analysis which has been undertaken in this space.

**Commercial Impacts arising from the PRTLI Supported Centres and Initiatives**

<table>
<thead>
<tr>
<th>Type of Enterprise</th>
<th>Spin-Outs</th>
<th>Established Companies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of company impacts identified</td>
<td>44</td>
<td>113</td>
<td>157</td>
</tr>
<tr>
<td>Number of company impacts in terms of commercial turnover, investment or savings identified</td>
<td>24</td>
<td>26</td>
<td>50</td>
</tr>
<tr>
<td>Estimated commercial impact in terms of commercial turnover, investment or savings identified</td>
<td>€99.6 million</td>
<td>€654.1 million</td>
<td>€753.7 million</td>
</tr>
<tr>
<td>Estimated employment impact resulting from the research undertaken by PRTLI supported centres and initiatives</td>
<td>192 jobs</td>
<td>1,063 jobs</td>
<td>1,255 jobs</td>
</tr>
<tr>
<td>Number of companies where future impact in terms of commercial turnover, investment or savings is projected</td>
<td>12</td>
<td>19</td>
<td>31</td>
</tr>
<tr>
<td>Estimated future impact (next 5 years) resulting from the research undertaken by PRTLI supported centres and initiatives</td>
<td>€96.3 million</td>
<td>€1.012 billion</td>
<td>€1.108 billion</td>
</tr>
</tbody>
</table>

*Source: PA Consulting Impact Validation Exercise*

The next stage of development requires a renewed approach...

From the time when the PRTLI was established in 1998 and was followed by other substantial research support interventions, we can see a notable closing of the gap with international averages. The improved performance has now allowed Ireland to achieve a position where it sits above the EU and world averages and is on a par with that of the OECD in terms of research performance indicators (including, for example in the Thomson Reuters research impact index shown below). Although Ireland’s innovation system has made significant progress in developing world-class research and development facilities and expertise, it is still not as mature as other leading systems (e.g. Finland, Sweden, Germany, etc). Although Ireland is now ‘at the table’ as a significant player in international research, further investment will be required in order to bring it onto the same stage.

**Thomsons Reuters Research Impact Indicators 1980-2008**

*Source: Thomson Reuters InCites March 2010*
We have found that the establishment of the PRTLI and subsequent investment programmes through SFI, the HRB, IRCSS, IRCSET, the EU, etc. have resulted in the rapid growth, expansion and improvement of research in Ireland. Ireland is now at a point where we need to reflect on our approach to research and development, how and where we invest and how we manage and organise the policy agenda strategically. Case studies of innovation leaders have shown that establishing infrastructure and developing specialisms represents only the first part of the journey in putting in place an effective innovation system. We are at a different point in terms of the stage of maturity of our research base and in the development of the economy. These conditions mean that there is an urgent need to ensure value for money across all future investment areas and to maximise return on investment. From the assessment conducted, it is our judgement that continued investment in specialist research activity offers the potential to ensure that an economic return is made. However this will only be the case if the targeted commercial and economic impacts are made clear at the point of funding and monitored and pursued at every stage of the research process. By doing this and taking a very strategic approach to the support of research, focused on building on success and key areas of strength, a platform exists for significant future economic success.