

SCOTLAND'S FUTURE

HIGHER EDUCATION RESEARCH IN AN INDEPENDENT SCOTLAND

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MINISTERIAL FOREWORD



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Cabinet Secretary for Education and Lifelong Learning

This Government's vision for an independent Scotland is of a thriving and successful European country which reflects our core values of fairness, prosperity and social cohesion. An outstanding higher education sector and research base goes to the heart of this ambition.

As Cabinet Secretary for Education and Lifelong Learning, I'm proud of what the higher education sector in Scotland has achieved and goes on achieving. The sector's defining characteristics of autonomy, collaboration, innovation, diversity and learner focus reflect the principle that we invest in ourselves and our future when we invest in education. The sector also delivers world beating results – we have five universities in the world's Top 200, unmatched by any other country per head of population.

Due to the quality of the research we produce, Scotland consistently punches above its weight in the proportion of competitive research funds won.

This Government has demonstrated its commitment to research with increased investment in research and knowledge exchange and with independence we will continue to provide levels of public investment in university research that enable our researchers and universities to remain internationally competitive.

At the same time we recognise that in order to thrive, internationally excellent universities require much more than financial support. Therefore, as well as delivering record levels of investment, we have delivered a core commitment to advancing and better utilising research at all levels, from the critical link between research and teaching as a vital part of what makes a university, to the need for fundamental blue sky research recently highlighted by Professor Peter Higgs' Nobel Prize success. We also recognise the benefits of responsible autonomy and see this, alongside an on-going commitment to the Haldane principle, as foundation stones for continued success.

By any standard, higher education in Scotland is performing well. But I strongly believe that independence gives us the opportunity to do better and to do more. Independence will allow us to use the advantages of being a small and agile European country to collaborate more across boundaries and borders; it will enable us to promote the Scottish higher education brand on the world stage, giving us a competitive edge in attracting talented academics to Scotland, and to increase the ways in which research can be translated into economic growth and further embedded into the social fabric of our country.

This paper sets out how the higher education sector can gain from an independent Scotland that has full power and control of its own resources. I look forward to continuing to engage with the sector and others in the debate.

A handwritten signature in black ink, appearing to read 'M. Russell', with a long horizontal stroke extending to the right.

MICHAEL RUSSELL MSP

Cabinet Secretary for Education and Lifelong Learning

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INTRODUCTION

Investing in our internationally excellent universities, supporting their world-class and high impact research and helping them build links and collaborations across the globe is at the heart of our ambitions for an independent Scotland.

Following a vote for independence in the referendum on 18 September 2014, there will be a period of preparation for Scotland to become an independent country. The Scottish Government is clear that setting an independence date of March 2016 will allow a reasonable time for Scotland to assume its status as an independent country before the Scottish parliamentary elections in May 2016. This period between the referendum and independence will see negotiations with the rest of the UK, represented by the Westminster Government, and with the EU and other international partners and organisations.

This paper sets out further details of the Scottish Government's vision for the future of university research outlined in Scotland's Future¹ and the policies it would pursue in the negotiations and if re-elected in May 2016 as the government of an independent Scotland. The paper is structured around four key principles:

A strong research base is at the heart of the Scottish Government's ambitions for an independent Scotland – with independence we will be better-placed to support a further strengthening and enhancement of our world-class research base

Scotland's universities have a track record of success in attracting funding from a range of sources, reflecting the excellence and global reputation of our universities and the quality of their research. This research delivers tangible economic and social benefits for Scotland and the wider world. This Government has demonstrated its commitment to supporting university research – both through investment such as the Global Excellence Initiative and through novel ventures including Innovation Centres. We will continue to support research in an independent Scotland, providing levels of public investment in university research that will enable our researchers to remain internationally competitive. As part of this commitment we will ensure that existing levels of Government investment (through the Scottish Funding Council and the Research Councils) are at least maintained. We will further ensure that there is no adverse funding impact from Scotland's transition to independence and indeed believe that independence will bring opportunities for increased research funding through collaborations with the private sector and with partners in Europe and beyond facilitated by access to additional financial levers and our greater presence and profile on the world stage as an independent nation state.

Research excellence is underpinned by extensive collaborations across the globe – with independence we will maintain existing collaborations while extending our global reach with new partnerships and collaborations

Knowledge knows no boundaries. The very best research operates across boundaries be they disciplinary, institutional or nation state. Research excellence is achieved through collaboration – whether within Scotland (for example, through our world-renowned Research Pools), within the UK (such as Technology Strategy

¹ Scotland's Future: Your Guide to an Independent Scotland, 26 November 2013, <http://82.113.138.107/00439021.pdf>

Board Catapults), or across Europe and the wider world. Scotland can already point to significant successes in working across boundaries and attracting international research centres to Scotland. With independence we will seek to maintain existing collaborations that work well – such as remaining part of a common research area with the UK – while enhancing collaborations with other countries within the European Research Area, and in particular with our Nordic neighbours and across the globe.

The ability to determine our own destiny – with independence we will have full powers to develop a research funding policy and landscape tailored to Scotland’s strengths and needs

The Scottish Government is the largest single source of university research funding in Scotland with funding allocated through the Scottish Funding Council accounting for one third of university research income in 2012/13. A further quarter of research income is secured from the Research Councils. This dual funding system comprising funding from the Scottish Funding Council and competitively awarded grants from national Research Councils (funded through the tax base) works well. We will maintain this approach with independence. There are clear benefits to Scotland and the rest of the UK of continuing to operate a common research area with shared Research Councils. Scotland currently contributes financially to the Research Councils through its share of UK tax receipts – equivalent to a £292 million contribution in 2011/12 and £262 million in 2012/13. With independence we will seek to agree a continuation of the current arrangements while also using the opportunity independence provides through providing a direct funding contribution to have a clearer, more transparent input into the functioning of the Research Councils and the identification of research priorities. We will do this within the context of our commitment to the Haldane Principle recognising that researchers, not politicians, are best placed to take decisions around what research to fund.

Independence offers wider opportunities and benefits – with independence we will be able to create an environment that better supports a vibrant and flourishing research base

Independence will give future Scottish Governments a full range of fiscal levers to incentivise research and to encourage greater collaboration between universities and the private sector supporting productivity and sustainable economic growth. It will create a clear platform for Scotland to engage in international arenas – especially in Europe where we would take our seat at the table as a full member of the European Union. Independence will also enable Scotland to reverse current UK immigration policies which are damaging the university sector and put in its place an immigration policy that welcomes international students and high calibre researchers from across the world and recognises the contribution they can make to Scotland’s economy and society.

1. A STRONG RESEARCH BASE

A strong research base is at the heart of our ambitions as a Government – with independence we will be better placed to support a further strengthening and enhancement of our world-class research base

Introduction

1. Higher education research in Scotland is internationally recognised and respected for its quality and its innovative and collaborative nature. Researchers in Scotland have a strong track record of competing successfully for funding nationally and internationally attracting £969 million of research investment in 2012/13² from a range of sources reflecting the excellence of our universities and the high quality of their research. In 2012, Scotland's Higher Education Research and Development (HERD) expenditure as a percentage of GDP ranked top of the 12 countries and regions of the UK and was fourth highest among the Organisation for Economic Co-operation and Development countries³.

Investing in Excellence

2. Scotland's universities are renowned for their excellence and continually punch above their weight internationally. In the latest Times Higher Education (THE) World University Rankings⁴ five of our universities feature in the Top 200, reinforcing the success of Scotland's universities highlighted in the 2013/14 QS university rankings⁵ that ranked the University of Edinburgh 17th in the world and which showed improved standings in the top 150 for the universities of Glasgow, St Andrews and Aberdeen.
3. Moreover, when adjusted for population, Scotland has more universities in the Times Top 200 world universities per head of population than any other country⁶ (see Figure 1). This achievement is particularly impressive given the increasing global competition our universities have faced from the Asia-Pacific countries including China, Singapore, the Republic of Korea and Taiwan – all of whom have seen their top universities climbing up the world rankings in recent years as a result of significant public investment and interest in higher education.
4. Scotland's universities similarly excel when it comes to citations. Scotland's research is cited by other researchers around the world more often than any other country in comparison to its GDP and Scotland ranks third in the world (after Switzerland and the Netherlands), ahead of all the G8 countries in terms of citations per researcher⁷.

2 HESA Finance Plus 2012/13, Table 5b, http://www.hesa.ac.uk/index.php?option=com_pubs&task=show_pub_detail&pubid=1710&Itemid=276 plus SFC estimate of Total Research Funding

3 Gross Expenditure on Research and Development 2012, ONS

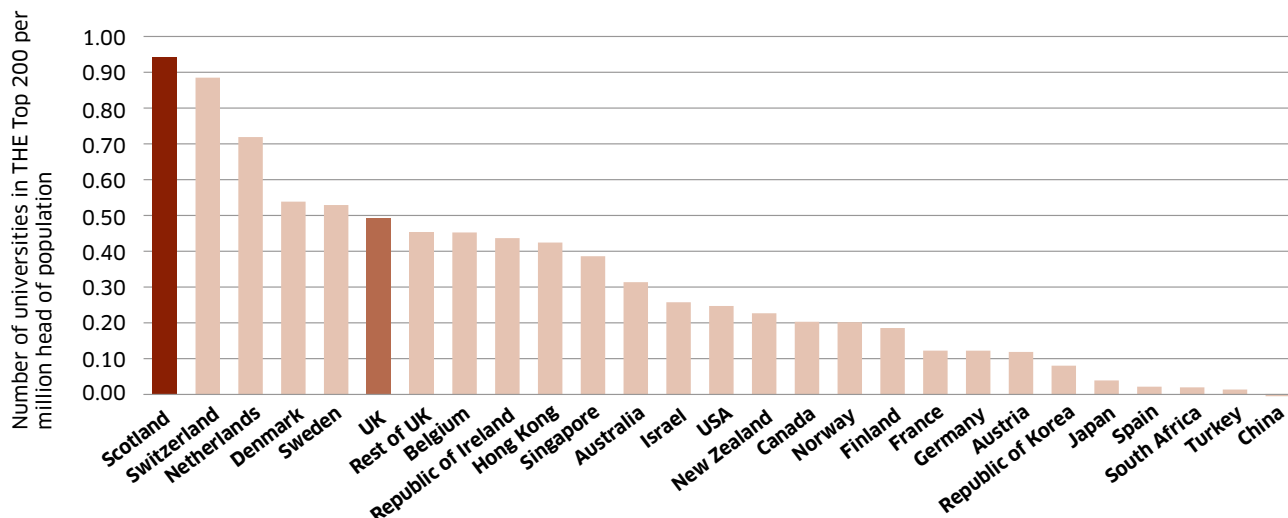
4 World University Rankings 2013/14 – Times Higher Education

5 [http://www.topuniversities.com/university-rankings/world-universityrankings/2013#sorting=rank+region="+country="+faculty="+stars=false+search="](http://www.topuniversities.com/university-rankings/world-universityrankings/2013#sorting=rank+region=)

6 World University Rankings 2013/14 – Times Higher Education and SG analysis

7 International comparative performance of Scotland's research base, November 2009, <http://www.scotland.gov.uk/Resource/Doc/981/0093770.pdf>

Figure 1: Number of universities in the THE World Universities Top 200 adjusted for population⁸



Source: SG calculations based on Times Higher Education World Rankings 2013/14

5. But rankings and citations are not the only measure of excellence. In 2012/13, the latest year for which published figures are available, Scottish higher education institutions (HEIs) won £231 million in Research Council funding⁹ funded through the Scottish and UK tax base accounting for 15.7% of the £1.5 billion Research Council grant and contract funding awarded to UK HEIs on a competitive basis reflecting the high quality of their research. If we look at the overall spend by UK Research Councils in Scotland, then data provided by the Research Councils UK (RCUK) indicates that Scottish HEIs received 13.1% of the £2.0 billion of research funding to UK HEIs in 2012/13 for grants, studentships and fellowships, while overall, Scotland secured 10.7% of the £2.9 billion total Research Council spending in 2012/13 – just slightly greater than our (8.3%) population share and 9.1% contribution to UK tax revenues (see Chapter 3).

6. The high esteem in which Scottish universities and their research is held is further evidenced by the significant investment the sector secures from charities for research (amounting to £127 million in 2012/13¹⁰). For example, Cancer Research UK has established three Centres of Excellence in Scotland in Dundee, Edinburgh and Glasgow. The Centres are partnerships working at a local level with universities, NHS Boards, cancer networks and other charities, and at a national level with government and industry. These Centres of Excellence will deliver world-class research, improved patient care and greater local engagement while making a significant impact in the global fight against cancer. Other charitable investments include the Edinburgh Centre for Cardiovascular Science (funded by the British Heart Foundation) and the Centre for Cell Biology Edinburgh (funded by the Wellcome Trust).

⁸ Source: SG calculations based on Times Higher Education World Rankings

⁹ HESA Finance Plus 2012/13, Table 5a, http://www.hesa.ac.uk/index.php?option=com_pubs&task=show_pub_detail&pubid=1710&Itemid=276

¹⁰ HESA Finance Plus 2012/13, Table 5b, http://www.hesa.ac.uk/index.php?option=com_pubs&task=show_pub_detail&pubid=1710&Itemid=276

Dundee Cancer Centre (DCC) provides a hub to facilitate collaboration and communication of cancer-related activities funded by Cancer Research (CR-UK) and others across the University of Dundee, NHS Tayside and partner organisations.

Through targeted support for training and translational research, the DCC harnesses world-leading cancer research and clinical practice, promotes health equity, and supports more rapid transformation of research outcomes into the prevention, diagnosis and treatment of cancer for the local community and beyond, both nationally and internationally.

In the coming five years the Dundee Cancer Centre aims to:

- establish itself as a hub and build collaborations across all cancer-focused activities in the University of Dundee, NHS, CR-UK and other partner organisations in Tayside and beyond, both nationally and internationally
- contribute to advancing translational research in Dundee and to promoting national and international collaboration
- support clinical trials and the activities of the joint Dundee-Edinburgh Experimental Cancer Medicine Centre (ECMC)
- enhance cancer research-related training and development in Dundee
- expand cancer-focused public engagement activities through science and health engagement programmes and work with local supporters, contributing to CR-UK, NHS and university strategies.

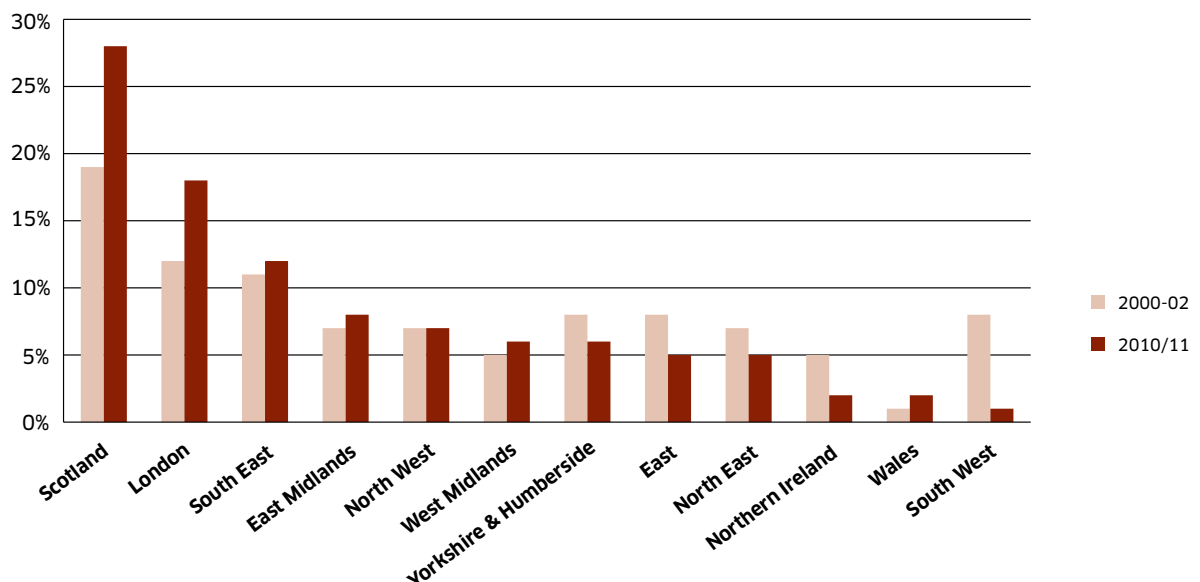
Investing in Impact

7. Excellence however is not an end in itself. Universities are embedded in the fabric of our society and economy, routinely translating their world-class research into tangible economic and social benefits for Scotland and supporting sustainable economic growth.
8. For example, universities are at the heart of the innovation system in Scotland being the primary source for ground-breaking innovations and often the key avenue through which longer-term more speculative research can be undertaken. Through their research activity, Scottish universities make an important contribution to Scotland's overall innovation performance – a key driver of productivity – and, in turn, to sustainable economic growth. Even relatively small improvements in productivity can have significant impacts on economic performance. Indeed Scottish Government analysis estimates that boosting labour productivity in Scotland by just 1% could raise employment by over 21,000 over the long term (around 20 years)¹¹.
9. The EU has identified 'an open and excellent attractive research system' as one of the key drivers of innovation and this can be seen in the success of Scotland's universities in the commercialisation of their world-leading research. According to

¹¹ Building Security and Creating Opportunity: Economic Policy Choices in an Independent Scotland, Scottish Government, November 2013, <http://www.scotland.gov.uk/Publications/2013/11/2439>

a recent survey by PraxisUnico¹², Scotland is the most successful part of the UK in creating new spin out companies accounting for 20% of new spin-outs created in the UK over the past decade and 26% in 2012 alone, with five Scottish universities (Edinburgh, Aberdeen, Glasgow, Strathclyde, and Heriot-Watt) featuring in the top ten universities most active in the creation of spin-outs in the past three years (2010-12).

Figure 2: Proportion of University Spin-out Companies by Region 2000-02 to 2010/11



Source: The PraxisUnico Spin-outs UK Survey: Annual Report 2013

10. Scotland also leads the UK in securing successful exits for its spin-out companies through trade sale or flotation. Over the ten years (2003-12), 21% of all successful exits have been spin-out companies from universities in Scotland compared to 19% from universities in London and 18% from universities in the South East.

Optoscribe is a spin-out from Heriot Watt University in Edinburgh specialising in ultrafast laser inscription technologies for photonic device manufacturing. Based in Livingston, Optoscribe develops and manufactures 3D waveguide based and micro-machined photonic devices for communications and novel sensor applications.

Optoscribe has joined the European Commission's MIRAGE project on next generation optical interconnects for Datacenter applications. The three-year research programme aims to develop breakthrough photonic integration technology enabling terabit capacities in optical interconnect links. Its consortium brings together seven partners from across the value chain comprising university research centres and leading companies from several European countries¹³.

¹² The PraxisUnico Spin-outs UK Survey: Annual Report 2013 (Further information on the survey can be found at, <http://www.spinoutsuk.co.uk/>)

¹³ <http://optoscribe.com/news/>

11. Scotland's universities also contribute more widely to the Scottish economy, with a recent report, *Grow, Export, Attract, Support*¹⁴ published by Universities Scotland in September 2013 estimating that, in 2012/13, universities contributed £6.7 billion gross value added (GVA) to the Scottish economy and supported 142,000 jobs. Research activity is a key contributor to this economic benefit with research and knowledge exchange estimated, in the report, to account for over a quarter of university exports internationally and recognised as a key factor in attracting foreign investment.
12. University research also has a wider range of societal benefits. For example, a recent clinical trial involving researchers at the University of Glasgow and surgeons at the Golden Jubilee Hospital, one of the UK's leading 'heart attack centres', demonstrated that heart attack patients have a much better outcome if other narrowed arteries are stented at the same time as the one that triggered the attack. This 'preventive angioplasty' has already provided significant benefits both for the individual patients who have been treated and in contributing towards a reduction in the longer term cost of their healthcare. There are potential significant reductions in the cost of healthcare if this approach is more widely adopted.
13. Elsewhere, collaborative academic and practitioner research undertaken by the Scottish Institute for Policing Research (SIPR) has supported the development of violence reduction strategies, public order policing strategies including community policing and the creation of safer neighbourhoods and the creation of an evidence base of community safety interventions for use by the Scottish Community Safety Network (SCSN).

A Supportive Government

"The news about our research funding figures, and our continued rise in the various world league tables, is very welcome and reflects the quality, hard work and dedication of our staff and students, as well as the highly strategic support we receive from the Scottish Government. With such support, the university can go on producing world-leading research which has the potential to change people's lives for the better." Professor Sir Timothy O'Shea, Principal of Edinburgh University, *Herald*, 10 September 2013.

14. The Scottish Government recognises the contribution our universities and their research base make to Scotland's society and economy. That is why this Government is investing, through the Scottish Funding Council (SFC), £364 million in research and knowledge exchange in 2013/14, an increase of 11% on the previous year and a rise of 38% (£100 million) since 2007¹⁵. The main element of this funding is the **Research Excellence Grant** amounting to £242 million in 2013/14 to support the research base in Scottish universities ensuring it is maintained, sustained and remains globally competitive and attractive to the best researchers.

¹⁴ *Grow, Export, Attract, Support: Universities' contribution to Scotland's economic growth*, Universities Scotland, Sept 2013, <http://www.universities-scotland.ac.uk/index.php?page=publications>

¹⁵ Figures from Scottish Funding Council

15. The **Global Excellence Initiative**, launched in May 2013, provides an additional investment of £13.8 million to help further boost Scottish output of world-leading research and the international reputation and standing of our universities. Shared between Scottish universities on the basis of current research rated 4* (world-leading), this investment is being match funded by the universities (in receipt of greater than £0.5 million) and used to support research excellence in a range of ways. For example, the University of Edinburgh are using the funding provided under the Global Excellence Initiative to recruit around 120 Chancellors Fellows (early career academics) and around 40 (per annum) 4 year PhD studentships to support strategic developments in research that will further boost the university's research profile.
16. While funding is clearly important, the Scottish Government's support for research is about much more than the allocation of monies. It is about creating an environment where research is respected and valued and where government, businesses and universities work in partnership to grow our economy and improve our society.

Respect for Autonomy

17. Scotland's higher education sector is one of the most autonomous in the world according to the European University Association (EUA) Autonomy Scorecard¹⁶. We have recognised the clear benefits of responsible autonomy in supporting innovation, competitiveness and fleetness of foot across the sector and been clear that this remains the bedrock for our future success. In particular, in relation to research, we have supported the Haldane Principle, that researchers – not politicians – are best placed to make decisions on what research gets funded. This will remain a central principle of our approach with independence along with our continuing commitment to fundamental research that underpins successful innovation.

Innovative Approaches

18. The effective circulation and exchange of knowledge is fundamental to securing maximum benefits from our world-class research. Scotland has a long and proud tradition of leading new and innovative approaches to research and to collaborations with industry but with independence we could do more. Innovative economies are more resilient and adaptable to change and, with independence, future Scottish Governments would have additional financial levers to support and encourage innovation and research investment (see Chapter 4 for further details).
19. In recent years, within our existing powers, we have worked closely with the SFC and our universities to take forward a number of successful, innovative initiatives which have helped our institutions to continue to punch above their weight internationally and to ensure that our research base supports our ambitions for growth.
20. Over the last decade, for example, the Scottish Government has invested £156 million¹⁷ in **research pools**, which has attracted another £360 million from the universities and their business partners. This collaborative approach has gained much domestic and international attention, attracting leading international researchers and postgraduate students to Scotland and providing the basis for further significant developments in research and interactions with business and industry.

¹⁶ <http://www.university-autonomy.eu/>

¹⁷ Scottish Funding Council

21. A study commissioned by the British Council found that “Scottish research pools constitute an innovative approach to research collaboration that leverages excellence to concentrate activity and stimulate collaboration between universities (both domestically and internationally)”¹⁸.

Established in 2007, the **Scottish Universities Life Sciences Alliance** (SULSA) is a research pooling partnership among the Universities of Aberdeen, Dundee, Edinburgh, Glasgow, St Andrews and Strathclyde and is supported by the SFC. SULSA aims to maintain and advance Scotland’s global position in Life Sciences by recruiting international research leaders and funding world-class research facilities.

The research excellence within SULSA was instrumental in helping Scotland secure a central role in the European Commission’s Innovative Medicines Initiative programme aimed at discovering new drugs. A state-of-the-art drug screening facility, supported by global pharmaceutical companies, the European Lead Factory (ELF) is being established at the BioCity Scotland site at Newhouse.

The ELF facility will provide researchers from SULSA, from SMEs and patient organisations across Europe an unprecedented opportunity to advance medical research and develop new medicines.

22. We are also investing, through SFC, £124 million over six years in a network of **Innovation Centres**. Developed in partnership with Scottish Enterprise and Highlands and Islands Enterprise, Innovation Centres (ICs) are collaborations between universities, businesses and others to enhance innovation in and across Scotland’s key economic sectors. Widely recognised by the sector as game changers, these centres have the potential to transform the scale and nature of university-business relationships and collaboration, further enhancing sustainable economic growth.

Innovation Centres: Aims and Objectives

- to offer collaborative knowledge exchange and research activities to help solve industry defined problems and co-create innovative opportunities for growth;
- to enhance two way knowledge exchange between universities, industry and others towards realising tangible benefits for businesses while also stimulating and challenging the Scottish research base;
- to provide an environment that supports the development of the next generation of business innovators, academics and entrepreneurs in Scotland and a culture change towards greater and more effective university/industry collaboration;
- to simplify the innovation landscape in Scotland through creating conduits to university knowledge and expertise for all businesses in Scotland and being complementary to and exploiting existing initiatives such as Interface and Innovation Scotland.

¹⁸ A Strategic Analysis of The Scottish Higher Education Sector’s Distinctive Assets, British Council Scotland 2013

23. The first three innovation centres: the Stratified Medicine Innovation Centre; the Sensors and Imaging Systems Innovation Centre; and the Digital Health Institute were officially launched by the First Minister in April 2013. Backed by £30 million of public funding, the centres – supported by the Scottish Funding Council – will concentrate on developing world-leading Scottish technology and life sciences. The three centres will ensure that Scotland continues to be a pioneer in life sciences, innovative technology, ideas and development and will create more than 2,000 jobs in their first five years.
24. Speaking at the launch of the first three innovation centres, Chair of the Digital Health Institute, Professor George Crooks OBE, said “We have ambitious plans to revolutionise the health service efficiencies in Scotland and at the same time improve patient experiences, as well as nurturing and inspiring our entrepreneurs to rise to the challenge and ensure Scotland remains at the forefront of the sector”¹⁹.

The Stratified Medicine Scotland Innovation Centre (SMS-IC) will be located at the new Learning and Teaching facility on the South Glasgow Hospital campus and is a partnership involving Health Science Scotland (the combined Scottish Medical Schools) and industry, including both local SMEs and major global companies.

Stratified medicine involves examining the genetic makeup of patients and their differing responses to drugs designed to treat specific diseases. By building up an understanding of the ‘strata’ of responses and the genetics of the diseases, medical researchers hope to create more personalised and effective forms of treatment. As well as the medical benefits, there is a clear economic argument for the development of stratified medicine. Of the £595 billion global spend for pharmaceuticals in 2011, an estimated £393 billion was used for therapies which did not produce the desired effect.

The SMS-IC will focus primarily on developing new forms of treatment for chronic diseases, including cancer, stroke, diabetes, rheumatoid arthritis and respiratory and cardiovascular diseases.

Speaking at the launch event at the South Glasgow Hospital Campus, David Sibbald, Chairman and CEO of Aridhia – the company providing the biomedical informatics platform and expertise for the Centre said:

*“The Stratified Medicine Scotland Innovation Centre is a globally significant program to determine the future of healthcare in the 21st century ... By combining our expertise with that of our academic, clinical and commercial partners, the SMS-IC will support the creation of new knowledge to inform the delivery of quality health care across the world and create economic growth for Scotland.”*²⁰

¹⁹ <http://www.scotland.gov.uk/News/Releases/2013/04/over-2000-jobs-at-new-30million-innovation-centres>

²⁰ http://www.gla.ac.uk/news/headline_275904_en.html

25. A fourth Innovation Centre – Industrial Biotechnology – was launched in February 2014 and a further four centres covering Aquaculture, Construction, Data Lab (Big Data) and Oil and Gas will be launched later this year.
26. Alongside these large-scale ambitious projects of excellence, the Scottish Government is leading wider efforts to strengthen business and university collaboration and embed innovation and creativity at the heart of our businesses. For example, in October 2013 we launched **Innovation Scotland**, a new **knowledge exchange initiative** – a shared strategy to improve the effectiveness of support for business growth.
27. Innovation Scotland will focus the efforts of SFC, the universities, the enterprise agencies and government on improving and simplifying the experience of Scottish businesses who work with Scotland’s universities to develop and exploit innovative ideas through a number of interventions including creation of a National Policy Forum; extension of the role of the SFC-funded matchmaking service ‘Interface’ (which provides a central hub connecting businesses from a wide variety of national and international industries to Scotland’s higher education and research institutes) and the provision of bespoke sectoral knowledge exchange resources.
28. Initiatives such as these typify the advantages of a small country in facilitating connectivity across boundaries – in this case supporting joint working between universities, business and the public sector. They also highlight the ability of the research base to respond quickly and flexibly to harness new opportunities. Such agility and adaptability is critical in competing successfully in a rapidly changing world and will ensure Scotland’s universities retain a competitive edge globally, continuing to attract inward investment to Scotland.
29. However, there remains scope for further progress and independence provides the opportunity to build on our existing successes to increase the ways in which research is transferred into economic growth and into the development of the social fabric of the country. By providing a clear focus on the strengths and requirements of the Scottish economy, business and academia, independence has the potential to further strengthen the environment for innovation and offers an opportunity to develop a more coherent framework for innovation in Scotland enabling the full range of economic levers – including taxation, public investment and economic regulation – to be utilised in a more co-ordinated and joined-up way. This coherent approach, combined with strong partnerships between our universities and businesses, will be critical to develop new and innovative approaches to research which will support our key industries and play a strong role in our future success as a nation²¹.

²¹ Further details on how independence would support an economy-wide focus on increasing innovation are set out in Chapter 6 of Building Security and Creating Opportunity, Scottish Government, November 2013, <http://www.scotland.gov.uk/Publications/2013/11/2439>

2. A GLOBALLY-CONNECTED RESEARCH COMMUNITY

Research excellence is underpinned by extensive collaborations across the globe – with independence we will maintain effective existing collaborations while extending our global reach with new networks and partnerships

30. The best research operates across boundaries be they disciplinary, institutional or nation state. Scotland’s universities are highly internationalised and have vast networks of academic and professional connections around the globe. Our universities collaborate across Scotland, the UK, Europe and internationally. With independence we will continue to participate in existing collaborations that work well while seeking to extend our global reach as an independent country.

Collaboration with the UK

31. Independence provides the ability for Scotland to take decisions in Scotland’s best interests. Scotland is currently a member of six unions²² and is seeking to become independent from only one – the political and economic union – in order that decisions about Scotland’s future are taken by the people who live and work in Scotland. At the same time we would look to use the powers of independence to recast these unions and make them work more effectively for Scotland.
32. We recognise the benefits – for the academic community, business and research charities – of maintaining long-term stability in research funding and systems that support initiatives of scale and researchers working together across boundaries enabling the UK to benefit from Scottish academic expertise and vice versa. We therefore see it as in the interests of both Scotland and the rest of the UK – who benefit from access to Scottish academic expertise, facilities and research excellence – to maintain **a common research area** including shared Research Councils, access to facilities and peer review.
33. The **Research Councils** system works well enabling, as it does, world-class researchers from across the UK to collaborate to the benefit of all across a wide range of disciplines without the prospect of collaborative projects having to be peer reviewed twice in different jurisdictions and to be successful in both to be funded.

A consortium of Scottish universities and NHS National Services Scotland has won over £10 million from a £39 million initiative to create a UK-wide health informatics research institute, to be known as the **Farr Institute**. The funding was awarded by a consortium of UK Research Councils, charity and government funders, led by the Medical Research Council. Scotland will host one of the four nodes of the Institute, and will also lead the UK-wide network. Scotland has long been a leader in the use of routinely collected health data for research and this new investment will help to keep us at the international cutting edge.

²² The political and economic union, the social union, the currency union, the union of the crowns, the defence union (through NATO), and the European Union

The Theory and Practice of Social Machines (SOCIAM), is an ESRC funded collaboration between the University of Southampton, the University of Edinburgh and the University of Oxford. The core objective of SOCIAM is to establish the research, methods, tools, networks and collaborations to allow the understanding of social machines, in order that they can be designed and deployed by the full range of potential beneficiaries. The research is complex, as the 'components' of the social machine are both human and technological; the incentives for participation vary widely from personal gain to reciprocity to social responsibility to altruism, while problem identification and solution design are both radically decentralised.

34. As well as benefiting universities, continued operation as a common research area would be welcomed by businesses and charities across the UK, facilitating continued collaborative projects with a range of institutions from across the UK. However, in all circumstances we will guarantee no adverse funding impact from Scotland's transition to independence and indeed believe that independence will bring opportunities for increased research funding through collaborations with the private sector and with partners in Europe and beyond.
35. In the same way that we see it as clearly in the interests of both Scotland and the rest of the UK to maintain a common research area, including shared Research Councils, we would view it as being in the interests of both Scotland and the rest of the UK to maintain our close working relationship with the UK Technology Strategy Board. The Technology Strategy Board (TSB) provides funding for innovation and its wide range of programmes and competitions are open to applicants from across the UK.
36. Under the current structure, Scotland's ability to contribute to the policy direction of the TSB is limited, which means that it may not always be in line with Scottish industrial or research strengths. Therefore, where there is a joint interest in priorities between Scotland and the rest of the UK – and it is to the mutual benefit of both countries – an independent Scotland could seek to continue to work with the TSB to deliver on shared objectives. Where priorities diverge, under independence future Scottish Governments would have the opportunity to develop policy approaches which address specific needs.

Collaboration within Europe

37. While the rest of the UK will remain an important research partner, we also want to extend our global reach using the opportunities independence provides to better promote Scotland overseas and engage in national and international fora building collaborations with other countries as a sovereign state. Scotland can already point to significant successes in working across European boundaries with international research centres increasingly attracted to Scotland by the quality of our research base including the Fraunhofer Centre for Applied Photonics – the first Fraunhofer Institute to be located in the UK; the European Lead Factory, a pan-European platform for drug discovery supported by the Innovative Medicines Initiative; and the first Max Planck International Partnership in the UK.

The **Fraunhofer Centre for Applied Photonics**, Europe's largest contract research organisation has chosen Glasgow as the destination for the organisation's first centre in the UK. Fraunhofer-Gesellschaft is creating a hub for laser research and technology in a strategic collaboration with the University of Strathclyde. The hub will be based in the University's Technology and Innovation Centre, which is due to open in 2014 and will cover a variety of sectors including security, healthcare, energy and transport. The photonics centre is being funded by Fraunhofer, the University of Strathclyde, the Scottish Government, Scottish Enterprise and the Scottish Funding Council.

BioCity Scotland is one of just three facilities in Europe capable of handling large compound collections. Its Automated Compound Store can store millions of samples in a highly controlled environment. Each sample can be individually retrieved by robots and delivered to research laboratories for High Throughput Screening (HTS), which provides an ideal test bed for new innovations in drug discovery. This helped BioCity Scotland, the University of Dundee and the Scottish Universities Life Science Alliance (SULSA) to join forces with Dutch and English Partners and win the £100 million Innovative Medicines Initiative (IMI) European Lead Factory Programme which will speed up the development of new drugs. The project will provide a base for 30 senior scientists working on drug compound screening.

38. We want to build on and further extend these kinds of partnerships with independence enabling Scotland to be more fully involved in the development of European research policy as an independent member state. We are following with interest progress in the further development of the **European Research Area** with its focus on strengthening transnational co-operation and enabling researchers and scientific knowledge to circulate freely to enhance Europe's global competitiveness. We support the European Commission in its ambition of 'a reinforced European research area partnership for excellence and growth'²³ with researchers, research institutions and businesses moving, competing and co-operating across borders more intensively.
39. These ambitions are reflected in **Horizon 2020**, the EU's new programme for research and innovation. Running from 2014-20 with a budget of just under €80 billion – including some €24 billion to support top-level research – Horizon 2020 offers a significant opportunity for Scotland's universities to further extend their global reach. Scotland has been an active player in the preceding research framework programmes – securing €636 million from the Framework Programme 7 (FP7)²⁴ which ran from 2007-13, equating to 10.4% of the UK total and 1.6% of the EU total over the period – but the combination of research and innovation budgets into a combined programme offers particular opportunities for Scotland, with our strong track record in research and innovation, to access new and larger sources of research revenue.

²³ Communication of the European Commission "A Reinforced European Research Area Partnership for Excellence and Growth" of 17 July 2012

²⁴ Of which Scottish universities and research organisations received €538 million for Research and Technological Development

Horizon 2020 is the financial instrument implementing the Innovation Union, a flagship initiative aimed at securing Europe's global competitiveness. Running from 2014-20 the EU's new programme for research and innovation is part of the drive to create new growth and jobs in Europe.

Horizon 2020 provides a major simplification of the funding landscape through a single set of rules and combining into a single pot the research and innovation funding currently provided through the Framework Programme for Research and Technical Development, the innovation related activities of the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT).

40. A programme to promote our support and ambitions for participating in Horizon 2020 throughout Scotland is underway. For example, the **Scottish European Research and Innovation Steering Group** has worked across key public sector agencies (including the enterprise agencies, Scotland Europa and the Scottish Funding Council) and with other stakeholders to prepare and deliver an awareness-raising programme. It is also working to ensure that support for innovation that is available through other EU programmes, such as through European Structural and Investment Funds, builds upon, rather than cuts across, our research and innovation ambitions for Scotland.
41. It also offers the small and medium sized enterprise (SME) community in Scotland a huge opportunity to secure research and development funding and participate in European projects. Participation in FP7 by Scottish SMEs represented some 17% of participations, and exceeded the participation target of 15% set by the European Commission for SMEs engagement within FP7's Cooperation sub-programme. Under the revised Horizon 2020 arrangements, we are seeking to increase SME participation and funding even further.

As part of its contribution to supporting the Scottish Research and Innovation Steering Group, the Scottish Funding Council recently extended the Innovation Voucher scheme with £400,000 of funding available to help a minimum of 80 Scottish small to medium enterprises (SMEs) break into the European research market. **The Horizon 2020 SME Engagement Scheme** intends to support SMEs to explore Horizon 2020 European research funding opportunities with the assistance of Scottish universities. The voucher scheme provides up to £5,000 of support for each project and is based on the Innovation Voucher Scheme run through Interface, which has already helped hundreds of Scottish SMEs access Scottish universities' research and academic expertise to develop new products, processes, and services. Under the new scheme, each SMEs' proposed programme of activity should lead to an increase in the number of applications for Horizon 2020 funding that will benefit the business and the Scottish economy.

"I am delighted to welcome the launch of the Horizon 2020 SME Engagement Scheme, administered by the team at Interface, which will provide Scottish business and university partnerships the opportunity to explore cross collaboration through competitive European funding calls."

Professor Peter Downes, Principal, University of Dundee, 19 September 2013²⁵

²⁵ http://www.sfc.ac.uk/web/FILES/PressReleases_SFPCR082013/SFCPR082013.pdf

42. Scotland is also reaching out to partners across Europe, joining in June 2013, the EU's Smart Specialisation Platform which will allow us to showcase Scottish research and innovation strengths and provide potential for new collaborators in research and innovation programmes from across the regions and institutes of the EU.
43. Our active engagement with partners within the European Union, enhanced by our position as an independent nation and full member state, will be complemented by continuing to develop and extend collaborations with our Nordic and Baltic neighbours outside the EU, building on existing research activity in areas of common interest. For example, there are existing embryonic collaborations between research groups in Norwegian and Scottish universities on the topic of water waves – including internal waves and surface waves. This includes The Norway-Scotland Waves Symposium organised under the auspices of an agreement signed in 2005 between the Norwegian Academy of Science and Letters (DNVA) and the Royal Society of Edinburgh (RSE) to promote increased collaboration between the two national academies and the research communities in their respective countries. The 3rd Norway-Scotland DNVA-RSE waves symposium took place on 16 September 2013 and a 4th symposium is planned in Scotland in 2015 to review collaborative research progress in the intervening period and to enhance sustainable collaborations in future years.
44. We are keen for Scotland to develop these links and will investigate further the opportunities for collaboration. A current priority for the Scottish Government is to promote innovation cooperation around Horizon 2020 through fostering and developing policy and university level partnerships and we will be encouraging Scottish bodies to work with Nordic and Baltic colleagues to develop valuable collaborative projects. In this context we will look closely at the example of NordForsk, an organisation under the Nordic Council of Ministers that supports Nordic research cooperation through funding, advice and input to inform Nordic research policy. With a membership comprising Finland, Iceland, Norway and Sweden, Nordforsk facilitates collaboration within all fields of research building on existing national priorities in the individual Nordic countries.

Global Collaboration

45. While we will continue to be an active player in Europe, a truly international higher education sector is fundamental to our ambitions for an independent Scotland. Internationalisation of higher education can bring a variety of benefits not only to our universities but to our students, businesses and society more generally. Our universities already have a very strong record of attracting students from around the world to study here. In 2012/13, 20% of students studying in Scotland were from outwith the UK, including 28,300 international students from outwith the EU²⁶. This internationalisation is further reflected in the academic staff body – in 2011/12, 15% of academic staff were from an EU member state other than the UK and a further 13% of academic staff in Scotland were of non-EU nationality²⁷.

²⁶ HESA – Non-UK domicile students, http://www.hesa.ac.uk/index.php?option=com_content&task=view&id=2663&Itemid=161

²⁷ Higher Education and the Question of Independence, Lindsay Paterson, http://www.royalsoced.org.uk/cms/files/events/programmes/2012-13/speaker_notes/LindsayPaterson.pdf

46. In that context we remain extremely concerned about the **damaging impact that UK Government immigration policies**, including changes to student visa rules, are having on our universities hindering their ability to attract and retain talented researchers. Independence would allow us to better support a thriving internationally connected and competitive university sector through the removal of damaging immigration restrictions and development of an immigration policy that encourages and attracts talent from around the world (see Chapter 4).
47. Our universities are already active players on the world stage extending their world-class teaching offering and forming partnerships and collaborations across the globe. For example, in October 2011, the First Minister opened Heriot-Watt University Dubai Campus, catering for around 2,500 students on programmes in management, built environment, engineering and textiles and are now looking to further extend their global reach through a new campus in Malaysia and developing a truly global network of 50 international academic learning partners in 30 countries. Elsewhere, the University of Glasgow and the University of Electronic Science and Technology of China (UESTC) successfully bid to the Chinese Ministry of Education for a Joint Educational Programme (JEP).
48. Similarly, Scottish universities are actively pursuing research collaborations with countries across the world.

The Universities of Strathclyde, St Andrews, Heriot-Watt and Glasgow, together with Stanford University and the California Institute of Technology (Caltech), are collaborating with local industry to build enduring relationships which form the basis of a network which helps to sustain the economic impact of photonics in both the UK and California. The project, known as **SU2P**, capitalises on leading research in the photonics sector, in fields including life sciences and renewable energy, and the commercial opportunities the research offers. It also bolsters existing links between universities and businesses in Scotland and the US, gives talented young researchers the opportunity to experience working in laboratories in California and enables businesses in the US and Scotland to share ideas and expertise with academics in both countries.

The **European Virtual Institute for Malaria Research (EViMalaR)** is a joint research Network of Excellence, funded by the European Commission and currently involving 62 partners from 51 institutes in Europe, Africa, India and Australia. Coordinated from the University of Glasgow, EviMalaR seeks to integrate malaria research that is directed towards a better understanding of the basic knowledge of the parasite, its vector and of the biology of the interactions between the parasite and both its mammalian host and vectors. The goal is to contribute to efforts to reduce the burden of malaria disease. According to figures released by WHO there were some 219 million cases of malaria in 2010 with an estimated 660,000 deaths from the disease – 90% of those in Africa.

49. Scottish universities are also increasingly collaborating together to harness global opportunities and to promote the Scottish brand. For example, recent trade missions to Hong Kong and Indonesia organised in conjunction with Scottish Development International, the British Council and Universities Scotland, have had a focus on the opportunities offered by the excellence of the Research Pools and the high quality of education available from the higher education sector within Scotland.

50. This is an exceptionally strong starting position and shows clearly the contribution Scotland makes internationally. Yet, a recent report by the British Council Scotland²⁸ highlighted that, while Scottish higher education has many distinctive assets, these assets and differences from the rest of the UK are not always fully recognised overseas.
51. The internationalisation of our higher education sector and promotion of Scotland as the educational and research destination of choice would remain a priority in an independent Scotland but with independence we would be better-placed to assert the Scottish brand on the world stage and secure a competitive edge in attracting talented academics to Scotland. As an independent nation state, Scotland will be in a stronger position to promote Scottish higher education overseas through a dedicated overseas diplomatic and trade network. This network will further enhance Scotland's visibility on the international stage, support Scottish universities and specialist institutions in promoting Scotland, its education and research expertise overseas and will assist in building long-term collaborative links with other countries.
52. We will also invest in the development of commercial opportunities for Scotland in key markets overseas. Co-ordinated teams of trade experts and diplomats will represent Scottish interests, opening up markets – including education markets – and assisting Scottish businesses and universities to expand internationally. Supported by an immigration policy that welcomes international students and high calibre researchers from across the world, our approach to global affairs and promoting Scotland overseas, will support increased research investment in our universities and underpin the continued and increased prosperity of the nation.

²⁸ A Strategic Analysis of the Scottish Higher Education Sector's Distinctive Assets, Neil Kemp and William Lawton, British Council Scotland 2013

3. A RESEARCH FUNDING POLICY AND LANDSCAPE RIGHT FOR SCOTLAND

The ability to determine our own destiny – with independence we will have full powers to develop a funding policy and landscape tailored to Scotland’s strengths and needs and will ensure that the levels of public investment in university research are sufficient to enable our researchers and universities to remain internationally competitive

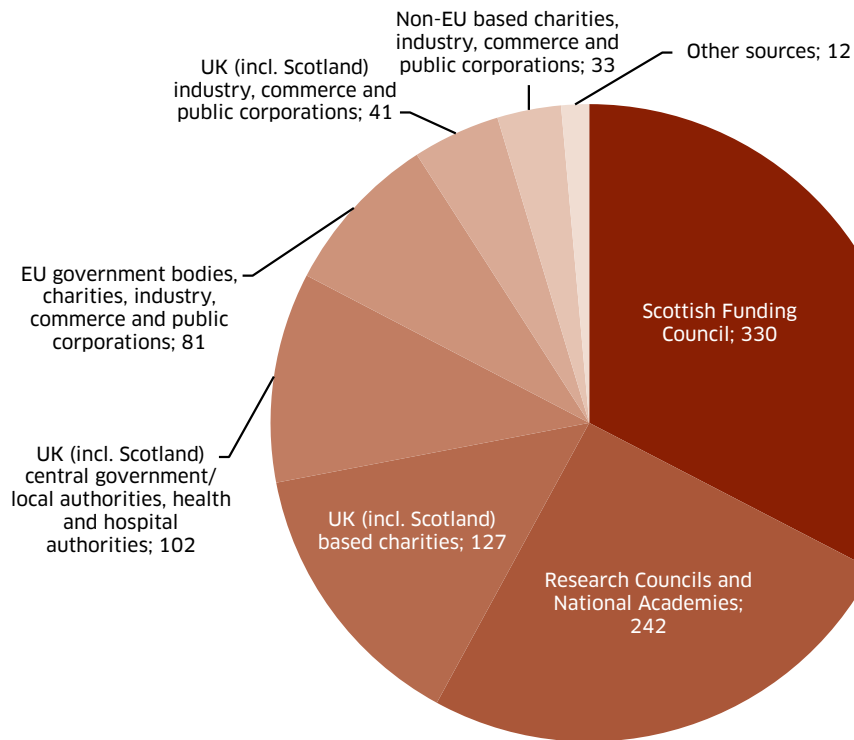
53. Public funding for university research in Scotland and across the UK is currently delivered by a **dual support system** comprising:
- (i) a block grant given by the funding council of each country (funded from devolved budgets) and;
 - (ii) competitively awarded grants from the UK-wide Research Councils (funded through the tax base).
54. These two sources make up the majority of university research income. In 2012/13 Scottish universities received a third of their research income (£330 million) from the Scottish Funding Council and won a further quarter (£242 million) in competitive funding from the Research Councils and National Academies (representing 15.7% of the £1.5 billion won by UK HEIs). Additional public funds can be won from other sources – see Table 1 and Figure 3 below.

Table 1: Sources of Scottish universities’ income from research grants and contracts (% of total research grants and contract income)²⁹

	Income 2012/13 (£ million)	% from research and grants
Scottish Funding Council	330	34.0%
Research Councils and National Academies	242	24.9%
UK (incl. Scotland) based Charities	127	13.1%
UK (incl. Scotland) central government/local authorities, health and hospital authorities	102	10.6%
EU government bodies, charities, industry, commerce and public corporations	81	8.4%
UK (incl. Scotland) industry, commerce and public corporations	41	4.3%
Non-EU based charities, industry, commerce and public corporations	33	3.4%
Other sources	12	1.2%
TOTAL	969	100%

²⁹ HESA Finance plus 2012/13 Table 5b, The SFC figure, comprising funding for research and knowledge exchange, is not listed in the HESA Finance Plus Publication and is provided for comparative purposes only

Figure 3: University research income 2012/13 (£969 million)



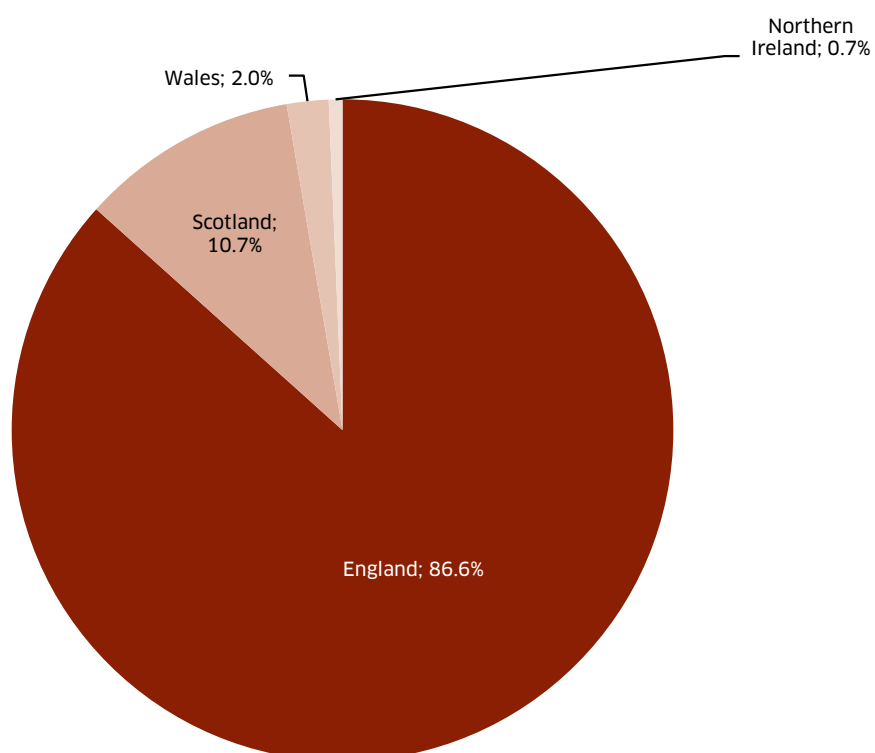
55. By focusing on funding won by HEIs, the HESA figures however, do not represent the totality of Research Council funding accruing to Scotland. According to data provided by the RCUK, Scotland secured £307 million from the Research Councils in 2012/13 representing 10.7% of total Research Council spend of £2.9 billion. Within this overall figure, Scotland secured 13.1% of the £2.0 billion funding to HEIs (for grants, studentships and fellowships) and 5.4% of £927 million funding to Research Council institutes, independent research organisations (IROs) and infrastructure funding (see Table 2 and Figure 4)³⁰.

³⁰ Figures received from Research Councils UK, <http://www.rcuk.ac.uk/about/aboutrcs/research-funding-across-the-uk/>

Table 2: Estimated Research Council expenditure (£m)

	2010/11	2011/12	2012/13	Average for 2010/11 to 2012/13
Research funding to HEIs including grants, studentships, fellowships				
UK spend	1,866	1,976	1,954	1,932
Scotland spend	239	243	257	246
% spend in Scotland	12.8%	12.3%	13.1%	12.8%
Research funding to Research Council Institutes, IROs, infrastructure funding				
UK spend	1,014	1,001	927	981
Scotland spend	86	55	50	64
% spend in Scotland	8.5%	5.5%	5.4%	6.5%
Total Research Council expenditure				
UK spend	2,881	2,977	2,880	2,913
Scotland spend	325	298	307	310
% spend in Scotland	11.3%	10.0%	10.7%	10.6%

Figure 4: Share of Research Council spend by country 2012/13



56. The block grants that universities across the UK receive for research is predominantly quality related (QR) (Research Excellence Grant, REG, in Scotland) funding, allocated on the basis of prior performance. The key data for assessing the distribution of QR funding are the size of research groups and the quality of work as judged by a cross-UK assessment of research quality developed and delivered through a partnership of the four funding bodies³¹. The amount and distribution of QR money is determined within each nation.
57. Publicly-funded investment by the Scottish Funding Council is also used to support Scottish priorities reflecting both the strengths and needs of our research base and the economic and societal issues that require to be addressed.

The **Research Assessment Exercise (RAE)** ranked research on the basis of its originality, significance and rigour as unclassified or one of:

4* – world-leading;

3* – internationally excellent;

2* – internationally recognised;

1* – nationally recognised.

In the 2008 RAE, 15% of research submitted from Scotland was classified as world-leading³².

58. The UK also operates as a 'single research area' supporting collaborative research and access to facilities for researchers throughout the UK.

Future Funding Options

59. The dual support system, comprising funding from the Scottish Funding Council (based on research quality and addressing Scottish priorities) and competitively awarded grants from Research Councils (supporting research excellence), works well. We will maintain this approach with independence.
60. Within this overarching approach there are a number of options for research funding. A review of research funding in Scotland undertaken by Professor Ian Diamond, Principal University of Aberdeen and former Chief Executive of the Economic and Social Research Council, identified a number of options including:
- a) Maintenance of the current **single research area arrangements** including pan-UK Research Councils.
61. This option would facilitate continuing collaborative research enabling world-class researchers across Scotland and the rest of the UK to collaborate across a wide range of disciplines without the prospect of joint projects having to be peer reviewed twice in different jurisdictions and to be successful in both to be funded. It would also maintain a common framework for peer review (ensuring consistent quality assessment) and support economies of scale in the funding of research and scientific facilities.

³¹ The last Research Assessment Exercise took place in 2008 and is being replaced by the Research Excellence Framework which assesses the impact as well as the quality of research

³² <http://www.universities-scotland.ac.uk/uploads/briefings/ResearchFF120511.pdf>

b) Establish a **Scottish Research Council**

62. While scale would argue against replicating a framework of seven Research Councils, a second option would be to establish a **Scottish Research Council** with a small number of disciplinary sub-sections. Such a model would allow Scotland to retain a major programme of blue skies research across all disciplines and identify funding priorities directly in line with Scottish interests and priorities.
63. A Scottish Research Council might fulfil a number of roles including: funding programmes and research studentships, leading decisions on the allocation of research funds and representing Scotland's interests in international discussions around use of facilities and locations of international initiatives. In such circumstances Scotland would ensure that the levels of public investment in university research enable our researchers to remain internationally competitive. As part of this commitment we guarantee that current levels of government investment in university research (through SFC and the Research Councils) will be at least maintained while also supporting universities in securing additional research investment from extended collaborations with overseas partners and with the private sector.
64. A Scottish Research Council might also be used as a mechanism to route funding into pan-UK Research Councils ensuring that funding decisions are underpinned by the Haldane Principle.

c) A **Mixed Model**

65. Thirdly, Scotland could consider establishing a '**mixed model**' combining a Scottish Research Council with buying into funding programmes in other countries, most notably those of RCUK, where these overlapped with Scottish priorities – much as currently happens in areas of devolved responsibility. For example, devolved rural research monies were used to enter into a partnership with RCUK for the Living with Environmental Change research programme while SFC used devolved funds, to join an ESRC/AHRC initiative on Language Based Area Studies enabling funding of Centres in Edinburgh and Glasgow.
66. There would also be scope for exploring the development of **common research areas** and development of common research programmes with other countries both within Europe and beyond including, for example, our Nordic neighbours (see Paragraphs 38-45).
67. At the same time, and outwith the future funding options set out above, we will review existing research funds within Scottish Government and, where appropriate, partner bodies including Scottish Enterprise to explore the scope for bringing together these funds into a small number of research streams. The current collaboration between Scottish Funding Council, Scottish Enterprise and Highlands and Islands Enterprise in establishing a network of Innovation Centres demonstrates the benefits of a partnership approach. Building on this work to consolidate or align different research funding streams would enable resources of scale to be directed at national priorities.

Our Approach

68. We recognise the benefits – for the academic community, business and research charities – of maintaining long-term stability in research funding and systems that support initiatives of scale and researchers working together across boundaries. **With independence we would seek to agree continuity of a single research area**

with the UK with shared Research Councils (Option a) recognising the benefits this brings to academic communities both north and south of the border in terms of collaboration, enabling the UK to benefit from Scottish academic expertise (and vice versa) and supporting a world leading research base.

69. As part of a common research area, universities across the UK would continue to benefit from the economies of scale to be achieved in **shared access to research and scientific facilities**. These include facilities run by individual universities and research institutes, those run in partnership with other funders and those owned and operated by RCUK. There are currently 49 RCUK owned and operated facilities in the UK. These include the National Nuclear Laboratory, the Diamond Light Source, Rutherford Appleton Laboratory and Daresbury. Seven of these facilities are located in Scotland including ARCHER (Academic Research Computing High End Resource), and the UK ATC (Astronomy Technology Centre).
70. These Research Council facilities are shared assets and a shared resource available to researchers across all of the UK as well as, in some instances, available for use by academia and industry in the UK and Europe. At the same time, subscription funding from the RCUK allows access to international facilities for researchers based in Scotland and the rest of the UK including, for example, the accelerators at the European Organisation for Nuclear Research (CERN), the telescopes of the European Southern Observatory (ESO) and the neutron facilities at Institut Laue-Langevin (ILL).
71. Both Scotland and the rest of the UK benefit from sharing research facilities and infrastructure which supports collaboration and efficiency. The Wakeham Review, Financial Sustainability and Efficiency in Full Economic Costing of Research in UK Higher Education Institutions (2010), made two specific recommendations which are relevant here:
 - Recommendation 7 – We consider that the greater intensity of utilisation of assets by HEIs should be encouraged, particularly the sharing of research equipment and facilities.
 - Recommendation 14 – We recommend that the assessment processes of the Research Councils should encourage more intensive use of existing assets across the research base.
72. The Scottish Government accepts the validity of these recommendations. Scotland and the rest of the UK's research base can only be made stronger with increased collaboration and sharing of facilities both within and between countries. The current rules put in place by the Research Councils regarding capital funding on research grants requires applicants to show that they have looked at alternative provision, such as sharing other available assets either locally or further afield; it requires universities to commit co-funding from their own resources in proposals for mid-range equipment; and requires the submission of a strategic business case, making reference to broader cross-UK strategic considerations regarding the asset and its location, on high-cost assets.

73. The Scottish Government would support a similar approach continuing post-independence. As a partner and direct co-funder of the Research Councils we would support a strong emphasis on sharing research equipment and facilities to the benefit of the academic community in both countries. We would also support funding collaborations with other funders including charities, business and universities themselves. Our funding for shared Research Councils would also support subscription costs, where required, for access to facilities based outwith the UK. Scottish researchers would also continue to access facilities funded by other bodies based on science excellence in collaboration with other partners from across the UK and beyond much as they do now.

The **Centre for Innovative Manufacturing in Continuous Manufacturing and Crystallisation** (CMAC) based at the University of Strathclyde is an international technological collaboration with global firms (including GSK, Novartis, AstraZeneca), Cancer Research UK and academic partners at the Universities of Bath, Cambridge, Edinburgh, Glasgow, Heriot-Watt, and Loughborough.

The Centre's internationally-leading research team are working pre-competitively to establish a world-class facility to accelerate innovative technology delivery and establish new supply chains for medicines. In addition to investment from GSK, Novartis, AstraZeneca and Cancer Research UK, public funding has been received from the Engineering and Physical Sciences Research Council (EPSRC), the UK Research Partnership Investment Fund (UKRPIF), the Scottish Funding Council, the UK Technology Strategy Board and the European Union.

The combination of public and private sector investment allows these facilities to further develop in order to support the cutting-edge manufacturing research programme. In strengthening the National Centre's capabilities, the state-of-the-art facilities will not only benefit researchers at Strathclyde but the wider UK academic and industrial community.

The **GreenCow** facility is part of Scotland's Rural College (SRUC) and located at their Beef and Sheep Research Centre at the Bush Estate near Edinburgh. Opened in March 2011, it is a world-class research facility funded by the European Regions Development Fund, the Scottish Government and SRUC and it is used for inter-linking projects funded by Defra, the Scottish Government and other devolved administrations, together with EBLEX (the organisation for beef and lamb levy payers in England).

The data collected from GreenCow will help inform models used to advise policy makers and industry on farming methods with a lower carbon footprint and will assist research on reducing livestock greenhouse gas emissions.

The facility has been integral to the research carried out by the Agricultural Greenhouse Gas Inventory Research Platform, a partnership of universities, research institutes and private companies delivering one of the largest government funded research programmes in the United Kingdom on measuring and mitigating greenhouse gas emissions.

Copies of GreenCow are being built in Brazil, Indonesia, Australia and New Zealand, showing that Scotland is leading the way in reducing uncertainties in the area of methane emissions from livestock.

74. Scotland would also continue to participate in a **common framework for the assessment of research quality** – as it has chosen to do since devolution – providing an important benchmark of research quality that serves academics north and south of the border well supporting collaboration across the UK and with partners in Europe and further afield.
75. As well as benefitting universities in Scotland and the rest of the UK, continued operation as a common research area would be welcomed by businesses and charities facilitating continued collaborative projects with a range of institutions from across the UK.

“Running a single overall excellence-based system for research funding across the UK works very well for everyone.” David Willetts Minister for UK Universities and Science, *Holyrood Magazine*, January 2013

“I can’t see it’s in the interests of anyone in the rest of the UK to want to exclude Scotland, nor is it in the interest of Scotland to be excluded from collaboration.” Professor Sir Ian Diamond, Principal of The University of Aberdeen and former Chief Executive, Economic and Social Research Council, *Scotland on Sunday*, 1 September 2013

“..there is no reason why any form of constitutional change should preclude participation in higher order Research Councils.” Professor Sir Timothy O’Shea, Principal of Edinburgh University, *The Times*, 13 April 2013

“We strongly support Scotland retaining its position in a single research ecosystem... We would like to see a single research system continue whether there is a yes vote for independence or not.” Professor Paul Boyle, Chief Executive of Economic and Social Research Council, representing Research Councils UK, *Education and Culture Committee, Official Report* 25 March 2014

76. We believe that maintaining a single research area and shared Research Councils would be in the interests of both Scotland and the rest of the UK and with independence we would seek to agree continuity of the Research Councils and their role in funding research in Scotland, including access to shared facilities and datasets for the benefit of researchers across the UK.
77. As highlighted in Paragraph 5, the excellence of the Scottish research base is reflected in Scotland winning a greater than population share of Research Council competitive awards and a slightly greater share of overall Research Council funding. It has been suggested that Scotland might be required to contribute funding in line with the proportion of funding secured by Scottish universities. We believe that the allocation of research funding via shared Research Councils should be based on merit not geography and with independence, we would intend to negotiate with the UK Government a fair funding formula for Scotland’s contribution based on population share but taking reasonable account of the fact that the amount of research funding received by Scottish institutions from the Research Councils may reflect higher or lower levels of funding.

78. At the same time we do not consider that Scotland is unfairly advantaged in the current system. Over the three years, 2010/11 to 2012/13, Scotland secured 10.6% of total research council spend while contributing 9.4% of UK tax receipts with the difference over the three years ranging from just 0.2 percentage points to 2 percentage points. It is also important to note that Scotland's public finances are currently in a stronger position than the UK as a whole providing a strong basis for continued and enhanced investment in the research base.
79. The National Statistics publications, Government Expenditure and Revenue Scotland (GERS) provides estimates of Scotland's public finances under the current constitutional framework³³. In doing so it estimates all tax revenue generated in Scotland and all public spending undertaken on behalf of Scotland. When quantifying public spending for Scotland, all spending undertaken directly for Scottish residents and businesses by every tier of government, including the UK Government, the Scottish Government and Scottish Local Authorities is included. This includes the funding received by Scottish universities from the Research Councils.
80. Analysis of the official statistics included in GERS shows that over the period from 2008/09 to 2012/13, Scotland was in a stronger fiscal position than the UK as a whole. When expressed in cash terms, this relatively stronger fiscal position was equivalent to £8.3 billion, or £1,600 per person³⁴. It is therefore clear that Scotland has the financial capacity to maintain funding for the activities funded by the Research Councils in Scotland at their current level.
81. With independence, Scotland's contribution to the Research Councils would come from the Scottish Government budget. This would create more transparency and clearer accountability around our investment enabling Scottish interests – such as our commitment to enhanced postgraduate training – to be better and more consistently reflected in the identification of Research Council priorities. More widely, we would also use the opportunity provided through independence to enhance Scotland's input into the running and functioning of the Research Councils.
82. In the spirit of the current arrangements we would ensure that the Research Councils continue to make awards on the basis of merit and in line with the Haldane Principle recognising that decisions about what research to fund are best taken by researchers. We would also support continued funding of fundamental 'blue sky' research as an essential underpinning of innovation and critical to attracting inward investment.
83. Working with the rest of the UK as part of a single research area is consistent with the approach we have taken since devolution where we have consistently supported and been active partners in cross-UK wide systems and processes (such as the UK-wide Research Excellence Framework (REF)) and invested devolved research budgets in cross-UK research programmes recognising the importance of collaboration in research and the value of sharing expertise across geographical boundaries.

³³ Further information on GERS is available on the Scottish Government website, <http://scotland.gov.uk/gers>

³⁴ A detailed briefing note is available alongside the News Release on the Scottish Government website: <http://news.scotland.gov.uk/News/Scotland-s-finances-a4c.aspx>

84. For example, in health, the Chief Scientist Office (CSO) within the Scottish Government co-funds a number of research units jointly with the Medical Research Council (MRC), such as the MRC/CSO Social and Public Health Sciences Unit and the Scottish Collaboration for Public Health Research and Policy, and is a member of a number of funding consortia involving UK Research Councils, charities and government departments. Initiatives funded through such consortia include the National Prevention Research Initiative, the Translational Infection Research Initiative and the eHealth Informatics Research Centres initiative.
85. The CSO also contributes to a number of National Institute of Health Research (NIHR) funding streams so that Scottish priorities are taken into account in the development of the programmes, and to ensure that researchers in Scotland are eligible to apply. This funding model has been highly successful. Researchers based in Scotland are estimated to have won 9.8% of Medical Research Council funding in 2011/12, but 14.6% of NIHR awards in the funding streams in which we participate.
86. It also aligns with recent initiatives by the Research Councils to extend collaborations and collaborative funding arrangements with partners outwith the UK. For example, Research Councils UK (RCUK) recently signed a Statement of Intent with Fonds National de la Recherche (FNR) in Luxembourg introducing a 'Lead Agency' arrangement. Under this arrangement UK and Luxembourg researchers who want to work together can write a single collaborative proposal that goes through a single peer review process rather than having to make separate bids to their own funding councils. This avoids the risk of 'double jeopardy' where funding might be approved in one country but not in the other.
87. Similarly, in November 2013 the Arts and Humanities Research Council (AHRC) and the Economic and Social Research Council (ESRC) signed an agreement with the Swiss National Science Foundation (SNSF) within which the parties agree to reciprocally open their national research project funding schemes to collaborative proposals involving researchers from the other country.

“Addressing the major global societal challenges requires collaboration across disciplines and national boundaries. Like the AHRC and ESRC, the SNSF is committed to finding ways to remove barriers to international collaboration, allowing the brightest minds to work together regardless of where they are based. Opening up national project funding to international co-investigators is a simple and effective way of encouraging such collaboration and I am therefore pleased to sign this joint statement, which I hope this will be the first of several with other sister agencies internationally.” Professor Paul Boyle, Chief Executive of Economic and Social Research Council, on the signing of the agreement³⁵

³⁵ The UK and Switzerland collaborate to support international research excellence, 11th November 2013, <http://www.esrc.ac.uk/news-and-events/announcements/29152/the-uk-and-switzerland-collaborate-to-support-international-research-excellence.aspx>

88. More widely, through Science Europe – an organisation set up to promote the collective interests of the Research Funding and Research Performing Organisations of Europe – the RCUK have developed a ‘toolkit’ comprising a number of mechanisms (including Lead Agency arrangements) to facilitate cross-border research collaboration within Europe³⁶.
89. RCUK is also exploring wider international collaborations and have recently entered into a new two-way lead agency agreement with the United States National Science Foundation (NSF) that enables a simplified and flexible process for researchers wishing to apply for UK-US collaborative research funding. The agreement will be in place until 2018 and an operational management plan has been put in place, which will lay the foundation for future collaborations between the Research Councils and other NSF Directorates, as well as between RCUK and other national funding agencies³⁷.

In a programme designed to transform future farming while reducing pollution and energy demands, researchers at the University of Edinburgh and Imperial College London, are to work together with the Carnegie Institution of Science, Pennsylvania State University and Massachusetts Institute of Technology, USA, on a collaboration funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and US National Science Foundation (NSF) to address the growing global food demand, which will need 190.4M tonnes of nitrogen-fertiliser by 2015. The goal is to provide plants with the capacity to harvest nitrogen from the environment to make their own fertilizer rather than having it provided for them.

90. Maintaining a single research area and common systems and processes is also consistent with the drive at a European level to increase transnational research co-operation, collaboration and partnership (see Paragraph 39) which we would be better-placed to support and promote as an independent nation.

³⁶ <http://blogs.rcuk.ac.uk/2013/10/01/crossing-borders-removing-barriers/>

³⁷ <http://www.esrc.ac.uk/news-and-events/announcements/28126/groundbreaking-two-way-lead-agency-pilot.aspx> (5th September 2013)

4. A SUPPORTIVE ENVIRONMENT FOR RESEARCH

Independence offers wider opportunities and benefits – with independence we will be able to create an environment that better supports a vibrant and flourishing research base

91. While we will look to build on what works, we will also harness the clear opportunities independence brings for Scotland and our research base. In particular, independence will give future Scottish Governments **additional financial levers which could be used to support and encourage innovation and research investment**. For example, there would be the potential to use either direct financing levers (such as the provision of loans and guarantees; the use of competitive grants; and innovation vouchers) or indirect levers (normally tax based incentives) to incentivise research investment.
92. Indirect financing levers normally provide tax incentives aimed at encouraging innovation activities and can be applied to either expenditure (related to R&D) or income (from the benefits of R&D). Potential levers include R&D tax credits; tax allowances; payroll tax reductions for workers involved in R&D; and preferential tax rates on income accruing from investment in knowledge and innovation. Such incentives can be targeted at specific types of firms – where there was deemed to be particular barriers to investing in R&D – such as SMEs.
93. Independence would also enable Scotland to ensure that we have an intellectual property and patent system that best supports Scotland’s needs and the stimulation and financing of research and innovation³⁸.
94. Smaller economies have tremendous potential to operate as international test beds for new technologies. Science and research are closely linked to innovation and it is the ability to translate the scientific excellence, which Scotland can clearly demonstrate, into innovation and new technologies which will support the development of Scotland as an independent country.
95. The Global Innovation Index (GII) 2013, published by Cornell University, INSEAD and the World Intellectual Property Organisation (WIPO) looked at 142 economies around the world, using 84 indicators including the quality of top universities, availability of microfinance and venture capital deals – gauging both capability of innovation and measurable results. The GII 2013 ranked the UK at number 3 (see Table 3 below) but it is interesting to note that many small European countries (including countries of a similar size to Scotland such as Sweden, Finland and Ireland) were also in the top ten, demonstrating the innovation potential that can be harnessed by smaller economies.
96. Scotland’s universities can already point to successful innovative activity and translation of research into economic success (see Chapter 1). With independence future Scottish Governments would have much greater opportunities to further strengthen the relationships and linkages between key partners in innovation – including businesses, universities, funding providers, and public sector agencies –

³⁸ Further details on economic policy choices in an independent Scotland are set out in Building Security and Creating Opportunity, Scottish Government, November 2013, <http://www.scotland.gov.uk/Publications/2013/11/2439>

and establish a coherent framework for supporting innovation in Scotland with co-ordinated use of the full range of economic levers.

Table 3: Global Innovation Index (GII) 2013

GII Top Ten 2013 ranking ³⁹	
1	Switzerland
2	Sweden
3	United Kingdom
4	Netherlands
5	United States of America
6	Finland
7	Hong Kong (China)
8	Singapore
9	Denmark
10	Ireland

97. Independence will also give Scotland a **clear platform to engage in international arenas** and a greater opportunity to influence research agendas as a sovereign state. This would be particularly the case within Europe where independence would give us a far more stable basis to engage in European activity. This Government is committed to our relationship with Europe and strengthening Scotland’s voice in Europe will ensure that Scottish interests are fully represented at the European level, while making clear to the rest of Europe the wealth of experience and resources Scotland has to offer as a nation. As a full member state, Scotland would have a stronger voice being able to take our own seat at the table to ensure Scottish representation in European research policy and funding forums and removing uncertainties around continued UK membership and commitment to the European Union.
98. Independence would also enable us to have a **controlled, transparent and efficient immigration policy that meets the needs of Scottish society**. Scottish universities are highly attractive to overseas students with Scotland welcoming over 45,000 students from overseas each year including 28,300 international students from outwith the EU. These students make a huge contribution to Scotland. In 2012/13 Scottish institutions received an income of £374 million⁴⁰ from non-EU course fees alone as well as benefitting from the wider contribution that international students make to Scotland’s economy and society.

³⁹ Gil 2013: <http://www.globalinnovationindex.org>

⁴⁰ Higher Education Statistics Agency HE Finance Plus

99. However, failures in UK immigration policies, including changes to the student visa rules, are putting that at risk and are widely recognised as damaging to the university sector preventing and deterring international students from some parts of the world from coming to Scotland and creating barriers to the in-movement and interchange of world-class researchers and students. For example, the number of students from India in Scottish higher education institutes has almost halved – from 3,290 in 2010/11 to 1,665 in 2012/13 while the number of students from Pakistan decreased by 39% (from 860 to 525)⁴¹.

“It is deeply worrying to see such steep declines in students from India, Nigeria and Pakistan studying in Scotland. These are important markets for Scottish higher education and countries with which we have long-standing academic relationships...It is telling that such a fall occurred only months after the UKBA announced the end to its post-study work route for international students.”
Alastair Sim, Director of Universities Scotland, *The Scotsman*, 12 February 2013

100. In evidence to the Education Committee on 2 October 2012, the Scottish Council for Development and Industry (SCDI) warned that their “biggest source of concern” for research in Scotland was Westminster’s tightening of student visas noting that that student visas “is a huge challenge to universities socially and financially and to Scotland economically”.

“The UK’s visa regime is now significantly more restrictive than that applied by a range of competitor nations who are vigorously seeking to attract talented learners from around the world. This places the UK, including Scotland, at a competitive disadvantage.” Universities Scotland, *Universities in a dynamic constitutional environment*, November 2012.

101. With independence, this Government plans to reintroduce the post-study work visa which will encourage more talented people from around the world to further their education in Scotland, providing income for Scotland’s education institutions and contributing to the local economy and community diversity⁴². We will actively promote a welcome for international students in the markets where we continue to be successful, such as China, and the markets like India, Pakistan and Africa where UK policies are having a detrimental impact. This strategy will also apply to the recruitment of overseas academics.

⁴¹ Higher Education Statistics Agency

⁴² Further details on immigration in an independent Scotland are set out in Chapter 7 of *Scotland’s Future: Your Guide to an Independent Scotland*, November 26th 2013 <http://82.113.138.107/00439021.pdf>

CONCLUSION

102. Scotland has a world-class higher education sector with a track record of success in attracting investment from a range of sources reflecting the excellence and global reputation of our universities and the quality of their research. With independence, we will be better-placed to support a further strengthening and enhancement of our world-class research base through strategic investment in our universities, their research excellence and the translation of that excellence into economic and social impact for Scotland facilitated by access to the full range of economic levers and the opportunity this provides to create a more coherent framework for research and innovation.
103. Research excellence is underpinned by collaboration and we will maintain existing collaborations that work well – such as remaining part of a common research area with the rest of the UK – recognising the benefits of systems that support initiatives of scale and researchers working together across boundaries. At the same time, we will further extend our global reach supporting the drive at a European level to encourage greater transnational research cooperation and collaboration and building on existing success in establishing effective international partnerships and attracting international research centres to Scotland.
104. Our universities are already active players on an international stage and independence provides the opportunity to further support a thriving internationally connected and competitive university sector with the better promotion of Scotland and our universities overseas through a dedicated diplomatic and trade network and through the development of an immigration policy that encourages and attracts talent from around the world.

GLOSSARY

British Council: the UK's international organisation for educational opportunities and cultural relations.

Common Research Area: ensures no barriers to collaborative research and access to facilities for researchers throughout the UK. It allows world-class researchers across the UK jurisdictions to collaborate to the benefit of all across a wide range of disciplines without the prospect of collaborative projects having to be peer reviewed twice in different jurisdictions and to be successful in both to be funded.

Dual Support System: funding system for university research comprising block grants given by the funding council of each UK country (funded from devolved budgets) and; competitively awarded grants from the UK-wide Research Councils (funded through the UK tax base).

European Research Area (ERA): formed in 2000, the European Research Area (ERA) is a system of scientific research programmes integrating the scientific resources of the European Union (EU).

Global Excellence Initiative: a two year initiative funded by the Scottish Funding Council to help further boost Scottish output of world-leading research and the international reputation and standing of Scotland's universities.

Haldane Principle: describes the principle that decisions about what to spend research funds on should be made by researchers rather than politicians. It is named after Richard Burdon Haldane, who in 1904 and from 1909-18 chaired committees and commissions which recommended this policy.

Horizon 2020: the EU's new programme for research and innovation. Horizon 2020 runs from 2014-20 and has a budget of just over €70 billion.

Innovation Centres: collaborations between universities, businesses, enterprise agencies, the Scottish Funding Council and others to enhance innovation in and across Scotland's key economic sectors. Innovation Centres will have significant economic impact.

Innovation Scotland: the umbrella name for the movement, involving Scottish Funding Council, universities, enterprise agencies and others, to improve and simplify the experience of Scottish businesses who work with Scotland's universities to develop and exploit innovative ideas.

Interface: a national programme which match-makes businesses with research resources in our universities and research centres.

QS World University Rankings (QS Rankings): annual university rankings published by Quacquarelli Symonds (QS) which provides overall rankings as well as ranking for individual subjects.

Research Pools: created by the Scottish Funding Council to enable leading researchers across Scotland's universities to pool their resources and maximise their contribution to research excellence through collaboration.

Research Assessment Exercise (RAE): a system for ranking research on the basis of its originality, significance and rigour. Forms the current basis for allocation of Research Excellence Grant.

Research Excellence Framework (REF): the new system for assessing the quality of research in UK higher education institutions (HEIs). It replaces the RAE. The first REF exercise will be completed in 2014.

Research Excellence Grant (REG): block research grant provided by the Scottish Funding Council to universities, currently on the basis of their RAE 2008 results. REF results will determine allocation of REG post-2014.

Research Councils (RCs): seven publicly funded agencies responsible for co-ordinating and funding particular areas of research from medical and biological sciences to astronomy, physics, chemistry and engineering, social sciences, economics, environmental sciences and the arts and humanities.

The seven are:

- Arts and Humanities Research Council
- Biotechnology and Biological Sciences Research Council
- Engineering and Physical Sciences Research Council
- Economic and Social Research Council
- Medical Research Council
- Natural Environmental Research Council
- Science and Facilities Research Council

Research Councils UK (RCUK): the strategic partnership of the UK's seven Research Councils.

Scottish Funding Council (SFC): is the public body that distributes funding from the Scottish Government to the country's colleges and universities. It was set up by the Further and Higher Education (Scotland) Act 2005, and was established on 3 October 2005 when the Scottish Further Education Funding Council and the Scottish Higher Education Funding Council merged.

Spin-outs: new, small, companies formed to exploit Intellectual Property developed during the course of an individual's employment in a larger organisation – often a university.

Technology Strategy Board (TSB): UK public body operating at arm's length from the UK Government reporting to the Department for Business, Innovation and Skills (BIS). Its aim is to accelerate economic growth by stimulating and supporting business-led innovation.

Times Higher Education World University Rankings (THE Rankings): global university performance tables that judge world-class universities across their core missions of teaching, research, knowledge transfer and international outlook.



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