

BiGGAR Economics

University of Strathclyde Economic Impact Study

A report to



17th September 2013

BiGGAR Economics

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1 EXECUTIVE SUMMARY

The University of Strathclyde is a “place of useful learning”; this is the University’s founding statement, guiding philosophy and statement of purpose for the future. Through the realisation of this purpose, the University generates economic impact, through its day-to-day operations of generating income for teaching, research and knowledge transfer, purchasing supplies, employing staff and capital investment and through a range of activities that involve engaging with partners to solve problems of significance to contemporary society. The baseline economic impact of the University of Strathclyde for 2012/13 has been estimated as:

- £276.5 million gross value added (GVA) and 7,805 jobs in Glasgow;
- £489.7 million GVA and 13,031 jobs in Scotland; and
- £527.5 million GVA and 13,194 jobs in the UK.

When the increased future productivity (associated with a one year cohort of graduates) is included the total economic impacts are estimated at:

- £523.3 million GVA in Glasgow;
- £1,009.3 million (i.e. £1 billion) GVA in Scotland; and
- £1,118.7 million (i.e. £1.1 billion) GVA in the UK.

However, this figure is an understatement of the University of Strathclyde’s impact on the economy and of the impact of its partners’ investment in Scotland and consequent economic benefits. The University’s collaborative relationship with industry and the public sector and the leadership role it has in delivering innovation and the development of competitive advantage in priority sectors is crucial to future economic performance; however, this scale of this impact is hard to measure due to its intangible nature.

While the full long term economic impact of the University of Strathclyde’s activities is difficult to measure, even those impacts that can be measured represent a good return on the investment from the taxpayer.

In 2012/13 the University of Strathclyde had an income of £237 million. Of this, £92 million was accounted for by grants from the Scottish Funding Council (SFC) and a further £31 million came from tuition fees from Scottish and EU students (most of which was also funded from Scottish public sector budgets), giving a core income from the public sector of £123 million. Therefore, for every £1 received by the University of Strathclyde from the Scottish public sector budget, an economic impact of more than £8 was generated in the Scottish economy (including increased future productivity associated with a one year cohort of graduates).

Consultation with industry partners, undertaken as part of this economic impact study, confirms that the collaborative research partnerships in which the University of Strathclyde is involved are expected to have a significant economic value but a value that is not possible to quantify. The research programmes are focused on pre-competitive, industry-level challenges, with expected outputs that can then be further developed into new or enhanced products or processes by individual companies. The industry partners consulted anticipate that many of the global market opportunities associated with the challenges being addressed by the collaborative research programmes could be in the hundreds of millions, or even billions.

The wider role of the University in driving future economic growth, over and above those impacts that can be quantified, is illustrated in the figure below.

Figure 1-1: University of Strathclyde and Future Economic Growth



The figure above shows some examples of how the University of Strathclyde’s approach of useful learning and working collaboratively with industry and the public sector to solve problems delivers results for the economy. Further examples and indicators of the University’s economic contribution include:

- research and commercialisation – the University’s excellence in this activity is demonstrated by its position as the fifth best university in the UK for spin-out and start-up formation in the last ten years and the rank of fourth in the UK for the number of Knowledge Transfer Partnerships being undertaken;
- collaborative research centres – an example of the approach the University takes to useful learning is through the formation of collaborative research centres. There is not one set model of working in partnership with industry and the public sector; instead the University has a flexible approach to each partnership that demonstrates its ethos of useful learning in action. The method of engagement depends on the problem to be solved, the nature of the partners involved and the University’s existing and potential strengths. Partnership with industry involves engagement of the key companies in the field, which are typically international companies such as Rolls Royce and GlaxoSmithKline, and small and medium sized enterprises (SMEs) including indigenous growth companies that are wishing to be part of the supply chains of global companies. The University’s role in pulling together the activities of industry and the public sector is exemplified by the Technology & Innovation Centre (TIC), the University’s contribution to a large scale collaborative economic development project at the International Technology & Renewable Energy Zone (ITREZ) in Glasgow City Centre. The TIC will create a new kind of partnership, challenge conventional thinking about university collaboration and help the UK and Scotland’s industries compete on the world stage. This will be done by revolutionising the way that researchers in academia and industry collaborate and innovate together to find solutions to challenges in sectors central to economic competitiveness and growth;

- inward investment – education, training and innovation are the University's main areas of activities. These activities also contribute to the attractiveness of a location for inward investment. In particular, Scotland has been more successful than the rest of the UK at attracting manufacturing inward investment projects; the University of Strathclyde supports Scotland's manufacturing investment proposition ranging from renewables to bioengineering to pharmaceutical manufacturing. The research-intensive inward investment attracted is particularly important as the UK and Scotland rank poorly compared to comparative countries for the percentage of gross domestic product that is invested in research and development (R&D). In particular, the contribution of business R&D to total R&D spend in the UK and Scotland is lower than other comparative countries. The University of Strathclyde helps to address this weakness in the Scottish economy, for example, by attracting business R&D investment to collaborative research centre membership schemes. Another example of attracting business and R&D is the Technology Strategy Board's (TSB) Catapult programme, which is investing £1 billion to create a network of world-leading centres to transform the UK's capability for innovation in seven specific areas and drive future growth. These centres are where UK businesses, scientists and engineers work together on late-stage research and development. Glasgow is participating in three of these seven centres: the Future Cities Catapult, the High Value Manufacturing Catapult and the Offshore Renewable Energy Catapult. The University of Strathclyde was instrumental in attracting all three to Scotland. Collaborations with industry are also a driver of global links; this is exemplified by the University of Strathclyde's selection as the exclusive European partner university for South Korea's global research and commercialisation programme; and
- priority sectors – the UK government has identified advanced manufacturing as one of its strategic sector while the Scottish Government has seven priority sectors of which three are sectors that the University of Strathclyde is deeply engaged in: energy (in particular renewables), life sciences and the universities sector. In addition there are opportunities presented in Scotland's strengths in public sector dominated industries including education and healthcare. The University is a significant contributor to these industries training Scotland's teachers, being a leader for pharmaceutical teaching, home to one of only two UK courses in prosthetics and orthotics and using the TIC to enhance engagement with industry in health technologies.

As with other universities a key contribution of the University of Strathclyde to businesses, sectors and the economy and society as a whole is the contribution of skilled workers, at graduate and advanced degree levels. For example the University of Strathclyde is one of UK's largest engineering schools and the largest in Scotland, producing nearly 50% of Scotland's engineering undergraduates in electronics, mechanics and software. This increases long-term economic productivity (and has been valued by using the graduate premium, an estimate of the additional lifetime earnings associated with a university education).

These activities maintain and support the current business base in Glasgow and Scotland, increase their propensity for R&D and engagement with priority sectors and help to attract companies to invest in the area. Key sectors include renewables and life sciences.

The University's day-to-day operations support a core impact from generating income for teaching, research and knowledge transfer, purchasing supplies, spending of employees' wages and investment in capital projects. These activities

also support other economic activities such as the spending and working of students and increased visitors due to friends and family visiting staff and students, conferences and events hosted by the University and activities that are enabled by the increase in visitor accommodation capacity provided by the University's student accommodation.

The presence of the University in the centre of Glasgow has a qualitative impact through adding to the vibrancy of the city centre and a quantitative impact through capital projects, which support the regeneration of the city centre. In particular the ITREZ, of which the TIC is the largest component, will be a key element in the regeneration of Glasgow city centre and is identified as a regeneration priority in various local and regional planning and regeneration strategies.

These impacts are the foundation of future growth in the economy. The University aims to be respected as one of the leading technological universities in the world. To achieve this the University will:

- extend its £350 million estates programme to produce a campus fitting for its ambition;
- significantly expand its current collaboration activities; and
- develop new collaboration activities in issues of global importance

Realising this aim will enhance the UK and Scotland's global profile, global links and global competitiveness and attract more partners and create further growth, meaning that the future economic impact of the University of Strathclyde is expected to be even greater than its current impact.

2 INTRODUCTION

The University of Strathclyde's guiding principle since its foundation has been to be a 'place of useful learning'. This study examines how following this principle impacts on the economy, in terms of contribution to jobs and economic activity and to economic competitiveness and productivity.

The University's ethos can be attributed to Professor John Anderson, a practical man inspired by the radical ideas of the Scottish Enlightenment. He challenged the medieval model of the university as a place apart. When he died in 1796 his will left a bequest for the establishment of a second higher education institution in Glasgow, which would be a place of useful learning and education for all regardless of gender or social class. He envisaged a university whose purpose would be to work for the public, for the good of mankind and the improvement of science.

In 2012/13 the University of Strathclyde had an income of £237 million. Of this, £92 million was accounted for by grants from the Scottish Funding Council (SFC). A further £31 million came from tuition fees from Scottish and EU students (most of which was also funded from Scottish public sector budgets), giving a core income from the Scottish public sector budget of £123 million, approximately half of the University's total income.

The University of Strathclyde employs 3,248 people and is located in Glasgow city centre.

This study quantifies the impact from the University's turnover and employment including the purchase of supplies, the spending of employees' wages in the economy and spending on capital projects in **Chapter 3 – Core Impacts**. This analysis does not include examining alternate uses of public funding.

The presence of staff and students also has other impacts, which are also examined in this study in **Chapter 8 – Student Impacts** and **Chapter 9 – Tourism Impacts**.

This study examines the University of Strathclyde's role in benefiting society by reaching outside the University to make the world better educated, prosperous, healthy, fair and secure. This includes the University's role in delivering economic policy, meeting the objectives of both UK and Scottish Governments.

For example, economic policy in Scotland is guided by the Government Economic Strategy (GES), which was published in 2007 and updated in 2011¹. The GES states that the ability of Scotland's businesses to grow and be successful will depend on a variety of factors. Universities have a part to play in many of these factors, in particular they are central in delivering:

- a skilled, educated and adaptable workforce; and
- a research and business base that supports commercialisation and innovation

In addition, the University of Strathclyde is delivering on two further factors:

- a culture of entrepreneurship, leadership, creativity and international ambition; and

¹ The Government Economic Strategy, Scottish Government, 2011.

- an ability to secure a competitive advantage from utilising Scotland's natural and energy resources more efficiently.

The delivery of a culture necessary for businesses to grow is shown by the University's role in collaborating with industry. Higher education institute (HEI) collaborations with industry traditionally have two approaches, either the HEI commercialises research or the HEI works with industry to solve their problems. This is characterised by efforts to either make academics more business-like or businesses more aware and engaged with the resources of HEI. These efforts are important and discussed and quantified in the report in **Chapter 5 – Research and Commercialisation**.

The University's approach to useful learning means it also collaborates with businesses at a more fundamental level by working in partnership with industry so that together they can set the agenda for research and development (R&D), not just for both partners but also for the sector and the country as a whole. This dynamic relationship seeks to change the innovation ecosystem into one that is more conducive for innovation to occur and flourish. This study illustrates the University's entrepreneurship and leadership role in creating these dynamic relationships through collaborative research centres and attracting inward investment in **Chapter 4 – Collaborative Centres** and **Chapter 6 – Inward Investment and Global Activity**.

This leadership role and international ambition exemplified by its goal to be respected as one of the leading technological universities in the world in turn drives the international ambition of the country. This study highlights how this role impacts on priority sectors to create innovation clusters of knowledge intensive activity in **Chapter 7 – Priority Sectors**.

The report discusses the University's contribution to the productivity of the economy through teaching and training students. It also highlights the University's contribution to widening access to higher education, which also contributes to productivity. This is discussed in **Chapter 10 – Future Productivity**.

All the impacts which can be quantified are summarised in **Chapter 11 – Baseline Quantitative Baseline**; however, this figure is an **understatement of the impact** of the University of Strathclyde's impact on the economy and of the impact of its partners' investment in Scotland and consequent economic benefits. The University's relationship with industry and the leadership role it has in delivering innovation and creating priority sectors is crucial to economic performance but these roles are hard to measure due to their diffuse and diverse nature and the static quantification of impact does not capture the dynamic role of the University in contributing to the capacity of an area to deliver an output. In addition this close partnership with industry means that the priorities and plans for research and development are directed in the areas of greatest usefulness and the University is able to anticipate the evolving priorities of government, funders and industry.

The economic impact of the University's contribution to innovation is also an underestimate because as well as delivering new products and services the University also supports technology improvements. These improvements can occur in products such as aeroplane engines or wind turbines where there are hundreds of components. The value of a technological discovery or improvement is often estimated by the sale of the new or improved product. However when a complex product is improved due to the cumulative effect of hundreds of discoveries and improvements it is difficult to value the contribution of the one

individual discovery or improvement. Therefore the nature of the industries that the University is involved in means its research is difficult to value.

This baseline impact is expected to increase in the future as the University realises its aim of being recognised globally as a leading technological University. Therefore the possible economic impacts that could occur in the future are discussed in **Chapter 12 – Future Impacts**.

3 CORE IMPACTS

The core impacts associated with the University of Strathclyde constitute a significant proportion of the quantifiable impacts. These impacts would occur for most organisations of a similar size as they reflect the day-to-day operation of the University. The core impacts that are covered in this chapter include:

- direct impacts (University income and employment);
- supplier impacts (spending on supplies and services and jobs supported by this spend);
- income impacts (impact of the spending of employees); and
- capital impacts (impact of the capital spending of the University).

3.1 Core University Direct Impact

The total income for the University of Strathclyde for the academic year 2012/13 was £236.9 million. Of this, £92.3 million was accounted for by grants from the Scottish Funding Council, this accounts for 39% of the Universities income. The University of Strathclyde spent £235.0 million in 2012/13, of which £133.2 million was on operating staff costs.

The University of Strathclyde employs 3,248 people, equivalent to 2,882 full time equivalent (fte) employees.

Table 3.1: Direct Impact – Assumptions

	Source	Value
Income of University	Strathclyde University	£236.9m
Amount spent on supplies	Q3 Estimates	£235.0m
Employees (jobs)	Strathclyde University	3,248
Employees (ftes)	HR	2,882

The direct Gross Value Added (GVA) of the University was calculated by subtracting the non-staff expenditure from the total income of the University. In this way it can be estimated that the direct GVA impact of the University of Strathclyde was £135.0 million.

Table 3.2 – Core Impact

	Glasgow	Scotland	UK
Total GVA (£m)	135.0	135.0	135.0
Total Employment (ftes)	2,882	2,882	2,882

Source: BiGGAR Economics

3.2 Core University Supplier Impact

The University of Strathclyde has an impact on the wider economy through the purchase of goods and services. This will increase turnover and support employment in the companies that supply the University. In 2012/13 the University of Strathclyde spent £101.9 million on supplies.

The supplier impact has been estimated by breaking down the amount that the University of Strathclyde spends by sector and by location. The spend in each sector supports different GVA depending on the turnover/GVA ration for that sector. The UK Annual Business Survey² gives a breakdown of these figures for industries and smaller sectors.

The breakdown of expenditure on supplies by sector was used to estimate the total GVA is £44.5 million from the £101.9 million spend on supplies. The breakdown by industry also enabled the employment from this increased turnover to be calculated. Applying the turnover per employee in the industries relevant to the spend on supplies indicates this directly supports 1,627 jobs.

The multiplier effect that is associated with this increased GVA and employment was then applied depending on the industry. The multipliers used include both the effect of employee spending and the supply chain, which are provided in the Scottish Government's Input-Output tables³. The multiplier effect increases the GVA impact by a further £40.1 million and the employment impact by a further 886 jobs.

The location of the spend on supplies is given in Table 3.3. This shows that two thirds of the supplies are sourced from Scotland, and almost a quarter from within the Glasgow City Council area.

Table 3.3 – Expenditure by Location

	Glasgow	Scotland	UK
% of expenditure by location	24%	66%	100%

Source: University of Strathclyde

Applying the total GVA and jobs impacts associated with the supply chain to the proportion of expenditure by location gave the impact in each area. In this way it can be estimated that in Scotland the GVA impact is £56.3 million and the expenditure on supplies supports 1,656 jobs. In the UK the GVA impact is £84.9 million and the expenditure on supplies supports 2,501 jobs

Table 3.4 – Supplier Impact

	Glasgow	Scotland	UK
Total GVA (£m)	13.9	56.3	84.9
Total Employment (ftes)	461	1,656	2,501

Source: BiGGAR Economics

3.3 Core University Income Impact

The staff who are employed by the University of Strathclyde have an impact on the wider economy through the spend of their wages. The University of Strathclyde spent £129.7 million on staff salaries in 2012/13. The impact of the spending of the staff in each area depends on where they live. The majority of the staff of the University live within Glasgow and most of the others stay elsewhere in Scotland. The salaries paid to staff residing in each of the areas is shown in Table 3.5.

² ONS, UK Annual Business Survey 2010, 2012

³ Scottish Government, Input-Output Tables 1998-2009 – Year 2007, 2013

Table 3.5 – Staff by area of residence

	Glasgow	Other Scotland	Other UK
Staff residency (jobs)	1,912	1,246	90
Staff Salaries (£m)	71.9	53.3	4.5

Source: University of Strathclyde

Although the staff live in different areas, it was assumed that the spend of the staff was not limited to the area in which they live. Particularly with the city centre location of the University of Strathclyde it was assumed that those commuting to the Glasgow from elsewhere spent a proportion of their income in the city centre. The location of this spend is given as an estimate in Table 3.6.

Table 3.6 – Staff spending assumptions

	Staff Location		
	Glasgow	Rest of Scotland	Rest of UK
Spending in Glasgow	35%	35%	30%
Spending Rest Scotland	20%	50%	30%
Spending Rest UK	20%	0%	80%

Source: BiGGAR Economics Assumption

The spending of the staff in each of the different areas was then calculated using these proportions. Of the £129.7 million that was paid in salaries to staff, £36.7 million was spent in Glasgow, £88.5 million was spent in Scotland and the remainder was spent elsewhere in the UK.

Table 3.7 – Increased spend by area

	Glasgow	Scotland	UK
Staff Salaries (£m)	36.7	88.5	129.7

Source: BiGGAR Economics

The direct economic impacts associated with this increased spend are calculated using the turnover/GVA ratio and turnover/employee ratio for the whole economy. Type 1 multipliers were then applied to include the indirect impacts of this increased turnover. In this way it can be estimated that the income effect generated £43.4 million GVA in Scotland and supported 1,111 jobs. The impact in the UK was £63.5 million and 1,628 jobs.

Table 3.8 – Staff Spending Impact

	Glasgow	Scotland	UK
Total GVA (£m)	9.1	43.4	63.5
Total Employment (ftes)	241	1,111	1,628

Source: BiGGAR Economics

3.4 Capital Spend

The capital spending of the University of Strathclyde has an impact on the economy, in particular the construction sector. The five year plan for the capital development of the University of Strathclyde is discussed further in Chapter 12. In this section the quantifiable economic impacts are calculated.

The average annual capital expenditure for the investment period 2012 to 2017 is expected to be £50.6 million. This is greater than the amount that will be spent in 2012/13, which is £39.6 million. The five-year average figure is what has been used in this analysis to reflect the capital strategy.

The location of the capital contracts was assumed to be the same as that for the supplies.

The turnover/GVA and turnover/employee ratios were taken from the construction sector. This indicated that the £50.3 million spent on capital projects contributed £18.8 million GVA to the UK and supported 381 direct jobs. Of this, £12.4 million GVA and 253 jobs were in Scotland.

The multipliers used are also for the construction sector and these are applied to the direct impacts. In this way it can be estimated that the total impact from the capital projects was £26.6 million GVA in Scotland and 553 jobs and £40.1 million GVA and 835 jobs in the UK.

Table 3.9 – Capital impact

	Glasgow	Scotland	UK
Total GVA (£m)	6.2	26.6	40.1
Total Employment (ftes)	128	553	835

Source: BiGGAR Economics

3.5 Core Impacts Summary

The total core impacts are shown in Table 3.10 and Table 3.11 for each of the study areas. The total impact in Scotland was £261.2 million and 6,203 ftes. In the UK the total impact is £323.6 million and 7,846 ftes.

Table 3.10 – Core impacts GVA (£m)

	Glasgow	Scotland	UK
Direct Impact	135.0	135.0	135.0
Supplier Impact	13.9	56.3	84.9
Income Impact	9.1	43.4	63.5
Capital Spend Impact	6.2	26.6	40.2
Total Core Impact	164.3	261.2	323.6

Source: BiGGAR Economics – Figures may not total due to rounding

Table 3.11 – Core impacts jobs (ftes)

	Glasgow	Scotland	UK
Direct Impact	2,882	2,882	2,882
Supplier Impact	461	1,656	2,501
Income Impact	241	1,111	1,628
Capital Spend Impact	128	553	835
Total Core Impact	3,712	6,203	7,846

Source: BiGGAR Economics – Figures may not total due to rounding

4 COLLABORATIVE CENTRES

The emphasis on useful learning at the University of Strathclyde goes beyond the commercialisation of research and transfer of knowledge. Collaboration is embedded in the University; for example, many departments have industry boards that advise departments of develop in sectors. To maximise the potential and usefulness of the expertise and facilities of the University, Strathclyde has set up a number of centres in which academia works in partnership with industry, public sector and policy makers. The University's realises its ethos of useful learning by working flexibly and speedily with potential partners. This results in a range of approaches to collaboration, discussed in this chapter.

4.1 Partnerships with Industry

The University has a range of centres, which seek to solve key issues together with industry. Many of these centres have a membership scheme. Tier 1 membership is for large national and international companies who sit on the Centre's boards and influence the future research programmes. Tier 2 membership is for smaller companies, such as those in the supply chain who obtain access to the research, typically indigenous SMEs with high growth potential. These centres include:

- **Power Networks Demonstration Centre (PNDC)** - The PNDC is a collaborative project between the University of Strathclyde, Scottish Enterprise, SSE and Scottish Power to create a world-class facility to support the development and validation of future electrical power distribution technologies. PNDC plays a central role in accelerating the deployment of emerging smart grid technologies by demonstrating their functionality within a realistic, controllable grid environment. Such developments should allow more renewable generation sites to be accommodated within existing power networks. It will involve a high degree of industrial collaboration and is based in Cumbernauld and was officially opened by the First Minister in May 2013. Scottish Power and SSE are Tier one members of PNDC;
- **Continuous Manufacturing and Crystallisation (CMAC)** – a reflection of the University's reputation is its invite in 2010 by GSK (the UK's largest headquartered pharmaceutical company) to take the lead in developing a new industry-led RTD Programme involving 4 Scottish universities and several companies (including multinational corporations and specialist SMEs) in Continuous Manufacturing and Crystallisation for improved manufacturing of high-value pharmaceuticals and medicines. The project is expected to position Scotland as a global centre of excellence for crystallisation science; and
- **Advanced Forming Research Centre (AFRC)** – this is a specialist RTD facility and equipment owned, managed and academically-led by the University of Strathclyde and operated on behalf of a consortium involving Tier 1 and Tier 2 industry members. Established in 2008, AFRC's core RTD programme in forming and forging technologies is developing new industrial products and processes, as well as trouble shooting established industrial processes. AFRC is helping to cement Scotland's global reputation for excellence in engineering and is already receiving demand for research from around the world. The collaborative approach between the University and leading engineering companies will ensure that Scotland continues to be at the forefront of innovation in the high-value manufacturing sector, while making a significant contribution to the wider economy. To illustrate the level of demand for AFRC, it currently has 6 Tier 1 members including Boeing, Mettis Aerospace and Rolls-

Royce (each of whom contributes >£1M over five years to AFRC's core RTD Programme) and eight Tier 2 members with a steady stream of enquiries from companies wishing to join the Programme. The AFRC is based in its own building in Inchinnan, west of Glasgow, and is part of the High Value Manufacturing Catapult along with six other leading manufacturing research centres in the UK.

Each of the centres is expected to have an impact on the industry in which it is operating. This is achieved through its industry members who are able to use the research in their own products and services. The impacts associated with centres will depend on the number of industry partners, which is expected to grow.

4.2 Other Partnerships

The University's ethos of useful learning means that it will translate its responsibility to be useful in the world into action through innovative responses to the environmental and social challenges of the 21st century. This is demonstrated by other University centres, which demonstrate the range of problems that the University seeks to solve and the range of partners that it works with:

- Fraunhofer Centre for Applied Photonics (CAP) – the CAP provides laser research and development for a variety of sectors including, energy, transport, healthcare and security. This Centre is an example of both the University's global reputation and strength in applied research as it is the first Fraunhofer in the UK. It also demonstrates the University's innovative approach to working with industry. The University's links with industry in this area was previously not as extensive as with the centres described in the previous section. However, Fraunhofer is Europe's largest contract research organisation with over 60 institutes in Germany and has strong links with industry through generating 70% of its income through contract research. Therefore this collaboration will enable the University to develop its industry links in this area;
- Weir Advanced Research Centre – this is an example of how the University partners with a company. The University is working closely with the Weir Group on a range of collaborative projects, including the design of new and improved products for competitive global markets. This partnership has resulted in significant levels of research funding and the recent formation of the Weir Advanced Research Centre (WARC). The University's academics have been working in partnership with the Weir Group on a number of R&D activities, including: mechanical design reviews, manufacture process reviews, material testing and assessment programmes, new product mechanical/strength design projects, structural integrity assessment, product life optimization, computational fluid dynamics investigation of existing and new design concepts;
- Fraser of Allander Institute – The Fraser of Allander Institute is a research unit and is formally part of the Department of Economics and the Strathclyde Business School. The Institute is a partner for policy makers as it carries out research on regional issues generally and the Scottish economy in particular, including forecasting and the analysis of short-term and medium-term movements in Scottish economic activity;
- Centre for Excellence for Looked After Children in Scotland – this centre was set up in order to improve the outcomes and opportunities for looked after children through a collaborative and inclusive approach to partnership working. It receives funding from the Scottish Government and has a strategic steering

group consisting of senior representatives from the University and independent members from education, health and social work. It also has a partnership group involving a range of organisations involved in education, health and social work including other further and higher education institutes, NHS Scotland, Local Authorities and organisations such as the Fostering Network and the British Association of Adoption & Fostering;

- Strathclyde Institute for Global Public Health – this is a collaboration in research and education between the University of Strathclyde and the International Prevention Research Institute (iPRI) in Lyon, France. The partnership will deliver a two-year full-time Masters programme;
- Cancer Research UK Formulation Unit – this centre is funded by Cancer Research UK and was established at the University of Strathclyde due to its pharmaceutical expertise, existing facilities and links with cancer researchers. The Unit manufactures and prepares experimental anti-cancer drugs for clinical trials in the UK by taking promising new drug discoveries and turn them into useable anti cancer drugs that can be tested in patients in early phase clinical trials; for instance a tablet, capsule or injectable solution. It is the biggest manufacturing facility for new anti-cancer drugs anywhere in the UK outside the major pharmaceutical companies. The Unit helps to get new treatments to people with cancer as quickly as possible; and
- Centre for Youth Justice – the Centre is an independent national resource providing a range of services to those working in, or concerned about, criminal and youth justice social work services. The Centre works in partnership with statutory and voluntary sector service providers, and with central government, to identify, promote, develop and disseminate good practice and management.

Further examples of partnership working are described in Chapter 7 which describes a another solution that the University provided to GSK, the MAKO Centre for Robotic Orthopaedic Surgery and the Confucius Institute for Scotland's Schools which aims to promote Chinese language and culture in schools in Scotland.

4.3 Technology and Innovation Centre

The Technology & Innovation Centre (TIC) is the University of Strathclyde's contribution to a large-scale collaborative economic development project called the International Technology & Renewable Energy Zone (ITREZ), located in Glasgow City Centre. The primary aims of TIC are to create economic and societal benefit through more effective innovation processes and uptake by industry of jointly created (with universities) RTD results. It will create a new kind of partnership, challenge conventional thinking about university collaboration and help the UK and Scotland's industries compete on the world stage. This will be done by revolutionising the way that researchers in academia and industry collaborate and innovate.

The TIC represents an £89 million investment in the research infrastructure of Glasgow, Scotland and the UK and will provide the space for up to 1,200 academic and industry researchers, engineers and project managers to work side-by-side. The TIC will be used by the University and its partners to create a dynamic environment in which large-scale industry demand-led collaborative RTD programmes, University research facilities and associated research staff and postgraduate research students, SME engagement and company creation activities will be co-managed. The TIC's key drivers will be benefits for industry partners and the economy. The TIC will enable Strathclyde and its industry

partners (including SMEs) to achieve step change improvement in exploiting new and emerging technologies, platform technologies and bridge gaps between research, technology and commercialisation.

The TIC is focussed on finding solutions to challenges in four sectors, energy, health, manufacturing and future cities. Centres that will be hosted in the TIC include:

- Continuous Manufacturing and Crystallisation;
- Fraunhofer Centre for Applied Photonics;
- Weirs Advanced Research Centre; and
- Future Cities Observatory.

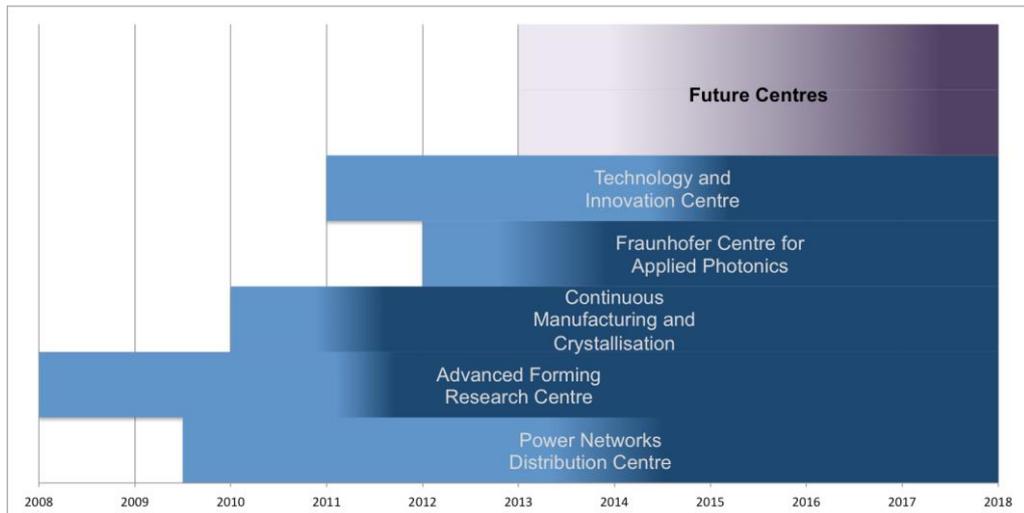
The TIC is not just about a physical building but about the activities that realise the University's approach towards useful learning by developing innovative ways to collaborate with partners. For example the University is currently successfully recruiting Tier 1 and Tier 2 industry members to the long-term collaborative RTD programmes of the TIC. In parallel with its investment in the TIC and ITREZ, Scottish Enterprise is securing major inward investments of staffing in Glasgow city centre from corporates for engineering and other technical centres associated with their new businesses in offshore renewable.

The TIC building is currently under construction in the centre of Glasgow and is due to open in 2014. The impacts that the centre will bring have been modelled by BiGGAR Economics for the period up to 2025. These impacts are discussed in Chapter 12.

4.4 Scale and Pace of Collaboration

The centres that have membership programmes and the TIC are a new innovation in how the University works with partners. As shown by the diagram overleaf the University reacts quickly to opportunities and discussions that arise with partners with very few years passing from the start of an idea to the opening of a centre (the dark blue of the bar). The diagram shows the mass of collaborative activity that is occurring in the economy due to the University. The commitment of industry to these partners and the flexibility and speed of the University's approach will mean that its strategic aim of being a desirable partner to national and international organisations is realised. The diagram shows that this activity is set to grow as new centres are developed.

Figure 4-1: Timeline of collaborative research centres



The level of initial investment in each of these centres is shown in Table 4.1. The largest investment is the £89 million capital investment in the Technology and Innovation Centre. The initial investment in the other centres amounts to an additional £83 million. These centres are expected to significantly grow and the potential future impacts are discussed in Chapter 12. For example CMAC has increased their initial investment to now raising £60 million.

Table 4.1 – Collaborative Centres – Current Status and Initial Investment

	Initial Investment
TIC	£89.0m
AFRC	£34.2m
PNDC	£12.0m
CMAC	£28.0m
CAP	£9.0m
Total	£172.2m

Source: BiGGAR Economics

Consultations undertaken with industry partners during the economic impact study provided some insight into their objectives and expectations when working with the University of Strathclyde. Many of the partners in the collaborative research centres had some prior experience of working with the University including the recruitment of Strathclyde graduates and smaller scale research projects. However, in the collaborative research centres, the industry partners are looking for a deeper and longer term relationship. The centres work on pre-competitive, industry-level challenges and so are expected to generate outputs that can then be developed into new or enhanced products and processes.

At this stage in the R&D process, the investment decisions of industry partners are not taken based on financial hurdles such as a minimum return on investment; however, robust business cases are required, setting out the scale of potential future business benefits.

The industry partners also appreciate that there are opportunities to leverage their own investment at the pre-competitive R&D stage, perhaps by as much as £15 for each £1 of direct investment, by working collaboratively on industry-level

challenges, attracting co-investment from other companies and from public sector research funders.

The industry partners also value the leadership role taken by the University of Strathclyde, and in particular the Principal, to make the case to government in Europe, the UK and Scotland for a more strategic approach to research and technology development, such as the TIC model pioneered by Strathclyde and being taken forward by the TSB's Catapult investments.

The outputs from the collaborative research programmes are expected to be breakthroughs that can be taken forward by further collaborative research, by global companies or by technology suppliers, many of whom might be smaller companies. The industry partners consulted anticipate that many of the ultimate global market opportunities associated with the challenges being addressed by the collaborative research programmes could be in the hundreds of millions, or even billions.

5 RESEARCH AND COMMERCIALISATION

The ethos of the University of Strathclyde is to be a “place of useful learning”, an aspiration that was articulated by its founder Professor John Anderson, over 200 years ago. This mantra is the core principle of the University and ensures that knowledge transfer and research commercialisation are at the heart of its operations.

As a result of its ethos, in 2011/12 the University of Strathclyde had the highest knowledge transfer income⁴ per member of academic staff amongst the Ancient and Chartered universities⁵ in Scotland. However, beyond this the University of Strathclyde plays a large role in levering in commercial research and development investment through its collaborative research centres and promoting Scotland and Glasgow as expertise rich areas for inward investment. These impacts are discussed in Chapters 4 and 6

Along with the collaborative research centres that are discussed in the previous chapter there are other research centres that enhance the reputation of the University and attract industry. These centres include Fraser of Allander Institute, Strathclyde International Public Policy Institute, Health Technologies at Strathclyde, Centre for Excellence for Looked After Children in Scotland (CELCIS), Centre for Youth Justice and Confucius Institute for Scotland’s Schools.

The research and commercialisation activity has an impact on the economy through a variety of channels. The activities that are discussed in this chapter are:

- Knowledge Transfer Partnerships;
- consultancy;
- continued professional development;
- licencing;
- spin-outs and start-up companies; and
- PhD centres.

5.1 Knowledge Transfer Partnerships

The University of Strathclyde is very involved with the knowledge transfer partnership (KTP) programme. There are currently 22 KTPs being undertaken at Strathclyde, the fourth most of any institution in the UK. The University of Strathclyde has also completed 30 KTPs in the past six years. The majority of these partnerships have been with companies in Scotland, with only two being in other areas of the UK.

A strategic review of the KTP programme undertaken in 2010⁶ found that on average, KTPs undertaken in Scotland contributed £713,000 GVA to the Scottish economy, equivalent to an annual impact of £119,000 in the six years after the KTP is completed. It is assumed that the annual impacts for the duration of the project are only 10% of the impacts after the KTP has been completed, as the outputs of

⁴ Scottish Funding Council – Knowledge Transfer Income Metrics for Academic Year 2011-12

⁵ Ancient Institutions are: Aberdeen, St. Andrews, Dundee, Edinburgh and Glasgow.

Chartered Institutions are Strathclyde, Stirling and Heriot-Watt.

⁶ Regeneris Consulting (February 2010), Knowledge Transfer Partnerships Strategic Review

the knowledge exchange will not have been realised. The same study found that on average, each KTP projects support the creation of three jobs.

By multiplying the impacts from this strategic review by the number of KTP projects undertaken by the University it was possible to estimate the economic impact that the KTPs have in each area. In this way it can be estimated that these partnerships contributed £5.8 million to the Scottish economy and support 120 jobs.

Table 5.1 – Knowledge transfer partnership impacts

	Glasgow	Scotland	UK
Total GVA (£m)	2.0	5.8	6.2
Total Employment (ftes)	45	120	129

Source: BiGGAR Economics

5.2 Consultancy Impact

Academics at the University of Strathclyde offer consultancy services to businesses that operate within their area of study. Although the university is engaged in a wide variety of consultancy projects, the basic principle is that a company pays an academic to undertake a specific project on their behalf. The relationship between the two parties is a commercial one and although the academic involved may generate some research findings as a result of the work, these are not the main objective. Instead, the primary focus of these types of projects is to produce a report (or other output) for the company client.

The total income received by the University of Strathclyde from consultancy projects in 2011/12 was £4.4 million. It has been assumed that the income for 2012/13 will be similar. The data provided regarding consultancy did not give details as to the locations of the companies involved and therefore assumptions have been made.

The companies who commission the consultancy work to be undertaken would not do so unless the increased turnover that they would expect to arise from this research was at least the value of these contracts. It was assumed that the average return from the companies' investment was 200%⁷. On this basis the additional turnover in the businesses would be equal to the value of the consultancy contracts.

The economic impact of the additional turnover of £4.4 million was calculated by dividing the increased turnover by the GVA/turnover ratio and turnover/employee ratio for the appropriate sectors. In this instance the sectors chosen were those in which the University of Strathclyde has strengths that would attract consultancy work. The multipliers for these industries were also applied in order to capture the indirect benefits that this increase in turnover would generate.

In this way it can be estimated that the consultancy contracts undertaken by staff at the University of Strathclyde supported £3.0 million GVA in the Scottish economy and supported 47 jobs. In the UK these consultancy contracts generated £3.8 million GVA and supported 59 jobs.

⁷ Economists would normally assume that the value of such spending would be equal to the cost of the service provided, since the market would result in prices being set at this level. However, in practice, businesses will typically seek a reasonable marginal benefit in excess of costs when deciding to commission external expertise.

Table 5.2 – Consultancy impacts

	Glasgow	Scotland	UK
Total GVA (£m)	1.0	3.0	3.8
Total Employment (ftes)	16	47	59

Source: BiGGAR Economics

5.3 Continued Professional Development

The University of Strathclyde also offer opportunities for companies and individuals to undertake continued professional development (CPD) courses. As with the consultancy impact the companies and individuals who undertook the continued professional development courses would only undertake these courses if the returns were greater than the cost. As with the consultancy impact this return is assumed to be 200% the cost of the CPD courses.

In 2011/12 the University of Strathclyde was paid £11.7 million for CPD courses. It has been assumed that the income for 2012/13 will be the same. The majority of the clients were based in Scotland and the UK. The proportion of clients that were based in Glasgow is unknown. The value of courses that were undertaken by overseas companies was £0.6 million. Therefore the additional increase in turnover that is associated with the CPD courses in the UK is £11.7 million.

The economic impact of the additional turnover of £11.7 million is calculated by dividing the increased turnover by the GVA/turnover ratio and turnover/employee ratio for the appropriate sectors. In this instance the sectors chosen were those in which the University of Strathclyde has strengths that would enable them to undertake continued professional development courses. The multipliers for these industries were also applied in order to capture the indirect benefits that this increase in turnover would generate.

In this way it can be estimated that the economic impacts of the continued professional development courses that were offered by the University of Strathclyde was £7.7 million GVA and 118 jobs in Scotland. The impact in the UK was £10.1 million and 157 jobs.

Table 5.3 – Continued professional development impacts

	Glasgow	Scotland	UK
Total GVA (£m)	No data	7.7	10.1
Total Employment (ftes)	No data	118	157

Source: BiGGAR Economics

5.4 Licencing

The commercialisation of research at the University of Strathclyde is one of the ways in which it tests its ‘useful learning’. In 2011/12 the University received payments of £0.5 million in royalties for licences that it had granted to companies. Of this, £0.2 million came from companies within Scotland and £0.2 million from companies in the rest of the UK. Royalties received from companies outwith the UK amounted to £0.1 million. It has been assumed that the income for 2012/13 will be the same.

The relationship between the royalty paid for a technology and the turnover it generates depends on the details of the licensing agreement and can vary

considerably from company to company. In order to agree a licence, negotiators must first form a view of how much the IP is worth to the prospective licensee. There are a wide variety of variables that may inform this judgement but a training manual issued by the World Intellectual Property Organisation⁸ states that a common starting point is the “well known and widely quoted” 25% rule.

The 25% rule is a general rule of thumb according to which the licensor should receive around one quarter to one third of the profits accruing to the licensee and has been used by IP negotiators for at least 40 years. The rule is based on an empirical study first undertaken in the 1950s and updated in 2002⁹. The study found that royalty rates were typically around 25% of the licensee’s profits, which equates to around 5% of sales from products embodying the patented technology. This implies that royalties paid for a technology typically represent around 5% of the total turnover generated by that technology.

Applying this 5% to the licence income receive from each area shows that the increased turnover associated with the licences technologies is £4.6 million in Scotland and £8.9 million in the UK.

The economic impact of the additional turnover was calculated by dividing the increased turnover by the GVA/turnover ratio and turnover/employee ratio for the appropriate sectors. In this instance the sectors chosen were those in which the University of Strathclyde has strengths that would enable them to commercialise research. The multipliers for these industries were also applied in order to capture the indirect benefits that this increase in turnover would generate.

In this way it can be estimated that the economic impact of the licenced technologies was £8.1 million GVA and 125 jobs in the UK. Of this, £4.2 million GVA and 65 jobs were in Scotland.

Table 5.4 – Licencing impacts

	Glasgow	Scotland	UK
Total GVA (£m)	0.0	4.2	8.1
Total Employment (ftes)	0	65	125

Source: BiGGAR Economics

5.5 Spin-out and start-up companies

Another way in which research undertaken at the University of Strathclyde is converted into economic activity through commercialisation is through the creation of spin-out and start-up companies. The University’s excellence in research and commercialisation is shown in the 2013 annual report for the PraxisUnico Spinouts UK survey¹⁰, it was ranked joint 7th in the UK for spinouts created in the last three years and joint fifth in the UK with Cambridge University for spinouts created in the past ten years.

There are currently 104 operational companies that are spin-outs of the University of Strathclyde. Two thirds of these companies are based in Glasgow and 5 are based outside of Scotland.

⁸ Exchanging Value, Negotiating Technology Licensing Agreements: a training manual, World Intellectual Property Organisation, 2005.

⁹ Goldscheider, Use of the 25% rule in valuing IP, les Nouvelles, 2002.

¹⁰ PraxisUnico, Quarterly Journal – issue 8 News Comment and Analysis on Spinouts from UK HEIs, June 2013

The impact of the spin-out and start-ups is calculated based on previous studies of spin-out companies carried out by BiGGAR Economics and an analysis of employment data that was available. The University of Strathclyde maintains shares in a number of these companies.

The companies employed 1,306 individuals throughout the UK. Of these 74% of the employees are based in Glasgow, 14% in the rest of Scotland and 11% elsewhere in the UK. The average direct GVA from the spin out companies in previous research was £574,022. The direct GVA in Scotland from these companies is £56.8 million and in the UK is £59.7 million.

The indirect multiplier impacts were calculated using the employment and GVA multipliers for the relevant industries. In this way it can be estimated that number spin-out companies of the University of Strathclyde contributed £46.6 million GVA and 1,138 jobs in Glasgow and £98.1 million GVA and 2,006 jobs in the UK.

Table 5.5 – Spin-out and start-up impacts

	Glasgow	Scotland	UK
Total GVA (£m)	46.6	93.4	98.1
Total Employment (ftes)	1,138	1,776	2,006

Source: BiGGAR Economics

5.6 PhD Centres

The usefulness of the learning and research undertaken by the University of Strathclyde is exemplified by the new approach that it has taken to PhD students. Doctoral studies and research at the University is now clustered around areas of research expertise, with emphasis on particular sectors rather than disciplines. This change has been driven by the fact that PhD graduates work in sectors rather than disciplines once they leave academia. This has a further benefit beyond skills as it will create networks and relationships between future workers in the sector. Although this impact has not been quantified, this approach contributes to economic impact as it is important to deliver capacity in Glasgow and Scotland to respond to the needs of sectors and to opportunities for sectors.

This is shown by the University's involvement in eight EPSRC Doctoral/Industrial Training Centres covering Medical Devices, Wind Energy, Advanced Forming and Manufacture, Systems Engineering, Nuclear Engineering, Optics and Photonics, Offshore Renewable Energy, and Continuous Manufacture and Crystallisation. For example the Wind Energy Centre for Doctoral Training is designed to develop highly skilled, research-orientated professionals that will drive the industry forward once they have moved on. The students are equipped with a wide range of skills and knowledge beyond their original area of expertise and study. The Centre began in 2009 and recruits 10 graduates each year to doctoral research positions that last for four years. During this time, along with their own personal development the doctoral students work with local primary and secondary schools to educate the pupils about the benefits and mechanics of wind energy.

5.7 Research and Commercialisation Summary

The research and commercialisation activity described in this chapter contributes £49.6 million GVA to the economy of Glasgow and supports 1,199 jobs. The impact in Scotland was £114.1 million GVA and 2,126 jobs. The impact in the UK was

£126.5 million GVA and 2,476 jobs. The impacts are summarised in Table 5.6 and Table 5.7.

Table 5.6 – Research and Commercialisation impacts GVA (£m)

	Glasgow	Scotland	UK
Consultancy	1.0	3.0	3.8
KTPs	2.0	5.8	6.2
Licence	0.0	4.2	8.1
Spin-Outs	46.6	93.4	98.1
CPD	0.0	7.7	10.1
Total Research & Commercialisation impact	49.6	114.1	126.5

Source: BiGGAR Economics – Figures may not total due to rounding

Table 5.7 – Research and Commercialisation impacts (jobs)

	Glasgow	Scotland	UK
Consultancy	16	47	59
KTPs	45	120	129
Licence	0	65	125
Spin-Outs	1,138	1,776	2,006
CPD	0	118	157
Total Research & Commercialisation Impact	1,199	2,126	2,476

Source: BiGGAR Economics – Figures may not total due to rounding

6 INWARD INVESTMENT AND GLOBAL ACTIVITY

The UK and Scotland performs poorly compared to other advanced countries in terms of the percentage of GDP that is spent on R&D and the levels of business R&D. The University of Strathclyde has a significant role in addressing this issue as the inward investment it attracts is for R&D activity including business investment in R&D.

This chapter explores the importance of inward investment and innovation to the competitiveness of the economy further and shows how the University contributes to increasing the levels of inward investment and innovation. This is also illustrated by the involvement of Glasgow in three of seven of TSB's Catapults.

This chapter also discusses how the attraction of inward investment maintains and attracts companies to an economy and how this leads to an economy participating in a greater level of global activity.

6.1 Inward Investment and Innovation

In 2010, the UK ranked 18th out of 34 advanced countries in terms of level of R&D spending as percentage of gross domestic expenditure¹¹. In comparison to other OECD countries, the UK ranks 11th in terms of business R&D as a percentage of GDP and Scotland would be ranked second from bottom¹² since Scotland has a lower level of R&D as a percentage of GDP (1.56%) than the UK (1.79%) which in turn has a level lower than the EU (1.94%) and significantly lower than the EU's target of 3%. This shows the importance of improving the levels of R&D and business R&D in order to keep the economy competitive. The UK and Scottish Governments consider it to be a key determinant of productivity growth and economic performance. Therefore the activity of the University of Strathclyde in attracting inward investment in R&D is crucial to the competitiveness of the economy.

Ernst & Young tracks inward investment across Europe through its European Investment Monitor. The sectors that are most attractive for inward investment include sectors in which the University has a strength and focus on: information and communication technologies, energy and utilities, pharmaceutical and biotechnologies industries and clean tech. This survey also finds that manufacturing remains pivotal to European growth with 84% of investors saying that they will continue to manufacture in Europe in the next 10 years. Inward investment in the manufacturing sector is what has made Germany erode the UK's place as the leading location for European foreign direct investment. Manufacturing foreign direct investment is an area of strength for Scotland. The respondents to the survey were asked what would be the main areas of reform to make Europe a leader in innovation, the top two answers were improved education and training in new technologies (46%) and develop a culture of innovation and creativity (36%). These are two key aims of the University of Strathclyde.

The GE Global Innovation Barometer explores how business leaders around the world view innovation. This survey confirms the strength and attractiveness of the University's approach to industry. The latest survey was published in January 2013 and found that collaboration is perceived as the key to increasing business innovation success. The biggest drives of collaboration are access to new technology and the possibility to enter new markets. The survey discusses

¹¹ OECD.Stat Gross domestic expenditure on R&D

¹² Scottish Government Gross Expenditure on Research and Development Scotland 2011 27 March 2013

collaboration in terms of collaborating with entrepreneurs and other companies. Collaborating with the University fulfils both as the University is an entrepreneur in innovation and collaborating with the University involves partnering with other businesses to solve global problems.

The survey finds that the improvement of existing products or services is still the main driver of growth for businesses although business model innovation is expected to play a larger role in business performance globally. The University by taking a leadership role in collaboration and bringing together academia, public sector and industry is well placed to work with industry partners to develop their capacity and approach to innovation and thus innovate their business model.

6.2 Catapults

The last UK Government commissioned a report from the entrepreneur Hermann Hauser, "The Current and Future Role of Technology & Innovation Centres in the UK", published in March 2010 just before the last UK General Election, which made a robust case for long-term UK investment in such centres and identified best practice from around the world. Following a review led by James Dyson, the current UK Government announced its support for the concept, which has the aim to transform the UK's capability for innovation in specific areas and help drive future economic growth as these areas are identified as strategically important for the UK and which has a large global potential.

In January 2011 the TSB formally announced its intention to invest in these Catapults centres, in seven key growth sectors. Three of these Catapults involve the University of Strathclyde:

- offshore renewable energy – the goals of this catapult include accelerating advancement of the UK offshore renewables industry, reinforcing it as a global leader and enabling SMEs to enter the sector. The Catapult will play a key role in bringing the vision of a successful UK offshore renewable energy sector into reality. The Catapult is expected to receive almost £70 million in its first five years of operations. This Catapult will be located in the ITREZ;
- high value manufacturing – this brings together seven institutions across a broad range of sectors to support UK manufacturing in the commercialisation of cutting edge technologies. One of these seven centres is the Advanced Forming Research Centre and is expected to have an income of almost £70 million by 2017; and
- Future Cities Catapult – this Catapult will enable business to develop products and services for the cities of the future. There are three initial programmes including a 'city simulator' to test ideas, innovate and prove the business case called the Future Cities Demonstrator. Glasgow City led by Glasgow City Council won a nationwide competition involving 30 other UK cities to secure £24 million to implement their proposal for this Demonstrator. The Demonstrator will have a City Observatory, which will allow researchers to analyse more than 200 information feeds about Glasgow to understand how a city operates. This City Observatory will be located in the TIC.

These Catapults make an important contribution to the level of business R&D investment as commercial funding will be part of their income.

6.3 Maintaining and Attracting Companies

The University's success in attracting R&D investment to Scotland builds from its role in maintaining the presence of companies in an area, which then builds more activity through more collaboration. For example Scottish and Southern Energy (SSE) in 2009 selected Glasgow as the location for its new Centre of Engineering Excellence for Renewable Energy in partnership with the University. This would create 250 jobs and safeguard a further 70. This coincided with the University hosting the UK's first doctoral training centre for wind energy. In 2010 SSE and Mitsubishi signed a strategic agreement to co-operate on low energy. These links have further deepened with the Power Networks Demonstration Centre. This activity has contributed to other major renewable developers, ScottishPower Renewables and Gamesa having their Centres of Excellence in Glasgow. Another example is the Wood Group establishing an operation in the West of Scotland due to the ability to recruit graduates from Strathclyde.

6.4 Global Activity

Collaborations with industry are an approach to creating global links and enabling the work of the University to be used around the world. This is exemplified by the University of Strathclyde's selection as the exclusive European partner university for South Korea's global research and commercialisation programme. This programme is funded by the Ministry of Knowledge and Economics and it provides funding each year to support the development of research expertise between the University and Korean SMEs. This funding will support both feasibility study projects and full-scale research and development projects.

The collaboration with industry is essential for future bids for competitive research funding such as European research funding. The Horizon 2020 covers all EU research and innovation activities and has a budget of £60 billion for 2014-2020. A key trend in the requirements for competitive funding is the requirement for collaboration particularly with industry. The partnership the University has with industry means that it is well placed to find partners for funding proposals and to work quickly and efficiently with industry to secure funding and thus attract further inward investment in research and development to the UK and Scotland.

7 PRIORITY SECTORS

The activities of the University are conducive to supporting sectors that deliver the priorities of UK and Scottish Governments. This section discusses the University's fit with Government policy and its role in delivering the development of priority sectors.

7.1 Government Policy

The UK government is developing an industrial strategy that is a plan for a long term, whole of government approach to how business is supported. There are five actions. The first is to develop strategic partnerships with industry sectors where the most impact on growth can be achieved. These sectors are:

- advanced manufacturing – aerospace, automotive, life sciences and agricultural technologies;
- knowledge services – international education, information economy and professional and business services; and
- enabling sectors – energy – nuclear and oil and gas and construction.

The second action is to support emerging technologies. The first part of this is the TSB's Catapult centres discussed in the previous chapter. The second is the support of eight technologies:

- big data;
- satellites;
- robots and other autonomous systems;
- synthetic biology;
- regenerative medicine;
- agricultural technologies;
- advanced materials; and
- energy storage.

Economic policy in Scotland is guided by the Government Economic Strategy (GES) which was published in 2007 and updated in 2011¹³ with the overarching objective of delivering sustainable economic growth. The GES identifies five strategic objectives that are expected to be critical to future economic growth. One of these objectives is for Scotland to become 'greener', which means making improvements to the natural and built environment and the sustainable use and enjoyment of it. The GES also identifies seven key sectors which are expected to drive the Scottish economy in the future:

- creative industries;
- energy

¹³ The Government Economic Strategy, Scottish Government, 2011.

- financial and business services;
- food and drink;
- life sciences;
- sustainable tourism; and
- universities.

The University is naturally a contributor to the universities priority sector.

The University is strongly involved in the priority sector of energy. In particular renewable energy is identified in the strategy as one of the greatest opportunities for Scotland. The next section describes how the University is developing a thriving cluster in renewable energy and particularly offshore technologies.

Another of the priority sectors, which the University of Strathclyde has deep involvement in is life sciences. In particular the GES mentions the opportunity for capitalising on key business opportunities in medical technologies and pharmaceutical services which are traditional strengths of the University and a key area of focus for the future as outlined in previous chapters and discussed further in this chapter.

As well as identification of growth sectors the GES states that the Scottish Government will seek to take advantage of the opportunities presented in Scotland's strengths in public sector dominated industries, including education and healthcare. This is discussed further in this chapter.

Innovation and commercialisation is discussed in the GES as being vital to boosting growth. The TIC is discussed as a case study in the GES to highlight the importance of supporting this activity. This type of innovation is at the heart of the TIC project, which will provide a vehicle for translating the world leading research undertaken by Scottish universities into commercial reality by building effective new partnerships with Scottish businesses.

7.2 Cluster Development

The previous chapters highlight the University's collaboration with industry. A successful cluster also requires a thriving network of small and medium enterprises (SMEs). The Centres described in Chapter 5 that have membership subscription engage with industry on two levels. There are Tier 1 companies which lead the research and Tier 2 companies which are companies in the existing supply chain who want to keep up to date with developments in the industry or companies who would like to be in supply chain. Engagement with the Centres enables supply chain companies have access to new technology and research. SMEs will also arise from new company formation which, as described in Chapter 5, is a particular strength of the University.

For example, a third of the total impact of the PNDC is expected to be from SME growth and new spin-outs. At present there is a small group of micro-companies in Scotland that specialise in smart grid technologies. These, and expected spin-outs, could achieve rapid growth if they are able to take full advantage of PNDC.

The University works closely with the public sector including Scottish Enterprise which is tasked with driving forward the focus of the GES on growth companies, growth markets and growth sectors. This close collaboration ensures that SMEs are able to access and exploit opportunities. This is partnership with the public

sector and the development of a cluster is shown by the Scotland's International Technology and Renewable Energy Zone. This is located in Glasgow City Centre and the heart of it is the University of Strathclyde's TIC. Located alongside it is Scottish Enterprise's Inovo building which will provide a range of office suites that support collaborative working in the area of Renewable Energy Research.

The importance of the University's role in developing Scottish companies in key sectors is recognised by the Scottish Government's Low Carbon Strategy¹⁴. The transition towards a low carbon economy is regarded by the Scottish Government as both an economic and environmental imperative, which offers the potential to stimulate and exploit rapidly expanding global markets.

The Strategy acknowledges the existing research strengths of Scotland's universities - particularly in the areas of off shore wind, carbon capture and storage, marine and smart grid technologies - and emphasises the role of research and innovation as a key driver of the transition towards the low carbon economy. Specifically, the Strategy argues that...

"If Scottish companies are to secure sustainable growth in existing markets and a significant share of new global markets in the Low Carbon and Environmental Goods and Services sector, then they need to be at the forefront of innovative technologies, and their research, development, demonstration and deployment (RDD&D). This will require not only maintaining existing collaborations but developing new ones with universities and leading researchers."

This pulling together of activity across the public sector and industry catalyses activities which leads to a development of critical mass as shown in Section 6.2 with the development of the offshore renewables cluster in Glasgow and Scotland.

The importance of this for economic impact is shown by the fact that offshore renewable energy offers the single most important opportunity for industrial transformation in Britain. The UK is the undisputed leader in early deployments and the scope and scale of the future market is substantial.

The UK is by far the largest market with 2,094 megawatts (MW) of offshore wind installed, representing over half of all installed capacity in Europe. Even at current moderate build out rates for offshore wind, analysts estimate a contribution of 0.4% to GDP and over 97,000 jobs by 2020; and by 2030, £18.8bn in net exports, 0.6% to GDP growth and 173,000 jobs¹⁵.

If the UK secures first mover advantage it will be in a position to export overseas and increasing the exporting activities of UK companies and improving the global competitiveness

7.3 Public Service Provision

7.3.1 Education

The University's School of Education is the largest provider of professional education courses for teachers and other childhood practitioners in Scotland and among the largest in Europe. It provides training of Scotland's teachers. The School shows its application of the University's ethos in useful learning and global ambition by hosting the Confucius Institute for Scotland's Schools (CISS). The aim

¹⁴ Scottish Government (November 2010), A Low Carbon Economic Strategy for Scotland.

¹⁵ *The macroeconomic benefits of investment in offshore wind*. Centre for Economics and Business Research Ltd, (June 2012).

of CISS is to promote Chinese language and culture in schools in Scotland. It was established in 2012 in partnership with Tianjin Educational Commission and is funded by the Scottish Government, the Hanban and the Confucius Institute Headquarters of China. Another example is its hosting of the Scottish Government funded Autism Network Scotland which aims to be a hub for autism information, to create networking opportunities and to help raise awareness and promote the sharing of good practice.

In particular the School's dedication to the University's focus of useful learning is reflected in its interest in taking on research, strategies and schemes that will make a measurable difference to the quality of education and quality of life in schools, and for families and communities both locally and internationally. This is reflected by the regular commission of research, evaluation and provision of training opportunities for staff and policy makers in the sector by the Scottish Government and local authorities.

In addition to providing Higher Education courses the University provides education to the workforce and the wider population through the Centre for Lifelong Learning (CLL). The courses run in the CLL are accredited through the University and enable students to participate in the Scottish Credit Qualifications Framework (SCQF). The SCQF allows pupils to demonstrate their knowledge in their careers or through volunteering opportunities. Pupils who have gone through these courses have also been given the confidence to change their career or re-enter the labour market after a period of unemployment. The CLL has been running for 25 years and has more than 4,500 attendees.

7.3.2 Healthcare

The University is unique in being a leading institution in health research despite not having a medical school. This is demonstrated by Cancer Research UK, the funders of over half of the UK's cancer research. One of the charity's highest priority strategic initiatives is the establishment of Cancer Research UK Centres which are Centres of excellence in cancer and will deliver world-class research, improved patient care and greater local engagement by being a place of research collaboration between charities, universities, NHS Trusts and cancer networks. There are seventeen centres involving eighteen universities. Only one of these centres involves collaboration between universities and only one of these eighteen Universities does not have a medical school: the University of Strathclyde.

The University's strength in healthcare includes being one of the UK's leading universities for pharmacy. The Strathclyde Institute of Pharmacy and Biomedical Sciences is a leading centre for research and training focused on the discovery, development and delivery of better medicines and has moved in 2013 to a £36 million new building with a dedicated Knowledge Exchange Hub. In order to realise the University's ethos of useful learning the relationship between research, education and their application to the broader community must be seamless. An example of this is the University's partnership with GSK. One activity is developing the continuous professional development of GSK's medicinal chemists in order to better equip them with the skills to develop scientific excellence in order to have the highest quality chemists to design, develop and deliver novel transformational medicines that meet the needs of patients. The solution was the development of an innovative framework that allows the employees to work towards a higher research degree through their work-based research projects. The success of the programme has resulted it being extended and objectives being achieved ahead of target and cited at both UK and Scottish Government levels.

The University is one of only two institutions in the UK offering undergraduate and postgraduate education in Prosthetics and Orthotics. This has contributed to the University being an innovator in rehabilitation engineering and medical devices. An example of this is the MAKO Centre for Robotic Orthopaedic Surgery, a collaboration between bioengineers, NHS Greater Glasgow & Clyde's Royal Infirmary and the American corporation MAKO Surgical, engaged in randomised clinical trials of MAKO's RIO® Robotic Arm Interactive Orthopaedic System, which allows surgeons to perform a precise knee resurfacing procedure called MAKOplasty®. If successful, the Centre will contribute to improving the functional outcome of knee surgery patients in Glasgow, reducing pain and helping patients recover more quickly. In addition, the technology could reduce the cost to the NHS.

The University's focus on health technology involves all four of the University's four faculties, which includes social sciences, which results in the University's expertise in health to include the evaluation of health interventions and informing policy.

This unique strengths of the University of Strathclyde in health together with its focus on useful learning, technological development and collaboration with industry leads to a wide variety of healthcare activities beyond the identification and treatment of disease. This is highlighted by the focus of the University's health activities, biomedical engineering, biomedical imagery, supporting health and developing medicines.

8 STUDENT IMPACTS

The impacts associated with the students of the University of Strathclyde are discussed in this chapter. These impacts include:

- student spending impacts;
- student work impacts; and
- student volunteering impacts.

8.1 Student Spending

The students of the University of Strathclyde have an impact on the economy through their spending in the same way that staff have an impact through the spend of their wages. In order to calculate this impact it is necessary to establish:

- how much students spend;
- where they spend it; and
- what they spend it on.

How much students spend will depend a lot on the type of accommodation that they reside in. The assumptions about the types of accommodation that each student lives in are given in Table 8.1. These assumptions are based on the location data provided by the University of Strathclyde and BiGGAR Economics previous work for Universities in Scotland.

Table 8.1 – Number of Full Time Students in each Type of Accommodation by Location

	Glasgow	Other Scotland	Other UK
Student accommodation	1,674	-	-
Private let	4,682	3,331	-
Living with parents	1,122	3,331	991
Total Students	7,478	6,662	991

Source: University of Strathclyde and BiGGAR Economics

The amount of money that students spend was based on the cost of living assumptions that are given on the University of Strathclyde’s website¹⁶. This was given for three broad areas of spend and is given for the full term. The average annual cost of living that the University of Strathclyde anticipates for students living in self-catering accommodation is £8,650.

¹⁶ <http://www.strath.ac.uk/sees/infoint/costofliving/> accessed 24/07/13

Table 8.2 – Number of Full Time Students in each Type of Accommodation by Location

Spend over term	
Accommodation	£4,400
Recurrent living expenses	£3,750
One-off annual living costs	£500
Total	£8,650

Source: University of Strathclyde and BiGGAR Economics

The type of accommodation that the students stay in will determine which of the above categories that they will spend in. For example it was assumed that students living with parents will not pay accommodation costs, bills and utilities. The accommodation costs associated with students living in University accommodation is already included in the direct impact and is therefore omitted to avoid double counting. The increased spend in each of the different areas is the calculated based on the number of students living in each accommodation type in that area.

Table 8.3 – Number of Full Time Students in each Type of Accommodation by Location

	Glasgow	Scotland	Elsewhere
Increased spend (£m)	51.0	42.1	4.0

Source: BiGGAR Economics

The direct economic impacts of the increased spend were calculated using the GVA/turnover ratio and the turnover/employee ratio for the appropriate sector. The multipliers were then applied to include the indirect benefits of this increased spend. In this way it can be estimated that student spending contributes £56.5 million GVA to the Scottish economy and supports 1,218 jobs.

Table 8.4 – Student Spend Impact

	Glasgow	Scotland	UK
Total GVA (£m)	23.5	56.5	57.8
Total Jobs	513	1,218	1,264

Source: BiGGAR Economics

8.2 Part Time Work of Students

The part-time work that students undertake also contributed to the economy. The economic impact of this work comes from the additional GVA of the businesses that employ them and the multiplier effect that these additional workers have on those businesses supply chain.

A survey by the University of Strathclyde found that 32% of the full time student population work part time. The average number of hours that these students worked per week was 15.2, equivalent to 0.4 FTE. It was assumed that students in part-time jobs were paid the national minimum wage of £6.08 per hour.

Using this survey it can be shown that students worked a total of 73,355 hours per week. This is equivalent to 1,983 ftes. However it is possible that if these students were not able to fill these jobs, other people in the labour market would have been able to fill these positions. In previous studies undertaken by BiGGAR Economics it has been assumed that this displacement effect would be minimal because the jobs that students were taking are often low-paid and with irregular hours, making

them unattractive to others in the labour market. However, in the current economic climate with higher levels of unemployment, this can no longer be assumed to be the case. For this reason, a 50% displacement factor has been applied. This implied that if students from the University of Strathclyde were not available for work, then 50% of these jobs would be filled anyway. Therefore the additional hours worked was 36,678, which is equivalent to 991 ftes.

Table 8.5 – Student Work Assumptions

Assumption	Value	Source
Proportion of full-time students who work part-time	32%	University of Strathclyde Survey
Average number of hours worked	15.2	
Additional labour	50%	BiGGAR Economics Assumption
Minimum wage (2011 – over 21)	£6.08	UK Government

The additional GVA that these hours worked generate for the businesses in which they are employed is calculated using the GVA per employee ratios for the industries in which students most frequently find work. This was multiplied by the equivalent number of full time students working in each area. In this way it can be calculated that the additional student workers contributed £23.4 million GVA directly to the companies for which they work.

It was assumed that the students were paid a total of £11.6 million for this work. This money was spent by the students in the wider economy and has already been included in the analysis of student spend. It was therefore necessary to deduct this from the total direct GVA impact, which gave a direct GVA impact (excluding student wages) of £11.8 million. The GVA and employment multipliers for the relevant industries have been applied to take account of the indirect impact of this additional GVA.

In this way it can be shown that the total economic impact of student part time work was £15.0 million in Scotland and 1,343 jobs, and £16.0 million and 1,437 jobs in the UK.

Table 8.6 – Part-Time Work Impact

	Glasgow	Scotland	UK
Total GVA (£m)	6.5	15.0	16.0
Total Employment (ftes)	563	1,343	1,437

Source: BiGGAR Economics

8.3 Volunteering

The University of Strathclyde Students Union promotes volunteering opportunities to students as a way of increasing their employability while having a positive impact on the communities in which they will work. A lot of the impacts of volunteering, such as befriending disabled children, are unable to be quantified but will have an enormous impact on the children and their families. However it was still possible to measure the economic impact of these volunteers is measured through the wages that would have been paid to the student if they have received the national minimum wage.

The Students Union has 1,650 students who are registered as volunteers. These volunteers recorded 22,000 volunteering hours. However the Students Union highlighted that this will be an underestimate of the volunteering activities that the students undertake as they are aware a number of students who volunteer outwith the structured Students Union volunteering programme. The impact of the volunteering hours is quantified by multiplying these hours by the national minimum wage of £6.08.

If the students volunteer with organisations that are in the same area as their home then the impact of volunteering would have been at least £0.1 million in Scotland. Of this, £57,000 would be within Glasgow.

Table 8.7 – Volunteering Impact

	Glasgow	Scotland	UK
Total GVA (£m)	0.1	0.1	0.1

Source: BiGGAR Economics

8.4 Summary of Student Impacts

The impacts that are associated with the activities of students generated £71.6 million GVA and 2,560 jobs for the Scottish economy. Of this £30.1 million GVA and 1,076 jobs are in Glasgow.

Table 8.8 – Student Impacts GVA (£m)

	Glasgow	Scotland	UK
Student Spending	23.5	56.5	57.8
Student Part-Time Work	6.5	15.0	16.0
Student Volunteering	0.1	0.1	0.1
Total Student Impact	30.1	71.6	74.0

Source: BiGGAR Economics – Figures may not total due to rounding

Table 8.9 – Student Impacts Jobs

	Glasgow	Scotland	UK
Student Spending	513	1,218	1,264
Student Part-Time Work	563	1,343	1,437
Student Volunteering			
Total Student Impact	1,076	2,560	2,701

Source: BiGGAR Economics – Figures may not total due to rounding

9 TOURISM IMPACTS

This chapter considers the tourism activity that is associated with the University of Strathclyde. The tourism impacts are generated by:

- friends and family visiting students and staff;
- people attending conferences and events hosted at the University of Strathclyde; and
- the role of University accommodation in increasing the tourism sector’s capacity at peak times.

9.1 Visits from Friends and Family

For the academic year 2012/13 there were a total of 18,469 staff and students associated with the University of Strathclyde. While working or studying at the University it is expected that friends and family who are not normally resident in the local area will visit many of these people. These trips are referred to as visiting friends and relatives (VFR). The expenditure of these visitors generates GVA and supports jobs in the tourism sector.

The first step towards calculating this impact is to estimate the number of visits from friends and family the students and staff of the University of Strathclyde will receive. Visit Scotland compile data on the number of VFR trips that are taken to different areas within Scotland and where the visitors come from, either domestic or from overseas¹⁷. These numbers are then divided by the population of Scotland to find the number of domestic VFR trips and overseas VFR trips per person. This shows that the number of domestic VFR trips per person in Glasgow City is 0.41 and the number of overseas VFR trips per person in Glasgow City is 0.17. In Scotland the number of domestic VFR trips per person is 0.45 and the number of overseas VFR trips is 0.12.

The total number of VFR trips was calculated by multiplying the average number of trips per person by the total number of staff and students in each area. In this way it can be shown that there were over 7,300 domestic VFR trips to staff and students in Scotland and 2,575 VFR trips to staff and students in Scotland from overseas.

Table 9.1 – Number of VFR Trips

	Glasgow	Scotland	UK
Domestic	3,840	7,361	7,842
Overseas	1,657	2,575	2,700
Total VFR Trips	5,496	9,936	10,543

Source: BiGGAR Economics – Figures may not total due to rounding

The next stage for calculating this impact is to consider the amount of money that was spent during these trips. Visit Scotland also compile the amount of money spent for both overseas and domestic VFR trips. The average spend per overseas VFR trip is £574, which is significantly higher than the amount spend per domestic VFR trip, which is £150. Applying these per visit spends to the number of visits to each area gave the increased total spend in the tourism businesses in each area.

¹⁷ Visit Scotland, Tourism in Western Scotland, 2011

The direct economic impacts of the increased spend were calculated using the GVA/turnover ratio and the turnover/employee ratio for the appropriate sector. The multipliers for these sectors were then applied to include the indirect benefits of this increased spend. In this way was estimated that VFR trips contributed £1.7 million GVA to the Scottish economy and supported 89 jobs.

Table 9.2 – VFR Impacts

	Glasgow	Scotland	UK
Total GVA (£m)	0.7	1.7	1.9
Total Employment (ftes)	37	89	94

Source: BiGGAR Economics

9.2 Conferences and Events

The University of Strathclyde holds a number of academic and professional conferences, corporate events and weddings. These have an impact on the tourist economy by attracting attendees to Glasgow. In total the University of Strathclyde hosted 185 events, which attracted 8,666 attendees in 2012/13. In addition to this there are events that are held within Glasgow that the University of Strathclyde has an impact on without having organised or hosted. These are larger events which would not have occurred in Glasgow without the influence and presence of the University of Strathclyde and its academic reputation. It is assumed that these conferences attract the same number of attendees as those organised by the University of Strathclyde.

The impact associated with these events varies because different types of events would have happened in Glasgow and Scotland regardless of the presence of the University of Strathclyde, such as weddings. The additionality factor for the Glasgow economy for weddings is 25%, therefore it was assumed that 75% of the weddings held by the University would have happened elsewhere in the city.

Table 9.3 – Conference and event assumptions

	Conferences (Strathclyde)	Conferences (Other)	Group Events	Corporate Events	Weddings
Attendees*	2,769	2,769	1,657	2,490	1,750
Glasgow additionality**	100%	100%	100%	50%	25%
Scotland additionality**	100%	100%	100%	25%	0%
UK additionality**	0%	0%	0%	0%	0%

Source: *University of Strathclyde Procurement and Commercial Services **BiGGAR Economics

The University of Strathclyde also attracts business tourism to Glasgow and Scotland outside its own venues. For example it supports the Glasgow City Marketing Bureau's (GCMB) mission in attracting conferences. In June 2013 the GCMB announced that it had attracted conference activity worth £1 billion to Glasgow since its inception in 2005¹⁸. Through GCMB's innovative Ambassador Programme, Glasgow has successfully attracted a large number of international

¹⁸ Glasgow City Marketing Bureau, <http://conventions.peoplemakeglasgow.com/%C2%A31billion> accessed 11 Sept 2013

meetings and conventions, with over 60% of international meetings sourced via senior academics in the city’s universities, particularly in areas where they are internationally active. The annual value of this in the financial year 2012/13 was £153 million. The University of Strathclyde contributed £55 million of business tourism for example the University worked in partnership with GCMB to bring the European Association for International Education conference to the city in 2015, which will see 5,000 delegates from around the world arrive in the city. This additional turnover in the Glasgow tourism sector has been added to the University’s impact.

The economic impact of this additional spend was calculated by dividing the additional turnover by the GVA/turnover ratio and the turnover/employee ratio for the appropriate sector. The multipliers for these sectors were then applied to include the indirect benefits of this increased spend. This method estimated the total impact of conferences of £39.6 million GVA and 1,976 jobs in Scotland, of which £30.9 million GVA and 1,728 jobs are in Glasgow.

Table 9.4 – Conference and event impacts

	Glasgow	Scotland	UK
Total GVA (£m)	30.9	39.6	0.0
Total Employment (ftes)	1,728	1,976	0

Source: BiGGAR Economics

9.3 Accommodation Impacts

The University of Strathclyde also supports the local tourist economy through the provision of rented student accommodation for visitors. By adding additional capacity to Glasgow’s tourist infrastructure it allows people to visit who would otherwise not be able to do so.

There are 1,840 student bedrooms that are available throughout the year. For the majority of the year these rooms are occupied by students, however during the holidays these rooms are leased out to tourists and visitors to events. It was assumed that the occupancy rate for these beds is 25% and that 50% of the visits are additional. This meant that half of the visitors would not have come to Glasgow if they had been unable to get accommodation at the University of Strathclyde.

The economic impact of these additional visitors was calculated by multiplying the average daily spend of domestic leisure tourists by the number of additional bednights. The additional spend was split between Glasgow and the rest of Scotland based on the proportion of the visit that was spent in each area.

Table 9.5 – Accommodation assumptions

	Value	Source
Student beds	1,840	Strathclyde Accommodation website
Weeks available	12	Strathclyde website “Cost of Living”
Occupancy	25%	BiGGAR Economics assumption
Additionality	50%	
% of visit spent in Glasgow	80%	
Daily spend	£57.08	VisitScotland Tourism Statistics 2010

In this way it can be estimated that the additional spending in Scotland associated with the additional visitors was £2.2 million. The direct economic impacts of the increased spend were calculated using the GVA/turnover ratio and the turnover/employee ratio for the appropriate sector. The multipliers were then applied to include the indirect benefits of this increased spend. In this way it can be estimated that VFR trips contributed £1.4 million GVA to the Scottish economy and supported 77 jobs. Of this £1.0 million GVA and 54 jobs were in Glasgow.

Table 9.6 – Accommodation impacts

	Glasgow	Scotland	UK
Total GVA (£m)	1.0	1.4	1.5
Total Employment (ftes)	54	77	77

Source: BiGGAR Economics

9.4 Summary of Tourism Impacts

The total impact from tourism activity associated with the University of Strathclyde was £32.5 million GVA and 1,818 jobs in Glasgow, £42.7 million GVA and 2,142 jobs in Scotland and £3.4 million GVA and 171 jobs in the UK.

Table 9.7 – Tourism Impacts GVA (£m)

	Glasgow	Scotland	UK
Visiting Friends & Family	0.7	1.7	1.9
Conference & Events	30.9	39.6	0.0
Accommodation	1.0	1.4	1.5
Total Tourism Impact	32.5	42.7	3.4

Source: BiGGAR Economics – Figures may not total due to rounding

Table 9.8 – Tourism Impacts Jobs

	Glasgow	Scotland	UK
Visiting Friends & Family	37	89	94
Conference & Events	1,728	1,976	0
Accommodation	54	77	77
Total Tourism Impact	1,818	2,142	171

Source: BiGGAR Economics – Figures may not total due to rounding

10 FUTURE PRODUCTIVITY

The learning that the students undertake in during their time at the University of Strathclyde enhances their future productivity in the economy. The two impacts are:

- graduate premium; and
- widening participation.

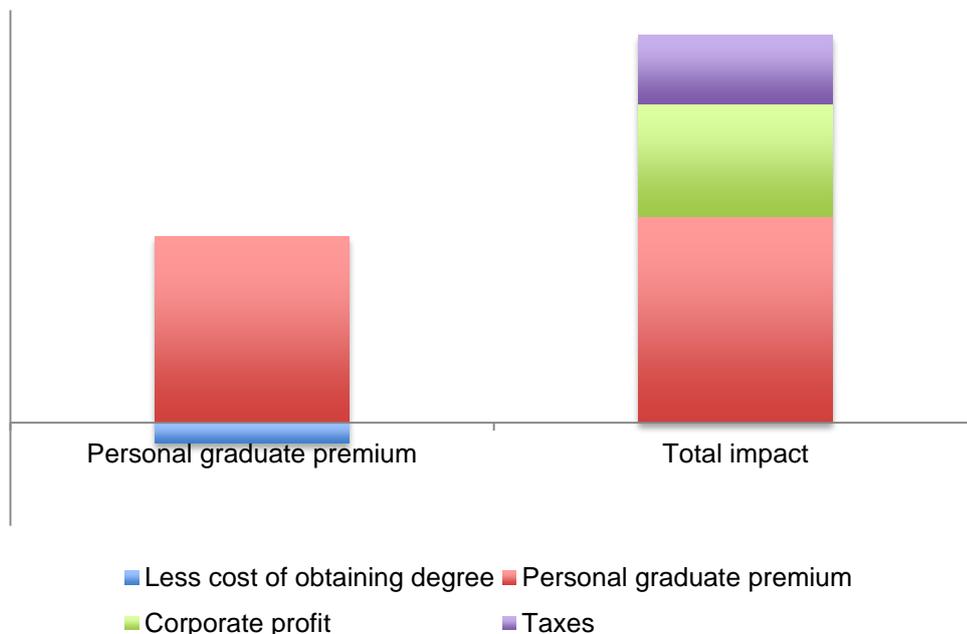
10.1 Graduate Premium

10.1.1 Sources and Methodology

The graduate premium is one method of quantifying the future productivity increases associated with annual cohort of graduates. The graduate premium for each subject is based on the calculations in the Department for Business Innovation & Skills research paper into The Returns to Higher Education Qualifications (June 2011). This considered data from the Labour Force Survey between 1996 and 2009. The analysis considers the after tax earnings of a graduate compared to the after tax earnings of a non-graduate. The direct and indirect costs are subtracted from the gross graduate premium for each degree to give the net graduate premium. In this way the total graduate premium gives the combined personal economic benefit that the year's graduates will obtain rather than the increase in national productivity associated with the degree, which will be higher.

The national benefits from the increased productivity of graduates will also include the corporate profit associated with each graduate as well as the taxes paid to the Treasury.

Figure 10-1: Personal graduate premium benefit vs. economic benefit



10.1.2 Graduates by Subject

The subject that a student graduates in determines the earnings premium that they can expect to achieve over the course of their working life. Graduates in medicine

and dentistry can expect to earn £371,432 more in their working life than if they had not gone to University. However, graduates in creative arts and design can only expect achieve a premium of £5,945. The average for all undergraduate degrees is £101,442.

Table 10.1 – Graduate Premium by degree subject

	Graduate Premium
Agriculture	£60,131
Architecture, building and planning	£125,337
Biological sciences	£65,788
Business and administrative studies	£115,295
Creative arts and design	£5,945
Education	£115,843
Engineering	£128,120
European languages	£61,501
Historical and philosophical studies	£21,843
Law	£161,436
Linguistics, classics and related	£49,036
Mass communication	£19,460
Mathematical and computing sciences	£136,629
Medicine and dentistry	£371,432
Non-European languages	£45,165
Physical /environmental sciences	£92,063
Social studies	£98,793
Subjects allied to medicine	£145,633
Technologies	£62,512
Veterinary sciences	£146,181
Average Undergraduate	£101,442
Postgraduate degree	£50,195

Source: Department of Business, Innovation and Skills, *The Returns to Higher Education Qualifications, 2011*

The number of students who graduated in 2011/12 in each subject area are shown in Table 10.2. The total personal graduate premium of these graduates is £617.6 million. The mix of subjects studied at the University of Strathclyde lean towards those that have a higher graduate earnings premium, particularly at the undergraduate level. The average premium for all undergraduate student graduates is £114, 012, which is higher than the average for all students, which is £101,442.

Table 10.2 – Graduate Premium Assumptions by degree subject

	UG Graduates	PG Graduates	Graduate Premium
Architecture, building and planning	220	168	£36,006,706
Biological sciences	90	43	£8,079,284
Business and administrative studies	676	1,084	£132,349,920
Creative arts and design	29	0	£172,405
Education	521	725	£96,744,955
Engineering	693	454	£111,575,463
European languages	44	2	£2,806,411
Historical and philosophical studies	140	27	£4,413,272
Law	208	227	£44,972,840
Linguistics, classics and related	83	18	£4,973,448
Mass communication	23	31	£2,003,610
Mathematical and computing sciences	176	82	£28,162,653
Physical /environmental sciences	226	94	£25,524,521
Social studies	448	118	£50,181,991
Subjects allied to medicine	446	93	£69,620,407
Total	4,023	3,166	£617,587,883

Source: BiGGAR Economics

The majority of graduates remain in Scotland¹⁹ and 39% of the graduates remain in Glasgow. The total graduate premium is divided by the location of the graduates. In this way it can be estimated that the total personal graduate premium of Strathclyde graduates in Glasgow was £241.5 million, in Scotland was £508.9 million and in the UK was £580.5 million.

Table 10.3 – Graduate Premium Impacts & Assumptions

	Glasgow	Scotland	UK
Location of graduates	39%	82%	94%
Total Graduate Premium (£m)	241.5	508.9	580.5

Source: BiGGAR Economics

10.2 Widening Participation

The University’s commitment to providing access to the widest range of students as possible has led it to recruit student from a wide range of backgrounds. It recruits 2.2% more students from SIMD 20 backgrounds than the average for the Scottish Universities sector and was the highest of all the Scottish research intensive Universities. Some of these students may otherwise have been unemployed as there are barriers faced by these students in applying to other Universities and there are ‘too few high-quality progression routes to follow as they make the transition

¹⁹ University of Strathclyde, Destination of Strathclyde Graduates, 2012

from being in full time education to being in full time work²⁰. The costs of unemployment ranges from cost to exchequer of benefits, to future costs in terms of earnings due to increased risk of not being in work²¹, increased risk of depression²² to estimated lifetime costs of £97,000²³. There are many reasons for students to be not in education, employment and training, therefore this report has made a conservative assumption based on the above sources of lifetime costs of having a spell of youth unemployment is £16,000²⁴.

The number of young people this impact affects is estimated by applying the following assumptions together:

- number of students in Glasgow City and Scotland that come from deprived backgrounds – this is estimated by applying the percentage of the full time undergraduates in 2011/12 who were from deprived areas to the number of students coming from Glasgow City and Scotland;
- assumption of unemployment created – this is assumed to be 50% of the number of students from deprived areas.

This resulted in an estimate of the impact of lowering unemployment in Scotland as £10.7 million.

Table 10-4: Widening participation impact

	Glasgow	Scotland	UK
GVA (£m)	5.3	10.7	10.7

Source: BiGGAR Economics

This figure is an underestimate of the costs of youth unemployment both to the economy and society. In particular youth unemployment relates to:

- reduced levels of mental and physical health – unemployment and lower educational attainment is related to increased incidence of mental health issues. The psychological effect of unemployment increases the probability of poor physical health outcomes; and
- reduced social mobility – not attending University can have an impact not only on a person’s social mobility it also affects the mobility of the next generation thus increases the inequality of a society.

²⁰ Third Sector Leaders ACEVO, “Youth unemployment: the crisis we cannot afford: (2012)

²¹ The ACEVO Commission on Youth Unemployment ‘ Youth unemployment: the crisis we cannot afford’ 2012

²² Princes’ Trust ‘ The Cost of Exclusion – Counting the cost of youth disadvantage in the UK’ 2007

²³ Godfrey, C., Hutton, S. Bradshaw, J. Coles, B., Craig, C., and Johnson, J., ‘Estimating the Cost of being “Not in Education, Employment or Training” at Age 16-18, Department for Education and Skills (2002)

²⁴ Based on data on earnings only, in 2013 prices, extracted from: Godfrey, C., et.al.

11 BASELINE QUANTITATIVE IMPACT

The total quantitative economic baseline impacts are given in Table 11.1 and Table 11.2.

The baseline economic impact of the University of Strathclyde for 2012/13 has been estimated as:

- £276.5 million GVA and 7,805 jobs in Glasgow;
- £489.7 million GVA and 13,031 jobs in Scotland; and
- £527.5 million GVA and 13,194 jobs in the UK.

When the increased future productivity (associated with a one year cohort of graduates) is included the total economic impacts are estimated at:

- £523.3 million GVA in Glasgow;
- £1,009.3 million GVA in Scotland; and
- £1,118.7 million GVA in the UK.

Table 11.1 – Impact Summary GVA (£m)

	Glasgow	Scotland	UK
Core impacts			
Direct impact	135.0	135.0	135.0
Supplier impact	13.9	56.3	84.9
Staff spending impact	9.1	43.4	63.5
Capital spending impact	6.2	26.6	40.2
Student impacts			
Student spending impact	23.5	56.5	57.8
Student work impact	6.5	15.0	16.0
Student volunteering impact	0.1	0.1	0.1
Tourism impacts			
Visiting friends & family impact	0.7	1.7	1.9
Conferences & events impact	30.9	39.6	0.0
Accommodation impact	1.0	1.4	1.5
Research and Commercialisation impacts			
Licencing impact	0.0	4.2	8.1
KTP impact	2.0	5.8	6.2
Spin-out & Start-up impact	46.6	93.4	98.1
CPD impact	0.0	7.7	10.1
Consultancy impact	1.0	3.0	3.8
Total Impact	276.5	489.7	527.5
Graduate Premium	241.5	508.8	580.5
Widening participation impact	5.3	10.7	10.7
Total Impact (inc. Grad Premium)	523.3	1,009.3	1,118.7

Source: BiGGAR Economics – Figures may not total due to rounding

Table 11.2 – Impact Summary (Jobs)

	Glasgow	Scotland	UK
Core impacts			
Direct impact	1,192	3,158	3,248
Supplier impact	461	1,656	2,501
Staff spending impact	241	1,110	1,628
Capital spending impact	128	553	835
Student impacts			
Student spending impact	513	1,218	1,264
Student work impact	563	1,343	1,437
Student volunteering impact	0	0	0
Tourism impacts			
Visiting friends & family impact	37	89	94
Conferences & events impact	1,728	1,976	0
Accommodation impact	54	77	77
Knowledge transfer impacts			
Licencing impact	0	65	125
KTP impact	45	120	129
Spin-out & Start-up impact	1,138	1,776	2,006
CPD impact	0	118	157
Consultancy impact	16	47	59
Total Impact	7,805	13,031	13,194

Source: BiGGAR Economics – Figures may not total due to rounding

In 2012/13 the University of Strathclyde had an income of £237 million. Of this, £92 million was accounted for by grants from the Scottish Funding Council (SFC) and a further £31 million came from tuition fees from Scottish and EU students (most of which was also funded from Scottish public sector budgets), giving a core income from the public sector of £123 million. Therefore, for every £1 received by the University of Strathclyde from the Scottish public sector budget, an economic impact of more than £8 was generated in the Scottish economy (including increased future productivity associated with a one year cohort of graduates).

The table below also shows that for every pound of SFC grant income (a common comparative measure across universities), £5.30 is supported in the Scottish economy and, including the increased future productivity, £10.93 is supported.

Table 11.3 – Total Quantitative Impacts GVA (£m)

	Without future productivity	With future productivity
Total Income : Impact	2.07	4.26
SFC Grant Income : Impact	5.30	10.93
Scottish Public Sector Income : Impact	3.97	8.17
Direct GVA : Total GVA	3.63	7.48
Direct Jobs : Total Jobs	4.52	4.52

Source: BiGGAR Economics

12 FUTURE IMPACTS

12.1 Capital Projects

The University of Strathclyde has a plan for increased capital investment over the next three years. The construction of the Technology and Innovation Centre between 2012 and 2014 will give a significant boost to the construction industry in Scotland.

The location of the construction, in the centre of Glasgow, will maximise the strategic and economic benefit of the construction. The ITREZ complex, of which TIC is the largest component, will be a key element in the regeneration of Glasgow City Centre and is identified as a regeneration priority in various local and regional planning and regeneration strategies.

The Glasgow and Clyde Valley Joint Structure Plan²⁵, which provides a 20 development vision for the region, identifies the City Science site on which the ITREZ will be developed as a strategic industrial and business location. Development of the site is supported by the plan as a means to “maintain the vitality and attractiveness of Glasgow City Centre”.

At a local level, both the Glasgow City Plan²⁶ and the Glasgow City Centre Action²⁷ Plan identify development of the site as a key regeneration priority. The City suggests that the creation of an International Higher Education District would help to promote the City Centre while the City Centre Action Plan suggests that the site will be a crucial link in the eastwards expansion of the City Centre towards the ongoing redevelopment of the Collegelands site and beyond to the 2014 Commonwealth Games sites.

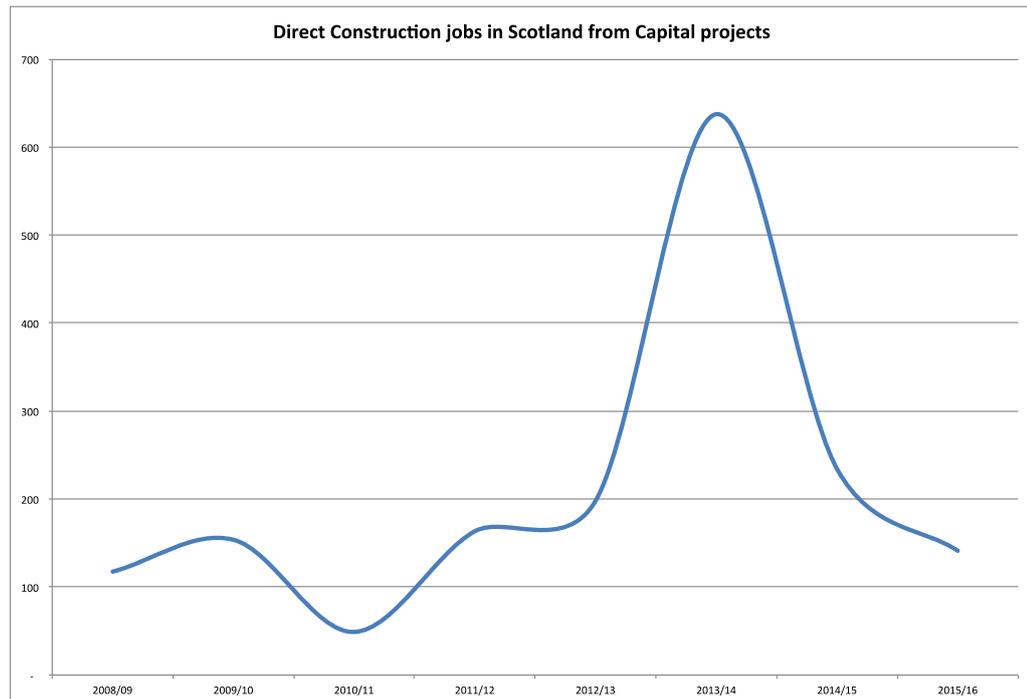
The direct impact of the future capital investment of the University of Strathclyde on the Scottish construction sector is shown in Figure 12-1. This shows that the capital project investment by the University will employ over 600 people in the Scottish construction sector in the academic year 2013/14. This is significantly higher than the year 2012/13, in which it was expected that fewer than 200 people would be employed.

²⁵ Glasgow and the Clyde Valley Joint Structure Plan Written Statement, 2006, Glasgow and the Clyde Valley Structure Plan Joint Committee, April 2008.

²⁶ Glasgow City Plan 2; part 2, Glasgow City Council, adopted December 2009

²⁷ Glasgow City Centre Action Plan, Glasgow City Council.

Figure 12-1: Direct Construction jobs in Scotland from capital projects



12.2 Collaborative Centres

The impacts associated with the collaborative centres have yet to be fully realised as they are at the early stages of the development.

12.2.1 Impacts on Industry

Although the collaborative research centres are new and there has yet to be quantifiable economic impacts on the industries in which they are working, the investments from companies and economic impact evaluations of the centres predict a sizeable boost to the industries in the future.

The impacts on the industries come from

- quicker deployment;
- financial confidence – the testing and analysis of the new technologies in centres such as these enables the risk to be reduced and quantified. This is vital in attracting both financial investors and insurance companies to support the product
- innovation through collaboration
- retaining research talent
- inward investment
- more educated workforce – increased postgraduate research students

In 2011 BiGGAR Economics was commissioned by the University of Strathclyde to undertake an economic impact analysis of the Technology and Innovation Centre. The net value of the TIC is expected to be over £1.4 billion over the next 25 years.

Table 12.1 – Summary of cumulative costs & benefits of TIC over 25 years

	Net value (£m)	NPV value (£m)	% cost/benefits
Total Capital Costs	89.3	78.3	n/a
Research Income & Staff	381.4	109.7	33%
Business RTD	274.2	71.3	6%
Commercialisation	314.2	86.6	26%
Support SMEs	467.5	115.1	35%
Total Benefits	1,437	382.6	100%

Source: BiGGAR Economics

12.2.2 Potential Future Economic Impact

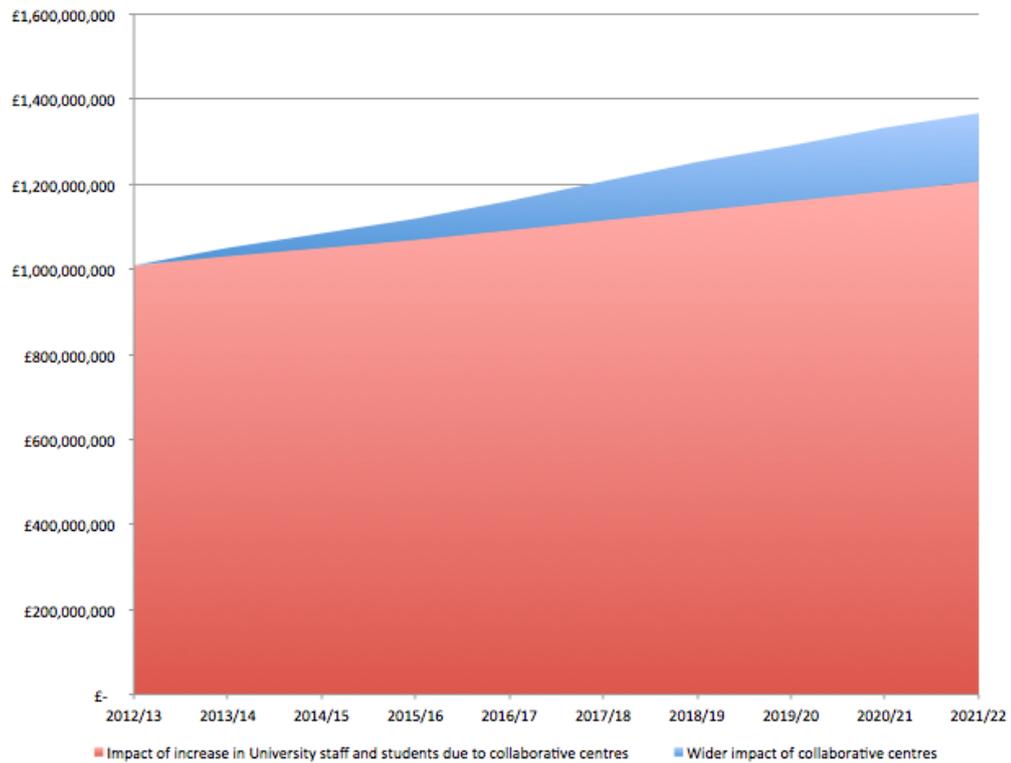
The economic impact of the University of Strathclyde is expected to grow in the coming decade. A significant proportion of this growth is expected to come from the collaborative centres, which will begin to have an impact on the industries in which they work.

As discussed above BiGGAR Economics was commissioned to undertake the economic impact analysis of one of these collaborative centres, the TIC. This found that the annual economic impact of the TIC by 2021/22 would be £64.5 million. It was assumed that the TIC would account for 40% of the growth associated with the collaborative research centres in this time period. Therefore the annual impact of the collaborative centres is estimated to be £161.2 million by 2021/22.

The University of Strathclyde is assumed to continue growing due to the collaborative centres making the University more competitive in attracting students and research income. This will also result in an increase in staff numbers. This growth is assumed to be 2% a year.

Using these assumptions it can be estimated that by 2021/22 the economic impact of the University of Strathclyde in Scotland will be £1,367.4 million, 35% higher than in 2012/13. This is equivalent to growth of £358 million, of which 45% will be attributable to the collaborative research centres.

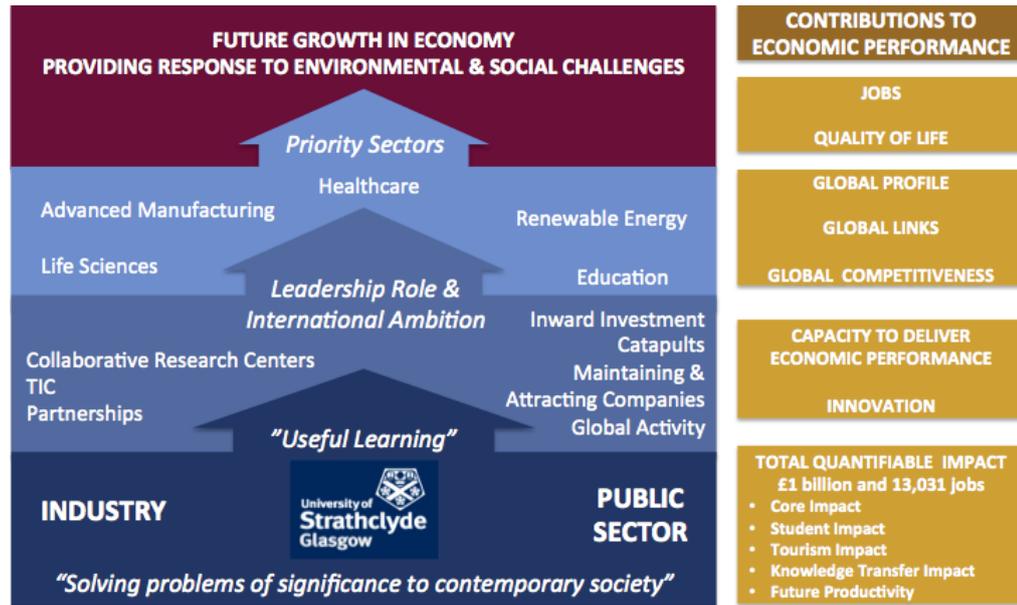
Figure 12-2: Impact of collaborative centres on future Scottish impact of the University of Strathclyde



12.3 Driving Future Growth

The quantification of the possible future impact of the University of Strathclyde through its collaborative centres does not fully capture how the University of Strathclyde drives future economic growth and therefore maintains and creates jobs in the economy as a whole. Some of the University’s contributions to economic performance and therefore jobs cannot be measured such as increasing innovation and creating global links. The following figure summarises some of the activities described in the previous chapter to show how the University’s approach and these activities underpin future growth in the economy.

Figure 12-3: University of Strathclyde and Future Economic Growth



Consultation with industry partners, undertaken as part of this economic impact study, confirms that the collaborative research partnerships in which the University of Strathclyde is involved are expected to have a significant economic value but a value that is not possible to quantify. The research programmes are focused on pre-competitive, industry-level challenges, with expected outputs that can then be further developed into new or enhanced products or processes by individual companies.

The industry partners consulted anticipate that many of the global market opportunities associated with the challenges being addressed by the collaborative research programmes could be in the hundreds of millions, or even billions.

13 APPENDIX A – METHODOLOGY

This chapter describes the methodology taken to calculating economic impact in this report.

13.1 Sources of Economic Impact

The sources of economic impact considered in this report include:

- **Core economic impacts** – including the direct employment and GVA created by the university, the impact of the University's expenditure on supplies, the impact of the expenditure of University staff and the impact of capital projects;
- **Student impacts** – including the impact of student spending on accommodation, food, leisure and other activities and the impact of part-time student employment;
- **Tourism impacts** – including the impact of additional visitor expenditure associated with the University of Strathclyde, including friends and family visiting students and staff, delegates attending conferences and events at Strathclyde University and other conferences in Glasgow that were supported by the University;
- **Knowledge exchange and commercialisation impacts** – including the impact of University spin-out companies and technology licensing, student placements, collaborative industrial research, consultancy and start-up companies;
- **Graduate productivity** – the learning that the students undertake in during their time at the University of Strathclyde enhance their future productivity in the economy.

13.2 Estimating Economic Impact

Economic impact is reported using two measures:

- **Gross Value Added (GVA)** - this measures the monetary contribution that the University, or a particular area of activity undertaken within the University, makes to the economy; and
- **Employment (jobs)** – this is the number of full time equivalent (fte) jobs supported by the University, or a particular area of activity.

Three types of quantifiable economic impact are considered in this assessment:

- direct effects – economic activity directly supported by the organisation or individual (i.e. the turnover of the University or the spending of university employees) and employment (i.e. staff employed by University or employment supported by the direct spend of a student or tourist);
- supplier (or indirect) multiplier effects – the purchases of supplies and services associated with the direct impact and all the resulting purchases of supplies and services down the supply chain that has occurred because of the original purchase; and
- income (or induced) multiplier effects – the expenditure of employees supported by the direct effect and supplier effect.

The grossing up from direct impacts to include the indirect impacts associated with the supplier and income effects used the Type 2 multipliers given in the Scottish Government Input-Output tables²⁸.

13.2.1 Calculating Gross Economic Impact

In this report income and spending are considered analogous to turnover. The approach used to estimate the economic impact of each source of impact varies depending on the information available about the source of impact:

- for impacts where turnover and spending on goods and services are both known (e.g. in calculating direct impact) expenditure on goods and services is subtracted from turnover to give GVA;
- for impacts where only turnover is known, turnover was first of all divided by an estimate of turnover/employee in the relevant sector to obtain an estimate of the employment supported. The number of jobs supported was then multiplied by an estimate of GVA/employee in that sector to obtain an estimate of the GVA generated; and
- for impacts where only employee numbers are known, the number of employees is multiplied by an estimate of GVA per employee to obtain an estimate of GVA.

For all types of impact, estimates of turnover/employee and GVA/employee were obtained from the Annual Business Survey 2011 published in 2013²⁹.

13.2.2 Gross to Net Impact

The total of these effects is the gross impact. This needs to be converted to net impact by taking account of:

- leakage – this considers how much of the economic activity occurs in the study area. Leakage is accounted for by considering the geographical source of the impact. This study considers the economic impact for five different geographic areas:
 - Glasgow;
 - Scotland; and
 - the United Kingdom.
- displacement – this takes into account whether and to what extent the activity of the University has resulted in the reduction of activity elsewhere in the study area (e.g. would conferences hosted by the University have been held elsewhere in Glasgow if the University did not exist, thus reducing the economic impact of other conference facility providers); and

The multipliers used in this report are for the Scottish economy as a whole. In order to use these multipliers for different geographical areas it is necessary to adjust them to reflect the relative size of the area concerned. Unless otherwise stated the value of multiplier at the Glasgow level has been assumed to be one-third of the Scottish multiplier value.

²⁸ Scottish Government, Input Output tables with multipliers 2009, May 2013

²⁹ ONS, Annual Business Survey 2011, June 2013