BiGGAR Economics

Economic Impact of the University of Warwick

A report to

The Chancellor's Commission

Final

5th February 2016

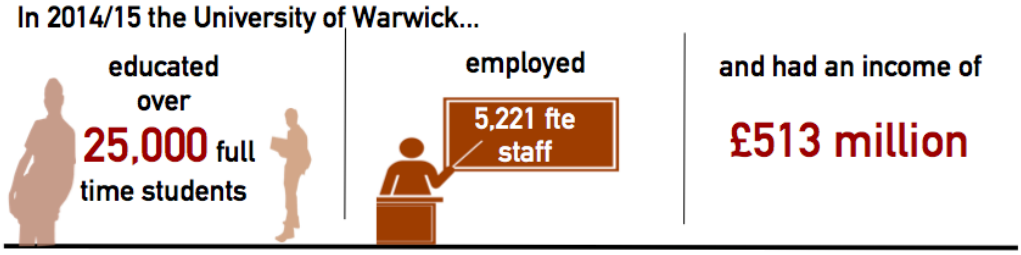
BiGGAR Economics
Pentlands Science Park
Bush Loan, Penicuik,
Midlothian, EH26 0PZ, Scotland
0131 514 0850
info@biggareconomics.co.uk
www.biggareconomics.co.uk

CONTENTS Page

EXECUTIVE SUMMARY

The University of Warwick

The University of Warwick, located in Coventry and Warwickshire, is a highly ranked UK university (placed 6th) and one of the world's leading universities (80th). It is also one of the most successful recently established universities, ranked 9th out of the top 100 universities in the world under 50 years old.

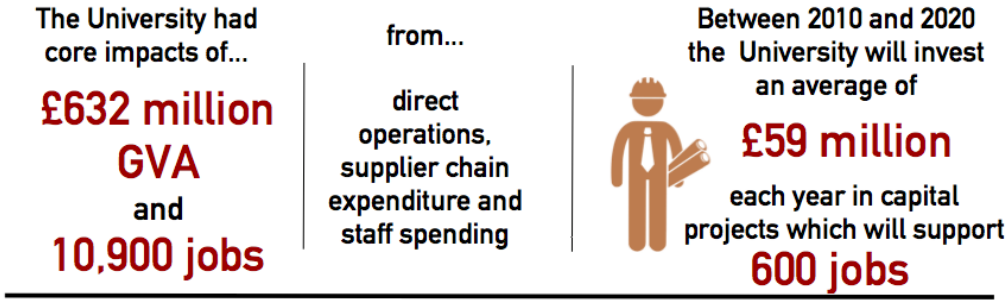


The highest ranking university in the West Midlands, the University of Warwick is an important driver of economic activity with over 25,000 students, more than 5,200 staff and an annual turnover of £512.8 million.

Quantifiable Economic Impact of the University

The University of Warwick makes an economic contribution to the economies of Coventry and Warwickshire, the West Midlands and the UK in a wide range of ways that stem from its high quality research and teaching. Some of this impact can be quantified and this study considers the impacts of the University through its core activities and research, its students and graduates, impacts on the tourism economy through attracting visitors to the area, its commercialisation activities, interactions with businesses and the University of Warwick Science Park.

In 2014/15 the University of Warwick had core impacts of £632.4 million Gross Value Added (GVA) and more than 10,900 jobs in the UK. Of this £473.6 million GVA and almost 7,840 jobs were retained in the West Midlands and £394.1 million GVA and 6,335 jobs in Coventry and Warwickshire. This impact was generated through people directly employed by the University, the University's expenditure on supplies, staff spending their wages in the economy and spending on capital projects.



Student expenditure, student part-time employment and student volunteering are worth a further £153.7 million GVA and 4,340 jobs in Coventry and Warwickshire, almost £190.0 million GVA and 5,030 jobs in the West Midlands and £205.8 million GVA and 5,340 jobs in the UK.

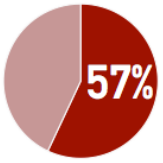
The students of the University of Warwick spent

£151 million

within the Coventry and Warwickshire LEP area

Students also contribute to the economy through part time employment and volunteering

hours of volunteering by Warwick Volunteers



of students work part time during term time

The total economic activity associated with the students of the University of Warwick was

£206 million GVA and 5,300 jobs

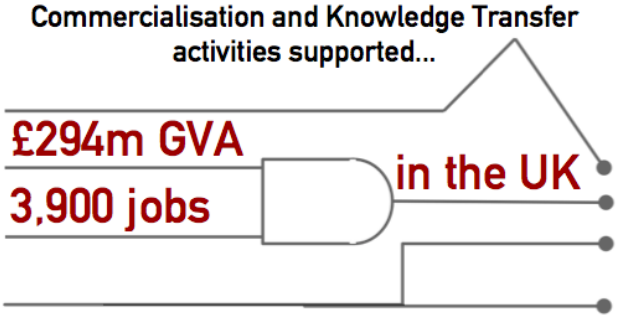
Friends and family visiting staff and students at the University and people attending conferences, open days and events at Warwick Arts Centre are estimated to have spent £9.6 million in Coventry and Warwickshire. This additional spending supports the tourism economy in the area and is estimated to amount to £3.6 million GVA and more than 110 jobs in Coventry and Warwickshire.

The University of Warwick contributes to the economy through the long-term returns from its teaching. In 2014/15, 9,432 students graduated from the University and it is estimated that over their working lives those graduates who remain in the UK will earn £571.4 million more than they would have without a degree.

The **increased productivity** of the University of Warwick's **graduates** support **£288 million GVA** over their working lives as a result of their university degree

The University of Warwick has wide and far-reaching impacts on the economy over and above its fundamental activities of teaching and research through the commercialisation activities of Warwick Ventures. In 2014/15 the University received £0.3 million in licensing income and had 29 spin-out and start-up companies which together employed almost 150 people and had a combined turnover of £4.4 million. This commercialisation activity is estimated to support £2.4 million GVA and almost 80 jobs in Coventry and Warwickshire, approximately £2.9 million GVA and 120 jobs in the West Midlands and £9.7 million GVA and more than 300 jobs in the UK.

The University of Warwick also works to transfer existing knowledge throughout the economy through the University's interactions with businesses. These activities include, professional training and education, commissioned research, consultancy projects, Knowledge Transfer Partnerships, facilities and equipment hire and access to technical expertise through Warwick Scientific Services. Together these activities are estimated to contribute an estimated £74.4 million GVA and 850 jobs in Coventry and Warwickshire, £113.3 million GVA and around 1,400 jobs in the West Midlands and £284.0 million GVA and more than 3,585 jobs in the UK.

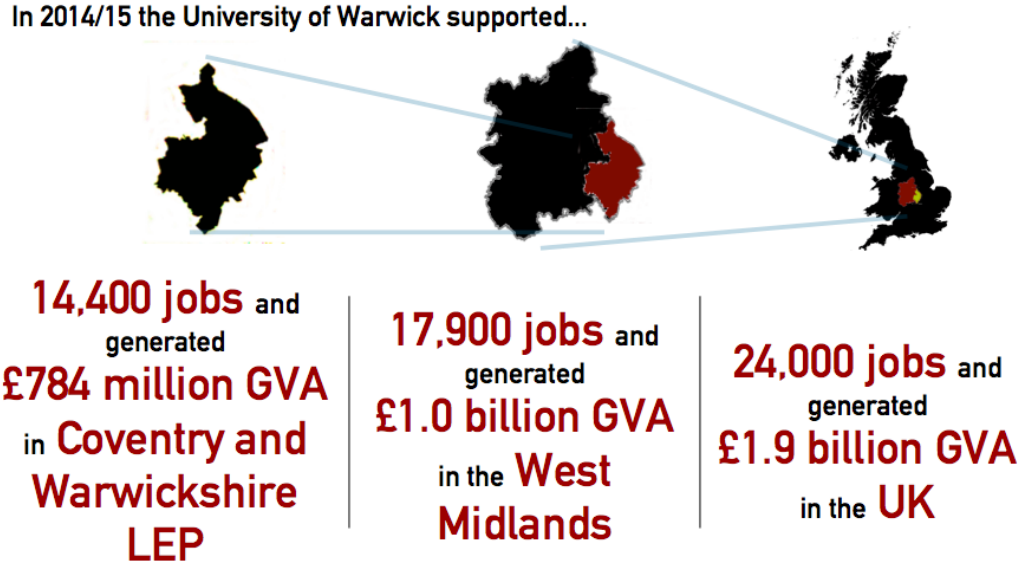


The health and medical research undertaken at the University of Warwick will generate quality of life and Gross Domestic Product (GDP) impacts that will be realised over a long period of time. These impacts are estimated to contribute £1.4 million to the Coventry and Warwickshire LEP area, £8.8 million GVA to the West Midlands and around £100.0 million to the UK economy.

The University of Warwick Science Park, located across five sites in the West Midlands, supports economic impact by providing space for businesses to locate in and grow thereby supporting informal knowledge sharing between the University and businesses. It also contributes to the inward investment proposition as the presence of knowledge infrastructures makes Coventry and Warwickshire a more attractive place to invest and locate. Across the five sites there are 123 companies, employing 2,530 staff and generating an estimated combined turnover of £169.7 million. It can be estimated that in 2014/15 the University of Warwick Science Park contributed almost £89.9 million GVA and almost 3,780 jobs in the UK, of which £83.8 million GVA and 3,456 jobs was in the West Midlands and £63.5 million GVA and 2,675 jobs in Coventry and Warwickshire.

All sources of impact together suggest that in 2014/15 the University of Warwick generated an estimated:

- **£783.6 million GVA** and supported **14,390 jobs** in the Coventry and Warwickshire LEP area;
- **£1.0 billion GVA** and supported **17,930 jobs** in the West Midlands; and
- **£1.9 billion GVA** and supported **24,000 jobs** in the UK.



To place this impact in context, the GVA impact of the University of Warwick is equivalent to 8.7% of the total GVA of Coventry. This indicates that although the University of Warwick is situated on the outskirts of Coventry it is an important driver of growth in the city. The University's impact in the Coventry and Warwickshire LEP area is equivalent to 4.1% of the total economy of the area.

The scale of this impact is substantial and implies that each £1 GVA directly generated by the University of Warwick contributes £5.61 to the UK economy and for every job directly created at the University, more than 4 jobs are supported in the UK. The University of Warwick also provides significant value for money as each £1 received by the University from the public sector supports a total of £32.07 GVA in the UK economy.

Unquantifiable Economic Impact of the University

The University of Warwick makes a far greater contribution than can be captured in the quantitative impacts described above and these unquantifiable impacts are discussed below. These wider impacts of the University are by no means a comprehensive list and are intended to demonstrate some of the various unquantifiable ways in which the University has impact.

Community Engagement and Cultural Contribution

The University plays an important role in the local area, with its social and community engagement through Warwick Volunteers and the local tourism and culture contribution that Warwick Arts Centre makes.

Student volunteering is actively encouraged at the University through Warwick Volunteers, which in 2014/15 had more than 2,360 volunteers registered with it,

volunteering an estimated 32,211 hours across more than 50 projects. Examples of community projects include extra-curricular activities, tutoring and foreign language teaching support in 56 schools in the local area. The value of this activity to society is much greater than can be quantified, as volunteers provide invaluable support to organisations that otherwise may not be able to offer the services required, service users experience a variety of benefits such as improved wellbeing and students themselves gain valuable skills.

Warwick Arts Centre supports cultural engagement in the local area through the events and performances it hosts as well as community-led productions by local schools and students. Warwick Arts Centre also undertakes outreach activities such as school-oriented workshops and productions, engaging with almost 50 schools in 2014/15, reaching over 15,000 people across 300 sessions.

Maximising Impact Locally

The University of Warwick works in a number of ways to maximise impact locally. This includes the University's capital investment in the area, contribution to the labour market and improving skills in Coventry and Warwickshire, as well as the civic leadership the University provides to drive regional economic development.

The University's significant capital investment (£59 million each year on average) is part of its commitment to investing in the local area. In order to maximise impacts locally the University employs construction and maintenance staff in long-term roles thereby providing stable long-term employment opportunities locally. To meet skills shortages, the University has developed strong relationships with local colleges to provide training and apprenticeships to young people in the local area.

As the highest ranked University in the West Midlands the University of Warwick plays an important role in attracting and retaining talent in the area with almost a quarter of the University's graduates remaining in the West Midlands after graduation. The University also plays an important role in realising local potential and growing local skills capacity through its Centre for Lifelong Learning, which enables adult learners to develop new skills through the world-class education of the University, irrespective of background. As well as this, the University, through Warwick Manufacturing Group (WMG) has established the WMG Academy for Young Engineers which aims to provide 14-18 year olds with the opportunity to learn business and engineering skills in an environment that integrates world-class academic learning with practical experience. Building on the success of this, a second Academy is scheduled to open in Solihull in late 2016.

The University of Warwick is committed to supporting economic development regionally and works in close partnership with the Coventry and Warwickshire Local Economic Partnership (LEP) to achieve this. The University is also an active participant in a wide variety of partnerships with local and regional organisations. As a driver of economic growth in the region this enables the University to work in collaboration with many businesses and organisations for the wider benefit of the area locally and regionally.

Warwick Manufacturing Group: A Model of University-Business Interaction

For more than 30 years WMG has been engaged in collaborative research and development with industrial partners, providing a bridge between academia and industry and successfully integrating fundamental and applied research, long before others had realised the full potential of university-business interaction.

The WMG approach is one characterised by research-led innovation with industrial partners. WMG works with several large firms including Jaguar Land Rover (JLR), Rolls-Royce and BAE Systems, as well as SMEs to apply cutting-edge research to specific real world business problems that can help produce new and improved products and processes. This is exemplified through WMG's support for the automotive sector, which has a long history in the West Midlands. The sector had been decline but the continuing presence and success of the automotive sector in the region can be attributed to WMG and its long standing industrial partnerships with companies like JLR.

The proposed National Automotive Innovation Centre, a joint initiative of JLR and WMG provides a further example of business-university collaboration, in this case working to further strengthen the automotive sector in the region. The Centre aims to provide a critical mass of research capability and will be a hub for JLR's advanced research teams with 600 staff co-locating at the Centre alongside University researchers and academics.

In addition to this, WMG provides world class teaching and education, offering a range of education opportunities for every stage of the career path, including undergraduate and postgraduate degrees as well as professional training and education courses. The professional education courses have been designed by WMG to align with business and market needs and to suit people of any educational background. In doing so, WMG provides a streamlined and integrated approach to professional education, designed to meet industry needs.

WMG therefore provides a model of university-business collaboration, where university research and teaching is directed by industry and market needs and is undertaken in partnership with businesses thereby driving innovation and economic growth.

Supporting Economic Sectors

The University of Warwick, and particularly WMG through its business-university partnerships, has helped to cement an industrial cluster based on advanced manufacturing and engineering in Coventry and Warwickshire. The Strategic Economic Plan for the area highlights the importance of the sector as a key driver of economic growth and a major strength for the area.

The University also has influence in other sectors in the economy such as health and education. By providing a consistent supply of trained professionals, the University enhances the healthcare and education provision available locally, regionally and nationally. In addition, the University's interdisciplinary research approach aims to address complex real-world problems, which presents opportunities in the future for the development of other high-value sectors in the area.

Conclusion

The University of Warwick aims to be a *world leader in research and teaching*, while serving its *local region - academically, culturally and economically.* The economic impacts associated with any learning institution are often seen to be incidental to the running of such an institution. However, the University of Warwick takes active steps to ensure that it maximises the purposeful economic impacts, in ways that are quantifiable and unquantifiable. Through these purposeful impacts the University ensures that the local region benefits academically, culturally and economically from its global profile as a world leading University.

1 INTRODUCTION

This report presents the findings of a study undertaken by BiGGAR Economics in late 2015 and early 2016 into the economic impact of the University of Warwick. The study will inform the Chancellor's Commission which will consider the future roles of the university in Coventry, Warwickshire and the wider Midlands as well as suggesting a long term vision and strategies for delivering those roles.

1.1 Impact Approach

1.1.1 Metrics for Quantitative Impacts

The approach in this study aims to demonstrate how the activities of the University of Warwick create benefits and impacts for the economy. Part of this process is to quantify impacts where possible. This quantification is expressed in terms of:

- Gross Value Added (GVA), which measures the monetary contribution that an organisation, company or industry adds to the economy through their operations; and
- employment, which is measured in terms of headcount jobs supported unless stated otherwise.

It takes account of impacts through the economy (multiplier impact) and impact that occurs outside the study area (leakage).

1.1.2 Sources of Quantitative Impacts

Our approach to quantitative impacts will cover the impact from the following sources:

- core operations of the University, including its income, employment of staff, staff spending, purchases of supplies and capital spending;
- student-related impacts from students spending, working and volunteering in the area;
- commercialisation activity undertaken by Warwick Ventures, including spin-out and start-up companies and licensing technology;
- knowledge transfer activities covering a wide range of interactions with businesses including professional training and education, consultancy, contract research, services provided by Warwick Scientific Services as well as the University of Warwick Science Park;
- tourism impacts from friends and family visiting students and staff, attendees to conferences and open days held at the University and events at the Warwick Arts Centre; and
- lifetime productivity gains from teaching and learning delivered by the University of Warwick (graduate premium).

1.1.3 Approach to Estimating Quantifiable Benefits

In order to estimate the economic impact arising from each of the sources of impact outlined above, it was necessary to consider how the value generated by

each type of activity might be measured and what data would be required to do this.

The economic analysis was primarily based on data specific to the University of Warwick, provided by the University itself. However, where data was unavailable and the University was assumed to be fairly typical, appropriate assumptions were made based on BiGGAR Economics' previous experience of other comparable institutions elsewhere in the world. For example, a breakdown of spending on goods and services by broad sector or category could not be provided by the University and therefore average spending patterns of universities across Europe were applied, as it was assumed that spending on supplies would be broadly similar across institutions.

In other cases the University of Warwick was assumed to be atypical and assumptions were therefore made based on the University's particular context. As an example, to estimate the student part-time work impact, local labour market conditions were taken into account by using the youth unemployment rate in the Coventry and Warwickshire LEP area. The various sources used are specified in the relevant sections of the report.

Each area of impact also requires the use of three types of economic assumptions:

- turnover to GVA ratio – this is used to estimate the direct GVA impact of the spend in an area. This is obtained from the UK Annual Business Survey[1];
- turnover per employee – this is used to estimate the direct employment impact of the spend in area. This is obtained from the UK Annual Business Survey; and
- GVA and employment multipliers – these are used to estimate the indirect and induced impacts, i.e. the supplier and income impact created by businesses that directly benefit from additional spend in the area. These multipliers have been based on those published in the Scottish Government's Input-Output tables[2]. The Scottish multipliers have been adapted to each of the study areas to reflect the comparative size of the economy in that area. This source has been used because it is more up to date than equivalent information published about the UK economy as a whole and also provides multipliers for different sectors.

1.1.4 Study Areas

The impacts in the report are assessed at three geographic levels:

- Coventry and Warwickshire LEP;
- West Midlands; and
- the UK as a whole.

Throughout the report the impact within the West Midlands includes the impact in the Coventry and Warwickshire LEP area and the UK impact includes the impact in the West Midlands.

[1] ONS (2015), UK Annual Business Survey 2013 Revised Results
[2] Scottish Government (2015), Input-Output Tables 2012

Chapter 16 summarises the impact of the University of Warwick in the local communities of:

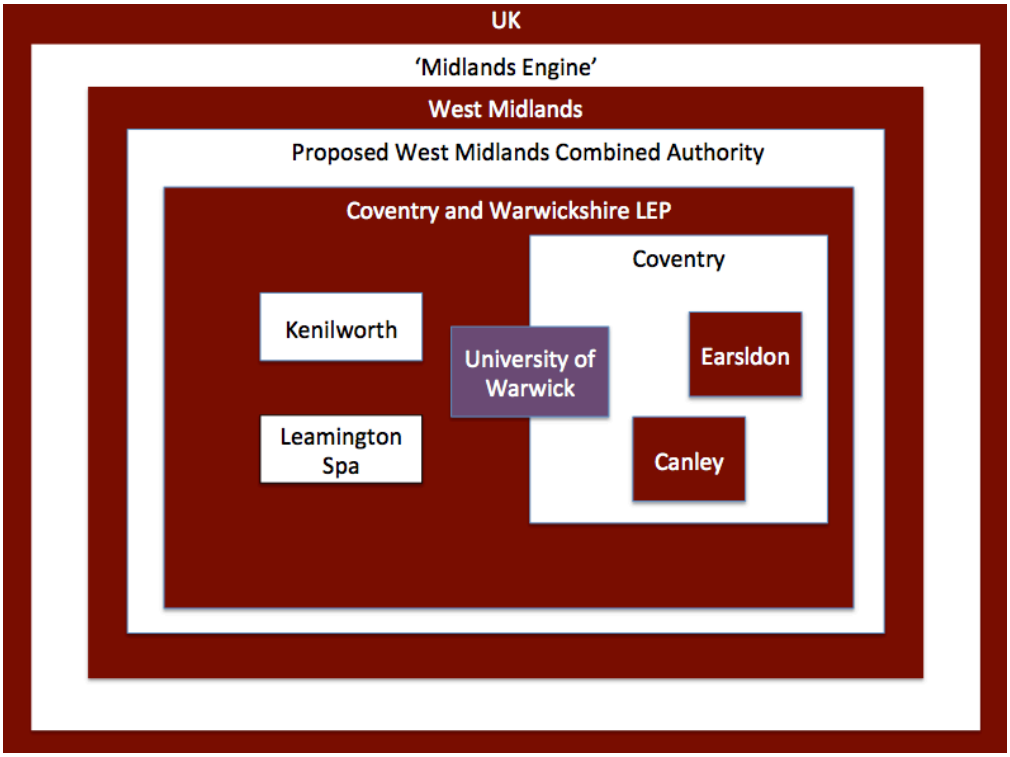
- Canley;
- Earlsdon (the electoral ward of Earlsdon);
- Kenilworth (the electoral wards of Abbey, Parkhill and St Johns);
- Leamington Spa (the area covered by Leamington Spa Town Council);

Chapter 17 outlines the economic impact that the University generates at the following geographic levels:

- Coventry (the area covered by Coventry City Council Area);
- Proposed West Midlands Combined Authority (including Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall and Wolverhampton); and
- 'Midlands engine' (the East and West Midlands regions).

Figure 1.1 outlines all of the study areas considered.

Figure 1.1 – Study Areas



1.1.5 Types of Economic Impact

Some of the activity undertaken by the University of Warwick generates activity elsewhere in the economy immediately. For example, purchases made by the University generate economic impact amongst the University's suppliers almost straight away.

However, much of the activity undertaken by the University of Warwick does not generate immediate economic impacts. For example, the additional earnings that

graduates from the University will earn as a result of the enhanced skills they gain while studying will be generated over their entire working lives – not just in the year after graduation. The impact generated in 2014/15 will therefore be the cumulative impact of activity undertaken over several previous years.

Limitations in data availability mean that it is generally not possible to estimate the actual impact of all historic activity that is realised in any particular year. To overcome this it is assumed that activity undertaken in 2014/15 generates impact in 2014/15. Although the impact of some activity that occurs in 2014/15 will not occur until a later date, some of the impact realised in 2014/15 will have been generated by historic activity. As no attempt is made to quantify the impact of historic activity this approach provides a reasonable proxy measure of the current impact of historic activity. The impacts considered in this report that have been estimated using this approach include:

- business support services including professional training, contract research, consultancy and Warwick Scientific Services described in Chapter 8;
- the impact of social returns to medical research described in Chapter 12; and
- the graduate impacts described in Chapter 6.

All of the other impacts considered in this report are annual impacts.

1.1.6 Wider Value to Society

This report attempts to quantify the economic contribution that the University of Warwick makes. This value has been quantified using two widely accepted measures of economic impact: jobs and GVA.

One of the reasons that these measures are so widely used is because they provide a convenient way of capturing the entire economic contribution of an organisation in a single number. While the appeal of such measures is easy to understand they do suffer from some important limitations in that monetary figures highlight only part of the value of an impact.

This report recognises that it is not possible to quantify all of the impacts of a higher education institution because:

- the data for monetisation of many of the benefits is at an early stage of research;
- even if it was possible to quantify all of the benefits, monetary value does not capture aspects such as quality, equality and life itself and therefore cannot reflect the fact that some types of activity are intrinsically more valuable to society than others;
- monetary value is static providing only a snapshot in time of the University of Warwick's activities. Much of the activity undertaken by Universities is focused on long-term outputs that often take a long time to realise – for example the University of Warwick is engaged in a wide range of world-leading research that will ultimately provide the foundations for the technologies upon which entirely new economic sectors will be based. Developing such technologies is fundamental to long-term economic competitiveness and growth but involve considerable time lags of the sort that are difficult to account for using traditional approaches to economic impact analysis;

- it is not always possible to estimate the value of the University of Warwick's contribution to impacts that have been generated as a result of collaborative effort between multiple partners, such as the University's work with industry partners to retain and develop entire sectors like the automotive sector; and

- the value of universities is more than economic value. Universities make important contributions to other socially valuable outcomes, such as improving social cohesion, facilitating social mobility and encouraging greater civic engagement. The value of these outcomes to the individuals affected and society as a whole simply cannot be quantified.

The quantitative impacts described in this report are therefore a significant underestimate of the University of Warwick's impact. For these reasons this assessment also highlights examples of the wider impacts of the University of Warwick both to individuals and communities at the local and regional level as well as its global impact.

1.2 Report Structure

The remainder of this report is structured as follows:

- chapter 2 provides background to the University of Warwick and describes the economic context in which the University operates;

- chapter 3 quantifies the economic impact of the University's core activities including direct employment, the turnover it generates, expenditure on supplies, staff expenditure and the impact of capital projects;

- chapter 4 illustrates how the University's students create impact through their spending, part-time work and volunteering;

- chapter 5 discusses how the University supports the visitor economy by attracting additional visitors through family and friends visiting staff and students, delegates to conferences, and attendees to open days and events at Warwick Arts Centre;

- chapter 6 outlines how the University's teaching activities support greater productivity in the economy through skilled graduates;

- chapter 7 describes how the University contributes to technological innovation through the commercialisation activities of Warwick Ventures, including the creation of new companies and licensing of intellectual property;

- chapter 8 discusses how the University of Warwick supports knowledge transfer through its interactions with businesses and quantifies this impact;

- chapter 9 quantifies the economic contribution that the University of Warwick Science Park makes to each of the study areas;

- chapter 10 describes the University's key research priorities, the interdisciplinary nature of research undertaken at the University as well as illustrating how this research has impact;

- chapter 11 discusses advanced manufacturing and engineering at the University of Warwick, through the activities of Warwick Manufacturing Group and how the WMG approach is a prime example of business supported research-led innovation;

- chapter 12 describes how the University contributes to the public sector by contributing to local workforce development in the health and education sectors as well as the economic and social returns to medical research and wider unquantifiable impacts of medical research undertaken at the University;
- chapter 13 describes the impact the University has on the local and regional labour market by attracting students to study in the area and retaining this talent as well as the University's contribution to increasing local skills capacity and supporting sectors of strategic importance;
- chapter 14 discusses the University's contribution to driving economic development locally and regionally by providing civic leadership and through strategic partnerships;
- chapter 15 summarises the quantitative impacts of the University of Warwick and draws together the main conclusions of the report;
- Appendix A summarises the impact of the University of Warwick in the local communities of Canley, Earlsdon, Kenilworth and Leamington Spa; and
- Appendix B outlines the economic impact that the University generates in Coventry, the Proposed West Midlands Combined Authority area and the 'Midlands Engine'.

2 THE UNIVERSITY OF WARWICK IN CONTEXT

This section provides background information about the University of Warwick and the socio-economic context in which it operates.

2.1 The University of Warwick

The University of Warwick is based on the outskirts of Coventry and was founded in 1965. The University had 60 members of staff and an initial intake of 450 undergraduate students on a 400-acre site. Since then, the University has grown significantly, joining with the Coventry College of Education in 1979 and parts of the Horticultural Research Institute in 2004.

In 2014/15, the University of Warwick had an annual income of £512.8 million, almost 25,200 students and 5,000 staff. The University of Warwick has a strong focus on collaboration with industry and businesses, working with over 400 companies, including Jaguar Land Rover and Tata Motors.

The University of Warwick is consistently ranked as one of the world's leading universities. It is ranked:

- in the top 1% of universities in the world (ranked 80th)[3];
- 9th out of the top 100 universities in the world under 50 years old[4];
- 6th in the UK and The Times and Sunday Times Campus University of the Year 2015[5]; and
- the highest ranked university in the West Midlands.

The University's current Strategic Plan[6] outlines how it will maintain and improve its position and reputation as one of the UK's top universities with six strategic goals:

- enable students to succeed;
- deliver world-class research;
- secure the University's global position;
- engage with communities;
- champion social, cultural and economic growth; and
- secure the future sustainably.

The University of Warwick has two campuses in addition to its Coventry base, the School of Life Sciences at Wellesbourne and WBS London at the Shard in Central London, part of Warwick Business School. These are discussed further in

[3] Times Higher Education (2015), World University Rankings 2015-16. These rankings are calculated using measures to evaluate the quality of teaching (30%) and research (30%), number and impact of citations (30%), international outlook (7.5%) and industry income (2.5%). Factors such as community engagement and economic impact are not considered.
[4] Times Higher Education (2015), 100 Under 50 Rankings 2015
[5] Times and Sunday Times (2015), The Times and Sunday Times Good University Guide 2016
[6] University of Warwick (2014), Looking Forward, Our University Strategy

Sections 2.1.1 and 2.1.2 below. In addition, the University provides flexible and informal study spaces for students living in Leamington Spa, known as the Learning Grid Leamington, so that they can study without the need to travel to the campus. As well as this local dimension to the University, it is a fully global university through its international activities.

As well as being a University focused on the local area and region, the University of Warwick is a global university through its international activities, which is discussed further in Section 2.1.3.

2.1.1 Wellesbourne Campus

Wellesbourne campus is located 12 miles, equivalent to a 20 minute drive, south of the University's main campus on the outskirts of Coventry, near the town of Stratford-upon-Avon. It is home to the School of Life Sciences, and particularly the Warwick Crop Centre. The site has been in use since 1949 with significant developments added in 1959 (the Prince Philip Building) and 1973 (the David Lowe Building). The current formulation of the Warwick Crop Centre was created through the consolidation of various agricultural institutes, specifically the Horticulture Research Institute (HRI), which it merged with in 1990. In 2010 it merged with the University of Warwick's Department of Biological Sciences to form the School of Life Sciences.

2.1.2 Warwick Business School

The Warwick Business School is recognised as one of the best business schools in the world, placing 25th in the Financial Times' prestigious Global MBA Ranking 2014, although it fell to 38th in 2015[7]. It was originally established as the School of Industrial and Business Studies in 1967, taking its present name in 1988.

It has since grown to employ more than 350 staff, with over 6,500 students (coming from 125 countries), including 2,000 studying for its MBA in the form of full-time, Executive, and distance learning, as well as the new Energy MBA. It also offers a variety of courses in the realms of business, marketing and finance[8].

It has a very highly regarded research profile, with over 80% of its research being ranked as either world leading or internationally excellent by the Research Excellence Framework in 2014. Research into the way organisations operate and businesses are led and managed forms the basis of its mission statement, with more than half of its 200 academic staff holding doctorates. In 2010 the Business School set up the Behavioural Science Group, which tries to understand human behaviour using approaches psychology, economics, philosophy and statistics.

In September 2014 the University of Warwick formally opened another branch of the Warwick Business School in the Shard at the heart of London Bridge Quarter. The new branch will offer part-time courses in Finance, Human Resource and Employment Relations, and the Warwick Executive MBA[9]. In locating a campus in one of the world's financial capitals, the University of Warwick aims to educate the business leaders and City professionals of the future.

[7] Financial Times (2015), Global MBA Rankings
[8] Warwick Business School (2014), Warwick Business School Media Pack
[9] Warwick Business School (2014), Warwick Seals Base at the Shard, Available at: http://www.wbs.ac.uk/news/warwick-seals-deal-for-campus-at-the-shard/

2.1.3 Global Profile

The University of Warwick has significant international reach through its full-time base in Venice as well as its strategic international partnerships with other universities.

The University has leased teaching premises in Venice for over 40 years and since 2007 has been housed in the 15th century Palazzo Pesaro-Papafava. The Venice base provides opportunities for research, with the appointments of staff with primary research expertise in Venice and also hosts conferences, symposia and workshops bringing together leading academics.

Since 1967 the Warwick History Department, joined later by the Warwick Art History Department, encourages third year undergraduates to spend a term in Venice. Students study Italian for the two years prior to this and while they are in Italy, study the history of Florence and Venice during the Renaissance, which is taught by University staff. Guided tours of the major monuments of the city form a key part of the module. The purpose of the module is to give students a unique opportunity to study the history of a Mediterranean city while living in it. Close links with the University of Venice Ca' Foscari mean that University of Warwick students can access its facilities and participate in a 'buddy scheme' which teams students from the two universities, thereby encouraging greater immersion and an enhanced student experience.

A further example of the University's international dimension is the strategic partnership it has with Monash University in Australia, which was launched in 2012. The Alliance is a research collaboration that aims to build on the complementary research strengths and capabilities of the two universities to address globally relevant problems. As part of this, joint Monash-Warwick professors who are employed by both Universities have been appointed. By attracting the highest quality academic talent, the Alliance aims to elevate both institutions to international leadership within particular fields. It also enables both Universities to offer an enhanced student experience through a joint Monash-Warwick PhD for postgraduates and for undergraduates the opportunity to study abroad at Monash. Joint development and exchange of digital and online material and modules are also being developed.

The University of Warwick is the only European partner in a unique consortium of world-class academic institutions, led by New York University, to establish a Centre for Urban Science and Progress (CUSP) in Brooklyn, New York City. The partnership involves industry partners including IBM, Cisco and Siemens amongst others. CUSP is an applied science research institute focused on researching and creating new solutions for the pressing and complex challenges confronting the world's growing cities. Its focus is the idea that if properly acquired, integrated and analysed data can enable better operations, planning and policy for cities. The aims of CUSP are closely aligned with the University of Warwick's own research priorities through its 'sustainable cities' global research priority (discussed further in Section 10.2) and the Warwick Institute for the Science of Cities.

2.2 Economic Context

The West Midlands is often considered to be the birthplace of the industrial revolution and was known as the 'workshop of the world' with strengths in coal mining, metal industries, engineering and ceramics.

It was also the site of Britain's automotive industry, especially focused around Coventry and Birmingham. However, its manufacturing industries declined unable to compete successfully in a more globalised economy. In 2005, the MG Rover Group went into administration epitomising the decline in manufacturing in the West Midlands. In addition, the West Midlands as a whole was particularly severely affected by the 2008 recession, which reduced output and drove up unemployment. The region has since recovered and gained strength and expertise in the areas of highly skilled manufacturing and engineering.

2.2.1 Population

As can be seen in Table 2.1 the population of Coventry and Warwickshire is almost 890,000 and comprises 15.6% of the population of the West Midlands.

Table 2.1 – Population of Study Areas

	CWLEP	West Midlands	UK
Population	889,000	5,713,300	64,596,800

Source: ONS (2015), Mid-Year Population Estimates, 2014

2.2.2 Key Employment Sectors

The industries that are most important for employment in the study areas are shown in Table 2.2. This indicates that the manufacturing sector is the most significant employer in the Coventry and Warwickshire LEP area employing 11.7% of the local population. Although this is lower than in the West Midlands (12.3%), it is significantly higher than in the UK as a whole (8.4%). This is primarily because manufacturing has historically always been an important sector in the West Midlands.

The public sector (health and education) is also a major source of employment, accounting for 21.1% of employment in the Coventry and Warwickshire LEP area, broadly in line with the averages across the West Midlands and the UK as a whole. The professional, scientific and technical services sector also has a large presence in the Coventry and Warwickshire LEP area, accounting for almost 8% of employment, in line with the UK average but higher than the average in the West Midlands (6.0%). This is due to the presence of the University of Warwick and its associated infrastructures, such as the University of Warwick Science Park, as well as the presence of Coventry University.

Table 2.2 – Key Employment Sectors

	CWLEP	West Midlands	UK
Manufacturing	11.7%	12.3%	8.4%
Health	11.1%	13.6%	13.4%
Education	10.0%	9.7%	9.2%
Retail	9.2%	10.3%	10.0%
Business Administration	8.5%	8.2%	8.7%
Professional, Scientific and Technical	7.8%	6.0%	8.1%

Source: ONS (2015), Business Register and Empoyment Survey, 2014.

2.2.3 Education and Skills

Qualification levels of those aged 16-64 for each of the study areas are shown in Table 2.3. This indicates that 11.5% of the population in the Coventry and Warwickshire LEP area have no qualifications. Although this is lower than the West Midlands (13.2%) it is almost double the UK average (6.2%).

At each level of qualifications, the Coventry and Warwickshire LEP area has a higher proportion of people qualified than the West Midlands, but a lower proportion than the UK. For example, 34.7% of Coventry and Warwickshire LEP's population has a degree or equivalent, higher than the West Midlands (29.4%) but lower than the UK (35.8%).

Table 2.3 – Qualification Levels: % of 16-64 Population

	CWLEP	West Midlands	UK
No NVQ Qualifications	11.5%	13.2%	6.2%
NVQ1+ (1-4 GCSEs or equivalent)	82.9%	79.9%	84.8%
NVQ2+ (5+GCSEs or equivalent)	70.5%	67.4%	73.1%
NVQ3+ (A-Levels or equivalent)	54.3%	50.1%	56.5%
NVQ4+ (Degree or equivalent)	34.7%	29.4%	35.8%
Other	5.6%	7.0%	9.0%

Source: ONS (2015), Annual Population Survey, Jan 2014 - Dec 2014.

2.2.4 Gross Value Added

Although Coventry and Warwickshire comprises 15.6% of the West Midlands population, it contributed 17.8% of the West Midland's GVA in 2012. It also has a higher GVA per head (£21,802) compared to the West Midlands (£18,894), although it is still lower than the UK average (£23,168).

Of the £19.0 billion GVA generated by the Coventry and Warwickshire LEP area, 13.2% is generated by the manufacturing sector and of the £106.6 billion GVA generated in the West Midlands as a whole, 13.9% is generated by the manufacturing sector. Although a higher proportion of GVA in the West Midlands is from manufacturing than Coventry and Warwickshire, the GVA per worker in the Coventry and Warwickshire manufacturing industry is £64,615 compared to £54,496 in the West Midlands, suggesting that it is highly skilled. They both produce proportionally more from manufacturing than the UK, where it constitutes 9.9% of £1,475.9 billion GVA.

Table 2.4 – GVA Indicators

	CWLEP*	West Midlands**	UK**
Workplace based GVA (£m)	£18,992	£106,608	£1,475,948
Of which manufacturing	£2,513	£14,811	£146,861
Workplace based GVA per head (£)	£21,802	£18,894	£23,168

*Source: *ONS (2015), GVA for Local Enterprise Partnerships - Reference Tables 2012. **ONS (2014), Regional Gross Value Added (income approach) NUTS3 Tables: 2012.*

2.2.5 Employment

The figures in indicate that the Coventry and Warwickshire LEP area has a significantly lower unemployment rate (4.2%) compared to the West Midlands as a whole (6.7%) and the average across the UK. The economic activity rate of 76.0% is higher than the West Midlands (75.2%) but slightly lower than the UK average (77.3%).

There is a lower proportion of the working age population claiming Job Seekers Allowance in the Coventry and Warwickshire LEP area than in the West Midlands and the UK as a whole. Average annual income is not available at the Local Economic Partnership level but is around £2,180 lower in the West Midlands than the average across the UK.

Table 2.5 – Employment Indicators

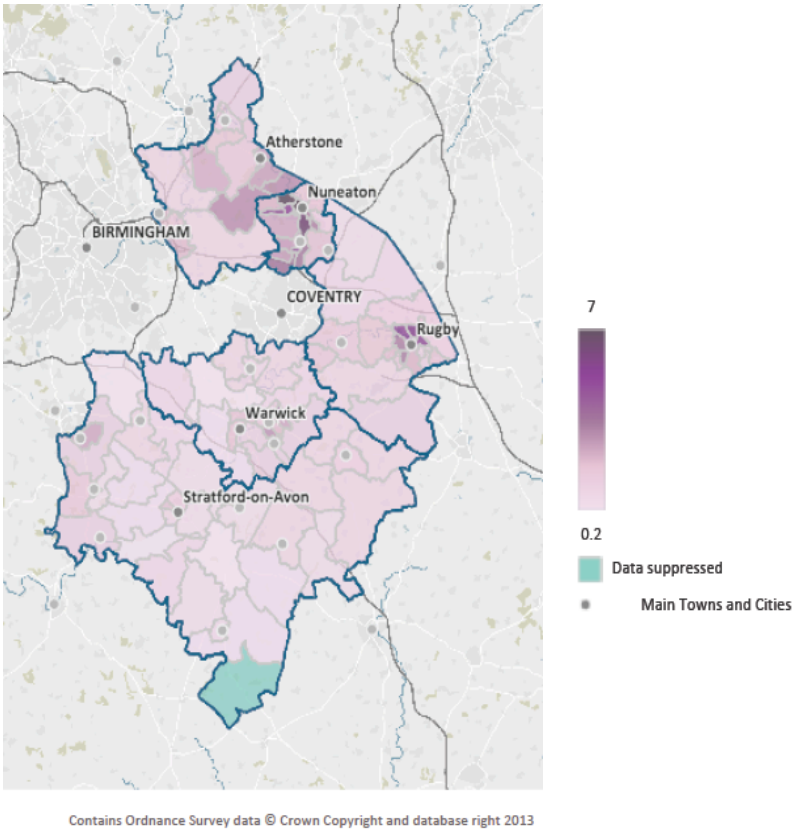
	CWLEP	West Midlands	UK
Unemployment Rate*	4.2%	6.7%	6.1%
Economic Activity Rate*	76.0%	75.2%	77.3%
Median Gross Annual Wage**	-	£25,018	£27,195
Claimant Count***	1.3%	2.1%	1.7%

*Source: *ONS (2015), Annual Population Survey, Apr 2014 - Mar 2015. **ONS (2015), Annual Survey of Hours and Earnings, 2014. ***ONS (2015), Jobseeker's Allowance with Rates and Proportions, August 2015.*

2.2.6 Geographic Variance

The Coventry and Warwickshire LEP area covers a wide and varied economic geography. This is represented by the varying rates of unemployment within Warwickshire, which is shown in in Figure 2.1. This shows that there is a higher proportion of the population in the northern half of the LEP area which is unemployed than in the southern half of the LEP area. The main concentrations are around the town of Nuneaton.

Figure 2.1 – JSA Claimant Rate in Coventry and Warwickshire LEP: All Ages (Month: June) 2013



Source: Warwickshire Obervatory

This difference in unemployment levels between the north and south of the LEP area is not the only variation between the two areas. The Social and Spatial Inequalities centre at the University of Sheffield have provided one of the most detailed splits of the "north-south" divide within England[10]. This used a range of socio-economic indicators to determine where the dividing line was between the north and the south of England and split the country by parliamentary constituency, which is shown in Figure 2.2. This shows that the constituencies in Coventry and Nuneaton are classified as the North of England and the remainder of the LEP area is in the South of England.

[10] Dorling, Prof Danny (2007), Available at: http://www.sasi.group.shef.ac.uk/maps/nsdivide/ns_line_detail.html

Figure 2.2 – "North-South Divide" passing through Coventry and Warwickshire

Source: Professor Danny Dorling, University of Sheffield

3 CORE UNIVERSITY IMPACTS

This section describes the impacts generated by the daily operations of the University of Warwick. The core impacts include:

- direct impact;
- impact on the University's supply chain;
- impact of staff expenditure; and
- impacts of capital expenditure.

3.1 Direct Impact

In 2014/15 the total income of the University of Warwick was £512.8 million and other operating expenses amounted to £175.0 million.

Table 3.1 – Key Assumptions for the Direct Impact

	Value	Source
Income of University	£512.8 m	University of Warwick Finance
Expenditure on goods and services	£175.0 m	
Staff (full time equivalents)	5,221	Statement of Accounts for the year ended 31 July 2015

The direct impact of any organisation is the value it adds to the economy and the number of jobs it supports in a given time frame. The direct GVA of the University was calculated by subtracting all of the non-staff expenditure from the total operational income of the University. In this way it can be estimated that the total direct GVA of the University was £337.8 million GVA.

The direct employment impact of an organisation is simply the number of people it employs. In 2014/15 the University directly employed 5,221 full time equivalent staff. These impacts are summarised in Table 3.2.

Table 3.2 – Direct Impact in 2014/15

Direct GVA (£m)	337.8
Direct Employment (ftes)	5,221

3.2 Supplier Impact

The University of Warwick has an impact on the wider economy through the purchase of goods and services as this increases turnover and supports employment in the companies that supply the University.

In 2014/15 the University of Warwick spent £175.0 million on goods and services. In order to estimate the impact by study area it was necessary to consider how much of the University's expenditure occurs in each study area. Assumptions about the location of expenditure were based on the analysis undertaken in the previous economic impact assessment of the University. This found that 82% of

supplies were purchased from the UK, with 24% of these purchased from the West Midlands and 16% sourced from the Coventry and Warwickshire LEP area.

It was also necessary to consider the spend on supplies by sector. Based on average spending patterns of universities across Europe, the University's spend on supplies was divided into broad categories. These categories and other key assumptions used to estimate this impact are summarised in Table 3.3.

Table 3.3 – Key Assumptions for Supplier Impact

	Value	Source
Expenditure on goods and services	£175.0 m	Statement of Accounts for the year ended 31 July 2014
% purchased from CWLEP	17%	BiGGAR Economics Assumption based on SQW (2013), Regional Impact Study of the University of Warwick and University of Warwick Finance
% purchased from West Midlands	24%	
% purchased from UK	93%	
Supplies by Category		
Administrative and support service	20%	BiGGAR Economics (2015), Economic Contribution of the LERU Universities
Professional, scientific and technical	33%	
Real estate activities	7%	
Information and communication	4%	
Accommodation and food service activities	6%	
Transportation and storage	4%	
Wholesale and retail trade; repair of motor vehicles and motorcycles	19%	
Construction	1%	
Electricity, gas, steam and air conditioning supply	0%	
Manufacturing	5%	

The direct GVA impact of these purchases was estimated by dividing total expenditure in each category by a turnover/GVA ratio appropriate to the sector in which the expenditure occurred (the UK Annual Business Survey gives a breakdown of these figures for industries and smaller sectors).

The direct employment impacts were then estimated by dividing total expenditure in each category by an estimate of turnover/employee in the relevant sector. Multiplier effects were then captured by applying GVA and employment multipliers appropriate to the sectors in which the expenditure occurred.

In this way it was estimated that the University of Warwick generated £115.7 million GVA and 2,322 jobs for the UK economy as a result of purchasing goods and services. Of this, an estimated £27.7 million GVA and more than 560 jobs were in the West Midlands, and of this £17.1 million GVA and 360 jobs were in the Coventry and Warwickshire LEP area.

Table 3.4 – Supplier Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	17.1	27.7	115.7
Employment	360	563	2,322

3.3 Staff Spending Impact

In 2014/15 the University of Warwick employed 5,221 full time equivalent staff. The staff who are employed by the University of Warwick also have an impact on the wider economy by spending their wages.

The starting point for estimating this impact was the University's total expenditure on wages, which in 2014/15 amounted to £198.4 million. Where staff spend their wages will depend to a large extent on where they live so in order to do this, it was first necessary to estimate the total amount of wages paid to staff living in each of the study areas. Analysis of the University of Warwick's staff postcodes indicates that 76% of staff lived in the Coventry and Warwickshire LEP area, 2% lived elsewhere in the West Midlands and 10% lived in the rest of the UK. These proportions were applied to the staff salaries paid by the University in 2014/15 in order to estimate how much of the staff spending occurs in each study area.

As the Annual Business Survey does not include Value Added Tax (VAT) in its turnover figures, it was necessary to deduct VAT from the total staff salaries paid. Analysis of ONS data indicates that 9% of general household expenditure is spent on VAT, and this proportion of spend was therefore excluded.

Table 3.5 – Key Assumptions for Staff Spending Impact

		Value	Source
Staff – Full time equivalents		5,221	Statement of Accounts for the year ended 31 July 2015
Expenditure on wages		£198.4 m	University of Warwick HR
	% living in CWLEP	76%	BiGGAR Economics analysis of University of Warwick staff postcodes
	% living in rest of West Midlands	2%	
	% living in rest of UK	10%	
Proportion of household expenditure spent on VAT		9%	BiGGAR Economics Analysis of ONS (2012), Family Spending

The next step was to estimate how much staff living in each study area spent in each of the three study areas. This assumption is different for the staff living in each study area, for example, staff living in the Coventry and Warwickshire LEP area are estimated to spend 93% of their salaries in the UK (i.e. 7% of salaries are spent outside the UK), of which 74% of salaries are spent in the West Midlands.

These assumptions are based on analysis of the Scottish Input-Output tables which indicate that people living in Scotland spend 93% of their expenditure within the UK, of which 74% is retained in Scotland. It was therefore assumed that 93% of spending would be within the UK and as the West Midlands is similar in size to

Scotland, it was further assumed that 74% of spending would be within the West Midlands. As no other data is available on spending patterns, reasonable assumptions were made for the remaining geographic levels. The assumptions used are presented in Table 3.6.

Table 3.6 – Staff Spending Matrix

	Where staff spend their salaries		
Where staff live	CWLEP	Rest of West Midlands	Rest of UK
CWLEP	40%	74%	93%
Rest of West Midlands	0%	74%	93%
Rest of UK	0%	0%	93%

Using these assumptions it was estimated that University of Warwick employees spent a total of £167.8 million in the UK in 2014/15, including £115 million in the West Midlands of which £54.9 million was spent in the Coventry and Warwickshire LEP area.

Employees spend their wages on a wide variety of goods and services. The economic impact of this expenditure was therefore estimated using average turnover/GVA and GVA/employee ratios for the UK economy as a whole. Multiplier effects were then captured by applying multipliers for the UK economy as a whole.

It was therefore estimated that staff at the University of Warwick by spending their wages contributed £140.9 million GVA to the UK economy and supported more than 2,750 jobs. Of this, £86.2 million GVA and 1,698 jobs were estimated to be in the West Midlands and £28.2 million GVA and 575 jobs in the Coventry and Warwickshire LEP area.

A breakdown of this impact for each of the study areas is provided in Table 3.7.

Table 3.7 – Staff Spending Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	28.2	86.2	140.9
Employment	575	1,698	2,752

3.4 Capital Spending

The University of Warwick is more than half way through a 10 year Campus Development Masterplan, which once completed will increase the existing University campus by 40%. Once completed, further community engagement and consultation will be undertaken to develop the next Masterplan.

Over the last 5 years, the University of Warwick has spent £238.5 million on capital projects. This has included:

- the Warwick Manufacturing Group Academy – £9.5 million;
- the 505 bedroom Bluebell Residences – £24 million;
- the 527 bedroom Sherbourne Residences – £20 million;

- the Warwick Business School Phase 3b – £30 million; and
- the Materials and Analytical Sciences Building – £24 million.

The University of Warwick has invested in reducing the environmental impacts associated with the organisation. The new buildings are highly energy efficient with many achieving Building Research Establishment Environmental Assessment Methodology (BREEAM) Excellent ratings.

The University is committed to sustainable energy and has undertaken a number of projects in this regard. The University has invested almost £9 million in the Cryfield Energy Centre, a combined heat and power energy plant that will meet the energy demands of current and future campus buildings while reducing the University's CO_2 emissions. A £1.8 million boilerhouse upgrade to replace the original 1960s boiler plant with a new, more energy efficient plant has also been completed. As well as this, the University has also invested in a new data centre, costing approximately £4 million, which will increase efficiency and reduce heating and cooling costs

These are just a few examples of recent projects. Future projects that are either currently under construction or are in development include, but are not limited to:

- the WMG Engineering Workshop which will allow the testing of manufacturing and assembly processes – £5 million;
- the Mechanochemical Cell Biology Building extension, which will create a new research laboratory for the Medical School – £4 million;
- the National Automotive Innovation Centre, which will provide space for the development of advanced technology, with a focus on increasing sustainability, in the automotive sector – £150 million (see Chapter 11); and
- the Cryfield Village, which will significantly increase the University's accommodation provision.

Capital projects such as these generate wealth and support employment within the construction sector. The scale of major capital investment projects means that expenditure often varies substantially from year to year. This means that expenditure in any one financial year may not reflect the true impact of this activity over time. In order to account for this, the impact of capital projects was estimated based on the University's average capital spend over the last five years and it's anticipated spend over the next five years. Average annual capital expenditure at the University of Warwick is anticipated to be £58.9 million per year over the period 2009-2015.

Given the University's Masterplan and the scale of investment it is unsurprising that the University has a reputation for continually developing and growing. In order to estimate the quantifiable impact of capital projects it was necessary to estimate how much of the £57.4 million capital spending occurs in each study area. As data for this was unavailable it was assumed that 95% of capital suppliers would be located in the UK, of which 60% would be in the West Midlands and 40% would be from within the Coventry and Warwickshire LEP area.

Some of this spend will be on land and buildings and this expenditure is therefore equivalent to additional turnover in the construction sector. Its impact on the economy was estimated by applying turnover/GVA ratios and turnover/employee

estimates for the construction sector. The multiplier effects of this activity were then captured by applying GVA and employment multipliers for the construction sector.

However, some of the spend is likely to be on plant, machinery and equipment. Analysis of the University of Warwick's Accounts indicates that over the last six years on average 29% of the University's spend on capital projects has been on machinery and equipment. This spend will be equivalent to additional turnover in the manufacturing sector and the impact was estimated by applying economic ratios and multipliers for the manufacturing sector.

Table 3.8 – Key Assumptions for Capital Spending Impact

		Value	Source
Average annual capital expenditure (2009-2019)		£57.4 m	University of Warwick Estates and Statement of Accounts
Average annual % of capital spend on machinery and equipment		29%	Statement of Accounts for the year ended 31 July 2015
	% capital suppliers from CWLEP	40%	BiGGAR Economics Assumption
	% capital suppliers from West Midlands	60%	
	% capital suppliers from UK	95%	

In this way it was estimated that the University of Warwick's expenditure on capital projects contributed £38.0 million GVA in the UK economy and supported 620 jobs. This impact was estimated to be £21.8 million GVA and 356 jobs in the West Midlands and £11.0 million GVA and 179 jobs in the Coventry and Warwickshire LEP area.

Table 3.9 – Capital Spending Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	11.0	21.8	38.0
Employment	179	356	620

3.4.1 Commitment to Maximising Impact Locally

The University of Warwick's significant capital projects and its continued commitment to investment as indicated by its 10 year Masterplan are particularly important given the economic climate over the last five years and given the University's efforts to maximising impacts locally.

The Estates department of the University, which is responsible for construction and maintenance, currently employs at least 400 people. These people are employed in long-term roles as opposed to the usual short-term contracts found in the construction sector. The University is committed to continuing to employ people rather than outsourcing construction projects ensuring longer term employment for people in the local community and thereby maximising impact locally. Additionally, in order to meet skills shortages the University has developed strong relationships with two local colleges, which provide training and apprenticeships to young people in the area. As well as this larger companies contracted by the University have also committed to training schemes.

The University has also taken steps to engage with the local supply chain in order to ensure as high a proportion as possible of construction contracts are granted within the local area. As part of this, the University is considering employment frameworks as a way to make it easier for local contractors to bid for University tenders.

By committing to continuing significant capital investment locally and by providing longer term employment and addressing skills shortages the University of Warwick is a dynamic driver of growth regionally and locally.

3.5 Summary of Core Impacts

The University of Warwick's core activities in 2014/15 supported economic activity that had a monetary value estimated at £632.4 million GVA and 10,915 jobs in the UK. Of this, £473.6 million GVA and 7,839 jobs was retained in the West Midlands and £394.1 million GVA and 6,335 jobs in the Coventry and Warwickshire LEP area. A breakdown of this impact within each of the study areas is provided in Table 3.10.

Table 3.10 – Core Economic Impact 2014/15

	CWLEP	West Midlands	UK
GVA (£m)			
Direct	337.8	337.8	337.8
Supplier Spending	17.1	27.7	115.7
Staff Spending	28.2	86.2	140.9
Capital Spending	11.0	21.8	38.0
Total GVA	**394.1**	**473.6**	**632.4**
Employment			
Direct	4,932	4,932	4,932
Supplier Spending	360	563	2,322
Staff Spending	575	1,698	2,752
Capital Spending	179	356	620
Total Employment	**6,335**	**7,839**	**10,915**

4 STUDENT IMPACTS

This chapter describes the impact that students at the University of Warwick have on the economy.

The impacts associated with the University of Warwick's students include:

- spending money on goods and services;
- working part-time while studying; and
- undertaking unpaid voluntary work for charities and third sector organisations.

A key impact of students is their increased productivity due to obtaining an undergraduate or postgraduate degree and this is considered in Chapter 6.

4.1 Student Population

In 2014/15 the University of Warwick had a student population of 25,181 students, of which 2,800 students were distance learners. The vast majority of these students were studying full-time with the University and this report only considers the economic impact of these 17,792 students. Of these, 72% were undergraduates and 28% were postgraduates. Table 4.1 provides a breakdown of the University of Warwick's student population.

There were 7,283 full-time and part-time international and EU students studying with the University in 2014/15. More than 38% of full-time students were from outside the UK.

Table 4.1 – Student Population

	Full-time	Part-time	Distance Learners	Total
Undergraduate	12,852	1,608	303	14,763
Taught Postgraduate	3,364	2,746	2,500	8,610
Research Postgraduate	1,576	232	0	1,808
Total	**17,792**	**4,586**	**2,803**	**25,181**

Source: The University of Warwick

4.2 Student Spending

Students at the University of Warwick have an impact on the economy through their spending in the same way that staff have an impact through the spend of their wages. The money that students spend generates economic activity in the businesses that they purchase goods and services from.

The basis for calculating the student spending impact is a study undertaken by the Department of Business, Innovation and Skills[11] that considered the level of expenditure of students studying in the UK on different commodities including accommodation, entertainment and food costs. As the survey was carried out in 2011/12 the results have been adjusted for inflation and are summarised in Table

[11] Department for Business, Innovation and Skills (2012), Student Income & Expenditure Survey 2011/12.

4.2. Based on this, it is estimated that the average student (living outside of London in England) spends £12,668 per year.

Table 4.2 – Average Student Expenditure Profile

Type of expenditure	Annual spend
Food	£2,119
Personal Items	£2,002
Entertainment	£1,243
Household goods	£379
Non course travel	£1,781
Other living costs	£39
Housing Costs	£4,211
Travel	£408
Books and Equipment	£485
Total	**£12,668**

Source: Department of Business, Innovation and Skills, Student Income and Expenditure Survey 2011/12 adjusted for inflation

As with the staff spending impact it was necessary to exclude spending on VAT. VAT at the rate of 20% was therefore deducted from VAT applicable items.

The type of accommodation a student lives in influences student expenditure. For example, students living in their parental or guardian home are unlikely to spend money on housing costs and will spend significantly less on food and household goods. The accommodation expenditure of students in institution maintained properties has already have been included in the direct income of the university and so was excluded here. A breakdown of students by accommodation type is given in Table 4.3.

Table 4.3 – Full-Time Students by Accommodation Type and Study Area

	CWLEP	West Midlands	UK
Institution Maintained Property	8,242	8,245	8,260
Rented Accommodation/Own Residence	8,286	8,561	8,736
Parental/Guardian Home	485	717	796
Total	**17,013**	**17,523**	**17,792**

Source: University of Warwick (adjusted to account for students whose location is unknown)

The assumptions in Table 4.2 and Table 4.3 allow the direct spend in each area to be calculated for each spending category. The economic impact of this expenditure was estimated by applying appropriate turnover/GVA ratios and turnover/employee ratios to each of the categories. (For example the impact of expenditure on accommodation was estimated using ratios for the rental sector and the impact of expenditure on entertainment was estimated using ratios for the arts, entertainment and recreation sector.) The indirect impacts were then estimated by applying the appropriate multipliers for each category of expenditure.

The economic impact of student expenditure is summarised in Table 4.4. This shows that students at the University of Warwick contributed £106.5 million GVA

and supported 1,800 jobs in the UK through their spending. Of this, £96.3 million GVA and 1,650 jobs were estimated to be in the West Midlands and £73.4 million GVA and 1,316 jobs in the Coventry and Warwickshire LEP area.

Table 4.4 – Student Spending Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	73.4	96.3	106.5
Employment	1,316	1,650	1,800

4.3 Student Part-time Work

Students also have an impact on the economy if they undertake part-time employment in local businesses as without students some businesses would not have the additional labour they require to increase their economic impact.

In order to estimate the economic impact of part-time student employment it was first necessary to estimate how much time students spend working. A nationwide student survey undertaken in 2013 found that 57% of students work while studying at University[12]. A similar study found that students work on average 14.2 hours a week[13]. It was assumed that students undertake part-time work where they live.

To avoid double counting it was then necessary to exclude those students who work part-time for the University (as the impact of this activity was included in (Chapter 3). It was assumed that 9% of students undertaking part-time work, work for the University of Warwick. This is based on an average of other higher education institutions that BiGGAR Economics has worked with who provided this data.

To account for the fact that some of the part-time jobs undertaken by students might otherwise have been undertaken by other residents of Coventry it was also necessary to estimate how much of the part-time employment is additional. The majority of part time employment undertaken by students is in unskilled or semi skilled roles. The lower the level of unemployment, the less likely the companies would be able to fill these roles without the student population. In particular, the youth unemployment rate (16-24 years old) gives the best indicator of the availability of replacement labour.

It was assumed that at 50% youth unemployment, the additionality of student labour would be 10%. This is because there would be a significantly large pool of workers, however, as not all of the positions that are filled by students could be easily filled by the wider workforce there is a minimum additionality set at 10%. It was assumed that the relationship between the additionality of student labour and the youth unemployment rate was linear. The Annual Population Survey published by the ONS indicates that 13% of young people in the Coventry and Warwickshire LEP area were unemployed in 2014. The additionality of student labour is therefore assumed to be inversely proportional to the youth unemployment rate and was calculated to be 77%.

[12] Endsleigh (2014), Endsleigh Insurance and National Union of Students Survey 2013
[13] National Union of Students (2010), Still in the Red

Table 4.5 – Key Assumptions for Student Part-time Work Impact

	Value	Source
Proportion of full-time students who work	57%	Endsleigh (2014) Endsleigh Insurance and National Union of Students Survey 2013
Proportion of employed students who work for the University of Warwick	9%	BiGGAR Economics calculation based on other universities
Average number of hours worked per week	14.2	National Union of Students (2010), 'Still in the Red'
Youth unemployment rate in Coventry and Warwickshire LEP	13%	ONS (2015), Annual Population Survey 2014
Proportion of labour supply that is additional	77%	BiGGAR Economics Calculation

These assumptions were then used to estimate how many additional hours of work students from the University of Warwick contribute to the local economy. This figure was then converted into a full-time equivalent number of jobs.

The GVA impact of these additional jobs was then estimated by applying an estimate of the average GVA/employee in sectors that students typically work in (such as retail and tourism). Indirect impacts were then captured by applying appropriate multipliers.

In this way it was estimated that part-time student employment supported almost 3,540 jobs across the UK and generated £99.1 million GVA. In the West Midlands this was estimated to be £93.2 million GVA and almost 3,380 jobs and £80.0 million GVA and more than 3,020 jobs in the Coventry and Warwickshire LEP area. The impact of student employment in each study area is summarised in Table 4.6.

Table 4.6 – Student Part-time Work Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	80.0	93.2	99.1
Employment	3,022	3,379	3,539

4.4 Social and Community Engagement – Warwick Volunteers

As well as undertaking paid part-time work, the students of the University of Warwick are also active as unpaid volunteers with different organisations.

Warwick Volunteers is the official volunteering organisation for the University of Warwick and co-ordinates the activities of over 2,360 students. Seven permanent staff and six elected student executives currently work for the organisation, overseeing 80 student project leaders who develop projects, recruit volunteers and offer mentoring and support.

Although Warwick Volunteers falls under the jurisdiction of Student Careers and Skills, the office is located at the University's Student Union, highlighting that the University sees Warwick Volunteers primarily as a way to engage with and contribute to the local community. Almost all of the projects and organisations it is

involved with are in the areas of Coventry or Warwickshire, specifically the towns of Leamington Spa and Kenilworth. Volunteering therefore creates important partnerships and links with the local community in the areas where many of the University's students live. This also means that volunteering is relatively convenient however, when the project that a student is working on is not located nearby travel and other out-of-pocket expenses are covered by the University.

Warwick Volunteers runs more than 50 volunteering projects, supporting the community in a wide range of sectors from education to legal advice. These projects can either be long-term (over a semester or with no fixed date) or short-term/one-off. Projects frequently focus on disadvantaged groups like the elderly or children from disadvantaged backgrounds.

Many projects are based in primary, secondary and special educational needs schools. In 2014/15, Warwick Volunteers were engaged with 56 schools, 38 of which were in Coventry, 11 in Leamington Spa, 4 in Kenilworth and a further 3 in Warwick. Projects range from running extra-curricular activities to tutoring support. For example, the Right to Read project provides one-to-one support for children, improving their reading ability and confidence levels. The Language Tutors project draws on the University's large body of international students to improve the teaching of foreign languages in schools and in some cases aids the integration of pupils new to the UK.

Warwick Volunteers have also been involved with the Citizens Advice Witness Service, which provides emotional support and information to witnesses, making them feel respected and informed so they can give their best testimony. This role asks for significant commitment and a four day training course must be passed first, but it provides an invaluable service to the community and develops maturity and empathy in volunteers.

4.4.1 Quantifiable Impact

Student volunteering contributes to the economy by enabling local third sector organisations to increase their operations and undertake activities they not otherwise be able to.

The economic impact of student volunteering was quantified by the output that they would provide to the organisations that they volunteer with. Data provided by Warwick Volunteers indicates that there were 2,361 volunteers registered with Warwick Volunteers in 2014/15. Of these, Warwick Volunteers tracked 1,006 students who were actively volunteering. Warwick Volunteers estimate the total number of hours volunteered to be 13,275 (i.e. 13.6 hours per volunteer). Only those hours are logged where a timesheet is signed by the community partner and the volunteer has exceeded 20 hours of volunteering. The impact of volunteering estimated here is therefore likely to be an underestimate of volunteering activity.

It was therefore assumed that all 2,361 registered volunteers were undertaking volunteering, on average 13.6 hours per volunteer, equating to 32,111 hours of volunteering in total. The total hours that the students spend on voluntary activities throughout the year was then converted into full time equivalent employees.

The value of the hours volunteered to organisations is estimated by assuming that the average output of a student's voluntary work is equivalent to the average GVA per employee in the social work activities sector (£11,552). This GVA per

employee was then applied to find the GVA impact. The assumptions used to quantify the volunteering impact are given in Table 4.7.

Table 4.7 – Key Assumptions for Student Volunteering

	Value	Source
Volunteers registered with Warwick Volunteers	2,361	Warwick Volunteers
Active volunteers	1,006	
Number of hours of volunteering recorded	13,725	
Average number of hours/volunteer	13.6	
Total number of hours volunteered (active and non-active volunteers)	32,211	BiGGAR Economics Calculation
GVA per employee in Social Work Activities without Accommodation sector	£11,552	ONS (2015), Annual Business Survey Revised Results 2013

Students were assumed to have undertaken their voluntary activities in the study area in which they reside during term time. It was therefore possible to estimate the economic impact in each of these areas. This impact is summarised in Table 4.8 and indicates that student volunteering contributed £0.2 million GVA to the UK economy.

The nature of this type of activity is that it will contribute to increasing the productivity of the organisation volunteered for (by contributing to service provision) and will therefore have a GVA impact rather than an employment impact.

Table 4.8 – Volunteering Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	0.2	0.2	0.2

4.4.2 Wider Benefits of Volunteering

However, in practice the value of student volunteering is greater than this figure suggests as the calculations are only a crude method which captures the value of the students' time. It does not reflect the wider community benefits such as:

- the value of the volunteering to the service supported as many organisations could not run without these additional volunteers;
- the value of this time and the value of the existence of the service to service users. The impacts will range from reducing isolation to increasing employability which will all contribute to increasing mental and physical health therefore wellbeing;
- the value of the impacts on the service users to society as the improvement in wellbeing will result in cost savings in health and social services. This improvement in wellbeing and the improvement in employability will result in savings to welfare and increased productivity; and

- volunteering creates positive effects, known as externalities, in the communities where it takes place. Even those who don't volunteer or receive volunteering services still benefit from the increased sense of community.[14]

As well as this there are several wider benefits of volunteering for students:

- Warwick Volunteers provides training specific to each project, such as first aid, safeguarding and disability awareness. Students are therefore able to acquire skills through these training initiatives;

- the voluntary work itself provides students with the opportunity to gain valuable skills. Students can gain specific skills in areas such as administration, marketing and fundraising. As well as this students can gain broader skills such as improved interpersonal skills and greater confidence which can improve employability; and

- studies have shown that volunteering can lead to higher levels of happiness, lower levels of depression and less social isolation and loneliness[15]. Those who take part in the National Citizen Service, a scheme which offers young people the opportunity to take part in community action and volunteering, have been shown to feel greater life satisfaction, more happiness and less anxiety while feeling that their life is more worthwhile.

4.5 Summary of Quantifiable Student Impacts

Students through their spending, part-time work and volunteering supported economic activity in 2014/15 with an estimated value of £153.7 million GVA in the Coventry and Warwickshire LEP area and around £190.0 million GVA and 5,029 jobs in the West Midlands. In the UK this was estimated to amount to £205.8 million GVA and 5,339 jobs.

Table 4.9 – Impact Supported by Students 2014/15

	CWLEP	West Midlands	UK
GVA (£m)			
Student Spending	73.4	96.3	106.5
Student Part-time Work	80.0	93.2	99.1
Student Volunteering	0.2	0.2	0.2
Total GVA	**153.7**	**189.8**	**205.8**
Employment			
Student Spending	1,316	1,650	1,800
Student Part-time Work	3,022	3,379	3,539
Student Volunteering	-	-	-
Total Employment	**4,338**	**5,029**	**5,339**

[14] Legatum Institute (2014), Wellbeing and Policy
[15] The King's Fund (2012), Volunteering in Health and Care in England

5 TOURISM AND CULTURE

The University of Warwick supports economic activity by attracting visitors and visitor expenditure to the study areas. Tourism impacts are generated by:

- friends and family visiting students and staff;
- visitors to conferences held at the University of Warwick;
- open day visits from applicants; and
- attendees to events at the University of Warwick Arts Centre.

The expenditure of all of these visitors is attributable to the presence of the University of Warwick and directly benefits the local tourism sector.

5.1 Visiting Friends and Family

The presence of staff and students in the area creates an economic contribution through visits from their friends and family. These trips are referred to as visiting friends and relatives (VFR). These visitors spend money in the economy and this spending increases turnover in local businesses which in turn supports local employment in the tourism sector.

In order to estimate this impact it was first necessary to estimate the number of visits from friends and family that students and staff will receive. The data for this comes from two sources. Friends and relatives who are visiting from within the UK are surveyed by VisitEngland in their Domestic Tourism Overview. Data for international visitors is taken from the International Passenger Survey published by VisitBritain. Both of these give the total number of VFR trips and the expenditure per trip for the West Midlands. The number of both types of visits per head of population in the West Midlands was then applied to the total number of staff and students.

The next stage in estimating this impact was to consider the total additional spend associated with these trips. According to the VisitEngland survey the average expenditure per domestic VFR trip was £100 and the International Passenger Survey states that the equivalent for overseas VFR trips was £343 in 2014. This enables the total expenditure in each area to be estimated. These assumptions are summarised in Table 5.1.

Table 5.1 – Key Assumptions for Visiting Friends and Family Impact

	Value	Source
Number of full-time students	17,792	The University of Warwick
Number of staff	5,221	
Number of domestic visiting family and friends trips to West Midlands/head of population	0.49	VisitEngland (2015), Domestic Tourism Overview 2014 and ONS (2015), Mid-Year Population Estimates 2014
Number of overseas visiting family and friends trips to West Midlands/head head of population	0.07	VisitBritain (2015), International Passenger Survey and ONS (2015), Mid-Year Population Estimates (2014)
Average expenditure/trip of domestic visitors to family and friends in West Midlands	£100	VisitEngland (2014), Domestic Tourism Overview
Average expenditure/trip of overseas visitors to family and friends in West Midlands	£343	VisitBritain (2014), International Passenger Survey

The direct economic impact of this expenditure in the tourism sector was estimated by applying the turnover/GVA ratios and turnover/employee ratios. The indirect impact was then estimated by applying GVA and employment multipliers. The economic ratios and multipliers were an average of the following sectors in which spending is likely to occur: accommodation and food services; arts, entertainment and recreation; retail trade except of motor vehicles; and sustainable tourism. The ratios and multipliers for the sustainable tourism sector are sourced from Scottish Government data.

In this way it was estimated that visiting friends and family contributed £0.8 million GVA and 23 jobs to the UK economy, of which £0.7 million and 21 jobs were in the West Midlands and £0.6 million GVA and 18 jobs were in the Coventry and Warwickshire LEP area (Table 5.2).

Table 5.2 – Visiting Friends and Family Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	0.6	0.7	0.8
Employment	18	21	23

5.2 Conferences and Events

Warwick Conferences is the largest commercial business at the University of Warwick with an annual turnover of £16 million, 479 hotel-style bedrooms and four conference centres, including the Conference Park, which can host up to 1,200 delegates. In 2014/15, there were 820 conferences and events held at the University of Warwick attracting 88,725 delegates. By attracting people to the area who would not otherwise have visited, the conferences and events held at the University of Warwick generate economic impact.

In 2014/15, there were 29,093 residential conference delegates. It was assumed that all of these delegates would stay in Warwick Conferences accommodation facilities. The expenditure of these delegates on accommodation has therefore already been captured in the direct impact of the University. However, the expenditure of these visitors on shopping, entertainment, food and drink has not been estimated elsewhere and would not occur if the University did not exist and is therefore estimated here. In order to avoid double counting it was also assumed that 20% of delegates are University staff and the spend of this 20% is therefore excluded.

It was assumed that 80% of these visitors were additional to the Coventry and Warwickshire LEP area; in other words 80% of delegates would not have been staying in the area were it not for the presence of the University. It was assumed that 50% of delegates were additional to the West Midlands. Analysis of business visitor data from VisitEngland and VisitBritain indicates that 34% of business visitors to the West Midlands were from overseas. Based on this, it was assumed that 34% of conference delegates to the University of Warwick were from overseas and therefore additional to the UK.

In order to estimate the additional spend, the number of additional delegates was multiplied by the average spend per night for domestic and overseas visitors. As mentioned above, based on analysis of official tourism statistics it was assumed that 66% of delegates were domestic visitors and 34% were from overseas. The relevant spend for business visitors to the West Midlands was then applied. Assumptions about location of spend were also applied; it was assumed that all of the spending would be within the UK and the West Midlands and 90% of spend would occur in the Coventry and Warwickshire LEP area (to account for travelling costs).

Data from VisitScotland indicates that 33% of visitor spend in Scotland was on accommodation. Based on this, it was possible to exclude spending on accommodation from the total visitor spend in order to avoid double counting.

There were 59,632 non-residential conference delegates to the University of Warwick in 2014/15. It was assumed that all of these would be domestic delegates. As before it was assumed that 20% of delegates were University staff and their impact was therefore excluded. It was also assumed that 20% of delegates would stay in the area in other accommodation (i.e. not in Warwick Conferences accommodation). The spend of this 20% was estimated in the same way as the residential conference delegates above but without subtracting their spend on accommodation. The remaining 80% of non-residential conference delegates were assumed to be day visitors and therefore average day visitor spend of £40 was applied after accounting for additionality.

These assumptions are summarised in Table 5.3.

Table 5.3 – Key Assumptions for Conferences and Events Impact

	Value	Source
Number of residential conference delegates	29,093	Warwick Conferences
Number of non-residential conference delegates	59,632	
Proportion of delegates that are University staff	20%	BiGGAR Economics Assumption
Proportion of residential conference delegates who stay in University accommodation	100%	
Proportion of non-residential conference delegates who stay overnight in the area	20%	
Proportion of overseas delegates	34%	BiGGAR Economics Calculation based on VisitEngland and VisitBritain data
Proportion of domestic delegates	66%	
Additionality of Visitors		
Proportion of visitors additional to CWLEP	80%	BiGGAR Economics Assumption
Proportion of visitors additional to West Midlands	50%	
Proportion of visitors additional to UK	34%	BiGGAR Economics Calculation based on VisitEngland and VisitBritain data
Location of Spend		
Proportion of spend in CWLEP	90%	BiGGAR Economics Assumption
Proportion of spend in West Midlands	100%	
Proportion of spend in UK	100%	
Average Visitor Spend		
Average day visitor spend in Coventry (2012-2014)	£40	TNS (2015), The GB Day Visitor Statistics
Average domestic business visitor spend per trip to the West Midlands	£194	VisitEngland (2015), Domestic Tourism Overview
Average overseas business visitor spend per trip to the West Midlands	£328	VisitBritain (2015), International Passenger Survey

The economic impact of the spend from residential and non-residential conference delegates was then estimated by applying average economic ratios and multipliers.

In this way it was estimated that delegates to conferences and events at the University of Warwick contribute £1.2 million GVA and 33 jobs to the UK, £1.6 million GVA and 47 to the West Midlands and £1.9 million GVA and 59 jobs to the Coventry and Warwickshire LEP area.

Table 5.4 – Conferences and Events Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	1.9	1.6	1.2
Employment	59	47	33

5.3 Open Days

Prospective students who attend open days at the University of Warwick will make an economic contribution. The expenditure of these visitors has not been captured elsewhere in this report and would not occur if the University of Warwick did not exist and is therefore included within this section.

In 2014/15, there were 29,425 attendees to the University's open days at its main campus in Coventry and 500 attendees to open day events at WBS London. Data provided by the University indicates that the vast majority of attendees (99%) are from the UK with the remaining 1% from overseas. Of those that are from within the UK, the vast majority are from the South of the UK (Table 5.5 provides more details).

It was assumed that visitors from overseas would stay overnight in the area and the average spend of overseas visitors to the West Midlands per holiday trip (£348) was therefore applied to these visitors. It was also assumed that domestic visitors from further afield (such as those from Scotland and Northern Ireland) would stay overnight. The Great Britain Tourism Survey 2014 indicates that overnight domestic visitors to Coventry on average spend £134 per trip. The remaining open day attendees were assumed to be day visitors and therefore average day visitor spend of £40 was applied.

It was assumed that 98% of spending would take place in the West Midlands and the Coventry and Warwickshire LEP area and 100% of spending would occur in the UK.

Table 5.5 – Assumptions for Open Days Impact

		Value	Source
Prospective students at Main Campus open day		12,908	The University of Warwick
Parents/supporters at Main Campus open day		16,517	
Open day attendees at WBS London		500	
Origin of Open Day Attendees			
Attendees from Overseas		1%	The University of Warwick
Attendees from the UK		99%	
	Midlands	20%	
	North	14%	
	South	63%	
	Wales	2%	
	Northern Ireland	0%	
	Scotland	0.1%	
Location of Spend			
Proportion of spend in CWLEP		98%	BiGGAR Economics Assumption
Proportion of spend in West Midlands		98%	
Proportion of spend in UK		100%	
Average Visitor Spend			
Average day visitor spend in Coventry (2012-2014)		£40	TNS (2015), The GB Day Visitor Statistics
Overnight domestic visitor to Coventry spend per trip		£134	TNS (2015), The GB Tourism Survey 2014
Overseas holiday visitor to West Midlands spend per trip		£348	VisitBritain (2014), International Passenger Survey

In this way it was possible to estimate the additional expenditure from open day attendees in each study area, to which economic ratios and multipliers were applied.

Attendees to open day events at the University of Warwick are therefore estimated to contribute £0.7 million GVA and 20 jobs in the UK, £0.6 million GVA and 19 jobs in the West Midlands and £0.5 million GVA and 17 jobs in the Coventry and Warwickshire LEP area.

Table 5.6 – Open Days Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	0.5	0.6	0.7
Employment	17	19	20

5.4 Local Tourism and Culture Contribution

5.4.1 Warwick Arts Centre

Warwick Arts Centre is located on the University's Coventry campus and opened in 1974. It is comprised of a concert hall, two theatres and a cinema as well as a restaurant, cafe, shop and bars. Warwick Arts Centre also contains the Mead Gallery, a large purpose-built contemporary art gallery, and the Music Centre, which contains rehearsal rooms and facilities for students to practise.

Warwick Arts Centre was instrumental in setting up the Coventry and Warwickshire 8 (CW8). CW8 is a group of 8 major cultural attractions in the region which also includes Compton Verney, the Royal Shakespeare Company, Shakespeare's Birthplace, Coventry Cathedral, Culture Coventry and Warwick Castle. It was formed as a way to increase the value and influence of the area's significant cultural capital, particularly in regards to the LEP, and also increased communication amongst its members, leading to better practice and a more joined-up strategy.

Given its scale and the quality of its theatre Warwick Arts Centre is able to attract top performers in the areas of comedy, music and drama. However, it also hosts community-led productions, such as those by local schools, Family Days, which draw in families from the local area and beyond, and productions by students at the University of Warwick, significantly increasing cultural engagement amongst the local community in Coventry and Warwickshire. An example of this is provided in Figure 5.1.

Figure 5.1 – One World Week

One World Week is a charitable event and the largest student-run event at the University of Warwick. It takes place for one week every year (in 2016 it will be 23rd-30th January) with the goal of celebrating cultural diversity and stimulating the personal development of all students. The week also promotes important issues such as justice, equality and sustainability.

Students at the University of Warwick support One World Week through a variety of events, such as debates, parades, performances, cultural exhibitions and workshops and a host of sporting tournaments. A fashion show is also held every year as part of this in which over 200 students take part.

Over 200 students volunteer to make the week a success and over 10,000 people participated in events during One World Week in 2014.

Warwick Arts Centre also undertakes outreach activities, running a variety of school-oriented workshops and productions. In 2014/15, the Centre engaged with 49 schools and similar organisations, reaching over 15,000 people across 289 sessions. These sessions include entertaining and informative events and shows, but can also involve developing the ability of teachers and other educators to engage with their students. These kinds of effects can be significant and long-term, improving schools and teachers, while instilling an appreciation of culture and the arts in generations of children.

The presence and activities of Warwick Arts Centre also contributes to creating the kind of vibrant, attractive and engaging environment that is desirable to live and work in.

5.4.2 Quantifiable Impact of Warwick Arts Centre

In 2014/15 more than 226,900 people attended live events, films and visited the Mead Gallery. Data provided by Warwick Arts Centre indicated that 72% of visitors were from within the Coventry and Warwickshire LEP area. The spend of these visitors was not considered additional to the LEP area as they are already located in the area. The spend of the remaining 28% of visitors was assumed to be additional to Coventry and Warwickshire because if Warwick Arts Centre did not exist these visitors would not have been in the area. It was assumed that these visitors come from the West Midlands and therefore their spend is not additional to the West Midlands or the UK.

The expenditure of these visitors was estimated by applying data from The GB Day Visitor Statistics, which indicates that day visitors from other parts of the UK who visit Coventry spend an average of around £40 per day. It was assumed that on average visitors to Warwick Arts Centre spend £15 on their ticket price and other spending within the Arts Centre or the University. It was further assumed that all of this spending would occur in the Coventry and Warwickshire LEP area.

Table 5.7 – Warwick Arts Centre Assumptions

	Value	Source
Number of paid attendees to Warwick Arts Centre	226,944	Warwick Arts Centre
% of audience from Coventry	30%	
% of audience from Warwickshire	42%	
% of audience from elsewhere	28%	
% of attendees additional to CWLEP	28%	BiGGAR Economics Assumption based on Warwick Arts Centre data
% of attendees additional to West Midlands	0%	
% of attendees additional to UK	0%	
Average day visitor spend in Coventry (2012-2014)	£40	TNS (2015), The GB Day Visitor Statistics
Average spend within Warwick Arts Centre (e.g. ticket price, food etc)	£15	BiGGAR Economics Assumption

Economic ratios and multipliers as an average of relevant sectors were then applied to the estimated spend in each study area. It was therefore estimated that Warwick Arts Centre contributes £0.6 million GVA and 18 jobs to the Coventry and Warwickshire LEP area.

Table 5.8 – Warwick Arts Centre Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	0.6	0.0	0.0
Employment	18	-	-

5.5 Summary Quantifiable Tourism Impact

Taken together the impacts considered in this chapter suggest that the additional tourism expenditure generated by the University of Warwick contributed

approximately £3.6 million GVA and 112 jobs in the Coventry and Warwickshire LEP area, £3.0 million GVA and 86 jobs in the West Midlands Area and £2.7 million GVA and 76 jobs in the UK. A breakdown of this impact within each of the study areas is provided in Table 5.9.

Table 5.9 – Tourism Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)			
Visiting Friends & Relatives	0.6	0.7	0.8
Conferences & Events	1.9	1.6	1.2
Open Days	0.5	0.6	0.7
Warwick Arts Centre	0.6	-	-
Total GVA	**3.6**	**3.0**	**2.7**
Employment			
Visiting Friends & Relatives	18	21	23
Conferences & Events	59	47	33
Open Days	17	19	20
Warwick Arts Centre	18	-	-
Total Employment	**112**	**86**	**76**

6 GRADUATE PRODUCTIVITY IMPACTS

The University of Warwick also contributes to the economy through the long-term returns from its teaching activity. The skills and knowledge given to students at the University enables students to become more productive employees after graduation.

6.1 Graduate Productivity

One of the most important ways in which the University of Warwick generates economic impact is through its graduates. The skills students learn and the experiences they have while at University directly enhance their future productivity.

The skills that employers look for in graduates go beyond the learning that is given in the classroom and include 'soft' skills that enable them to utilise their 'hard' skills in the most productive way. These include communication, language and leadership. International businesses have a particular interest in the skills that students acquire from exposure to the multi-cultural environments within universities. Studies[16] have found that business that deal with customers and organisations abroad value the ability to see business and personal issues from other cultural perspectives.

This enables them to contribute more to their employer and generate a greater benefit for the UK economy than they would otherwise be able to. The GVA of this productivity gain includes the additional profits that employers are able to generate by employing graduates and the additional employment costs they are willing to pay in order to generate these additional profits.

The subject of graduate earnings premiums has been well researched so information about them is readily available and can be used to provide a measure of the additional contribution graduates make to the economy each year. Unfortunately information about the additional profits of graduate employers or the additional taxation revenue they help to generate is not readily available so the impact presented in this section is likely to underestimate the true productivity impact of learning.

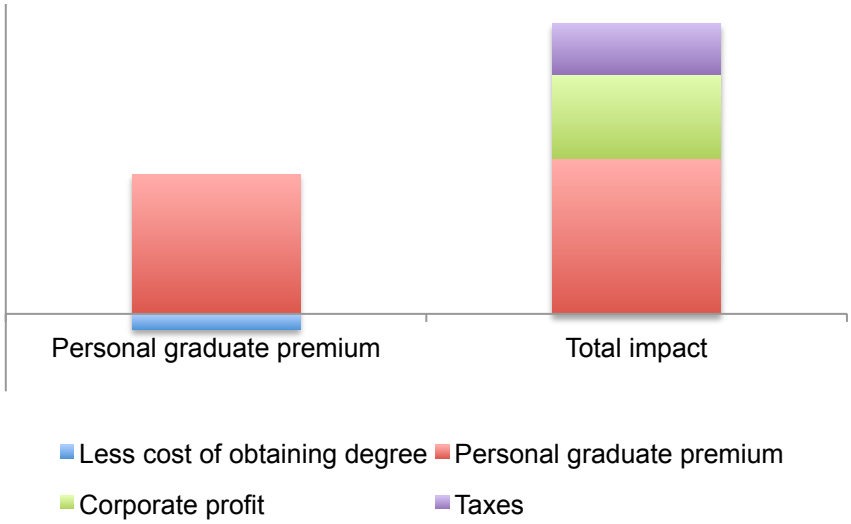
Information about the graduate premium for different subject areas is provided in a research paper produced by the Department for Business Innovation & Skills[17], which considered data from the Labour Force Survey between 1996 and 2009. Although the data used in the report is now somewhat dated, evidence from the OECD[18] suggests that returns to higher education are fairly consistent over time. For this reason, the report remains the most robust and comprehensive source available for estimating this impact.

The analysis considered the after tax earnings of a graduate compared to the after tax earnings of a non-graduate. Direct costs, such as tuition fees less student support, and indirect costs such as foregone earnings were then subtracted from the gross graduate premium for each degree subject to give the net graduate premium.

[16] Council for Industry and Higher Education (2008), Graduate employability: What do employers think and want?
[17] Department for Business Innovation & Skills (2011), The Returns to Higher Education Qualifications.
[18] Education at a Glance, OECD Indicators series

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. It therefore does not include the corporate profit associated with each graduate as well as the taxes paid to the Treasury. For these reasons (as illustrated in Figure 6.1) the impact presented in this section is likely to underestimate the full impact that graduates from the University of Warwick generate for the UK economy.

Figure 6.1 – Personal Graduate Premium Benefit Vs. Economic Benefit



6.2 Estimating the Graduate Earnings Premium

The subject that a student graduates in determines the earnings premium that they can expect to achieve over the course of his or her working life. The impact associated with graduates from the University of Warwick was therefore estimated by applying the graduate premium for each degree subject to the number of graduates in each subject area. The assumptions used to do this are provided in Table 6.1.

In the BIS study the earnings of students with bachelors degrees was compared to those with only a high school education and the earnings of graduates of Masters and PhD degrees were compared to those with an undergraduate degree. A study by HEFCE[19] found that 39% of those undertaking a PhD had a Masters degree. Therefore the PhD graduate premium for these graduates is the difference between the Masters and PhD premium in the BIS study.

[19] HEFCE (2011), PhD Study, Trends and Profiles 1996-97 to 2009-10

Table 6.1 – Graduate Premium Assumptions

	UK Undergraduates	Non-UK Undergraduates	Undergraduate Premium
Biological sciences	245	30	£66,443
Business and administrative studies	106	235	£117,853
Creative arts and design	57	14	£16,183
Education	121	0	£159,995
Engineering	217	88	£143,959
European languages	110	3	£66,859
Historical and philosophical studies	351	53	£23,226
Law	157	98	£171,543
Linguistics, classics and related	191	10	£67,286
Mathematical and computing sciences	445	138	£136,309
Medicine and dentistry	495	69	£380,604
Physical/environmental sciences	204	16	£94,021
Social studies	399	237	£103,470
Subjects allied to medicine	31	0	£186,392
Total/Average	3,129	991	**£108,121**
	UK Postgraduates	Non-UK Postgraduates	Postgraduate Premium (average)
Postgraduate graduates	2,656	2,656	£59,058

Source: The University of Warwick and Department of Business, Innovation and Skill (2011), The Returns to Higher Education Qualifications.

It was necessary to exclude students who leave the UK after graduation since these graduates will benefit the economies where they live rather than the UK. However, a study undertaken by the Department for Business Innovation and Skills[20] found that approximately 20% of overseas students remain in the UK after graduation. In 2014/15 there were 3,647 non-UK students graduating from the University of Warwick, and the impact of 20% of these students was included.

Assumptions about where graduates live after graduation (Table 6.2) were then applied to the total graduate premium of UK students and the total graduate premium of the 20% of non-UK students who remain in the UK after graduation. Data on the location of graduates was provided by the University of Warwick and indicates that a quarter of the University's graduates remain in the West Midlands.

[20] Department for Business Innovation and Skills (2012), Tracking International Graduate Outcomes 2011.

Table 6.2 – Location of Graduates

	CWLEP	West Midlands	UK
Location of Graduates	14%	25%	87%

Source: CWLEP and West Midlands data provided by the University of Warwick. UK proportion sourced from HESA (2015), DLHE Survey 2013/14.

In this way it was estimated that the total graduate premium across the UK amounts to £571.4 million.

Table 6.3 – Graduate Premium By Study Area (£m)

	CWLEP	West Midlands	UK
Total	90.5	165.3	571.4

7 COMMERCIALISATION

The University of Warwick has wide and far-reaching impacts on the economy over and above its fundamental activities of teaching and research, which will be discussed in the following sections. The University of Warwick is a vital source of technological innovation through the commercialisation activities that it undertakes, which is explored further in this section.

7.1 Warwick Ventures

Warwick Ventures is a wholly-owned subsidiary of the University of Warwick and oversees the University's technology transfer and commercialisation functions, including:

- supporting the creation of new businesses such as spin-out and start-up companies, which retain close ties to the University's expertise;
- commercialisation of the University's intellectual property by licensing technology;
- working closely with industry, providing businesses and investors access to the University's intellectual property;
- business development managers offer advice and support to researchers and others looking to develop a business through all the stages of business formation and development;
- access to two Proof of Concept funds, which aim to address the funding gap between the outputs of grant-funded research and a commercialisation-ready technology. The Warwick Impact Fund and the Warwick Ventures Proof of Concept Fund help researchers test their inventions, explore their technical feasibility and prove their market potential; and
- the Warwick Venture Software Incubator, based on the University campus, provides incubator space for software entrepreneurs.

7.2 Spin-Outs and Start-Ups

The University of Warwick currently has 22 active spin-out companies and 7 start-up companies. These 29 companies employ almost 150 people across the UK and have a combined turnover of £4.4 million.

As none of these businesses would have been created were it not for the research activity at the University of Warwick, all of the GVA they generate and jobs they support can be attributed to the University.

Turnover and employment data for each company was provided by Warwick Ventures as well as details of the sector in which each company operates. These assumptions are summarised in Table 7.1.

Table 7.1 – Key Assumptions for Spin-outs and Start-ups Impact

	Value
Number of Spin-outs and Start-ups	29
Turnover of Spin-outs and Start-ups	£4.4 m
Employment in Spin-outs and Start-ups	146
Location of Spin-outs	
% of companies in CWLEP	48%
% of companies in the rest of the West Midlands	14%
% of companies in the rest of the UK	38%

Source: Warwick Ventures (location of spin-outs based on postcode analysis undertaken by BiGGAR Economics)

The direct GVA impact of these companies was estimated by dividing the estimated turnover of each company by the turnover/GVA ratio for the sector in which it operates. The indirect impact of these companies was then captured by multiplying the direct impact of each company by GVA and employment multipliers appropriate to the sector in which it operates. The impact in each area was estimated by taking account of where each company is based.

In this way it was estimated that by supporting the creation of new businesses, the University of Warwick contributes an estimated £2.3 million GVA and almost 80 jobs in the Coventry and Warwickshire LEP area, £2.8 million GVA and 122 jobs in the West Midlands and £6.9 million GVA and more than 250 jobs across the UK.

Table 7.2 – Impact Supported by Spin-Outs and Start-Ups 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	2.3	2.8	6.9
Employment	78	122	251

7.3 Licensing

One of the ways research activity is translated into economic activity is through licensing agreements with industry. Licence agreements give companies the legal right to use a particular technology or other type of intellectual property (IP) to generate additional sales, reduce costs or otherwise improve their profitability. In return, companies pay royalties to the University.

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 Organisation 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 2002. 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.

In 2002[21] Goldscheider (et al) undertook further empirical analysis to test the continued validity of the 25% rule. The analysis was based on more than 1,500 licensing agreements from 15 different sectors between the late 1980s and the year 2000. The study found that although royalty rates ranged between 2.8% in the food sector to 8% in the media and entertainment sector, on the whole they differed very little from those used in the 1950s. This provides support for the continuing use of the 25% rule as a tool for calculating the value of intellectual property. The sectors considered in the Goldscheider analysis, along with the respective royalty rates are summarised in Table 7.3.

Table 7.3 – Royalty Rates by Sector

Sector	Median Royalty Rate
Automotive	4.0%
Chemicals	3.6%
Computers	4.0%
Consumer Goods	5.0%
Electronics	4.0%
Energy and Environment	5.0%
Food	2.8%
Healthcare Products	4.8%
Internet	7.5%
Machine Tools	4.5%
Media and Entertainment	8.0%
Pharmaceutical and Biotechnology	5.1%
Semiconductors	3.2%
Software	6.8%
Telecom	4.7%
Other (Average)	4.9%

Source: Goldscheider et al (2002), Use of the 25% rule in valuing IP.

In 2014/15 the University of Warwick received £0.3 million in licensing income. Warwick Ventures provided this data by academic department and it was therefore possible to apply the appropriate royalty rate for the sector the license is held in. In this way the additional turnover that these technologies generated for licence holding businesses was estimated.

In order to estimate the additional turnover by study area it was necessary to analyse the location of licence holders. Postcode analysis of licensees indicated that 37% of licensing income was from overseas. As this study only looks at the impact within the UK, overseas income was excluded. The key assumptions used to estimate this impact are summarised in Table 7.4.

[21] Goldscheider (2002), Use of the 25% rule in valuing IP, les Nouvelles.

Table 7.4 – Key Assumptions for Licensing Impact

	Value	Source
Total licensing income in 2014/15	£0.3 million	Warwick Ventures (location of licensee based on postcode analysis by BiGGAR Economics)
% of income from CWLEP	2%	
% of income from West Midlands	2%	
% of income from UK	63%	
% of income from overseas	37%	
Royalty income as % of turnover	5%	Based on Goldsheider (2002), Use of the 25% Rule in Valuing IP

The GVA impact of this was then estimated by dividing the additional turnover supported in each sector by a turnover to GVA ratio for that sector. The employment impact was estimated by dividing the total turnover generated in each sector by an estimate of the turnover per employee in that sector. The indirect impact of licensing activity was then estimated by multiplying the direct employment and GVA impacts by GVA and employment multipliers appropriate to the sector in which the impact was generated.

It was therefore estimated that license agreements at the University of Warwick contributed a total of £2.7 million GVA and almost 60 jobs to the UK economy. This is summarised in Table 7.5.

Table 7.5 – Impact supported by Licensing 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	0.1	0.1	2.7
Employment	2	2	59

7.4 Summary Commercialisation Impact

The University of Warwick supports economic activity through the activities of Warwick Ventures, such as the creation of new companies and licensing intellectual property. The total monetary value of this activity in 2014/15 was an estimated £2.4 million GVA and 80 jobs in the Coventry and Warwickshire LEP area, approximately £2.9 million GVA and 124 jobs in the West Midlands and £9.7 million GVA and more than 300 jobs in the UK.

Table 7.6 – Commercialisation Impact 2014/15

	CWLEP	West Midlands	UK
GVA (£m)			
Spin-outs and Start-ups	2.3	2.8	6.9
Licensing	0.1	0.1	2.7
Total GVA	**2.4**	**2.9**	**9.7**
Employment			
Spin-outs and Start-ups	78	122	251
Licensing	2	2	59
Total Employment	**80**	**124**	**310**

8 WORKING WITH BUSINESSES

The University of Warwick also works to transfer existing knowledge throughout the economy through the University's interactions with businesses including:

- facilitating knowledge transfer between academia and industry through the Knowledge Transfer Partnership programme;
- collaboration with businesses through undertaking consultancy projects or commissioned research;
- providing businesses and organisations access and use of the University's facilities and equipment;
- delivering professional training and education to help businesses develop the skills of their workforce; and
- providing access to technical expertise and the latest analytical equipment through Warwick Scientific Services.

8.1 Knowledge Transfer Partnerships (KTPs)

The KTP scheme is a UK wide initiative designed to enable businesses to access the knowledge and expertise available within UK Universities and Colleges thereby facilitating knowledge exchange. A KTP is a three-way partnership between an academic, a business partner (including private sector companies, charities and public sector organisations) and a recent graduate (known as the Associate) who is employed to work on the specific project relevant to the business partner.

In 2014/15 the University of Warwick was involved with 9 KTP projects. In total, the University has completed 26 KTP projects in the past six years.

Table 8.1 – Key Assumptions for KTP Impact

	Value	Source
Number of ongoing KTPs	9	The University of Warwick
Number of KTPs completed in last 6 yrs	26	
in CWLEP	8	
in Rest of West Midlands	3	
in Rest of UK	15	
Jobs created by each KTP	3	Regeneris Consulting (2010), Knowledge Transfer Partnerships Strategic Review
Annual GVA per KTP (West Midlands)	£145,500	
Annual GVA per KTP (East Midlands)	£111,167	
Annual GVA per KTP (UK average)	£137,667	

A strategic review of the KTP programme[22] undertaken in 2010 found that on average, KTPs undertaken in the West Midlands contributed £873,000 GVA to the UK economy, equivalent to an annual impact of £145,500 in the six years after

[22] Regeneris Consulting (2010), Knowledge Transfer Partnerships Strategic Review.

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

By multiplying the impacts from this strategic review by the number of KTP projects undertaken by the University in each of the study areas, it was possible to estimate the economic impact that the KTPs have in each area.

In this way it was estimated that KTPs with the University of Warwick contributed an estimated £3.7 million and almost 80 jobs to the UK economy, £1.7 million GVA and more than 30 jobs in the West Midlands and £1.2 million GVA and 24 jobs in the Coventry and Warwickshire LEP area.

Table 8.2 – Impact supported by Knowledge Transfer Partnerships 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	1.2	1.7	3.7
Employment	24	33	78

8.2 Business Collaboration

The University of Warwick also collaborates with businesses by providing consultancy services and undertaking commissioned research with businesses. Businesses and organisations can access consultancy services across a number of disciplines at the University of Warwick and thereby use the skills and research expertise of academics to benefit their businesses. As well as this small businesses and large multinationals can enter into direct research contracts with the University to benefit from the University's research expertise and work towards solving challenging problems. The University's global research priorities (discussed further in Chapter 10) provide an indication of the University's academic strengths and areas of expertise thereby providing a focus for these collaborative opportunities.

Figure 8.1 provides one example of a collaborative research venture the University of Warwick is involved with. Warwick Manufacturing Group also works in collaboration with organisations and businesses to provide novel and practical solutions to industry challenges and this is discussed in more detail in Chapter 10.

Figure 8.1 – Case Study: Business Collaboration with Novo Nordisk

One example of the University of Warwick's business collaboration activities is the partnership between Warwick Medical School and Novo Nordisk, a Danish healthcare company employing around 20,000 full-time employees and a world leader in diabetes care. Warwick Medical School has particular strengths in diabetes research and Novo Nordisk has one of the broadest diabetes product portfolios, including the most advanced products within the area of insulin delivery systems.

The joint initiative aims to improve clinical research in diabetes medicine. It is estimated that in 2014, 387 million people, worldwide were affected by diabetes, with this figure anticipated to increase to 592 million by 2035[23]. In the UK it is estimated that more than one in 16 people has diagnosed or undiagnosed diabetes and approximately £10 billion is spent by the NHS on diabetes, making it one of the most challenging medical problems of the 21st century. This partnership between the Warwick Medical School, the NHS and a private industry leader in diabetes care provides a collaborative approach to tackling one of the world's fastest growing chronic diseases.

In 2014/15, the University of Warwick received £32.0 million from consultancy and contract research projects with businesses. It is reasonable to assume that businesses that commissioned consultancy or contract research would only have done so if they expected these projects to generate positive returns. Detailed information about the level of these returns is not available for the University of Warwick's clients; however, an estimate can be made based on the findings of research from similar activity elsewhere.

In 2013 BiGGAR Economics undertook an evaluation of the Interface programme between that runs through Scottish universities. Interface was established as a central hub connecting businesses with Scottish higher education and research institutions. These connections that Interface has made have covered a range of different types of engagement from small consultancy projects and access to university equipment and facilities through to company sponsored PhDs. The BiGGAR Economics evaluation found that the costs to the businesses from participating in this programme was £12.9 million and the direct benefit to these businesses was £46.4 million GVA. Therefore the direct return to investment was 360%. In other words, every £1 invested by businesses generates £3.60 GVA in direct economic benefits.

This assumption is similar to other studies done in similar areas. In 2009 PriceWaterhouseCoopers LLP undertook a study for the Department of Business, Enterprise & Regulatory Reform[24], which considered the impact of Regional Development Agency spending. One of the aspects of this report considered the GVA returns to business development and competitiveness interventions between 2002 and 2007. This found that interventions in 'Science, R&D and innovation infrastructure' had achieved cumulative GVA equivalent to **340%** the cost of the projects. This was seen to be an underestimate as businesses continued to benefit from the returns to the intervention and it was estimated that this potential future GVA would contribute to a cumulative value of 870% the cost of the project.

[23] Diabetes UK (2015), Diabetes: Facts and Statistics, Available at: www.diabetes.org.uk/Documents/Position%20statements/Facts%20and%20stats%20June%202015.pdf

[24] PriceWaterhouseCoopers, *Impact of RDA spending – National report – Volume 1 – Main Report,* March 2009, DBERR

Table 8.3 – Key Assumptions for Business Collaboration Impact

	Value	Source
Income from Consultancy	£1.5 m	University of Warwick return to Higher Education-Business Interaction Survey (HE-BCI) 2014/15
Income from Contract Research	£30.6 m	
Total income from Business Collaboration	**£32.0 m**	
Direct GVA contribution from business collaboration projects	360%	BiGGAR Economics (2013), Evaluation of Interface
Location of clients		BiGGAR Economics Assumption based on location of KTPs
% in CWLEP	34%	
% in West Midlands	43%	
% in UK	100%	

The GVA impact of business collaboration activities at the University of Warwick was therefore estimated by multiplying the amount spent by businesses on these services by £3.60. The employment impact was then estimated by dividing the direct GVA impact by GVA/employee in relevant sectors and the indirect effects were captured by applying appropriate multipliers.

In this way it was estimated that business collaboration, such as consultancy and contract research contributed £190.8 million GVA and more than 2,820 jobs to the UK. This impact was estimated to be £76.4 million GVA and 1,111 jobs in the West Midlands and £50.3 million GVA and more than 690 jobs in the Coventry and Warwickshire LEP area.

Table 8.4 – Impact supported by Business Collaboration 2014/15

	CWLEP	West Midlands	UK
GVA (£m)			
Consultancy	2.3	3.5	8.7
Contract Research	48.0	72.9	182.1
Total GVA	**50.3**	**76.4**	**190.8**
Employment			
Consultancy	33	51	127
Contract Research	660	1,060	2,693
Total Employment	**692**	**1,111**	**2,821**

8.3 Professional Training and Education

In 2014/15 the University of Warwick received £7.3 million for delivering professional training and education, also known as continuing professional development (CPD). Professional training and education is offered across a number of departments at the University of Warwick.

In particular, Warwick Business School (WBS) offers general and bespoke executive education courses for businesses. Courses cover areas including,

behavioural science and leadership, decision-making and international finance amongst others. Workshops for SMEs in business innovation and growth are also offered. Examples of WBS professional training and education clients include ARUP, EDF Energy, Emirates, Birmingham Airport and the Chief Fire Officers Association, reflecting the breadth of training and education activities offered by WBS. A range of accredited continuing professional development (CPD) courses, including certificates and diplomas in teacher training, career studies, counselling and coaching are also offered by the Centre for Lifelong Learning. Professional training and education is also provided by Warwick Manufacturing Group (discussed in Section 11.1.1) and Warwick Medical School (discussed in Section 12.1).

All of these examples highlight the wide range of professional training and education offered by the University of Warwick. These programmes have a positive impact on the productivity of individuals, and therefore organisations and businesses, through bringing about an improvement in skills and knowledge.

As with any other investment decision, businesses will only invest in CPD for their staff if this is likely to generate positive commercial returns. No specific evidence about the extent of these returns is available for the University of Warwick's CPD clients but evidence from elsewhere suggests that returns are likely to be high. For example a study published by the Institute for Fiscal Studies in 2005[25] found that a 1% increase in training was associated with an increase in value added per hour of about 0.6%.

In order to model this effect it was assumed that the level of return expected for professional training and education would be similar to that expected for other types of knowledge transfer activity. The impact of this activity was therefore estimated in exactly the same way as the impact of business collaboration projects described in Section 8.2. That is by assuming that every £1 invested by businesses in professional training and education generated £3.60 GVA in direct economic benefits.

In order to estimate the additional turnover by study area it was assumed that the location of CPD clients would be similar to the location of the University's KTPs and that none of the attendees would be University staff.

Table 8.5 – Key Assumptions for Professional Training and Education Impact

		Value	Source
Total income from Professional Training and Education		£7.3 m	University of Warwick return to HE-BCI 2014/15
Direct GVA contribution from Professional Training and Education		360%	BiGGAR Economics (2013), Evaluation of Interface
Location of Professional Training Clients			BiGGAR Economics Assumption based on location of KTPs
	% in CWLEP	34%	
	% in West Midlands	43%	
	% in UK	100%	

[25] Dearden, Reed and Van Reenen (2005), The impact of training on productivity and wages: evidence from British panel data, Institute of Fiscal Studies WP05/16.

The economic impact of the additional turnover in each study area is calculated by dividing the increased turnover by the GVA/turnover ratio and turnover/employee ratio for the sectors in which CPD is likely to take place. The multipliers for these industries were then applied in order to capture the indirect benefits that this increase in turnover would generate.

In this way it can be estimated that CPD delivered by the University of Warwick generates £44.2 million GVA for the UK economy each year and supports almost 300 jobs. It was estimated that £17.7 million GVA and more than 100 jobs could be in the West Midlands and £11.6 million GVA and more than 40 jobs could be in the Coventry and Warwickshire LEP area.

Table 8.6 – Impact supported by Professional Training and Education 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	11.6	17.7	44.2
Employment	43	107	298

8.4 Facilities and Equipment Hire

The University of Warwick supports businesses by having a range of facilities and equipment that can be accessed by businesses. One example of this is Warwick Manufacturing Group's comprehensive equipment and capability directory, which is available online for businesses to view the research testing equipment that WMG has available across its four research and development centres. The equipment is wide ranging from quality inspection and processing of materials through to machining, electrical systems testing and sound quality evaluation.

By providing access to its world-leading facilities and equipment, the University supports businesses by enabling them to undertake research and development activity that they may not have the facilities to undertake in-house. In doing so, the University helps businesses to save time and cost as well as reducing business risk by testing and evaluating new developments early on. It also allows businesses to gain insight into cutting edge technologies that advance processes and product development. In addition to this, facilities and equipment hire can provide an opportunity for businesses to build relationships with the University.

In 2014/15, the University of Warwick received £7.4 million from 310 businesses and organisations for facilities and equipment related services. In order to avoid double counting, income to Warwick Scientific Services was excluded from this impact. As data about the location of facilities and equipment hire clients was not available, it was assumed that they would be located in a similar geographic proportion to KTP clients.

Table 8.7 – Key Assumptions for Facilities and Equipment Hire Impact

	Value	Source
Number of organisations using this service in 2014/15	310	University of Warwick return to HE-BCI 2014/15
Income from facilities and equipment hire	£7.4 m	
Income from Warwick Scientific Services	£0.3 m	Warwick Scientific Services
Income from facilities and equipment hire (excluding Warwick Scientific Services)	**£7.0 m**	BiGGAR Economics Calculation
Direct GVA contribution	360%	BiGGAR Economics (2013), Evaluation of Interface
Location of clients		BiGGAR Economics Assumption based on location of KTPs
% in CWLEP	34%	
% in West Midlands	43%	
% in UK	100%	

It was assumed that businesses that paid for access to facilities or equipment would only have done so if they expected these projects to generate positive returns. It was also assumed that the level of return expected would be similar to that expected for business collaboration projects and professional training and education.

The GVA impact of facilities and equipment related services at the University of Warwick was therefore estimated by multiplying the amount spent by businesses on these services by £3.60. The employment impact was then estimated by dividing the direct GVA impact by GVA/employee in relevant sectors and the indirect effects were captured by applying appropriate multipliers.

In this way it was estimated that facilities and equipment related services contributed £43.0 million GVA and 345 jobs to the UK. This impact was estimated to be £17.2 million GVA and 137 jobs in the West Midlands and £43.0 million GVA and 345 jobs in the Coventry and Warwickshire LEP area.

Table 8.8 – Facilities and Equipment Hire Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	11.2	17.2	43.0
Employment	88	137	345

8.5 Warwick Scientific Services

Warwick Scientific Services is a unique one-stop technical consultancy, offering measurement solutions, innovation and collaboration opportunities, research and development, consultancy and training for businesses. It exists to:

"boost innovation, build business advantage, improve access and provide solutions to interesting real-world problems, linking University of Warwick

academics, the cutting-edge frequently unique technical infrastructure within the universities laboratories, and industry."[26]

Warwick Scientific Services uses state-of-the-art scientific facilities combined with research knowledge and technical expertise to help businesses. The work undertaken is generally problem led, often to do with new product development, fault-finding with existing products or solving other problems that businesses have.

The service is aimed at any business – large or small, local or international – that has an idea it would like to put into practice but is lacking the expertise or facilities to do. Warwick Scientific Services particularly works in the areas of materials technologies, energy efficiency, life sciences, high performance computing and mechanical and environmental engineering.

In essence, Warwick Scientific Services provides businesses with access to world-leading academics and specialist instrumentation in order to increase business competitiveness, productivity and business advantage. In doing so, Warwick Scientific Services provides a bridge between academic research, world-class facilities and business innovation.

8.5.1 Quantitative Impact

Warwick Scientific Services supports businesses by providing technical consultancy as well as enabling them to undertake activity that they may not have the skills or facilities to undertake in-house. In 2014/15 Warwick Scientific Services worked with 56 clients and received an income of £0.3 million. Approximately half of these clients were located in the West Midlands with the remaining half located elsewhere in the UK

It is reasonable to assume that the businesses that commissioned Warwick Scientific Services would only have done so if they expected these projects to generate positive returns. Since its establishment Warwick Scientific Services has had a high level of repeat business as well as positive feedback which indicates that its work has been beneficial for businesses. The quantifiable impact of Warwick Scientific Services was therefore estimated in the same way as Sections 8.2 and 8.3.

Table 8.9 – Key Assumptions for Warwick Scientific Services Impact

		Value	Source
Number of clients in 2014/15		56	Warwick Scientific Services
Total income to Warwick Scientific Services		£0.3 m	
Direct GVA contribution from consultancy		360%	BiGGAR Economics (2013), Evaluation of Interface
Location of Warwick Scientific Services clients			Warwick Scientific Services (location of clients based on postcode analysis by BiGGAR Economics)
	% in CWLEP	14%	
	% in West Midlands	52%	
	% in UK	100%	

[26] Warwick Scientific Services Strategy, Available at: http://www2.warwick.ac.uk/services/ris/business/warwick-scientific-services/about/more/

Economic ratios and multipliers appropriate to the sector of each client were then applied to estimate the direct and indirect impacts. In this way it was estimated that Warwick Scientific Services contributed £2.3 million GVA and more than 40 jobs in the UK, of which £0.4 million GVA and 8 jobs were in the West Midlands.

This impact is likely to be a significant underestimate of the true value of Warwick Scientific Services to businesses because of the nature of the services offered. Warwick Scientific Services can deliver significant cost savings for businesses and help bring products to market more quickly and successfully than might otherwise have been possible, the monetary value of which is likely to be much higher and impossible to estimate.

Table 8.10 – Warwick Scientific Services Impact in 2014/15

	CWLEP	West Midlands	UK
GVA (£m)	0.1	0.4	2.3
Employment	2	8	43

8.6 Summary Working with Businesses Impacts

The University of Warwick supports economic activity through its interactions with businesses such as KTPs, business collaboration projects, professional training and the activities of Warwick Scientific Services.

The total monetary value of this activity in 2014/15 was an estimated £74.4 million GVA and 849 jobs in the Coventry and Warwickshire LEP area, approximately £113.3 million GVA and 1,396 jobs in the West Midlands and £284.0 million GVA and 3,585 jobs in the UK.

Table 8.11 – Working with Businesses Impact 2014/15

	CWLEP	West Midlands	UK
GVA (£m)			
Knowledge Transfer Partnerships	1.2	1.7	3.7
Business Collaboration	50.3	76.4	190.8
Professional Training and Education	11.6	17.7	44.2
Facilities and Equipment Hire	11.2	17.2	43.0
Warwick Scientific Services	0.1	0.4	2.3
Total GVA	**74.4**	**113.3**	**284.0**
Employment			
Knowledge Transfer Partnerships	24	33	78
Business Collaboration	692	1,111	2,821
Professional Training and Education	43	107	298
Facilities and Equipment Hire	88	137	345
Warwick Scientific Services	2	8	43
Total Employment	**849**	**1,396**	**3,585**

9 UNIVERSITY OF WARWICK SCIENCE PARK

The University of Warwick Science Park (UWSP) offers office and lab space on campus and across Coventry, Warwickshire and Solihull as well as business support services.

UWSP supports knowledge transfer as many companies and research institutes will choose to locate in close proximity to the University of Warwick in order to benefit from informal knowledge sharing as well as frequent face-to-face contact with academics involved in research. As well as this UWSP encourages regional economic development by providing space for businesses to locate in and grow.

UWSP also contributes to the inward investment proposition as the presence of knowledge infrastructures like the University of Warwick and UWSP contributes to making the Coventry and Warwickshire LEP area an attractive place to invest and locate. In addition, the presence of UWSP provides the potential for the development of knowledge clusters, which in turn attract and draw more people to the area. The significant presence of Jaguar Land Rover (more than 700 people) at the UWSP site on campus provides an indication of these effects at play (Section 11.1.3 further discusses the development of clusters).

9.1 Growth of UWSP

The University of Warwick Science Park was established in 1982 as a joint venture company owned by the University of Warwick, Coventry City Council, Warwickshire County Council and the West Midlands Enterprise Board.

Today the University of Warwick has five science park sites across four locations in the West Midlands under the UWSP banner. In each of the locations, the University works in close conjunction with relevant stakeholders, such as Coventry City Council, Warwickshire County Council, Solihull Metropolitan Borough Council and Coventry and Warwickshire Chamber of Commerce.

Across the five sites there are 123 companies, employing 2,530 staff and generating an estimated combined turnover of £169.7 million (Table 9.1). UWSP is the second largest science park when compared to other university associated science parks established by similar universities. Seven universities including the University of Warwick were founded in the 1960s and as they were all formed over the same time period they provide a useful comparison and benchmark. The others are the University of East Anglia, University of Essex, University of Kent, Lancaster University, University of Sussex and the University of York. Of these, three have science parks with a further two universities in the process of constructing science parks. UWSP is the second largest of these; only Norwich Research Park founded by the University of East Anglia and several other institutions, is larger in terms of number of people working at the science park. Notably, all of the other three university science parks were established between 1992 and 1996, whereas UWSP was established in 1982, suggesting that the University of Warwick was one of the earliest proponents of this idea.

Table 9.1 – University of Warwick Science Park Sites

	Location	Companies	Staff	Turnover of Companies (£m)
The Venture Centre	Coventry	22	161	19.8
Binley Innovation Centre	Coventry	25	154	29.1
Warwick Innovation Centre	Warwick	31	251	39.6
Blythe Valley Innovation Centre	Solihull	25	241	31.4
University of Warwick Science Park	Coventry	20	1,721	49.9
All Science Park Sites		**123**	**2,528**	**169.7**

Source: The University of Warwick (excludes University of Warwick start-ups and spin-outs to avoid double counting)

As well as providing flexible space for businesses to locate, UWSP provides business support services including:

- strategic consultancy – UWSP's business support team provides companies with strategic consultancy and business plan development to accelerate their growth including management workshops, one-on-one consultancy and business plan/business reviews;
- technical marketing – UWSP has its own technical marketing service, Techmark which can support companies in bringing products to market and provide strategies to access new markets and refresh existing market propositions;
- access to finance – this includes investment readiness and business plan development consultancy as well as access to UWSP's technology focused business angel network, Minerva;
- incubation – offered through UWSP's incubation and business acceleration programme, Ignite. Ignite is a flexible package of advice and support for pre-start, start-up, or early stage businesses offered across three Ignite incubators.

9.2 UWSP Economic Impact

UWSP supports knowledge transfer and encourages regional economic development. UWSP provided data on the number of companies at each site, the number of staff employed in each company, the turnover range of each company and the sector each company operates in. This provides the starting point for estimating the impact of UWSP.

Some of the businesses based at UWSP are spin-outs or start-ups from the University of Warwick. Jobs in these companies were excluded before estimating the impact of UWSP because the impact of spin-out and start-up companies has already been estimated in Chapter 7.

The direct employment impact of UWSP is the number of people employed in the companies which is 2,528 people. The direct GVA impact was estimated by

dividing the turnover of companies by the appropriate turnover/GVA ratio for the sector the company operates in.

Turnover data was provided for the vast majority of companies and the median of the given turnover range was used for each company. For those that turnover data was not available for, average turnover/employee for the relevant sector was used instead, based on whether the company had been profitable the previous year. If it had not been profitable, it was assumed the company had no associated turnover. It was therefore estimated that companies located at UWSP had a combined turnover of £169.7 million in 2014/15.

Each of the employees who work in the companies located at UWSP will generate further economic impact when they spend their wages. Similarly each of the businesses located at UWSP will support further economic activity when they purchase supplies. These indirect impacts can be captured by applying appropriate GVA and employment multipliers.

It was then necessary to estimate how much of the activity of UWSP is attributable to the University of Warwick as some of the companies could have found suitable properties elsewhere to locate to. UWSP provided data on the origin of each company; whether it was from within a 5 mile radius, 30 mile radius, from the rest of UK or internationally. Using this information it was possible to estimate the number of staff additional to each study area and each science park site.

In this way it can be estimated that UWSP contributed almost £90.0 million GVA and 3,780 jobs in the UK, £84.0 million GVA and 3,500 jobs in the West Midlands and £64.0 million GVA and 2,675 jobs in the Coventry and Warwickshire LEP area.

Table 9.2 – University of Warwick Science Parks Impact 2014/15

	CWLEP	West Midlands	UK
GVA (£m)			
The Venture Centre	7.8	8.9	9.5
Binley Innovation Centre	13.4	13.8	14.7
Warwick Innovation Centre	17.9	19.1	20.6
Blythe Valley Innovation Centre	-	14.5	15.6
University of Warwick Science Park	24.5	27.5	29.4
Total GVA	**63.5**	**83.8**	**89.9**
Employment			
The Venture Centre	153	186	203
Binley Innovation Centre	164	174	189
Warwick Innovation Centre	263	295	321
Blythe Valley Innovation Centre	-	280	309
University of Warwick Science Park	2,096	2,521	2,753
Total Employment	**2,675**	**3,456**	**3,775**

10 UNIVERSITY OF WARWICK RESEARCH

As a globally connected, research intensive university, it is the University of Warwick's mission to be part of the solution to the most pressing problems the world faces. The University aims to do this through its Global Research Priorities which present its major areas of research strength around key global priorities and challenges. The University's multidisciplinary approach to research is discussed further in this section, as well as some examples of the wide reaching impact of the University's research.

10.1 Research Strengths

The University of Warwick is a member of the prestigious Russell Group of leading research universities and in 2014/15 attracted research grants and totalling more than £135 million.

According to the Research Excellence Framework (REF) 2014, over 87% of the University of Warwick's research is either world-leading or internationally excellent and its outputs based on Grade Point Average (GPA) are the 6th highest in the UK. As well as this, six of the University's academic departments are ranked within the top five departments in their field in the UK by GPA. These departments are:

- English and Comparative Literary Studies;
- Agriculture, Veterinary and Food Science;
- Computer Science;
- Mathematical Sciences;
- Philosophy; and
- Economics and Econometrics.

A further 14 departments were placed in the top 10 in the UK in their unit of assessment based on outputs[27].

10.2 Global Research Priorities

As outlined above the University of Warwick has strengths in a number of research areas. The University's Global Research Priorities focus the University's research strengths around 11 key themes and reflect the University's view that one of the core functions of a leading University is to play a part in solving the word's most pressing issues.

Organising its research in this way brings three benefits to the University:

- it provides a focus for multidisciplinary research;
- it provides a platform from which to showcase the University's research; and
- provides a forum to engage stakeholders and users of the research.

[27] University of Warwick (2014), Research Excellence, Available at: http://www2.warwick.ac.uk/research/excellence/

The GRPs do not exist in isolation and there is overlap between them. The eleven key research themes are[28]:

- Behavioural Science – combining researchers from various fields at the Behavioural Science Research Laboratory, who look at the factors affecting decision-making;
- Connecting Cultures – involving experts from the Faculties of Arts, Medicine and Social Sciences this GRP seeks to contribute to theoretical and applied debates about what connects and divides culture;
- Energy – working in collaboration with industry this GRP focuses on the areas of electrical energy, solar energy, low carbon transport; thermal energy; nuclear fusion; and energy management;
- Food – involving several disciplines who look at the global food system, including issues of sustainability, governance and crop science, as well as changing and informing perceptions of food. Figure 10.1 provides a case study outlining an example of research in this GRP and the impact it has had;
- Global Governance – focuses on the goal of establishing better rules in national and international contexts, in diverse areas such as global health, internet governance and human rights, with a particular interest in post-crisis leadership;
- Innovative Manufacturing – seeks to encourage collaboration between business and science to commercialise the University's scientific output, and draws together different disciplines to overcome specific business problems, especially in the automotive industry. Section 11 discusses this in more detail;
- International Development – focuses on problems of how to improve living standards and alleviate suffering in less developed countries, with specific research into gender, health, rights and social justice and private sector development;
- Materials – with applications across several industrial areas materials science has a broad remit, with issues of sustainability, manufacturability, characterisation, performance, modelling and efficiency common to many of the them;
- Science and Technology for Health – working with partners across the world this GRP seeks to develop and utilise new technologies to overcome the challenges of healthy ageing, early diagnosis and improving health in underdeveloped countries. Section 12 provides examples of the impacts from health and medical research undertaken at the University as well as quantifying the social returns to medical research;
- Sustainable Cities – drawing from every faculty and working with the Centre for Urban Sciences and Progress (CUSP) in New York this GRP addresses issues and opportunities presented by the increasing numbers of people living in cities (the CUSP is discussed further in Section 2.1.3); and
- Cyber Security – the most recently launched GRP focuses on how to protect information as well as safeguarding the population, as the internet comes to dominate our lives and economic activity more and more.

[28] University of Warwick (2014), Responding through Research to Global Challenges.

10.3 Research Impact

This section discusses the impact of University of Warwick research through the three case studies below. These case studies only provide a snapshot of research at the University and demonstrate the wide range of research activity undertaken at the University and the diverse nature of the impacts resulting from the research.

Figure 10.1 – The Warwick Crop Centre

The Warwick Crop Centre focuses on the fields of Agriculture, Veterinary and Food Science and contributes to the Food GRP. The University of Warwick has significant research strengths in this field, with the REF placing the University 2nd in the UK in this field, behind only the University of Aberdeen, with 46% of its research ranked as world-leading. The Warwick Crop Centre works to improve the quality and yields of crops through research into more efficient use of resources, pest control and genetics, among other things. It also conducts significant research on improving livestock yields, particularly through research into disease and pest control.

The results of this research can have significant commercial impacts: research into footrot in sheep, was partly responsible for reducing its prevalence amongst sheep in England by over half, as well as being adopted internationally as best practice[29]; a study into herbicide resistance in weeds has improved crop management in the United States leading to higher, more sustainable yields[30]; and research into seed performance has led to new techniques and better understanding of seed priming, germination and genetics leading to global impacts[31].

The Warwick Crop Centre engages fully with industry and government in order to meet the challenges of food security and climate change. For example, research is disseminated to farmers and growers at conferences and through industry journals, and technology licensing arrangements are made with companies.

[29] Research Excellence Framework (2014), Rapid Antibiotic Treatment Reduces the Prevalence of Lameness caused by Footrot in Sheep
[30] Research Excellence Framework (2014), Improving Farming Strategies by Modelling Herbicide Resistance in Weeds
[31] Research Excellence Framework (2014), Improvement of Seed Vigour and Performance in Crop Production

Figure 10.2 – Effect of the National Minimum Wage

Research undertaken on the National Minimum Wage by Professor Mark Stewart has been very influential in informing the decisions of the Low Pay Committee, which is an independent body that advises the Government on the level of the minimum wage.

Beginning in 1998, one year before the UK introduced the minimum wage, Professor Stewart wrote a series of papers that anticipated and then explained the likely employment effects of a minimum wage, incorporating the employers market power and employee effort to show that it may and did have positive effects on employment. Particularly influential were two 2004 papers which demonstrated that the minimum wage had little effect on employment, or else decreased it slightly but not enough that it could not be compensated for by the higher wage rate, resulting in higher weekly earnings.

The innovative techniques pioneered in these papers have served as a foundation for other economists to analyse similar papers and their findings have provided vital insight to the Committee. The impact of this research remains substantial and it is frequently cited in Committee reports, as evidence of the effect of the minimum wage and an example of techniques that can estimate their effects.

The Committee has found that the national minimum wage has reduced inequality, reduced the gender pay gap and had a net positive effect on the public finances of £0.2 billion. It has also increased the pay of 1.4 million of the lowest paid workers by an average of £2,678 per year. These impacts can be at least partially attributed to the research undertaken by Professor Stewart as this research was highly influential in the decision to adopt the national minimum wage. Subsequently, Professor Stewart's research has informed techniques of evaluating the success of the national minimum wage.

Figure 10.3 – Engineering Applications of Non-Destructive Testing

Research carried out by the Ultrasonics Group, a team in the Department of Physics led by Professor Dixon, focuses on applying ultrasonic technology to non-destructive testing (NDT). The work was undertaken as part of the Research Centre for Non-Destructive Testing, a collaboration between six universities and industry which Professor Dixon chairs.

NDT using ultrasonic beams is a process by which beams are fired into the structure/material that is being tested and the results provide a 3D image of the structure. Through increasing the understanding of the underlying physics the University of Warwick has contributed to developments in electromagnetic acoustic transducers (EMATs), which allow multiple beams to be processed at the same time.

In 2005 the Group established a spin-out company called Sonemat, which commercialises the research outputs in EMAT technology and increases engagement with industrial-academic collaborative programmes. This company has easily repaid the University's investment and has continued to make year-on-year increases in profits, which it then reinvests in intellectual property.

Financial supporters of this research have recently included Tata Steel, Network Rail, and Elster (one of the world's largest electricity, gas and water measurement companies). Several other companies were original financial backers of the research including BAE Systems, National Nuclear Laboratory, Petrobras, and Rolls-Royce. The broad range of industries represented demonstrate that this technology has very significant applications in reducing costs and improving efficiency.

As an example, Ritech Inc an equipment manufacturer and global leader in high powered ultrasonics has used the EMAT technology to reduce the number of oil and gas platform breakdowns due to corrosion, which is responsible for a quarter of failures costing the $1.4 billion to the industry annually. Widespread application of the testing technology could therefore lead to huge cost savings to the industry.

11 ADVANCED MANUFACTURING AND ENGINEERING

The University of Warwick makes an important contribution to the engineering, manufacturing and technology sectors through the activities of Warwick Manufacturing Group (WMG). WMG is an academic department of the University providing education and research within these sectors as well as a model of university business interaction.

11.1 Warwick Manufacturing Group (WMG)

Warwick Manufacturing Group was set up in 1980 by Lord Bhattacharyya, who remains its chairman and most prominent advocate, with the goal of reinvigorating British manufacturing. It was designed to increase innovation and skills by acting as a bridge between industry and academia and encouraging business investment in R&D, long before many others had realised the full potential of university-business interaction. Today WMG has over 500 people working across six buildings on the Warwick campus as well as collaborative centres in seven countries.

11.1.1 Education

As part of the University of Warwick, WMG is a leading centre for world class education, offering a range of education opportunities for every stage of the career path.

Undergraduate engineering degrees are taught in partnership with the School of Engineering enabling students to benefit from staff who are at the forefront of the intersection between industry and research. The programmes are focused on engineering and business management as well as offering the opportunity for valuable work experience with WMG's research groups or local SMEs to allow students to develop a range of skills and experience. A part-time undergraduate degree, the Applied Engineering Programme, enables employees of engineering and technology-led companies who have technical skills to obtain a degree in engineering whilst working, and gives companies the opportunity to develop their workforce through access to key skills and the latest thinking. Postgraduate degrees also have a strong focus on research and industry, which has the advantage of instilling an understanding of business and how to apply new technologies from research.

WMG also provides an extensive range of professional training and education programmes, for people of any educational background, that are developed to align with business and market needs for engineering, manufacturing, technology and service-led companies. WMG has delivered customised professional programmes for companies including AstraZeneca, BAE Systems, Network Rail and Rolls Royce. This includes post-experience programmes for people who have professional experience without a degree. Successful completion of the Foundation Programme also enables people to enrol on any of the Master's degree streams thereby providing a streamlined and integrated approach to professional education. WMG also offer short courses which allow people to learn new skills quickly or learn about the latest thinking in a specific area without having to commit to studying for a long period of time. More generally, all of the modules which make up WMG programmes are available as short courses on a

standalone basis, with the option to validate learning through a work based assignment.

In addition, the WMG Academy for Young Engineers is focused on providing 14-18 year olds with the skills they need to become the engineers and inventors of the future. This is discussed in more detail in Section 13.3. To date there are 30,000 graduates from WMG working in companies in a range of sectors, and it awards about 700 Masters degrees and 400 professional awards a year. As highlighted here, WMG offers a significant range of undergraduate, postgraduate and professional training and education programmes catering to people of all educational backgrounds as well as providing a flexible and integrated approach to learning with a focus on industry.

11.1.2 Research-Led Innovation

In 2013 the UK government published the conclusions of the Witty Review[32], an in-depth investigation led by Sir Andrew Witty, the Chief Executive of GlaxoSmithKline (GSK), into how universities can better support economic growth and drive exports. In the foreword to the report, Sir Witty likens UK universities to *"the tip of an arrow, with the arrowhead behind it representing the economic activity enabled by research-led innovation."*

One of the main themes within the report is that universities have massive potential to enhance economic growth, not just through commercialisation but through a wide range of activity from local SME support and supply chain development to the development of primary technology and invention.

Given the quantity of high level research carried out by universities in the United Kingdom, it is natural that the Government has focussed on increasing the scope and scale of university-business interaction as a way of disseminating the knowledge created and stored in academic institutions such as the University of Warwick as a way to improve the productivity of the UK economy. As a result, several studies have been commissioned into how this can be expanded and seven Catapults were set up. Catapult centres are physical centres where businesses, scientists and engineers work alongside each other on late stage R&D in order to turn high potential ideas into new products and services. The High Value Manufacturing Catapult was the first to be established, in 2011, and is formed of a group of research facilities across the UK, including WMG.

However, for more than 30 years WMG has been engaged in collaborative R&D with industrial partners, connecting industry and academia, and successfully integrating fundamental and applied research. From its establishment WMG's mission has been to improve competitiveness through innovation solutions to real world challenges.

11.1.3 The WMG Approach

WMG research is highly regarded, with the Research Excellence Framework 2014 ranking 90% of the research in the unit of assessment that included WMG as world leading or internationally excellent, with an overall quality profile (GPA) of 3.22 (out of 4.0). Its research profile is characterised by an interdisciplinary multi-partner approach to addressing complex real-world problems in order to achieve global impact in the fields of low carbon mobility, healthcare and business.

[32] Department for Business, Innovation and Skills (October 2013), Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth.

As an example, one of WMG's key programmes is the Institute of Digital Healthcare, a partnership between WMG, the NHS and Warwick Medical School. The vision of the Institute is to improve people's health and wellbeing through the development, evaluation and implementation of innovative digital technologies. The IDH employs experts in biomedical and information systems engineering, health and behavioural psychology, informatics, clinical science as well as statisticians.

Industrial partnership is one of the cornerstones of WMG's success and it works with several large firms including Jaguar Land Rover (JLR), Rolls-Royce, BAE Systems and Airbus. The approach that WMG takes is to apply cutting-edge research to specific business problems, generally relating to proven concepts that WMG can help to turn into new and improved products and processes, thus generating maximum impact. WMG's approach can be demonstrated through its collaboration with the automotive sector, discussed further in Figure 11.1 and the proposed National Automotive Innovation Centre discussed in Figure 11.2.

Figure 11.1 – Case Study: WMG and the Automotive Sector

As discussed in Section 2.2, the automotive industry has a long history in the West Midlands, although it had been declining. The region has since recovered and gained strength and expertise in the areas of highly skilled manufacturing and engineering. Nowhere is this better embodied than JLR, which in 2008 following the financial crisis experienced a slump in sales and was sold to Tata, India's largest automobile manufacturer for £1.3 billion. Since then, JLR has experienced growth and increasing profitability and success whilst continuing to operate from its Coventry headquarters, no doubt due in part to the presence of the University of Warwick and WMG and its collaborative relationship with them.

WMG has been collaborating with the automotive sector for over 30 years and provides a prime example of how WMG has developed cutting edge research from a diverse range of disciplines, and through partner projects, has integrated these into innovative products that meet both social and consumer needs.

WMG's work with JLR includes pioneering the use of aluminium to make the Jaguar XJ/XF/F-Type and the new Range Rover lighter by developing forming and joining solutions. JLR is also the principal partner in the £62 million Premium Automotive R&D Programme (£10 million of which was match funded by JLR). There were 19 projects within the programme designed to support suppliers to premium car manufacturers develop their skills, products, processes and market understanding to such a level as to be competitive in global markets. The programme involved over 200 participating companies, developing new relationships in the industry between suppliers, between suppliers and JLR and between all the partners and WMG. By enabling JLR to have access to a more competitive supply base and from new product and process development, the programme provides a prime example of how universities can add value to industry,

Figure 11.2 – Case Study: National Automotive Innovation Centre

The National Automotive Innovation Centre (NAIC) is a significant new research centre focusing on the automotive industry and a joint initiative of Lord Bhattacharyya and Dr Ralf Speith, the CEO of JLR. The aim of the NAIC is to provide a critical mass of research capability by attracting national and international researchers and encouraging interdisciplinary, international collaboration. It is anticipated that the NAIC will meet the demands of the industry in developing fields such as low carbon technology and smart and connected cars as well attracting and training skilled R&D staff in the industry's supply chain.

Opening in 2017, the building will encompass an area 33,000m^2 and will be large enough to accommodate 1,000 staff working on a range of advanced projects. The facilities will be state-of-the-art and the centrepiece will be a £3.2 million Drive-in, Driver-in-the-loop, multi-axis driving simulator, which will allow the testing of any car within a highly controlled, safe environment which will create an invaluable opportunity to research driverless cars and user experience. It will also have cutting-edge workshops, laboratories, virtual engineering suites and advanced powertrain facilities, equipped to enable a full range of design, visualisation and prototyping activities

The NAIC will become the hub for JLR's advanced research teams, enabling JLR to co-locate 600 of its engineers, researchers and technologists to work collaboratively with academics and R&D specialists from across the automotive supply chain. The development of the new NAIC facility will complement JLR's product research and development centres in Gaydon (near Warwick) and Whitley in Coventry.

The NAIC will cost £150 million and its funding is a prime example of WMG's approach to collaboration between business, university and government organisations. The Higher Education Funding Council England (HEFCE), a government body, will provide £30 million of funding with further financing coming from the Engineering and Physical Sciences Research Council (EPSRC), JLR, Tata Motors and a range of companies in the supply chain as well as the University of Warwick and WMG.

By linking industry and world-leading research and providing world-class infrastructure to create and develop novel technologies, the NAIC will be a driver for economic growth in the region.

As well as working directly with several businesses, providing expertise and high-level research, the University of Warwick and WMG also serve to make Coventry and the West Midlands attractive places for companies to set up and invest. This occurs through the development of agglomeration effects, which were propounded by the Nobel Prize winning economist Paul Krugman[33]; the more companies specialising in a specific sector in a specific area, the more attractive that area becomes to other businesses in this same sector, as a deep labour market with talented staff and good markets with specialised suppliers have already developed in the region. The University of Warwick, and particularly WMG, has helped to cement an industrial cluster based on the automotive sector in the West Midlands as well as clusters in manufacturing and ICT through its high-level research and specialised staff and equipment.

One of the other key ways in which WMG achieves its aim is by allowing SMEs to access its high-tech facilities, which are constantly being added to and upgraded. These facilities are often beyond the budgets and expertise of firms, so by allowing access to this equipment and the expertise to use it WMG supports research and development in businesses, ensuring future growth and greater productivity. WMG has worked with over 1,200 small and medium sized firms since 2007. Figure 11.3 provides a case study of the International Institute for

[33] Paul Krugman (1991), Increasing Returns and Economic Geography

Product and Service Innovation as an example of WMG interaction and support for SMEs.

Figure 11.3 – International Institute for Product and Service Innovation (IIPSI)

The IIPSI opened in 2012 on the University of Warwick campus as an addition to WMG's facilities. The initiative was intended to boost R&D capacity and capability in the West Midlands and the competitiveness of SMEs in the West Midlands. It provides SMEs in the West Midlands with access to world-leading technology to enable development of leading, innovative products and services.

The Institute has three main themes: high value manufacturing, with the one of the key outcomes being to embed new technologies and capabilities into companies; internet of industrial and digital systems, giving greater control and generating data that can improve reliability and make processes more efficient; and customer insights, which help businesses understand customer needs and tailor their products and services accordingly. The overall goal is to support a future of smart, digitally connected, user centred products. Technology demonstration is an important feature at IIPSI and around the building there are opportunities for SMEs to find out about how the latest technology and tools can help their business.

The IIPSI has worked with over 200 companies in the creative industry, consumer products, electronics, engineering, the environment, food and drink, information technology and plastics. Examples include developing a new customer experience and new industrial process for England's longest-established bicycle manufacturer; developing new systems informed by customer experiences for a number plate manufacturer; streamlining the operations of a large consortium of businesses, leading to a significant increase in revenues and success in securing a grant.

A final evaluation of the programme found that the IIPSI, by providing a hub for SMEs to access world-leading technology to develop highly competitive, innovative products and services assisted 206 businesses, safeguarded 170 jobs and generated £16.9 million GVA for the region[34]. The WMG SME group continues to support innovation in SMEs by applying research-led tools and techniques and building sustainable and collaborative relationships.

[34] International Institute for Product and Service Innovation, Available at: http://www2.warwick.ac.uk/fac/sci/wmg/business/smeservices/iipsi/

12 HEALTH AND EDUCATION

The University of Warwick makes a significant contribution to the healthcare and education sectors. This chapter considers the impact the University has through:

- local workforce development in the education and healthcare sectors;
- social returns to medical research; and
- wider impacts of medical research at the University of Warwick.

12.1 Local Workforce Development

Warwick Medical School was established in 2000 as a part of a partnership with Leicester Medical School and was granted independent degree awarding status in 2007. In 2014/15 the Medical School trained over 560 doctors and 31 allied health professionals, about 70 of whom were international students. The stream of doctors and healthcare workers who have been trained at the University of Warwick who go into the NHS has wide reaching benefits because the consistent supply of trained professionals enhances the healthcare provision available to the people of Coventry and the West Midlands, as well as nationally.

Warwick Medical School also offers a portfolio of training courses and CPD programmes for healthcare professionals in a wide variety of areas including dentistry, diabetes, critical care, healthcare management and leadership, public health, reproductive health, medical education and advanced practice. As well as these the School provides tailored courses designed to meet specific training needs. CPD is particularly vital for healthcare professions in order to ensure that professionals in Coventry and Warwickshire remain able to practice safely, effectively and legally and have opportunities to enhance their skills and keep pace in an ever-changing workplace.

Furthermore, students at the Centre for Professional Development, which offers postgraduate courses in early years, primary and secondary education, are the teachers of the future. In 2014/15, 121 teachers became qualified to teach through University of Warwick courses. Additionally, the University presented current teachers with the opportunity to add to their educational experience with courses in Primary Modern Foreign Languages (a free online course), leadership, advanced maths teaching amongst others.

As well as this, whilst studying students undertake placements in the local area, learning themselves as well as contributing fresh ideas and approaches to the schools they work in. The University has partnerships with 300 schools in the local area who benefit in this way. In addition, when these students become teachers themselves they are able to apply the skills that they have learned as well as new approaches, increasing the quality of the schools in the local area.

12.2 Social Returns to Medical Research

Medical research undertaken at the University of Warwick has impacts on the quality of life as well as economic impacts, both of which are discussed in this section.

In 2014/15, Warwick Medical School received £18.5 million in health and medical research income. Research by the Wellcome Trust on the value of medical

research in the UK considers two types of return: health gains (net of the health care costs of delivering them) and economic gains[35].

12.2.1 Quality of Life Impact

The value of health gains was assessed in the Wellcome Trust report using the quality adjusted life years (QALY) method. This is a widely used method developed by health economists to assess how many extra months or years of life of a reasonable quality a person might gain as a result of treatment. The Wellcome Trust report considered two areas of medical research expenditure, for cardiovascular disease and mental health.

The value of the health benefit was presented as a return on the initial expenditure on the research (IRR). This varies slightly between the two different areas of study, and more widely between the different scenarios for each of the study areas. The best estimate for the IRR in cardiovascular disease research is 9.2%, although the report also considered high and low expenditure scenarios that ranged from 7.7% and 13.9%. Similarly, the best estimate for the IRR for investment in mental health research was 7.0%. The high and low estimates for this area of study had a greater range and varied between 3.7% and 10.8%.

In order to apply these IRRs to the wide range of medical research undertaken at the University of Warwick the average of the two best estimates was used. Therefore for every £1 invested in medical research results in health gains with a value of £0.08 each year in the UK for perpetuity.

12.2.2 Economic Impact

The Wellcome Trust also considered the effect that medical research expenditure would have on GDP. The study considered the impact that this would have in stimulating investment in the private R&D sector and the social returns to the private investment that is stimulated by the publically funded medical research. This found that a £1 investment by a public body in medical research and development stimulated an increase in private R&D investment of between £2.20 and £5.10. The report also found that the social rate of return to private sector R&D funding was approximately 50%.

As with the estimates for the Quality of Life IRR, the study finds that there is a range of estimates for the IRR for GDP impacts. The lowest estimate for IRR is 20% and the highest is 67%. The best estimate that is given is 30%. Unlike the Quality of Life research, there was no estimates given for the GDP impacts associated with mental health research and therefore the 30% is assumed to apply to all types of medical research. Therefore for every £1 invested in medical research results in GDP with a value of £0.30 each year in the UK in perpetuity.

12.2.3 Total Returns to Medical Research

Using the social and economic IRR from the Wellcome Trust report it was possible to calculate the Net Present Value of the University's investment in medical research using the Treasury approved discount rate of 3.5%. The impact in each of the other study areas was assumed to be proportional to their population.

[35] Wellcome Trust, Medical Research Council, Academy of Medical Sciences (2008), Medical Research: What's it worth? Estimating the Economic Benefits from Medical Research in the UK

Table 12.1 – Key Assumptions for Medical Research

		Value	Source
Research income to Warwick Medical School		£18.5 m	The University of Warwick
	CWLEP	1%	ONS (2015), Mid-Year Population Estimates 2014
	West Midlands	9%	
	UK	100%	
Time Period (Years)		20	BiGGAR Economics Assumption
Discount Rate		3.5%	
Social Return IRR		8%	Wellcome Trust (2008), Medical Research: What's it Worth?
Economic Return IRR		30%	

Using these assumptions it was estimated that in 2014/15, medical research undertaken by the University of Warwick could contribute almost £100.0 million GVA to the UK economy, of which £8.8 million could be to the West Midlands economy and £1.4 million in the Coventry and Warwickshire LEP area.

A breakdown of this impact by study area and by social and economic returns is provided in Table 12.2. At the UK level, £21.0 million would be from the social health gains and £78.7 million would be from economic impacts.

Table 12.2 – Medical Research Impacts 2014/15 (£m)

	CWLEP	West Midlands	UK
Social Returns to Research	0.3	1.9	21.0
Economic Returns to Research	1.1	7.0	78.7
Total Returns to Medical Research	**1.4**	**8.8**	**99.7**

12.3 Wider Impacts of Medical Research

The impact of medical research outline above is likely to underestimate the full impact of health and medical research at the University of Warwick, particularly in terms of the unquantifiable nature of improvements to quality of life and the difficulty of measuring how better healthcare policy and delivery leads to better health outcomes. Some of these impacts are discussed in Table 12.3 below.

Table 12.3 – Health Impacts

Beneficiaries	Benefit	Role of the University of Warwick
60,000 children born either very, moderate or late preterm in England each year with potential impacts in Europe	Has informed policy makers and practitioners of the special needs of those born preterm	Professor Wolke led several research programmes into the potential cognitive and behavioural difficulties of those born preterm
Over 59,000 new patients with myeloma in US, Japan, UK, Italy, Spain, Germany and France (in 2012). Higher level due to cumulative prevalence	Improved quality of life for patients as well as much shorter overall treatment times and higher life expectancy	Research collaboration with Birmingham University and a private company into the effect of longer, more intense dialysis, using modelling then initial clinical trials
Savings to NHS and people who may be affected by pandemics such as influenza	Shaped national policy in response to pandemics, (i.e. H1N1) and wrote an influential textbook that will inform the next generation	Researchers in the Epidemiology Group developed new mathematical and statistical techniques to map the spread of infectious diseases
4 NHS trusts in England who have adopted the SimLean strategy, with interest from Canada, Sweden and the Department of Health	The implementation of new models and techniques which improve hospital processes	Study by Warwick Business School, using simulation to provide information about how to use resources more efficiently and implement a policy of continuous improvement
Those suffering from a wide range of diseases including asthma, IBS, acne and several other diseases, a market worth $27bn	Anti-inflammatory molecule called FX125L which has significant applications in many areas. Drug patent was sold for several million dollars	Researchers, working with Funxional Therapeutics, discovered the molecule and worked out how to synthesise large quantities cheaply. Drug passed Phase1 and 2 clinical trials
240,000 patients globally who receive peritoneal dialysis (PD)	Increased understanding of PD therapy and reduction in levels of glucose degradation products (GDPs) in PD, leading to pain and disease	Research into the harmful effects of GDPs in PD, which led the industry to take steps to reduce it
Patients with Acute Respiratory Distress syndrome (ARDS)	Reduced use of potentially harmful drug in ARDS treatment.	Triple-blind clinical trial into drug's efficacy.
Those receiving emergency healthcare	Improved CPR techniques and equipment. Improved A&E responsiveness	Recalibration of devices and introduction of a novel e-learning programme. Trialled the effects of introducing new procedures such as fast-tracking individuals with minor injuries

Stroke patients and patients undergoing surgery	Able to measure physiologically important molecules in blood, which gives indications of the onset of a stroke	Developed a biosensor that is capable of measuring physiological important molecules called purines
Those receiving kidney transplants after suffering acute renal failure, which affects 1% of the population	Higher success rate of transplants due to reduced antibody mediated rejection and savings to NHS equal to £5mn from 100 patients	Researched new techniques for countering rejection in kidney transplants in people with high levels of antibodies

Source: The University of Warwick REF Case Studies

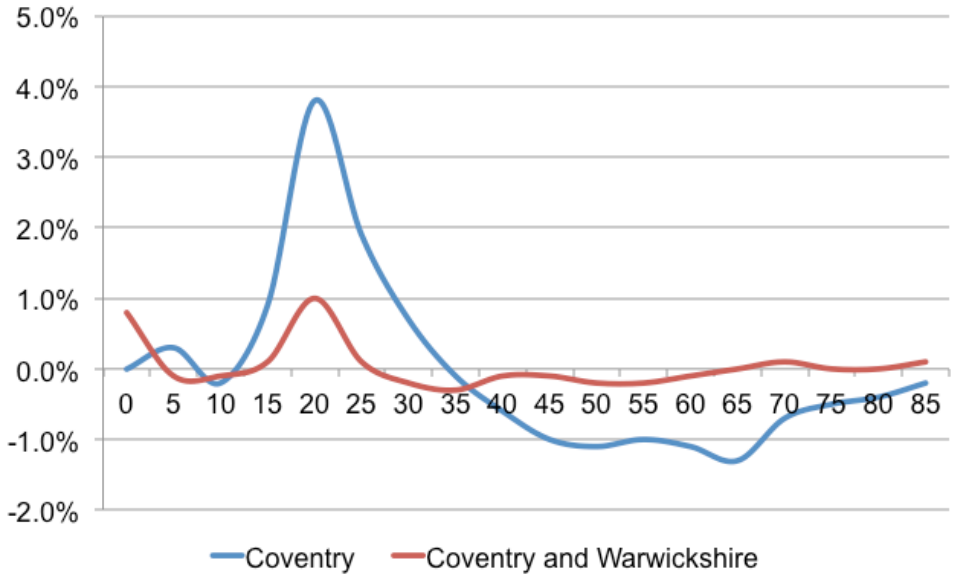
13 LABOUR MARKET AND SKILLS

The University of Warwick contributes to the labour market and improving skills in Coventry and Warwickshire. It does this by attracting students to the area to study at the University of Warwick and retaining this talent in the area, as well as taking steps to grow local skills capacity and supporting sectors of strategic importance in Coventry and Warwickshire.

13.1 Attracting and Retaining Talent

The University of Warwick is one of the major pull factors for attracting people to live and study in Coventry. Coventry has a significantly greater proportion of its population aged between 15 and 40 than the rest of the UK. Figure 13.1 shows the difference in the percentage of the population who are within each age bracket compared to the UK. This shows that people aged between 20 and 24 account for 10.5% of the population of Coventry and 6.7% of the population of the UK as a whole. The population share in Coventry is therefore almost 4% higher than the UK average. One of the factors that can lead to a significant influx of people of this age bracket is people moving in to an area to study at University. This demographic influx is visible until the ages of 35-39 where the proportion of the population within this age group in Coventry falls back in line with the rest of the UK.

Figure 13.1 – Population Share of Local Areas by Age Compared to the UK



Source: ONS Mid Year Population Estimates 2014

The role of the University of Warwick in contributing to this influx is not known, however it is likely to be significant. There are over 25,000 students at the University of Warwick, equivalent to 71% of the population of Coventry aged between 20 and 24.

In addition to attracting new students into Coventry and Warwickshire, the University also plays a role in retaining prospective students from the area. Data produced by HESA[36] shows that less than half (46%) of prospective undergraduate students from the West Midlands chose to study in the West

[36] HESA (2010), 2008/09 Students in Higher Education

Midlands. This therefore indicates that the majority of students in the West Midlands who go to University, choose to study elsewhere in the UK. This is not unusual and the West Midlands is the median of English regions in this regard. However, the University of Warwick is the highest ranking university in the West Midlands and gives those from the region an opportunity to study in one of the top ten institutions in the UK close to home.

The University of Warwick also supports the creation of roots through the strategic economic sectors it supports, its industrial partnerships and the overall vibrancy it adds to Coventry, all of which encourages students to stay and work in the area after they have gradated. Data provided by the University shows that almost a quarter of its graduates remain in the West Midlands to work with 14% of these graduates in Coventry and Warwickshire. This is supported by the ONS data shown in Figure 13.1, which shows that the region benefits from the influx of young people for 20 years.

13.2 Synergies with Coventry University

The University of Warwick is part of a wider academic community within Coventry. Coventry is also home to three further education colleges and Coventry University, which is ranked in the top 20 universities in the UK by the Guardian University Guide 2016.

Coventry University has a similar number of students to the University of Warwick and there are considerable synergies between the two institutions. For example the University of Warwick, in collaboration with Coventry University, has recently been awarded HEFCE funding to lead the Coventry and Warwickshire Network, to engage directly with the LEP to support sustainable economic development within the region.

The presence of two large universities within Coventry has created a critical mass of academic staff and students. The combined population of both universities is equivalent to 18.0% of the population of Coventry and therefore the universities will have an impact on the economy and culture of the city. The presence of the two universities will improve the skill levels of the population of Coventry and Warwickshire. It can be argued that this is already the case with Coventry and Warwickshire having a higher proportion of people qualified at every qualification level than the West Midlands (see Section 2.2.3 for more on this). As well as this the student populations of the two universities provide a significant labour supply benefitting businesses in the area.

The scale of the academic population provides a critical mass of research capability which can drive innovation. For example, in June 2015 Coventry and Warwickshire Local Enterprise Partnership was placed as the best LEP in the West Midlands for Innovation. The Director of CWLEP highlighted the role of the two universities in supporting the innovative talent in the area[37].

[37] Warwickshire Means Business, Available at: http://business.warwickshire.gov.uk/july-2015/news-in-brief/warwickshire-businesses-at-the-forefront-of-innovation (accessed 19th November 2015)

Table 13.1 – Academic Community within Coventry

	Staff	Students	Total
University of Warwick*	4,932	25,181	30,113
Coventry University**	5,500	25,245	30,745
Total	**10,432**	**50,426**	**60,858**
City of Coventry Population***			337,428
Universities as proportion of City			18.0%

*Source: *University of Warwick. **HESA 2013/14. ***ONS (2015), Mid-Year Population Estimates 2014.*

13.3 Realising Local Potential

This report has indicated that the University of Warwick is an important driver of economic growth. The University is also involved with growing local skills capacity as demonstrated by the Centre for Lifelong Learning. The Centre has for 30 years enabled adult learners to achieve their personal and professional goals by offering them an opportunity to develop new skills through a world-class education, irrespective of background.

The Centre offers a range of course at varying levels and with various funding arrangements: students can take part in free courses in social studies or which offer a gateway to postgraduate education; students can access part-time or foundational degrees for which student loans are available; students can take on a full time degree through the 2+2 route, for which student loans are available: and they can do an MA Social Work or PG Diploma Teaching and Learning, for which government funding is available due to the important social role that the professions would be qualified for.

Another important component of the University's commitment to regional development is its steps to realising local potential, through WMG Academy for Young Engineers, a University Technical College (UTC).

UTCs are government-funded schools that give 14–18 year olds the opportunity to specialise in technical subjects where there is a recognised skills shortage. They are designed to provide an environment that integrates technical, practical and academic learning. UTCs work closely with local universities and employers to develop their curriculum and are required to dedicate at least 40% of teaching time to their chosen technical specialism. They are smaller than traditional secondary schools but are not academically selective and do not charge fees.

WMG Academy for Young Engineers is designed to prepare students for the world of business and engineering. The Academy is unlike other schools in that it puts real, business-focused, practical problems at the centre of the curriculum which encourages students to make, create and design things.

The atmosphere is also very different from normal schools: students are expected to wear business dress and have high academic standards and the working day is longer than usual; an ethos of teamwork and communication pervades the school; and there are no formal classrooms, instead there are design rooms, study rooms and flexible working spaces.

Exploiting its position near WMG, students are able to use its cutting edge facilities and can work alongside academics and university students as well as

interacting with industrial partners who have spaces within the school and mentor students. This creates a tangible sense of how and where the skills that they have learned can be applied in a real world, business setting.

The success of the Academy in Coventry has led WMG to open a new Academy in Solihull, which will open in September 2016.

13.4 Supporting Strategic Economic Sectors

The University of Warwick is an important part of the regional economy of the West Midlands and is instrumental in realising the ambitions of the Coventry and Warwickshire LEP to improve the economic competitiveness of the economy of the area. The Strategic Economic Plan (SEP)[38] for the LEP highlights the importance of the advanced manufacturing and engineering sector as a key driver of economic growth and a major strength for the area. The SEP also recognises that Coventry and Warwickshire is a UK hub for advanced manufacturing and engineering with an unrivalled concentration of employment in the automotive industry particularly in R&D. As well as a significant business base, including companies like Aston Martin, BMW, JLR and Tata, the SEP emphasises the world-class research and development and innovation infrastructure provided by the University of Warwick and the importance of business-university collaboration.

As discussed in Chapter 10, the University of Warwick, through WMG, plays a vital role in supporting advanced manufacturing and engineering through its wide range of educational provision and its approach of research-led innovation in collaboration with industry. WMG provides invaluable support to the region's small and medium-sized businesses with its state-of-the-art technology and expertise, while it also harnesses its significant R&D potential to partner with large manufacturing groups such as JLR in high value manufacturing and research in areas such as autonomous cars. Undoubtedly, the University of Warwick's presence is a major factor in the development of Coventry and Warwickshire as a knowledge hub for advanced manufacturing and engineering.

Although manufacturing is significant to the West Midlands, the University has influence in other sectors of the economy such as health, education and professional services. The training of doctors and others in the medical industry in the Warwick Medical School creates economic and social value in one of the most important sectors to the local economy, supplying local hospitals and practices with well-trained doctors and supporting local pharmaceutical companies with highly skilled workers. Through its Centre for Professional Development the University trains teachers in all levels of from early childhood to GCSE and A-level, supporting local schools and education provision in the LEP area and beyond.

Moreover, the University's high impact research attracts researchers, academics and businesses to the area. As demonstrated in Chapter 10 the University's interdisciplinary research approach is addressing complex real-world problems which presents opportunities in the future for the development of other high value sectors in the area. For example, the presence of experts in the digital sphere and big data can attract researchers in pharmaceuticals companies who want to incorporate greater connectivity into their procedures.

[38] Coventry and Warwickshire LEP (2014), A Strategic Economic Plan for the Future and Bringing Manufacturing Home.

14 CIVIC LEADERSHIP

This chapter considers the important contribution that the University of Warwick makes to driving economic development locally and regionally by providing civic leadership and through its strategic partnerships with a number of organisations.

14.1 Economic Development

The University of Warwick is one of the most important institutions in the West Midlands and works in close partnership with the Coventry and Warwickshire Local Economic Partnership. Created in 2011, Coventry and Warwickshire LEP is designed to act as a guiding regional force, coordinating the actions of public sector, business and university institutions, and representing a strong voice putting forward the region's priorities and needs in terms of investment and devolution. The LEP has four key objectives:

- to drive economic growth;
- to help remove barriers to economic growth;
- to help create high value jobs; and
- to coordinate local government cooperation and support.

The University of Warwick is a major partner in the LEP with a position on the Board, in the form of Dr. Richard Hutchins who is director of JLR Programmes at WMG. Several members of the University's senior team are involved in the leadership and support of sub-groups and a member of staff is seconded to the LEP.

The University of Warwick is central to achieving the aims outlined in the Strategic Economic Plan for the Coventry and Warwickshire LEP[39], which puts Advanced Manufacturing and Engineering, with particular emphasis on R&D and innovation centres such as the National Automotive Innovation Centre, at the heart of achieving its aims.

The University of Warwick is a significant institution within the Coventry City Council and Warwick District Council areas, with the boundary between the two Council areas running through the middle of the University of Warwick campus and significant numbers of students living in both. The University has regular liaison meetings with both organisations and works in close conjunction with them.

14.2 Strategic Partnerships

The University of Warwick is an active participant in a wide variety of partnerships with local and regional organisations. As a driver of economic growth in the region this enables the University to work in collaboration with many businesses and organisations for mutual benefit as well as for the wider benefit of the area locally and regionally.

The University has partnerships with:

[39] Coventry and Warwickshire LEP (2014), Coventry and Warwickshire LEP (2014), A Strategic Economic Plan for the Future and Bringing Manufacturing Home.

- Coventry and Warwickshire Chamber of Commerce – provides a regional business network, which helps to connect businesses in need of services and can help businesses access streams of funding or support from organisations such as the International Institute for Product and Service Innovation at WMG;

- Confederation of British Industry (CBI) in the West Midlands – the CBI is a national organisation that represents the views of the business community. Specifically, they lobby and campaign to ensure that the interests of business are represented regularly engaging with policy makers in all levels of government including Westminster, the regions and internationally;

- Business in the Community – this agency, which is one of The Prince's Charities, is designed to encourage businesses to better engage with the community by using their resources in a more sustainable way, encouraging employee volunteering, offering practical advice for how to access research and training and showcasing best practice and innovation through a series of events;

- West Midlands Economic Forum – the forum was established in 2007 and provides independent research to analyse economic trends in the region and evaluate potential opportunities. The Forum brings together a wide range of experts including academics from the University of Warwick, policy makers, representatives of financial institutions amongst others; and

- Coventry and Warwickshire Champions – this scheme unites businesses, organisations (including the University of Warwick) and individuals across the area in a network to help develop and promote Coventry and Warwickshire and raise its profile.

14.3 Future Growth – Midlands Engine

The Midlands Engine is a major devolution scheme proposed by the Chancellor of the Exchequer, George Osborne, to make the East and West Midlands the engine of Britain's economic growth, in line with other devolution deals with Greater Manchester, South Yorkshire, the North East and the Tees Valley.

In the West Midlands, the scheme will be administered by the West Midlands Combined Authority, an organisation that has been created by the partnering of seven Metropolitan Authorities (Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall and Wolverhampton)[40]. The Combined Authority will choose a directly elected Mayor in 2017 and will have power over the areas of transport, planning, business support and skills training with the potential that these powers may be increased if devolution proves successful.

The Combined Authority will work to address the challenges facing the area, including a skills deficit, higher than average unemployment, low economic activity rate and the productivity gap. The proposed devolution agreement will involve an annual government contribution worth £40 million for 30 years to support an overall investment package worth £8 billion, alongside the creation of up to half a million jobs[41].

[40] West Midlands Combined Authority (2015), Launch Statement
[41] West Midlands Combined Authority and HM Treasury (2015), West Midlands Combined Authority Devolution Agreement

15 SUMMARY AND CONCLUSIONS

This section summarises the quantitative impacts considered in this report and presents the conclusions of the analysis.

15.1 Quantitative Impact

This report estimates that in 2014/15 the University of Warwick generated:

- £783.6 million GVA and supported 14,389 jobs in the Coventry and Warwickshire LEP area;
- £1.0 billion GVA and supported 17,930 jobs in the West Midlands; and
- £1.9 billion GVA and supported 24,000 jobs in the UK.

Table 15.1 summarises the GVA impacts of the University by study area and Table 15.2 provides the employment impacts.

Table 15.1 – The University of Warwick GVA Impact 2014/15 (£m)

	CWLEP	West Midlands	UK
Direct	337.8	337.8	337.8
Supplier Spending	17.1	27.7	115.7
Staff Spending	28.2	86.2	140.9
Capital Spending	11.0	21.8	38.0
Subtotal Core Impact	**394.1**	**473.6**	**632.4**
Student Spending	73.4	96.3	106.5
Student Part-time Work	80.0	93.2	99.1
Student Volunteering	0.2	0.2	0.2
Subtotal Student Impact	**153.7**	**189.8**	**205.8**
Visiting Friends & Relatives	0.6	0.7	0.8
Conferences and Events	1.9	1.6	1.2
Open Days	0.5	0.6	0.7
Warwick Arts Centre	0.6	-	-
Subtotal Tourism Impact	**3.6**	**3.0**	**2.7**
Spin-outs and Start-ups	2.3	2.8	6.9
Licensing	0.1	0.1	2.7
Subtotal Commercialisation	**2.4**	**2.9**	**9.7**
Knowledge Transfer Partnerships	1.2	1.7	3.7
Business Collaboration	50.3	76.4	190.8
Professional Training and Education	11.6	17.7	44.2
Facilities and Equipment Hire	11.2	17.2	43.0
Warwick Scientific Services	0.1	0.4	2.3
Subtotal Knowledge Transfer	**74.4**	**113.3**	**284.0**
Subtotal Science Parks	**63.5**	**83.8**	**89.9**
Sub-total Impact	**691.7**	**866.4**	**1,224.5**
Graduate Premium	**90.5**	**165.3**	**571.4**
Returns to Medical Research	**1.4**	**8.8**	**99.7**
GVA (£m)	**783.6**	**1,040.5**	**1,895.6**

Note: Totals may not sum due to rounding.

Table 15.2 – The University of Warwick Employment Impact 2014/15

	CWLEP	West Midlands	UK
Direct	4,932	4,932	4,932
Supplier Spending	360	563	2,322
Staff Spending	575	1,698	2,752
Capital Spending	179	356	620
Subtotal Core Impact	**6,335**	**7,839**	**10,915**
Student Spending	1,316	1,650	1,800
Student Part-time Work	3,022	3,379	3,539
Student Volunteering	-	-	-
Subtotal Student Impact	**4,338**	**5,029**	**5,339**
Visiting Friends & Relatives	18	21	23
Conferences and Events	59	47	33
Open Days	17	19	20
Warwick Arts Centre	18	-	-
Subtotal Tourism Impact	**112**	**86**	**76**
Spin-outs and Start-ups	78	122	251
Licensing	2	2	59
Subtotal Commercialisation	**80**	**124**	**310**
Knowledge Transfer Partnerships	24	33	78
Business Collaboration	692	1,111	2,821
Professional Training and Education	43	107	298
Facilities and Equipment Hire	88	137	345
Warwick Scientific Services	2	8	43
Subtotal Knowledge Transfer	**849**	**1,396**	**3,585**
Subtotal Science Parks	**2,675**	**3,456**	**3,775**
EMPLOYMENT	**14,389**	**17,930**	**24,000**

Note: Totals may not sum due to rounding.

15.2 Value for Money

The magnitude of the economic impact of the University of Warwick is considerable relative to the size of the organisation. The total GVA impact in the UK in 2014/15 was 2.39 times greater than the income received by the University. If long-term impacts associated with the graduate premium and returns to medical research are included the total GVA impact was 3.70 times greater than the total income to the University.

In 2014/15 the University of Warwick employed 5,221 fte staff and the total employment impacts from its activities was 24,000 jobs. Therefore for every job directly created at the University, 4.60 jobs are supported in the UK economy.

The University of Warwick also represents good value for money for the funding councils that provide financial support. In 2014/15 the University of Warwick received £59.1 million from funding councils. The total GVA impact in the UK in 2014/15 was 20.72 times greater than the funding council grants received by the University. If the long-term impacts associated with the graduate premium and returns to medical research are included the total GVA impact was 32.07 times greater than the total funding council grants received by the University.

Table 15.3 – Impact Multipliers (UK)

	Excl Long Term Impacts	Incl Long Term Impacts
Direct GVA : Total GVA	3.62	5.61
Direct Jobs : Total Jobs	4.60	4.60
Income : Impact	2.39	3.70
Funding Body Grants : Impact	20.72	32.07

Source: BiGGAR Economics

15.3 Impact in Context

In order to better understand the scale of the economic contribution generated by the University of Warwick it is useful to place the contribution within the context of the wider economy. The total GVA of Coventry in 2012 was £6.8 billion and the GVA impact of the University of Warwick was estimated to be £586.8 million in Coventry. This is equivalent to 8.7% of the total GVA of Coventry. Similarly, the University's impact in the Coventry and Warwickshire LEP area is equivalent to 4.1% of the total economy of the area.

Table 15.4 – The University of Warwick's Impact in Context

	Coventry	CWLEP	West Midlands
University of Warwick GVA Impact (£m)	586.8	783.6	1,040.5
Total GVA (£m)	6,770	18,992	106,608
As % total economy	*8.7%*	*4.1%*	*1.0%*

Source: BiGGAR Economics and ONS (2014), Regional Gross Value Added (income approach) NUTS3 Tables: 2012.

The role that the University of Warwick plays in the economy of the city of Coventry is significant, and indicates that economic impact does not depend on the location of a University (the University of Warwick is located on the outskirts of

Coventry as opposed to the centre like many other universities) and is instead dependant on the drive to generate economic impact.

Previous studies by BiGGAR Economics have found that the proportion of the economy of a host city that is supported by the University can range considerably. For example, the impact of the University of Southampton in Southampton is equivalent to 15.7% of the total GVA of the city. While in Sunderland, the University of Sunderland contributes approximately 4.1% of the City's GVA. The proportion of impact generated locally is dependent on a number of things, including the industries present in each city and the presence of other centres of population locally.

Table 15.5 – Impact of Universities in their Host City

	University of Sunderland	University of Warwick	University of Lancaster	University of Southampton
City	Sunderland	Coventry	Lancaster	Southampton
GVA of City	£4.7 billion	£6.8 billion	£2.0 billion	£4.7 billion
University Impact in City	£195 million	£587 million	£250 million	£729 million
University as %	*4.1%*	*8.7%*	*12.5%*	*15.7%*

Source: Previous BiGGAR Economics Studies

The role that a University plays in the city is therefore not dependent on it being located within the city centre. For example, the University of Lancaster is located on the outskirts of Lancaster, however has a significantly larger impact than the University of Sunderland, which is located in the centre of Sunderland.

15.4 Comparators

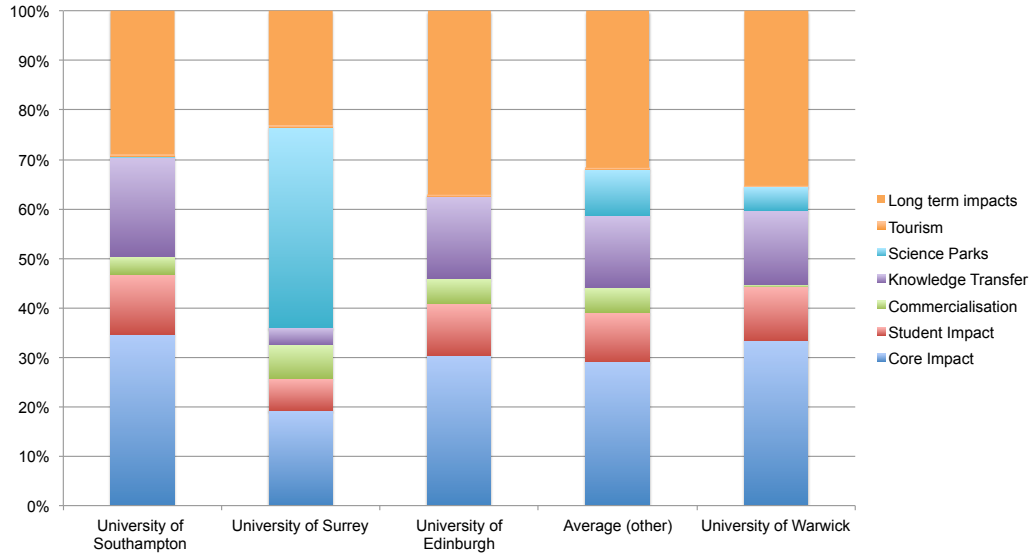
Each University in the UK has strengths and weaknesses relative to other institutions in the country. The economic contribution by source of impact of three UK universities recently studied by BiGGAR Economics is given in Figure 15.1 The figure also provides the average across all three universities. All three are highly ranked higher education institutions and amongst the strongest in the UK in terms of valorisation activity. The graph shows that some universities, such as the University of Surrey have particular strengths in areas such as science parks and commercialisation which can account for a significant proportion of its economic impact.

The figure indicates that the University of Warwick has a similar proportion of its impact being generated by long term impacts, namely the graduate premium and returns to medical research, as the University of Edinburgh. The graph also indicates that the University is in line with the average across the three comparator institutions in terms of knowledge transfer activities.

However, relative to the average, a lower proportion of the University of Warwick's impact is derived from commercialisation activities such as spin-out companies and licensing. The Spinouts UK Annual Report 2015[42] places the University of Warwick in the top 10 universities (8th) in terms of number of spin-outs since 2005. However, in order to match the highest ranked universities the University of Warwick would need to double the number of companies spun-out. This suggests that while the University is performing well in terms of valorisation, there is scope to increase this activity.

[42] Spinouts UK (2015), Annual Report 2015.

Figure 15.1 – Sources of UK Impact in Other Universities



15.5 Comparison with Previous Report

In 2012, the University of Warwick commissioned SQW to carry out an economic impact report to consider its impact the local area. The report quantified the impacts that the University of Warwick had on the economy through;

- supplier expenditure, at the University and the Students Union;
- staff salaries, at the University and the Students Union; and
- student expenditure.

In this way it found that the University generated £351.1 million in output and supported 10,918 jobs in Coventry and Warwickshire. At a regional level the University was estimated to generate £520.2 million output and supported 15,493 jobs in the West Midlands.

There are some differences in methodology used for the two studies. The main difference is that the previous report quantifies impact in terms of output, whereas the current report is calculated in Gross Value Added. Similarly, the BiGGAR Economics report has used an improved methodology for calculating the employment impacts associated with the output and GVA. This involved applying industry specific GVA per head ratios to the GVA supported in each industry, rather than applying a regional GVA per head to the overall output.

In addition to the differences in methodology this study also quantified a number of impacts that were discussed but not quantified in the SQW report. These impacts were:

- capital expenditure;
- student part-time employment;
- student volunteering;
- commercialisation activity;
- knowledge transfer activity;

- science park activity;
- tourism;
- medical research; and
- the graduate premium.

As a result of the differences in methodology and the additional impacts quantified, the quantifiable aspects of this report are not directly comparable with those in the SQW report. In particular, the difference in the employment impacts does not reflect a diminution of the University's role in the regional economy, rather it reflects an update to the methodology used to calculate this role.

15.6 Value Insights

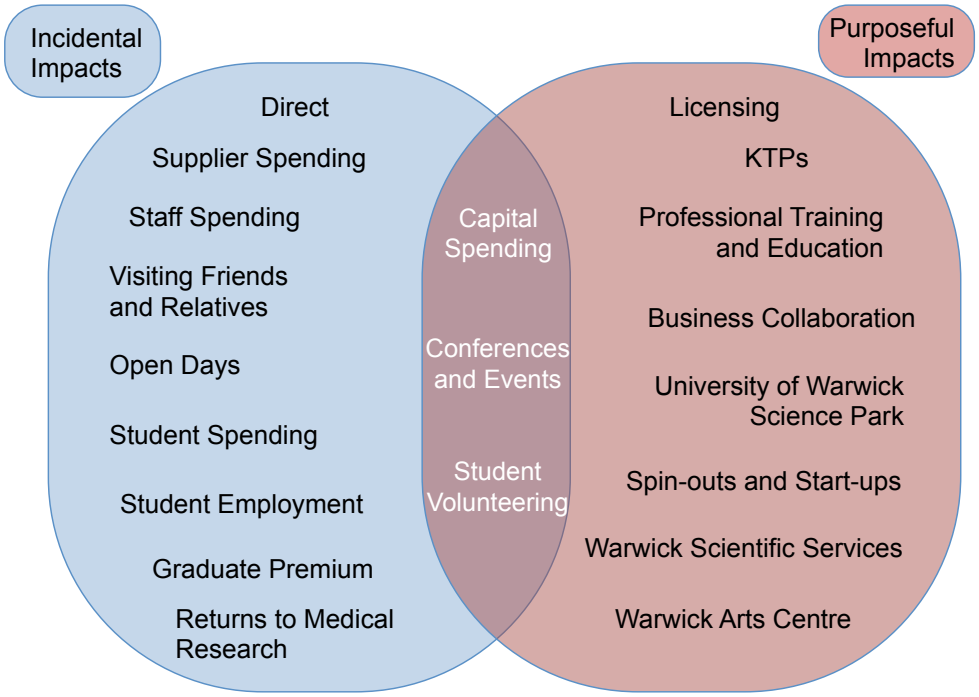
The economic impacts associated with any learning institution are often seen to be incidental to the running of such an institution. Local job creation and increased cultural opportunities are considered to be fortunate knock on impacts that can appease local concerns about the unfortunate knock on impacts such as increased traffic and noise. However, there are activities that can be undertaken by a University with the explicit purpose of creating positive economic impacts in the local area and further afield.

The University of Warwick has identified the importance of these purposeful activities and has actively considered its role as an economic driver in the Coventry and Warwickshire LEP area and wider region. This has been done through a variety of means, including:

- actively encouraging student volunteering in the local area;
- seeking local suppliers for capital and estates projects;
- supporting industrial partnerships to strengthen sectors of strategic importance; and
- supporting business development in multiple science park sites.

Figure 15.2 shows each of the quantifiable impacts split between those that are mainly incidental and those that are mainly purposeful. Those impacts in the intersection are those which are mainly incidental, however the University of Warwick is actively working in these areas to ensure that the economic impacts are maximised at a local and regional level.

Figure 15.2 – Quantifiable Incidental and Purposeful Impacts



Source: BiGGAR Economics

15.7 Conclusions

The University of Warwick's goal is to be a:

"Champion [of] social, cultural and economic growth: A catalyst and partner for regional, national and international development and sustainability"

The University of Warwick is a **champion of social growth** through the attraction and retention of young professionals to the area as students, staff or graduates.

The University of Warwick is a **champion of cultural growth** through its purposeful cultural programmes such as the Warwick Arts Centre, a resource that is widely used by the local community and through the incidental cultural exchanges that result from the university's international community.

The University of Warwick is a **champion of economic growth** through the significant economic impacts that are quantified in this report. The University supports over 13,900 jobs in the Coventry and Warwickshire LEP area and this is likely to grow in the future as current research projects and industrial collaborations reach their economic potential.

The University of Warwick is a **catalyst for development** through attracting businesses that are interested in recruiting from the talent pool of graduates that are produced by the University. The University, along with other educational institutions in the area has supported a strong culture of innovation within the Coventry and Warwickshire LEP area.

The University of Warwick is a **partner for development** through its work with the Coventry and Warwickshire LEP and other industrial partners. The work that the WMG group is undertaking with Jaguar Land Rover is an example of how this partnership can lead to important industrial developments in the local area.

16 APPENDIX A – LOCAL IMPACTS

The University of Warwick also makes an economic contribution to the local communities around it, in particular Canley, Earlsdon, Kenilworth and Leamington Spa.

This analysis also quantified the impacts in these local areas. These impacts were calculated using the same methodology that was used for the other study areas throughout the report.

The impacts associated with the University's activities were calculated using information received about each of the study areas, such as where students and graduates live. Where data was not available for smaller study areas, assumptions about the scale of impacts were made based on the relative size of the population. Table 16.3 summarises the assumptions used in the analysis.

The report estimates that the main sources of impact for Canley were from the University's core operations, which contributed £338.4 GVA and the activities of students, which contributed £64.1 million GVA and the Science Park, contributing £33.3 million GVA.

In Earlsdon, the main impact was from student activities, resulting in an impact of £4.3 million GVA.

The report estimates that the main impacts in Kenilworth were from the graduate premium, which contributed £6.1 million GVA, and student activities, which contributed £2.8 million GVA.

In Royal Leamington Spa, the report estimates that the main impacts were from student activities, which contributed £52.1 million GVA, and the graduate premium, which contributed £13.0 million GVA.

A summary of the quantifiable impacts in each of the local areas is given in Table 16.1 and Table 16.2. These show that the University of Warwick was estimated to have a total impact of:

- £442.2 million GVA and 9,418 jobs in Canley;
- £5.2 million GVA and 141 jobs in Earsldon;
- £10.5 million GVA and 114 jobs in Kenilworth; and
- £67.1 million GVA and 1,499 jobs in Leamington Spa.

Table 16.1 – GVA Impacts in Local Communities (£m)

	Canley	Earlsdon	Kenilworth	Royal Leamington Spa
Direct	337.8	0.0	0.0	0.0
Supplier Spending	0.2	0.2	0.3	0.5
Staff Spending	0.1	0.7	1.2	1.4
Capital Spending	0.4	0.0	0.0	0.0
Subtotal Core Impact	**338.4**	**0.9**	**1.5**	**1.9**
Student Spending	24.6	2.2	1.5	26.8
Student Part-time Work	39.4	2.1	1.3	25.2
Student Volunteering	0.1	0.0	0.1	0.1
Subtotal Student Impact	**64.1**	**4.3**	**2.8**	**52.1**
Visiting Friends & Relatives	0.2	0.0	0.0	0.1
Conference & Events	0.4	0.0	0.0	0.0
Open Days	0.0	0.0	0.0	0.0
Warwick Arts Centre	0.2	0.0	0.0	0.0
Subtotal Tourism Impact	**0.9**	**0.0**	**0.0**	**0.1**
Spin-outs and Start-ups	0.4	0.0	0.0	0.0
Licensing	0.0	0.0	0.0	0.0
Subtotal Commercialisation	**0.4**	**0.0**	**0.1**	**0.0**
Knowledge Transfer Partnerships	0.1	0.0	0.0	0.0
Business Collaboration	3.5	0.0	0.0	0.0
Professional Training and Education	0.8	0.0	0.0	0.0
Facilities and Equipment Hire	0.8	0.0	0.0	0.0
Warwick Scientific Services	0.0	0.0	0.0	0.0
Subtotal Knowledge Transfer	**5.2**	**0.0**	**0.0**	**0.0**
Science Parks	**33.3**	**0.0**	**0.0**	**0.0**
Sub Total Impact	**442.2**	**5.2**	**4.4**	**54.1**
Graduate Premium	**0.0**	**0.0**	**6.1**	**13.0**
Returns to Medical Research	**0.0**	**0.0**	**0.0**	**0.0**
GVA (£m)	**442.2**	**5.2**	**10.5**	**67.1**

Note: Totals may not sum due to rounding.

Table 16.2 – Employment Impacts in Local Communities

	Canley	Earlsdon	Kenilworth	Royal Leamington Spa
Direct	5,221	0	0	0
Supplier Spending	4	4	8	12
Staff Spending	2	15	25	29
Capital Spending	7	0	0	0
Subtotal Core Impact	**5,233**	**19**	**33**	**40**
Student Spending	491	41	27	478
Student Part-time Work	1,547	80	52	975
Student Volunteering	0	0	0	0
Subtotal Student Impact	**2,038**	**121**	**79**	**1,454**
Visiting Friends & Relatives	7	0	1	5
Conference & Events	15	0	0	0
Open Days	2	0	0	0
Warwick Arts Centre	6	0	0	0
Subtotal Tourism Impact	**29**	**0**	**1**	**5**
Spin-outs and Start-ups	23	0	1	0
Licencing	0	0	0	0
Subtotal Commercialisation	**23**	**0**	**1**	**0**
Knowledge Transfer Partnerships	3	0	0	0
Business Collaboration	44	0	0	0
Professional Training and Education	1	0	0	0
Facilities and Equipment Hire	6	0	0	0
Warwick Science Park	0	0	0	0
Subtotal Knowledge Transfer	**54**	**0**	**0**	**0**
Science Parks	**2,041**	**0**	**0**	**0**
Total	**9,418**	**141**	**114**	**1,499**

Note: Totals may not sum due to rounding.

Table 16.3 – Key Assumptions for Economic Impacts in Local Communities

Core Impacts Assumptions	Value	Source
Location of Supplier Spending		
% in Canley	0.2%	BiGGAR Economics Assumption
% in Earlsdon	0.2%	
% in Kenilworth	0.4%	SQW Regional Impact Study of University of Warwick 2013
% in Royal Leamington Spa	0.6%	
Location of Staff		
% in Canley	6%	University of Warwick
% in Earlsdon	5%	
% in Kenilworth	9%	
% in Royal Leamington Spa	7%	
Location of Capital Suppliers		
% in Canley	2%	BiGGAR Economics Assumption
% in Earlsdon	0%	
% in Kenilworth	0%	
% in Royal Leamington Spa	0%	
Student Impact Assumptions	**Value**	**Source**
Location of Students		
% in Canley	53%	University of Warwick
% in Earlsdon	5%	
% in Kenilworth	2%	
% in Royal Leamington Spa	32%	
Tourism Assumptions	**Value**	**Source**
Location of Conference and Events Spend		
% in Canley	20%	BiGGAR Economics Assumption
% in WMCA	0%	
% in Kenilworth	0%	
% in Royal Leamington Spa	0%	
Location of Open Days Spend		
% in Canley	10%	BiGGAR Economics Assumption
% in Earlsdon	0%	
% in Kenilworth	0%	
% in Royal Leamington Spa	0%	
Location of Warwick Arts Centre		
% in Canley	10%	BiGGAR Economics Assumption
% in Earlsdon	0%	

	% in Kenilworth	0%	
	% in Royal Leamington Spa	0%	
Commercialisation Assumptions		Value	Source
Location of Spin Outs and Start Ups			University of Warwick
	% in Canley	17%	
	% in Earlsdon	0%	
	% in Kenilworth	3%	
	% in Royal Leamington Spa	7%	
Location of Licence Holders			University of Warwick Licensing Data
	% in Canley	0%	
	% in Earlsdon	0%	
	% in Kenilworth	1%	
	% in Royal Leamington Spa	0%	
Knowledge Transfer Assumptions		Value	Source
Location of Knowledge Transfer Partnerships			University of Warwick Data on Knowledge Transfer Partnerships
	% in Canley	3%	
	% in Earlsdon	0%	
	% in Kenilworth	0%	
	% in Royal Leamington Spa	0%	
Location of Business Collaboration			BiGGAR Economics Assumption based on University of Warwick data on Knowledge Transfer Partnerships
	% in Canley	3%	
	% in Earlsdon	0%	
	% in Kenilworth	0%	
	% in Royal Leamington Spa	0%	
Location of Facilities and Equipment Hire			BiGGAR Economics Assumption based on University of Warwick data on Knowledge Transfer Partnerships
	% in Canley	3%	
	% in Earlsdon	0%	
	% in Kenilworth	0%	
	% in Royal Leamington Spa	0%	
Location of Warwick Scientific Services Clients			Postcode analysis of Warwick Scientific Services clients
	% in Canley	0%	
	% in Earlsdon	0%	
	% in Kenilworth	0%	
	% in Royal Leamington Spa	0%	
Science Park Employment			University of Warwick Science Park
	% in Canley	74%	
	% in Earlsdon	0%	

	% in Kenilworth	0%	
	% in Royal Leamington Spa	0%	
Long Term Impacts Assumptions		Value	Source
Location of Returns to Medical Health Research			ONS, Mid-Year Population Estimates
	% in Canley	0%	
	% in Earlsdon	0%	
	% in Kenilworth	0%	
	% in Royal Leamington Spa	0%	
Location of Graduate Premium			BiGGAR Economics Assumption
	% in Canley	0%	
	% in Earlsdon	0%	
	% in Kenilworth	1%	University of Warwick Alumni Database
	% in Royal Leamington Spa	2%	

17 APPENDIX B – IMPACTS AT OTHER GEOGRAPHIC LEVELS

The impact of the University of Warwick was considered at a further three geographic levels, where the University has an important presence. Therefore, the analysis quantified the impact of the University in the areas of Coventry, the West Midlands Combined Authority and the Midlands Engine, using the same methodology as was used for other study areas.

The impacts associated with the University's activities were calculated using information received about each of the study areas, such as where students and graduates live or where companies operate. Where data was not available for study areas, assumptions about the scale of impacts were made based on the relative size of the population. Table 17.3 summarises the assumptions used in the analysis.

The main sources of estimated impact in Coventry were the core impact, which contributed £365.2 million GVA to the economy and the impact from student activities, which contributed £86.1 million GVA.

In the Combined Authority Area the main sources of impact were core spending, which contributed £421.1 million GVA, impact from student activities, which contributed £107.8 million GVA, the graduate premium, which contributed £83.6 million GVA and science parks, which contributed £65.3 million GVA.

The report estimates that the main sources of impact in the Midlands Engine were the core impact, which contributed £518.4 million GVA, impact from student activities, which contributed £199.4 million GVA, impact from the graduate premium, which contributed £215.6 million GVA, and impact from science parks, which contributed £86.8 million GVA.

A summary of quantifiable impacts is given in Table 17.1 and Table 17.2 and demonstrates that the University supports:

- £587.8 million GVA and 11,239 jobs in Coventry;
- £768.6 million GVA and 14,020 jobs in the West Midlands Combined Authority; and
- £1,198.1 million GVA and 19,690 jobs in the Midlands Engine.

Table 17.1 – GVA Impacts at Other Geographic Levels (£m)

	Coventry	WMCA	Midlands Engine
Direct	337.8	337.8	337.8
Supplier Spending	8.5	21.6	48.5
Staff Spending	12.8	45.6	103.4
Capital Spending	6.1	15.9	28.6
Subtotal Core Impact	**365.2**	**421.0**	**518.4**
Student Spending	37.0	50.2	102.3
Student Part-time Work	49.0	57.5	96.8
Student Volunteering	0.2	0.2	0.2
Subtotal Student Impact	**86.1**	**107.8**	**199.4**
Visiting Friends & Relatives	0.3	0.4	0.8
Conference & Events	2.2	1.3	1.3
Open Days	0.5	0.6	0.7
Warwick Arts Centre	1.3	1.3	-
Subtotal Tourism Impact	**4.3**	**3.7**	**2.8**
Spin-outs and Start-ups	0.4	0.5	2.9
Licensing	0.1	0.1	0.3
Subtotal Commercialisation	**0.5**	**0.6**	**3.2**
Knowledge Transfer Partnerships	0.9	1.2	2.0
Business Collaboration	31.1	55.7	105.4
Professional Training and Education	7.1	12.9	24.4
Facilities and Equipment Hire	6.9	12.5	23.7
Warwick Scientific Services	0.0	0.1	0.4
Subtotal Knowledge Transfer	**46.1**	**82.4**	**156.0**
Science Parks	**44.6**	**65.3**	**86.8**
Sub Total Impact	**523.6**	**636.4**	**887.9**
Graduate Premium	**39.4**	**83.6**	**215.6**
Returns to Medical Research	**0.5**	**4.3**	**16.0**
GVA (£m)	**586.8**	**768.6**	**1,198.1**

Table 17.2 – Employment Impacts at Other Geographic Levels

	Coventry	WMCA	Midlands Engine
Direct	5,221	5,221	5,221
Supplier Spending	182	447	980
Staff Spending	266	911	2,028
Capital Spending	100	261	467
Subtotal Core Impact	**5,768**	**6,839**	**8,696**
Student Spending	693	887	1,740
Student Part-time Work	1,881	2,126	3,483
Student Volunteering	0	0	0
Subtotal Student Impact	**2,573**	**3,013**	**5,223**
Visiting Friends & Relatives	11	13	22
Conference & Events	71	39	38
Open Days	16	18	19
Warwick Arts Centre	43	40	-
Subtotal Tourism Impact	**140**	**110**	**80**
Spin-outs and Start-ups	29	58	127
Licensing	1	1	5
Subtotal Commercialisation	**30**	**59**	**133**
Knowledge Transfer Partnerships	18	0	42
Business Collaboration	417	791	1,547
Professional Training and Education	19	64	156
Facilities and Equipment Hire	54	99	190
Warwick Scientific Services	1	3	9
Subtotal Knowledge Transfer	**508**	**956**	**1,943**
Science Parks	**2,219**	**3,042**	**3,615**
Total	**11,239**	**14,020**	**19,690**

Table 17.3 – Key Assumptions for Economic Impact at Other Geographic Levels

Core Impacts Assumptions	Value	Source
Location of Supplier Spending		
% in Coventry	9.2%	SQW Regional Impact Study of University of Warwick 2013
% in WMCA	20.0%	BiGGAR Economics assumptions
% in Midlands Engine	40.0%	
Location of Staff		
% in Coventry	45%	University of Warwick
% in WMCA	53%	
% in Midlands Engine	90%	
Location of Capital Suppliers		
% in Coventry	25%	BiGGAR Economics assumptions
% in WMCA	50%	
% in Midlands Engine	75%	
Student Impact Assumptions	**Value**	**Source**
Location of Students		
% in Coventry	61%	University of Warwick
% in WMCA	65%	
% in Midlands Engine	100%	
Tourism Impact Assumptions	**Value**	**Source**
Location of Conference and Events Spend		
% in Coventry	90%	BiGGAR Economics assumption
% in WMCA	90%	
% in Midlands Engine	100%	
Location of Open Days Spend		
% in Coventry	98%	BiGGAR Economics assumption
% in WMCA	98%	
% in Midlands Engine	98%	
Commercialisation Impact Assumptions	**Value**	**Source**
Location of Spin Outs and Start Ups		
% in Coventry	24%	University of Warwick
% in WMCA	34%	
% in Midlands Engine	62%	
Location of Licence Holders		
% in Coventry	2%	University of Warwick data on licensing
% in WMCA	2%	
% in Midlands Engine	6%	

Knowledge Transfer Assumptions	Value	Source
Location of Knowledge Transfer Partnerships		University of Warwick data on knowledge transfer partnerships
% in Coventry	23%	
% in WMCA	34%	
% in Midlands Engine	57%	
Location of Business Collaboration		University of Warwick data based on knowledge transfer partnerships
% in Coventry	23%	
% in WMCA	34%	
% in Midlands Engine	57%	
Location of Facilities and Equipment Hire		University of Warwick data based on knowledge transfer partnerships
% in Coventry	23%	
% in WMCA	34%	
% in Midlands Engine	57%	
Location of Warwick Scientific Services Clients		Postcode analysis of Warwick Scientific Services clients
% in Coventry	2%	
% in WMCA	6%	
% in Midlands Engine	20%	
Location of Science Park Employment		Science Park data provided by University of Warwick
% in Coventry	81%	
% in WMCA	90%	
% in Midlands Engine	100%	
Long Term Impact Assumptions	**Value**	**Source**
Location of Warwick Arts Centre Spend		BiGGAR Economics assumption
% in Coventry	100%	
% in WMCA	100%	
% in Midlands Engine	100%	
Location of Returns to Medical Health Research		Estimates based on Mid-Year Population Estimates
% in Coventry	1%	
% in WMCA	4%	
% in Midlands Engine	16%	
Location of Graduate Premium		University of Warwick Alumni Database
% in Coventry	6%	
% in WMCA	13%	
% in Midlands Engine	33%	
Core Impacts Assumptions	**Value**	**Source**
Location of Supplier Spending		SQW Regional Impact Study of University of Warwick 2013
% in Coventry	9.2%	

	% in WMCA	20.0%	BiGGAR Economics Assumption
	% in Midlands Engine	40.0%	
Location of Staff			
	% in Coventry	45%	SQW Regional Impact Study of University of Warwick 2013
	% in WMCA	60%	BiGGAR Economics Assumption
	% in Midlands Engine	100%	
Location of Capital Suppliers			
	% in Coventry	25%	BiGGAR Economics Assumption
	% in WMCA	50%	
	% in Midlands Engine	75%	
Student Impact Assumptions		**Value**	**Source**
Location of Students			
	% in Coventry	61%	University of Warwick
	% in WMCA	65%	
	% in Midlands Engine	100%	
Tourism Impact Assumptions		**Value**	**Source**
Location of Conference and Events Spend			
	% in Coventry	90%	BiGGAR Economics Assumption
	% in WMCA	100%	
	% in Midlands Engine	100%	
Location of Open Days Spend			
	% in Coventry	98%	BiGGAR Economics Assumption
	% in WMCA	98%	
	% in Midlands Engine	98%	
Location of Warwick Arts Centre Spend			
	% in Coventry	100%	BiGGAR Economics Assumption
	% in WMCA	100%	
	% in Midlands Engine	100%	
Commercialisation Impact Assumptions		**Value**	**Source**
Location of Spin Outs and Start Ups			
	% in Coventry	24%	University of Warwick
	% in WMCA	34%	
	% in Midlands Engine	62%	
Location of Licence Holders			
	% in Coventry	2%	University of Warwick Data on Licensing
	% in WMCA	2%	

	% in Midlands Engine	6%	
Knowledge Transfer Assumptions		Value	Source
Location of Knowledge Transfer Partnerships			University of Warwick Data on Knowledge Transfer Partnerships
	% in Coventry	23%	
	% in WMCA	34%	
	% in Midlands Engine	57%	
Location of Business Collaboration			BiGGAR Economics Assumption based on University of Warwick data on Knowledge Transfer Partnerships
	% in Coventry	23%	
	% in WMCA	34%	
	% in Midlands Engine	57%	
Location of Warwick Scientific Services Clients			Postcode analysis of Warwick Scientific Services clients
	% in Coventry	2%	
	% in WMCA	6%	
	% in Midlands Engine	20%	
Location of Science Park Employment			University of Warwick Science Park
	% in Coventry	81%	
	% in WMCA	90%	
	% in Midlands Engine	100%	
Long Term Impact Assumptions		Value	Source
Location of Returns to Medical Health Research			ONS, Mid-Year Population Estimates
	% in Coventry	1%	
	% in WMCA	4%	
	% in Midlands Engine	16%	
Location of Graduate Premium			University of Warwick Alumni Database
	% in Coventry	6%	
	% in WMCA	13%	
	% in Midlands Engine	33%	