

Economic Contribution of the French
LERU Members

A report to
University of Strasbourg,
Pierre and Marie Curie University (UPMC)
and Université de Paris-Sud

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1 EXECUTIVE SUMMARY

BiGGAR Economics, an economic consultancy based in Scotland specialising in assessing the economic impact of universities, was commissioned to assess the economic contribution of three French research universities, the University of Strasbourg, Université Paris-Sud and Pierre and Marie Curie University. This assessment was undertaken alongside a study for the League of European Research Universities (LERU) to assess the economic contribution of its 21 member universities across Europe, including these three French universities.

The economic contribution was measured in terms of Gross Value Added (GVA)¹ to the economy and by the number of jobs supported by the organisation.

In 2014, the three French Universities combined generated a core economic contribution which is worth €2,523 billion in GVA in France and €2,569 billion GVA across Europe as a whole. Additionally, they supported 37 066 jobs in France and 39 208 jobs across Europe. This contribution was generated through people employed directly at the Universities, through the institutions' expenditure on supplies, through the money spent by staff in the local economy and through spending on capital projects on the site. The figure takes into account the indirect and multiplier effects of all the direct expenditure and employment.

Student expenditure and student employment (outside the Universities) are worth a further €1,078 billion in GVA to the economy of France and €1,153 billion GVA throughout Europe as a whole. This supports a further 17 931 jobs in France and 21 194 jobs across Europe.

We have considered six key aspects of knowledge transfer, enterprise and innovation activity supported by the Universities that can reasonably be quantified in economic terms. The aspects of these activities that we can quantify are technology licensing, consultancy, collaborative and contract research, spin-outs and start-ups, workforce training (CPD) and staff volunteering. These have a combined contribution which is worth €1,786 billion in GVA and 19 423 jobs in France and €1,890 billion in GVA and 23 162 jobs across Europe.

The tourism contribution created by visits to staff and students and attendance at conferences and events at the Universities create a contribution of €48,8 million in GVA and 722 jobs in France and €49,2 million in GVA and 813 jobs across Europe.

One final contribution has been measured which is conceptually different from the others in that it occurs over a much longer period of time. The graduate premium recognises the increased earnings over a lifetime that stem from educating people to degree level. This contribution is estimated to be worth €1,814 billion in GVA in France and €1,885 billion in GVA across Europe.

All contributions together suggest that **the University of Strasbourg, the Pierre and Marie Curie University and Université Paris-Sud combined generate a total economic value of €7,25 billion in GVA and 75 142 jobs in France and €7,55 billion in GVA and 84 378 jobs across Europe.**

¹ GVA is a measure of the economic value of goods and services produced in a given area. It is the total value of output less the value of intermediate inputs.

The direct to total GVA multiplier in France is €4,49 and the direct to total employment multiplier for France is 3,24. This implies that each €1 GVA directly generated by the Universities contributes €4,49 to the French economy and each direct employee of the Universities contributes 3,24 jobs in the French economy.

The direct to total GVA multiplier in Europe is €4,67 and the direct to total employment multiplier for Europe is 3,64. This implies that each €1 GVA directly generated by the Universities contributes €4,67 to the European economy and each direct employee of the Universities contributes 3,64 jobs in the wider European economy.

The results from this study can be used to estimate the economic contribution of the research universities sector in France as a whole, by using the findings as a sample that can then be grossed-up to the level of the whole group of research universities. It has been estimated that, the overall economic contribution of the French research universities sector is estimated at:

- GVA of €31 524,8 million and supports 326 704 jobs in France; and
- GVA of €32 811,7 million and supports 366 861 jobs in Europe as a whole (including France).

2 INTRODUCTION

This report summarises the findings of a study undertaken by BiGGAR Economics Limited into the economic contributions of the University of Strasbourg, the Pierre and Marie Curie University (UPMC) and the Université de Paris-Sud referred to in the report as 'the Universities'.

2.1 Objectives

The objectives of the study were to quantify the economic value of the Universities in terms of:

- their core contribution to income and employment;
- the student-related contribution from students spending and working in the area;
- the knowledge transfer, enterprise and innovation activity created by and arising from the Universities;
- the tourism contribution created by visitors to staff and students and attendance at conferences and events held at the Universities; and
- life-time productivity gains from teaching and learning delivered by the Universities (graduate premium).

All of these contributions are assessed on a national level for France and across Europe as a whole. The base year for all data is 2014, unless stated otherwise.

2.2 Background

This work was carried out as part of a wider appointment for the League of European Research Universities (LERU) to assess the economic value of its 21 members, located in 10 countries throughout Europe (Belgium, Finland, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland and the UK).

LERU is an association of research-intensive universities. It was founded in 2002 as a partnership among twelve multi-faculty research universities and expanded its membership to 21 in 2010. Its purpose is to influence research policy in Europe and to develop best practice through mutual exchange of experience. LERU regularly publishes a variety of papers and reports which make high-level policy statements, provide analyses and make recommendations for policymakers, universities, researchers and other stakeholders

The 21 members of LERU are: University of Amsterdam, Universitat de Barcelona, University of Cambridge, University of Edinburgh, University of Freiburg, Université de Genève, Universität Heidelberg, University of Helsinki, Universiteit Leiden, KU Leuven, Imperial College London, University College London, Lund University, University of Milan, Ludwig-Maximilians-Universität München, University of Oxford, Pierre and Marie Curie University (Paris), Université Paris-Sud, University of Strasbourg, Utrecht University, University of Zurich.

2.2.1 University of Strasbourg

A founding member of LERU, the University of Strasbourg was created in 2009 by the successful merger of three long-established universities in the region. It has a staff complement of over 6 000 people and is organised into 37 departments covering 5 academic fields. It offers bachelors degrees in 47 subjects, masters degrees in 192 subjects and doctorates in 145 subjects and has a student population of almost 45 000.

The University of Strasbourg is driven by the ambition to rank among the best research universities. Strasbourg has a cluster of activity in many scientific fields such as biology, biotechnology, pharmaceutical drugs, chemistry, material physics and space sciences and is strongly involved in the development of research in humanities and social sciences. Strasbourg was one of seven universities selected by the French government for the “Initiative of Excellence” programme launched in 2011.

The University is strongly tied to its neighbour universities of the Upper Rhine Region such as Freiburg and Karlsruhe in Germany and Basel in Switzerland. With 20% of its students coming from abroad (up to 50% for PhDs) the university is an attractor of international talent.

It has a strong commitment to technology and knowledge transfer and is a member of the international Biovalley cluster, one of the most important clusters in biotechnologies and health in Europe with more than 2 000 jobs and 45 companies created since 2005.

2.2.2 Pierre and Marie Curie University (UPMC)

UPMC is a leading French university of science and medicine. It is a direct descendant of the historic Sorbonne and is ranked the top French university by the Shanghai Rankings, 6th in Europe and 35th in the world. UPMC encompasses all major sciences, including mathematics (4th in the world); chemistry; physics; electronics; computer science; mechanics; Earth, marine and environmental sciences; life sciences; and medicine.

With a complement of 10 000 staff across seven departments and faculties, UPMC provides a diverse curriculum organised into 10 bachelor programs, 10 master’s degrees and 16 doctoral schools and France’s largest library centre to its 34 000 students.

The University has more than 3 750 professor-researchers and researchers in 100 laboratories in partnership with the four main French national research organizations. It has earned recognition not just for its contribution to fundamental science but also for its extremely targeted research, as demonstrated by the many awards regularly won by UPMC researchers. UPMC actively promotes corporate research and education partnerships (industry-sponsored research, chairs affiliated to a sponsoring company) and technology transfer. Its partnerships with major French and international research organizations and participation in various international networks are testament to the University’s international involvement.

UPMC is a founding member of Sorbonne University, one of the most comprehensive university centres in the country comprising five establishments, all top in their fields: UPMC, Paris-Sorbonne, Muséum National d’Histoire

Naturelle (MNHN), Compiègne University of Technology and INSEAD Business School. The comprehensive institution of Sorbonne University offers students an expanded choice of major-minor courses and degrees designed for emerging professions. As part of the Sorbonne University group, UPMC research spans not only the sciences and medicine, but also technology, economics, humanities and the arts.

Additionally, the Sorbonne University group and the University of Strasbourg have been chosen by the French Government to join the Excellence Initiative. This scheme will grant €7.7 billion in grants to a small number of major universities to boost their competitiveness and increase their attractiveness to the top researchers and students.

2.2.3 Université Paris-Sud

Université Paris Sud was founded in 1970 from a merger of five scientific research centres in the Orsay area and is now a distinguished research institution. With a complement of over 5 700 teaching, support and research staff across five faculties, three University Institutes of Technology and a School of Engineering, Université Paris Sud hosts a student population of around 24 000 full time students.

Unusually for a French university Université Paris Sud is not located in the centre of a city but in the suburbs around 40 minutes to the south-west of central Paris. At over 200 hectares, the University campus is also the largest in France. It incorporates large areas of green space, woods, a river and its own botanical garden and riding school, all of which contribute to create a distinct environment that is not replicated anywhere else in France.

As a multidisciplinary university with a strong science and health science component, it offers education and training in a broad range of fields, from pure sciences to clinical medical practice, through computer science, physics, chemistry, nanotechnologies, biology, and pharmacy. Mathematics and physics in particular have historically earned Université Paris Sud its worldwide standing, which has been recognised through a number of prestigious awards.

Paris-Saclay is an ambitious project to create an international innovation campus of a similar scale to major international universities such as Stanford, Berkeley, MIT, Harvard, Oxford and Cambridge. The project involves bringing together a group of 19 higher education institutions alongside a business cluster on the outskirts of Paris and has been dubbed the “French Silicon Valley”². As the largest partner involved in the creation of Paris-Saclay, Université Paris Sud is one of the main drivers behind the project.

2.3 National Research Institutions

This study has been undertaken in parallel with an assessment of the economic contribution of research universities across Europe. The French higher education and research systems are structured in a different way from most other European countries. For example, while the research universities in France work closely and collaboratively with national research institutions, these institutions also have a strong corporate identity of their own. This includes the direct employment of

² Times Higher Education (9th April 2015), Paris-Saclay: A Mega-university with Ambitions to Match.

research staff while in many other European countries comparable institutions fund research programmes but the researchers themselves tend to be employees in the universities sector.

In order to ensure comparability with the findings of the economic contribution analysis across the LERU members, and to reflect the mutually supporting relationship between the research universities and the national research institutions, those institutions that work most closely with the University of Strasbourg, UPMC and the Université de Paris-Sud have been included in the analysis. These include:

- National Centre for Scientific Research (CNRS): the largest fundamental research organisation in Europe was founded 1939 and accounts for a quarter of French public spending on civilian research, employing over 32 000 people. The CNRS operates in all major fields, including biology, humanities and computer science and is divided into 10 separate institutes;
- French Institute of Health and Medical Research (Inserm): a public scientific and technology institute founded in 1964 and employing over 5 000 permanent staff. 80% of its 318 research units are embedded in hospitals. Inserm includes nine thematic institutions including cancer; public health; and genetics, genomics and bioinformatics with scientific monitoring and expertise also falling under its remit;
- National Institute for Computing and Automation (Inria): a public science and technology institute created in 1967, employing 2 700 staff, including 1 800 scientists. Inria is organised around five fields of research from digital health, biology and earth to applied mathematics, computation and simulation.

2.4 Report Structure

This report is structured as follows:

- section three discusses the role of universities as drivers of productivity and economic growth, as well as the various ways in which universities impact the economy;
- section four presents the economic contribution arising from the Universities' core activities including those associated with direct income and employment, the purchase of bought in goods and services, staff spending and capital spending;
- section five describes the contributions associated with students whilst studying and spending in the local economy;
- section six describes the contribution of knowledge transfer, enterprise and innovation associated with the Universities and their employees using their knowledge to benefit other organisations, including the contributions from technology licensing, consultancy, contract and collaborative research, spin-outs and start-up companies, workforce training (CPD) and staff volunteering;
- section seven assesses the contribution to tourism from visits to students and staff and from expenditure at conferences and events hosted by the Universities;

- section eight discusses the economic contribution arising from the increasing earnings generated during the working life of graduates as a result of having a university level education;
- section nine summarises the Universities' total economic contribution; and
- section ten draws together the main conclusions about the Universities separately and combined.

Appendix A provides a guide to abbreviations and terms commonly used throughout the report. The methodology used to calculate these contributions are described in detail in a separate Supplementary Methodological Appendix.

2.5 Baseline Year, Measures and Geography

The economic contributions described in this report are for 2014, which is the latest year for which published data on income, staff and students was available at the time of writing, in the Spring and Summer of 2015.

Economic contribution has been reported using two measures:

- Gross Value Added (GVA) is the measure of the value that an organisation, company or industry adds to the economy through their operations. The analysis has used the production approach to measuring this contribution, where GVA is equal to the value of production less the value of the inputs used. Typically this is calculated by subtracting the non-labour costs of the organisation from the organisation's total revenue.
- employment (jobs) is measured in terms of headcount jobs unless stated otherwise.

The contributions have been calculated on two geographic levels: France and Europe.

2.6 Number Formats

We appreciate that several of the countries covered by the LERU members use a different format for number presentation. This report has been produced using French number formatting, i.e. the symbol for the decimal marker is a comma on the line.³

³ 22nd General Conference on Weights and Measures, 2003.

3 UNIVERSITY DRIVEN GROWTH

Universities are recognised throughout the world as one of the critical drivers of economic growth. The growth of advanced economies has been associated with a growing role for universities, providing the intellectual and human capital required for a successful modern economy. This chapter examines the role of universities in underpinning growth by discussing how knowledge and innovation contribute to productivity growth and therefore economic growth and the various ways that universities impact the economy.

3.1 Theoretical Foundations

As producers of highly-skilled graduates and postgraduates, generators of world-class research and development and located at the centre of industry clusters universities contribute to economic growth. In recent years a number of influential economists have published works that set out a theoretical and empirical case for the role that high level skills and innovation play in both boosting economic competitiveness and addressing inequality in society.

In the late 1950s Robert Solow published papers that showed that it was not the savings rate or increases in the factors of production (labour and capital) that determined the long-run growth rate, but increases in productivity. In the early 1960s Kenneth Arrow published papers on research and development and on learning by doing, which showed that almost all economic growth could be accounted for by innovation, both new ideas emerging from research and improving productivity through learning by doing during the process of production itself.

Building on this, the Nobel prize winning economist Joseph Stiglitz⁴ has argued that productivity is the result of learning and consequently, a focal point of policy should be to increase learning within the economy. The observation is made that even within countries and within industries there can be big gaps between the most productive and the others. This means that the diffusion of knowledge is as important as pushing the boundaries of knowledge. Moreover, since productivity growth is what drives growth in the economy, this means there is considerable scope for higher rates of economic growth. As an illustration of this, of the productivity growth that took place in the UK between 2000 and 2008, nearly one third was attributable to changes in technology resulting from science and innovation.⁵

The scale of knowledge and innovation that takes place is also important because there are dynamic effects that come into play. New knowledge and innovation (the diffusion of knowledge) are both based on the foundations of prior knowledge and high levels of investment in knowledge and innovation give rise to an accelerating pace of innovation. In contrast, cutting levels investment in knowledge and innovation, will mean that the pace of innovation slows because underinvestment compounds over time.

⁴ Stiglitz and Greenwald (2014), *Creating a Learning Society: A New Approach to Growth, Development, and Social Progress*.

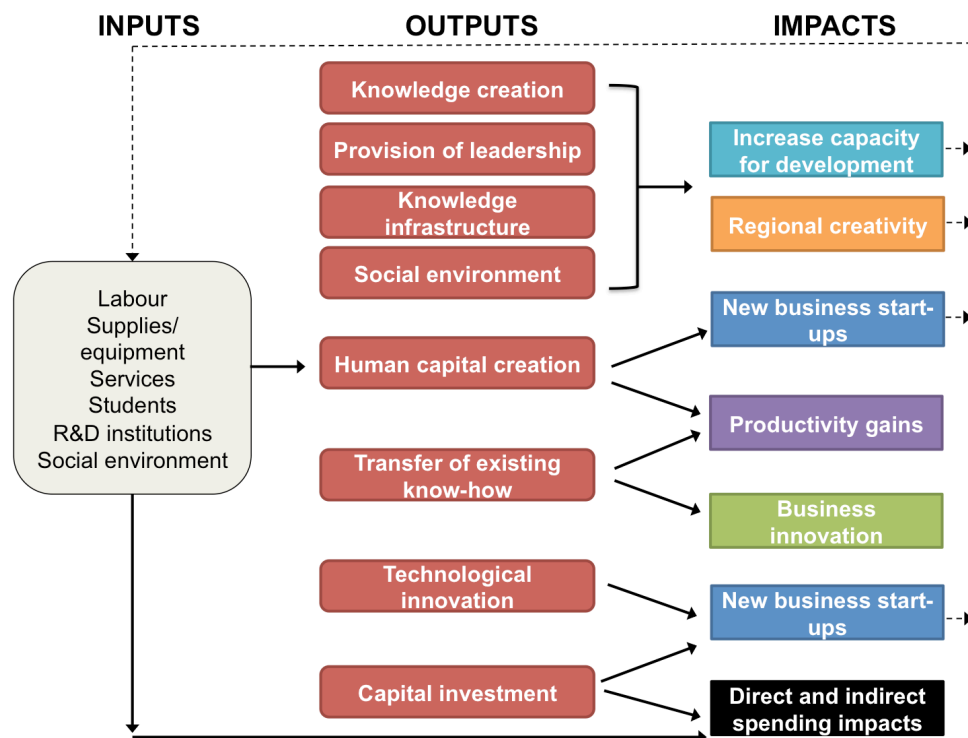
⁵ HM Treasury, Department for Business, Innovation & Skills (December 2014), *Our Plan for Growth: Science and Innovation*.

In summary, knowledge and innovation are fundamental to economic growth, since it is productivity growth that drives economic growth and productivity growth is in turn driven by knowledge and its diffusion (innovation).

3.2 The Impact of Universities on the Economy

Universities have wide and far-reaching impacts on the economy, which are often interrelated. The outputs and direct and indirect positive economic impacts associated with the main activities that universities undertake are illustrated in Figure 3.1.

Figure 3.1 – University Outputs and Expected Economic Impacts



Source: Goldstein and Renault (2004), *Contributions of Universities to Regional Economic Development: A Quasi-Experimental Approach*.

3.2.1 Knowledge and Human Capital Creation

The two fundamental activities of universities are the creation of intellectual and human capital. Universities contribute to knowledge creation through the basic and applied research that is undertaken. The most influential technologies today and the technologies of the future arise out of this research. Universities provide high quality graduates for the labour market which in turn increases the innovation potential of the economy, as well as leading to productivity gains for the economy.

3.2.2 Transfer of Existing Knowledge and Technological Innovation

Over and above these fundamental activities universities also work to transfer existing knowledge throughout the economy through their interactions with businesses such as through consultancy and workforce training, which increases productivity and business innovation. Universities are also a vital source of

technological innovation through the commercialisation activities that they undertake such as spin-off companies and licensing of intellectual property.

3.2.3 Knowledge Infrastructure

Universities also have a role to play in the production of knowledge infrastructures, which largely arise due to positive agglomeration effects. As an example, many research institutes, and companies choose to locate in close proximity to research intensive universities in order to benefit from informal knowledge sharing as well as frequent face-to face contact with academics involved in research. It is for this reason that cities with universities also have large numbers of associated knowledge infrastructures such as research institutes and science parks, which can ultimately develop into knowledge clusters.

3.2.4 Provision of Leadership

Many universities play an important leadership role regionally and nationally, through their involvement in the advisory boards of private, public and non-profit organisations. This ensures a coordinated economic development approach helping to match skills with regional needs and vice versa.

3.2.5 Social Environment – The University Ecosystem

Finally universities can have a number of impacts on the local environment. The staff and student base provided by the universities undoubtedly contributes to the overall vibrancy of the cities they are located in.

In addition to adding to the quality of the local environment, universities contribute to the attractiveness of a region as a knowledge centre. This wider role of universities in underpinning the economy is something that should not be overlooked. Universities provide a space for discussion and create connections between academia, students and companies that would not otherwise exist and therefore foster an environment for innovation. This creates clusters of people, which lead to the creation of entire university ecosystems, which in turn draw more people.

The further impact of the university ecosystem is that it makes these regions the most attractive places to invest and are, as a result, vital to drawing inward investment. This is particularly important as the market for inward investment is globally competitive: a competitiveness that is increasing with the research and development being poured into Asia. The international dimension of the research undertaken at universities and the international character of the institutions themselves therefore contributes to improving Europe's brand as a whole, making Europe more interlinked and providing opportunities for Europe to have partnerships with the wider world by attracting inward investment.

The university ecosystem is entirely built on the world-class research undertaken at universities and it is this world-class research that attracts companies and investment into a region, helping to catalyse innovation in local businesses. The fundamental research undertaken at universities therefore creates the knowledge sectors of the future. A Europe without this world-class research base would consequently be a Europe devoid of these knowledge industries.

4 CORE CONTRIBUTION

The core contribution covered in this chapter includes:

- the direct effect (income and employment);
- the supplier effect (contribution of expenditure on supplies and services and jobs supported by this spend);
- the income effect (contribution of staff spending); and
- the capital spending effect.

The Supplementary Methodological Appendix, a separate document which accompanies this report, gives a detailed explanation of the methods used to measure each aspect of economic contribution.

4.1 Direct Effect

The direct contribution of any organisation is the value it adds to the economy and the number of jobs it supports in a given time frame. The value an organisation adds to the economy is measured using gross value added (GVA), which is usually estimated in by subtracting the amount that an organisation spends on supplies from its total income.

Estimating the direct impact of universities in France is slightly more complicated than this however because in many of the research staff who work in French universities are actually employed by one of the national research organisations.

At the three Universities, 15 993 of the 23 976 people who work at the Universities are directly employed by them. The rest are employed by one of the national research institutions. These staff members have been included in the French Universities figures, to be comparable to other LERU universities.

The GVA and employment directly supported by the Universities is shown in Tables 4.1 to 4.3. These show that the Universities support 23 168 jobs in the French economy and have a direct contribution of €1,615 billion GVA. The further effects arising from this employment and economic output are estimated in the next section.

Table 4.1: The Universities combined – Inputs for Income

	Total (€mn)
Teaching	401,0
Research	529,3
Other	387,1
National Research Centres (NRCs)	587,9
Total Income	1 905,4

Source: *The Universities*.

Table 4.2: The Universities – Inputs for GVA

	Total (€mn)
Total Income	1 905,4
Less Expenditure on Supplies	290,1
Direct GVA	1 615,2

Source: *The Universities*

Table 4.3: The Universities – Inputs for Employment

	Total
University Employees (Headcount)	15 993
University Employees (fte)	15 443
NRC Employees (headcount)	7 983
Total number of employees (headcount)	23 976
Total number of employees (FTE)	23 168

Source: *The Universities*

4.2 Spending on Supplies

The supplier effect is the contribution occurring from buying in goods and services since these purchases generate GVA and support employment in businesses that supply the Universities. The inputs used to calculate the supplier effect are shown in Table 4.4. 93.1% of the supplier spending is based in France and 98.7% is based in Europe (including France).

Table 4.4: The Universities – Inputs for Spending on Supplies

	Value	Source
Universities	€210,6 mn	The Universities
National Research Centres	€79,5 mn	BiGGAR Economics calculation
Total Expenditure on Supplies	€290,1 mn	

A further round of GVA and employment is supported indirectly by the businesses that supply goods and services to the Universities and this is calculated using multipliers for all industries as a whole. It is assumed that a large proportion of this further round of spending is retained in France therefore the indirect effect is relatively large for this area.

The total supplier effect for the Universities is shown in Table 4.5. This shows that the universities' spending on supplies supports 4 176 jobs in France and an economic contribution of €285,8 million GVA, with a contribution of 5 635 jobs and €304,3 million GVA in Europe.

Table 4.5: The Universities – Contribution from Spending on Supplies

	GVA (€mn)	Employment (jobs)
France		
Direct Contribution	95,2	1 764
Indirect Contribution	190,5	2 412
Total Supplier Contribution	285,8	4 176
Europe		
Direct Contribution	101,1	1 905
Indirect Contribution	203,2	3 730
Total Supplier Contribution	304,3	5 635

Source: BiGGAR Economics Analysis

4.3 Staff Spending

The staff employed directly by the Universities spend their wages and salaries in the wider economy and this also increases turnover and supports employment in local businesses and throughout France and Europe as a whole.

This effect can be estimated by assessing the amount of wages spent in France and Europe, based on the number of employees and where they live. The key inputs used in calculating this contribution are shown in Table 4.6.

Table 4.6 – The Universities – Inputs for Staff Spending

Staff Numbers	Value	
Number of Employees (fte)*	23 168	
Staff Salaries*	€814,5 mn	
The Universities	Staff Location**	Location of Spending***
France	99.2%	95%
Europe	99.8%	99%

Source: *BiGGAR Economics calculation. **The Universities. ***BiGGAR Economics assumption

These expenditure figures can then be converted into a GVA contribution by applying an appropriate turnover/GVA ratio, which has the effect of excluding taxation paid by employees from the contribution estimates. The income effect estimated here is therefore a conservative estimate since it excludes the contribution of employees to the provision of public services paid for from Government taxation receipts.

The resulting employment contributions are calculated by dividing the GVA contribution by an estimate of the average GVA/employee and finally multipliers are applied to capture the indirect effects of subsequent spending rounds (details are provided in the Supplementary Methodological Appendix).

This results in a staff spending contribution of €540,7 million in GVA and 8 592 jobs in France, and €565,7 million GVA and 9 258 jobs in Europe as a whole. This is summarised in Table 4.7.

Table 4.7: The Universities – Contribution from Staff Spending

	GVA (€mn)	Employment
France		
Direct Contribution	190,1	3 255
Indirect Contribution	350,5	5 337
Total Staff Spending Contribution	540,7	8 592
Europe		
Direct Contribution	199,0	3 448
Indirect Contribution	366,6	5 810
Total Staff Spending Contribution	565,7	9 258

Source: BiGGAR Economics Analysis

4.4 Capital Spending Contribution

4.4.1 The University of Strasbourg

The University of Strasbourg occupies around 600 000 square meters of space spread over more than 120 buildings. Although these buildings are owned by the French Government, responsibility for upgrading and maintaining the estate lies with the University of Strasbourg.

In recent years the University of Strasbourg has invested significantly in its campus. This investment has not only served to improve the quality of research and teaching facilities at the University's disposal but also helped to generate wealth and employment for the local construction sector. Much of this investment has been made possible as a result of the University's success in securing additional funding as part of the Operation Campus programme. This funding will be used to support several flagship projects including:

Operation Campus is an initiative run by the French Ministry of Higher Education and Research. It will provide over €5 billion of funding over the next few years to support major capital investment in 12 campuses across France, including the University of Strasbourg.

- developing an extension to the internationally renowned IRCAD research institute that will provide start-up support and incubation facilities for early-stage biomedical companies;
- relocating the Faculty of Dental Surgery and dental Patient Care Centre to the Civil Hospital;
- constructing a new 14 000 square meter building within the Civil Hospital to accommodate various public administration and intellectual property functions; and
- large-scale modernisation of the National University library of Strasbourg.

Over the ten year period from 2009 to 2019, average expenditure on these types of capital projects is anticipated to be €19,5 million per year. As the nature of the capital projects will vary from year to year, this average annual expenditure figure was used to reflect the fact that the University is likely to periodically invest in major capital development projects over the longer term.

4.4.2 UPMC

Each year UPMC invests in upgrading and developing its estate, activity that generates wealth and supports employment in the local construction sector. The starting point for estimating the value of this contribution is the amount that the University typically spends each year on capital projects. As investment in capital projects tends to vary significantly from year to year this figure was derived based on the average annual expenditure (and anticipated expenditure) over the period 2009 to 2014.

Deriving this figure was complicated by the fact that over the past 20 years UPMC's main Jussieu campus, in the heart of Paris, has undergone an extensive programme of renovation, representing a total investment of €1,7 billion. Although investment in the campus was undertaken by the French Government, this expenditure would not have occurred if the UPMC did not exist so it is reasonable to attribute this impact to the University.

An investment of this scale will have generated a substantial impact for the local construction sector and supported a significant number of jobs for local people; however, the project has now largely been completed so future investment in the campus by the French Government is likely to be much lower. To avoid over estimating the future contribution of capital investment this investment was therefore excluded when estimating average annual capital expenditure, which was equal to €22.4 million per year.

Even after excluding investment by the French Government UPMC's future capital investment plans remain substantial. These plans include proposals to create a new 15 000 sqm innovation park, which is due to commence in 2016 and plans to develop a new conference centre with the capacity for up to 500 delegates.

4.4.3 Université Paris-Sud

Each year Université Paris Sud invests in new and existing buildings and facilities. This investment generates income for the construction companies involved in delivering the projects, which in turn supports construction related employment.

Between 2009 and 2014 the University invested over €61 million on capital projects. One of the largest of these projects was the development of the new Biology, Pharmacology and Chemistry (BPC) building. This project was the result of a decision to co-locate these areas of research to try and exploit synergy between the disciplines.

Over the next five year Université Paris Sud plans to invest a further €270 million on new and upgraded facilities. This means that over the ten years from 2009 to 2019, Université Paris Sud will have spent an average of €30.1 million on capital projects per year.

Although the nature and value of the capital projects varies from year to year, this figure is broadly typical of average annual expenditure and as such can be used to estimate an annual economic contribution.

4.4.4 Universities Combined

This combined expenditure of the Universities was converted into GVA by applying a turnover to GVA ratio for the construction sector as a whole. The employment contribution of this expenditure is estimated by dividing the GVA contribution by an estimate of average GVA per employee in the construction sector.

The indirect contributions of this expenditure can then be calculated by applying GVA and employment multipliers for the construction sector. In this way it can be estimated that the total contribution of construction expenditure by the Universities amounts to €83,9 million in GVA in Europe as a whole, of which €81,4 million occurs in France. This results in an overall employment contribution of 1 147 jobs in Europe, of which 1 130 are supported in France.

The inputs used in calculating this contribution are summarised in Table 4.8 and the results are summarised in Table 4.9.

Table 4.8: The Universities – Inputs for Capital Spending

Capital Spending	Value
Average Annual Capital Expenditure, 2009-2019	€72,0 mn

Source: *The Universities*.

It is assumed that 96% of capital spending is spent in France and 99% in Europe.

Table 4.9: The Universities – Contribution from Capital Spending

	GVA (€mn)	Employment
France		
Direct Contribution	22,3	447
Indirect Contribution	59,1	683
Total Capital Spending Contribution	81,4	1 130
Europe		
Direct Contribution	22,9	452
Indirect Contribution	61,0	695
Total Capital Spending Contribution	83,9	1 147

Source: *BiGGAR Economics Analysis*

4.5 Summary of Core Contributions

The contributions associated with the core activity of receiving income, supporting employment, spending on goods and services and capital projects results in an estimated contribution of €2,523 billion in GVA and 37 066 jobs in France and €2,569 billion in GVA and 39 208 jobs in Europe as a whole. These figures include the multiplier effects of the core activity.

The core contributions are summarised in Table 4.10.

Table 4.10: The Universities – Core Contribution Summary

	GVA (€mn)	Employment
France		
Direct Contribution	1 615,2	23 168
Supplier Contribution	285,8	4 176
Staff Spending Contribution	540,7	8 592
Capital Spend Contribution	81,4	1 130
Total Core Contribution	2 523,0	37 066
Europe		
Direct Contribution	1 615,2	23 168
Supplier Contribution	304,3	5 635
Staff Spending Contribution	565,7	9 258
Capital Spend Contribution	83,9	1 147
Total Core Contribution	2 569,0	39 208

Source: BiGGAR Economics Analysis

5 STUDENT CONTRIBUTION

The contributions covered in this chapter are those associated with students whilst studying, including:

- student spending; and
- students working part-time; and
- student placements.

5.1 Student Population

In 2014 Universities had a combined student population of 106 548 students, of which 63% were undergraduates and the remaining were postgraduate students.

The vast majority (95%) of these students were studying full time and this report only considers the economic contribution of these 101 079 students.

Table 5.1: The Universities – Student Population

	Full time	Other*	Total
Undergraduate	65 062	2 461	67 523
Taught Postgraduate	29 322	630	29 952
Research Postgraduate	6 126	116	6 242
Other	569	2 262	2 831
Total	101 079	5 469	106 548

Source: *The Universities*. *Other includes part-time and distance learning students

5.2 Student Spending

Students create an economic contribution through spending their income in local businesses. In turn these businesses are able to employ more people, which creates further multiplier effects in the local economy.

The basis for calculating the student spending impact is a study undertaken by the UK Government⁶ that considered the level of expenditure of students in the UK. This report considered the expenditure of students on different commodities, including accommodation, entertainment and food costs.

As the costs of living vary from city to city, the expenditure of students is also likely to vary. In order to reflect this, the expenditure per commodity for London, as given in the UK Government report, was adjusted to reflect the comparative cost of living for Paris. This was calculated using the Consumer Price Index (CPI) and Rent Index (RI) for Paris. As data for Strasbourg was not available the profile for Paris was used. This provided an expenditure profile, which was applied to the number of students at the Universities.

This estimates that, on average, students will require €1 179 per month to cover housing, living and social costs while studying. The key inputs used in making these calculations are shown in Table 5.2.

Table 5.2: The Universities – Inputs for Student Spending

The Universities	
Total number of full time students	101 079
Monthly Student Expenditure Profile (€)*	
Accommodation***	366
Travel	210
Food/Household Expenses	232
Entertainment	96
Course Costs (e.g. books, equipment)	59
Other	216
Total Monthly Expenditure	1 179
Term-time Residence**	
France	100%
Europe	100%
Time on Campus**	
Undergraduates (months per year)	9
Postgraduates (months per year)	12

Source: *BiGGAR Economics calculation based on Department of Business, Innovation and Skills, Student Income and Expenditure Survey 2011/2012 and CPI and Rent Indexes** BiGGAR Economics Assumption ***Excludes rent paid to university

We then calculate how much GVA this level of expenditure provides and how many jobs it supports across the relevant sectors of the economy using national level input-output ratios for each sector. The Supplementary Methodological Appendix provides a more detailed description of the methodology used. These ratios vary for each sector depending on the relative amount of capital and labour involved in generating output from each one.

A further round of GVA and employment is then supported indirectly through this level of spending (the indirect effect) and this is estimated by applying sector-specific multipliers to the direct contribution. Finally, these figures are added together to estimate the total contribution of student spending. The results are shown in Table 5.3.

This results in a student spending contribution of €825,9 million GVA and 12 600 jobs in France and €890,7 million GVA and 15 683 jobs in Europe as a whole.

Table 5.3: The Universities – Contribution from Student Spending

	GVA (€mn)	Employment
France		
Direct Contribution	318,7	5 180
Indirect Contribution	507,3	7 420
Total Student Spending Contribution	825,9	12 600
Europe		
Direct Contribution	318,7	5 180
Indirect Contribution	572,0	10 503
Total Student Spending Contribution	890,7	15 683

Source: BiGGAR Economics Analysis

5.3 Part-time Work

Students working part-time can make an important contribution to the local labour market by helping local businesses and organisations to deliver their goods and services.

It is reasonable to assume that some of these jobs may otherwise have been filled by non-students. In order to reflect this we have taken account of local labour market conditions by using the youth unemployment rate in France as an indicator of the availability of replacement labour. France has a youth unemployment rate of 25.4% and based on this the additionality of student labour has been calculated to be 54%. (See Supplementary Methodological Appendix for a full explanation of how this has been calculated.)

The key inputs used in calculating the contribution of student part-time work are shown in Table 5.4.

Table 5.4: The Universities – Inputs for Student Part-time Working

	The Universities
Number of Full Time Students*	101 079
Proportion of students who undertake part-time work*	13%
Number of students who undertake part-time work for the University*	13 510
Additionality of part-time labour **	54%
Average hours worked per week***	15
Number of hours worked per week in FTE equivalent job***	30

Source: *The Universities. **BiGGAR Economics Assumption based on youth unemployment rates. ***BiGGAR Economics assumption

The value of the additional economic activity (GVA) supported by student employment is estimated by applying national ratios of GVA/ employee for the sectors in which students typically work. A further round of GVA and employment is then supported indirectly through this level of spending (the indirect effect) and this is estimated by applying sector-specific multipliers to the direct contribution.

This results in a total contribution from student employment of €141,6 million GVA and 3 743 jobs in France and €149,8 million GVA and 3 923 jobs in Europe (Table 5.5).

Table 5.5: The Universities – Contribution from Student Part-time Working

	GVA (€mn)	Employment
France		
Direct Contribution	89,6	2 158
Indirect Contribution	52,0	1 585
Total Part-time Working Contribution	141,6	3 743
Europe		
Direct Contribution	89,6	2 158
Indirect Contribution	60,2	1 765
Total Part-time Working Contribution	149,8	3 923

Source: BiGGAR Economics Analysis

5.4 Student Placements

A number of degree programmes require students to undertake work placements and these have an impact on the economy through the students' contribution to the organisations they are placed with. Only placements that are longer than 12 weeks have been considered, as shorter placements would not allow students enough time to learn about the organisation's activity sufficiently well to make an effective contribution.

The contribution of these students to the organisations they are placed in is lower than the average output that would be expected by a worker due to a student having less experience and therefore being less productive. To reflect this it is assumed that the GVA of students on placement is 50% of the average workers' GVA. The impact of these placements has been estimated by applying this percentage to the weekly GVA per employee and then to the number of weeks that the placements last.

Table 5.6: The Universities – Inputs for Student Placements

The Universities	
Number of students on placement (medical)*	3 768
Number of students on placement (non-medical)*	4 480
Length of placement (weeks)*	12
Productivity as proportion of sector worker**	50%

Source: *The Universities. ** BiGGAR Economics assumption.

Applying appropriate economic ratios and multipliers as explained in the Supplementary Methodological Appendix, this results in a total contribution from student placements of €111,2 million GVA and 1 588 jobs in France and €112,8 million GVA and 1 588 jobs in Europe (Table 5.7).

Table 5.7: The Universities – Contribution from Student Placements

	GVA (€mn)	Employment
France		
Direct Contribution	68,7	940
Indirect Contribution	42,5	648
Total Placements Contribution	111,2	1 588
Europe		
Direct Contribution	68,7	940
Indirect Contribution	44,2	648
Total Placements Contribution	112,8	1 588

Source: BiGGAR Economics assumption

5.5 Summary of Student Contributions

The economic value associated with student spending and student employment is estimated at €1 078,7 million in GVA and 17 931 jobs in France, and €1 153,4 million in GVA and 21 194 jobs in Europe (Table 5.8).

Table 5.8: The Universities – Economic Contribution from Student Activities

	GVA (€mn)	Employment
France		
Student Spending Contribution	825,9	12 600
Student Working Contribution	141,6	3 743
Student Placement Contribution	111,2	1 588
Total Student Contribution	1 078,7	17 931
Europe		
Student Spending Contribution	890,7	15 683
Student Working Contribution	149,8	3 923
Student Placement Contribution	112,9	1 588
Total Student Contribution	1 153,4	21 194

Source: BiGGAR Economics Analysis

6 KNOWLEDGE TRANSFER, ENTERPRISE AND INNOVATION

This section considers the contribution of knowledge transfer, enterprise and innovation occurring in the economy due to the Universities' activity. This is often referred to as commercialisation or valorisation activity. It relates to the concept of capitalising on the research, technology and skills within the work of the Universities and transferring the benefits more widely through the creation of new businesses and opportunities outside the organisation⁷.

Specifically, we have considered the contribution of six key aspects of knowledge transfer, enterprise and innovation that can reasonably be quantified:

- licensing;
- consultancy;
- contract and collaborative research
- start-up and spin-out companies;
- workforce training (CPD); and
- staff volunteering.

6.1 Licensing

One of the main ways in which 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 Universities.

The amount of royalties paid depends on the details of the licensing agreement and this can vary considerably from company to company. In order to agree a licensing deal, 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 including potential risks to the company, the technology's stage of development, any capital investment which might be required and market conditions.

In 2014, the Universities earned €1,934 million in royalty income from licence agreements for technologies.

⁷ See Section 3 for further discussion on how universities create economic impact through knowledge transfer.

Table 6.1: The Universities – Inputs for the Value of Licensing

The Universities	
Licensing Income	€1,934
Companies located in France	96%
Companies located in Europe	98%

Source: *The Universities*

The Supplementary Methodological Appendix describes the methodology used to convert this into turnover and then into GVA. The accompanying contribution to employment is then calculated by dividing the GVA contribution by an estimate of the average GVA added by each employee in these sectors. The effect of subsequent spending rounds is captured by applying GVA and employment multipliers.

In this way it can be estimated that the licensing activity of the Universities contributes €40,2 million GVA to the French economy and supports 464 jobs, and contributes €41,6 million GVA to the European economy and 527 jobs.

Table 6.2: The Universities– Contribution from Licensing

	GVA (€mn)	Employment
France	40,2	464
Europe	41,6	527

Source: *BiGGAR Economics Analysis*

6.2 Consultancy

Businesses and organisations benefit from academic knowledge through contracting the universities to undertake consultancy projects. In France such contracts are regarded as private transactions between the academic and the company involved and as such the University does not record data on the value of consultancy undertaken.

Regardless of the nature of the contractual arrangement, companies appoint academics to undertake consultancy because of their professional expertise and academic qualifications, which are directly linked to their role within the university. For this reason it is reasonable to attribute the impact of this activity to the University.

It was assumed that in 2014, academic staff from each of the Universities undertook consultancy contracts with an average value of €1 464 per employee. This assumption is an average based on all LERU Universities that provided consultancy data and accounts for the fact that the LERU Universities that do not report this data are likely to have less consultancy activity. This average was then multiplied by the number of employees to provide an estimate of consultancy income.

The majority of these consultancy contracts, 90%, are assumed to be with companies based in France. The method used for estimating the economic contribution made by consultancy contracts is explained in detail in the Supplementary Methodological Appendix.

Table 6.3: The Universities– Inputs for the Value of Consultancy

The Universities	
Average consultancy income per FTE *	€1 464
Total Number of Staff (fte)*	23,168
Estimated total consultancy income**	€33,9 mn
Proportion of consultancy clients in France***	90%
Proportion of consultancy clients in the rest of Europe***	10%
Direct GVA contribution from research****	360%

Source: *BiGGAR Economics calculation based on data provided by LERU Universities. **BiGGAR Economics calculation. ***BiGGAR Economics Assumption. ****BiGGAR Economics previous research

In this way it can be estimated that consultancy projects at the Universities contribute €338,5 million GVA and support 3 976 jobs in France and €373,1 million GVA and 5 726 jobs in Europe.

Table 6.4: The Universities – Economic Contribution from Consultancy Activity

	GVA (€mn)	Employment
France	338,5	3 976
Europe	373,1	5 276

Source: BiGGAR Economics

6.3 Contract and Collaborative Research

The benefits of the research activity undertaken by the Universities are not restricted to activity directly undertaken by academic researchers but also include the benefits of collaborative research and consultancy ventures with partners both nationally and internationally. Although the extent of this effect is difficult to quantify, collaborative research is of such importance to the French economy that it is essential that this contribution be considered.

An important feature of academic research is that it does not typically represent the final stage of technology development process i.e. in general it tends to be focused at an intermediate stage in the technology development cycle and is unlikely to lead to immediate full scale commercial production or application.

In order for the full results of such research to be realised, it is normally necessary for industrial partners to undertake further development work. The amount of subsequent research investment required will depend on the readiness level of the technology concerned and is likely to vary significantly between projects and could amount to many times the original investment.

It is possible to estimate how much collaborative research is worth to the economy based on the amount of income the Universities secures from industry each year. This income represents direct investment by private companies in research undertaken by academic researchers. It is then possible to calculate the value of this activity to the French economy by applying an assumed multiplier for the relevant group of industries.

Previous studies by BiGGAR Economics have found that companies that were involved with research contracts with universities generate an average of 360% direct GVA contribution over time to their investment in research. The increased GVA in these companies is supported by increased employment in these companies. These inputs and assumptions were used to calculate the direct contribution of private investment in research and development at the university. The total economic contribution (or value) was then calculated based on the appropriate multipliers and ratios for the industries involved.

In 2014 the University combined received €86,6 million in contract research income. The inputs used to estimate the economic contribution of contract and collaborative research are presented in Table 6.5.

Table 6.5: The Universities – Inputs for the Value of Contract and Collaborative Research

The Universities	
Total Contract and Collaborative Research Income*	€86,5 mn
Location of Research Income	
France*	94%
Rest of Europe*	6%
Returns to Research	
Direct GVA Contribution from Research**	360%

Source: *The Universities. **Previous BiGGAR Economic Research

Using these inputs and applying appropriate economic ratios and multipliers as explained in the Supplementary Methodological Appendix suggests that industrial spillover effects attributable to the Universities contribute €1 149,8 million GVA to the European economy each year and supports 14 737 jobs. This is summarised in Table 6.6.

Table 6.6: The Universities – Contribution from Contract and Collaborative Research

	GVA (€mn)	Employment
France	1 085,8	12 544
Europe	1 149,8	14 737

Source: BiGGAR Economics Analysis

6.4 Start-ups and Spin-outs

The Universities contributes to the economy through the creation of start-up and spin-out companies. Chapter 3 contains a discussion on the way in which universities can contribute to wider economic development in the regions in which they are located.

In 2014 the Universities combined had 165 active start-up and spin-out companies. These companies employ 830 people between them.

The economic contribution of these companies is found by converting the estimated turnover of each company into GVA by applying industry ratios. The contribution to employment is found by then applying the relevant

GVA/employment ratios. The indirect contribution is calculated by applying sector-specific multipliers to these base figures.

Table 6.7: The Universities – Inputs for the Value of Start-ups and Spin-outs

The Universities	
Number of Active Start-ups/Spin-outs*	165
Direct Employment** **	830

Source: *The Universities. **BiGGAR Economics calculation based on data provided by LERU Universities

The contribution of start-ups and spin-outs is estimated at €188,2 million in GVA and 2 439 jobs in France and €188,2 million and 2 623 jobs in Europe.

Table 6.8: The Universities – Contribution from Start-ups and Spin-outs

	GVA (€mn)	Employment
France	188,2	2 439
Europe	188,2*	2 623

Source: BiGGAR Economics Analysis. *GVA figures for France and Europe are the same due to multiplier effects. For a discussion of this see Supplementary Methodological Appendix Section 3.4.1.2

6.5 Workforce Training (CPD)

Workforce training or continuing professional development (CPD) has a positive impact on the productivity of organisations and business through bringing about an improvement in the skills and knowledge of their employees.

However, the nature of CPD is that it will increase the productivity of an existing workforce, rather than increasing GVA by increasing employment. Therefore there would be no material increase in direct employment as a result of investing in CPD.

In 2014 the Universities received €13,9 million in income from CPD courses. Attendees based at the University were excluded from the analysis to avoid double counting.

Table 6.9: The Universities – Inputs for the Value of Workforce Training

The Universities	
Income received from professional training*	€13,9 mn
% of attendees who are normally based at the University*	40%
% of attendees who travelled from outside France to attend events*	10%
Private returns to CPD investment**	360%

Source: *The Universities. **BiGGAR Economics previous research

Applying economic ratios and multipliers as previously explained, results in a contribution of €32,3 million GVA in France and €35,0 million GVA across Europe.

Table 6.10: The Universities – Economic Contribution from Workforce Training

	GVA (€mn)
France	32,3
Europe	35,0

Source: BiGGAR Economics Analysis

6.6 Staff Volunteering

Staff at the Universities often contribute their time to public and charitable bodies which is outwith their contracted hours. However it is their expertise and association with the university that enable them to make these contributions. The activities that staff participate in include:

- contributing to policy development;
- contributing to professional organisations; and
- volunteering.

The time that staff contribute to external bodies also benefits the university itself as it allows staff to further develop their skills in a non-university environment. For example, an academic member of staff contributing to a committee assessing research funding applications will simultaneously develop their own application writing skills.

The proportion of time that staff contribute to such activity is likely to vary and is not routinely collected and analysed. However, to give some indication of its value, it has been assumed that the time staff work on social and voluntary activities is equivalent to 7.5% of their working hours (approximately 2.5 hours per week). Therefore the costs which would be associated with this, if the public and charitable bodies were to pay equivalently qualified people, is equivalent to 7.5% of the total staff costs of the Universities. This takes into account that more senior staff are likely to spend a higher proportion of their time on such activities, while junior staff are unlikely to spend as much time.

Using these inputs and applying appropriate economic ratios and multipliers as explained in the Supplementary Methodological Appendix suggests that the total value of staff time which is given voluntarily to external organisations is €101,5 million GVA in France and €102,0 million GVA in Europe. The nature of this type of activity is that it will contribute to increasing productivity of the organisations volunteered for and therefore will have a GVA impact rather than an employment impact.

Table 6.11: The Universities – Economic Contribution from Staff Volunteering

	GVA (€mn)
France	101,5
Europe	102,0

Source: BiGGAR Economics Analysis

6.7 Summary of Quantifiable Knowledge Transfer, Enterprise and Innovation Contributions

The combined contribution due to knowledge transfer, enterprise and innovation activity generated by and sustained by the Universities is €1 786,5 million GVA and 19 423 jobs in France and €1 889,7 million GVA and 23 163 jobs in Europe (Table 6.12).

Table 6.12: The Universities – Contribution from Knowledge Transfer Activities

	GVA (€mn)	Employment
France		
Licencing	40,2	464
Consultancy	338,5	3 976
Contract and Collaborative Research	1 085,8	12 544
Spin-outs and Start-Ups	188,2	2 439
Workforce Training (CPD)	32,3	-
Staff Volunteering	101,5	-
Total Knowledge Transfer Contribution	1 786,5	19 423
Europe		
Licencing	41,6	527
Consultancy	373,1	5 276
Contract and Collaborative Research	1 149,8	14 737
Spin-outs and Start-Ups	188,2	2 623
Workforce Training (CPD)	35,0	-
Staff Volunteering	102,0	-
Total Knowledge Transfer Contribution	1 889,7	23 163

Source: BiGGAR Economics Analysis

6.8 Wider Impact of Research

6.8.1 University of Strasbourg

In addition to the quantifiable contribution that the University of Strasbourg makes through its knowledge transfer activity, the University is also indirectly responsible for attracting a significant amount of inward investment to the City.

The Carnot network was established in 2006 with the aim of developing partnership-based research involving public laboratories, industry and other important socio-economic players. The Carnot Label is granted for a five-year renewable period to public research structures. There are now 34 Carnot Institutes across France, including two connected with the University of Strasbourg.

For example the University's strength in materials engineering and telecom physics research has enabled it to attract two prestigious Carnot Institutes to Strasbourg: the Materials Institute

Carnot Alsace (MICA) and Telecom and Digital Society. Both of these institutes generate wealth and employment in Strasbourg, which is indirectly attributable to the University.

The University of Strasbourg has also helped to attract three other important international institutions to Strasbourg:

- **the Human Frontier Science Programme** – a European programme headquartered in Strasbourg that funds international frontier research projects in the field of life sciences;
- **European Science Foundation** – the European body responsible for driving progress in research and innovation across the EU; and
- **International Space University** – a private non-profit institution that specialises in providing graduate-level training to the future leaders of the emerging global space community.

Although the presence of the University of Strasbourg is not the only reason why these institutions are located in Strasbourg (the City's status as a major European diplomatic centre is also likely to have been important) it is believed to have been influential. It is therefore reasonable to attribute some of the impact of these institutions to the University.

As it is impossible to accurately assess the extent to which the presence of the University has contributed to the decision to locate each of these institutions in France it is not possible to quantify this benefit. It is however reasonable to assume that the wealth they generate and employment they support in the City is to some extent attributable to the University.

6.8.2 UPMC

Research undertaken at UPMC has helped to generate substantial health care benefits for different groups of people all over the world.

A good example of this are the health care benefits associated with UPMC's research on AIDS and the subsequent application of this research in the treatment of the condition. As highlighted above, the outputs from UPMC research are now used in around 90% of the anti AIDS drugs used around the world today.

According to the World Health Organization (WHO), Exit Disclaimer there were approximately 35 million people worldwide living with HIV/AIDS in 2013. Of these, 3,2 million were children. It is also estimated that 9,7 million of these people are currently receiving treatment for their condition. This implies that the AIDS research undertaken by UPMC has helped to improve the lives of 8,7 million people around the world.

UPMC has also been very influential in the development of treatments for eye disease. In 2005 this led to the creation of Fovea Pharmaceuticals, which was subsequently acquired by Sanofi-Aventis in a deal worth €370 million. It also led to the creation of a specialist vision institute, which aims to further understanding of the aging of the visual system and enable this understanding to be exploited for the benefit of visually impaired people.

To help fulfil this objective the Vision Institute has initiated a number of innovative platforms including StreetLab and HomeLab. These platforms enable researchers

to evaluate the performance of innovative technology solutions for the visually impaired within an artificial environment that closely mimics conditions that might be found in a real shopping street or home. The aim of these testing platforms is to enable researchers to collaborate directly with industry in order to design and develop effective technological solutions for the visually impaired.

These examples illustrate just two of the ways in which research undertaken at UPMC is helping to generate wider benefits for society. It is impossible to measure the value of such benefits on the lives of the people affected. This means the impact quantified in the previous section should be treated as a conservative estimate of the true value that UPMC research and knowledge transfer activity generates for society as a whole.

6.8.3 Université Paris-Sud

Université Paris Sud has long-established strengths in the fields of medicine and mathematics and by bringing these disciplines together has also been able to develop distinctive expertise in public health. In 1999 this resulted in the creation of the first doctoral school of public health in France. Since its creation the School has trained more than 200 doctors.

The School is involved with several major public health studies involving large cohorts of participants and has also been responsible for establishing a national register of cancer sufferers. These types of studies help to further understanding of the factors that affect disease, which is very important for medical research and ultimately public health. Although improving public health is an important objective in its own right, it also has an economic dimension because better public health helps to improve economic productivity by reducing the amount of time lost to ill health each year.

Additionally, the central role that Université Paris Sud is playing in the creation of Paris Saclay makes growth in these areas of activity very likely. The Paris Saclay initiative is specifically intended to drive economic renewal in France by fostering close and flexible interaction between higher education, public and private research institutes, major companies and technology SMEs and start-ups. As the initiative becomes more established, opportunities for collaborating with industry should increase, which should in turn increase the amount of knowledge transfer activity undertaken and the impact that this activity generates for the French economy.

7 TOURISM CONTRIBUTION

This section considers the contribution that the Universities make to tourism in the area. This contribution arises from:

- visits from friends and family to staff and students; and
- visitors who come to Strasbourg or Paris to attend conferences or other events held at the University.

7.1 Visits to Staff and Students

The presence of staff and students in the area creates an economic contribution through visits from their friends and family. These visitors spend money in the economy and this spending increases turnover in local businesses, which in turn supports local employment.

The contribution of visits to staff and students has been calculated by assessing the number of visits from friends and family per head of the population as estimated by the Eurostat data for 2012.

We then applied this ratio to the total number of staff and students at the Universities. Next, we applied an estimate of trip expenditure per visit. The economic contribution in the study areas was found by converting trip spend (turnover) to GVA and employment and applying multipliers to estimate the indirect and induced effect of this level of spending. The inputs used and the resulting contribution is shown in Tables 7.1 and 7.2.

This results in an estimated economic contribution from visits to staff and students of €28,4 million GVA and 421 jobs in France and €28,7 million GVA and 474 jobs in Europe as a whole.

Table 7.1: The Universities – Inputs for Visits to Staff and Students

The Universities	
Total number staff & students*	123 413**
No. of visits per staff/student***	1,59
Total number of visits from friends and family****	196 355
Trip spend per domestic visitor**	€145,1

Source: *The Universities. **Number does not match staff totals as excludes small number of staff not based in France ***Eurostat. ****BiGGAR Economics calculation.

Table 7.2: The Universities – Contribution from Visits to Staff and Students

	GVA (€mn)	Employment
France		
Direct Contribution	9,5	150
Indirect Contribution	19,0	271
Total Visitor Contribution	28,4	421
Europe		
Direct Contribution	9,5	150
Indirect Contribution	19,2	324
Total Visitor Contribution	28,7	474

Source: BiGGAR Economics Analysis

7.2 Conference & Event Contribution

Strasbourg and Paris are important international conference destinations and the Universities make an important contribution to this by organising conferences and events that attract people who would not otherwise have visited.

The Universities' conferences and events involved over 80 000 attendees in 2014. 5% of these attendees were assumed to be from outside Europe and a further 10% from outside France. 25% were assumed to be from the immediate area and their expenditure was therefore not additional.

Applying expenditure data on business trips from Eurostat data, we can estimate the additional total turnover generated by people attending conferences organised by the Universities. This is converted to additional GVA and employment by using ratios and multipliers appropriate to the sector.

The inputs used are shown in Table 7.3 and the resulting contribution is presented in Table 7.4.

Table 7.3: The Universities – Inputs for Conference & Events

	The Universities
Average number of conference attendees per fte*	4.70
No. of delegates to organised conferences and events at the Universities**	80 301
Average duration of each event (days)***	2
Estimated % of attendees normally based at the University***	25%
Estimated % of attendees who travelled from outside France***	10%
Estimated % of attendees who travelled from outside Europe***	5%
Trip spend per visitor on business****	€307,1

Source: *BiGGAR Economics calculation based on data provided by LERU Universities. ** BiGGAR Economics calculation based on average number of conference attendees per fte. *** BiGGAR Economics Assumption. ****Eurostat.

This results in an economic contribution from conferences of an estimated €20,4 million GVA and 301 jobs in France and €20,5 million GVA and 339 jobs in Europe as a whole.

Table 7.4: The Universities – Contribution from Conference & Events

	GVA (€mn)	Employment
France		
Direct Contribution	6,8	107
Indirect Contribution	13,6	194
Total Conferences Contribution	20,4	301
Europe		
Direct Contribution	6,8	107
Indirect Contribution	13,8	232
Total Conferences Contribution	20,5	339

Source: BiGGAR Economics Analysis

7.3 Summary of Tourism Contributions

The contribution of the Universities to the economy through attracting visitors results in an estimated €48,8 million additional GVA and 722 jobs per year in France and €49,2 million additional GVA and 813 jobs per year in Europe as a whole.

Table 7.5: The Universities – Economic Contribution from Tourism

	GVA (€mn)	Employment
France		
Visits to Staff and Students	28,4	421
Visits to Conferences and Events	20,4	301
Total Tourism Contribution	48,8	722
Europe		
Visits to Staff and Students	28,7	474
Visits to Conferences and Events	20,5	339
Total Tourism Contribution	49,2	813

Source: BiGGAR Economics Analysis

8 GRADUATE PREMIUM

8.1 Graduate Premium

One of the most important ways universities generate economic impact is through their graduates. The skills students learn and the experiences they have while at university directly enhances their future productivity. This enables them to contribute more to their employer and generate a greater benefit for the national economy than they would otherwise be able to.

The GVA of this productivity gain includes the additional profits that graduate 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.

As the subject of graduate earnings premiums has been well researched information about the earnings premium of graduates 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 & Skills⁸, 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 OECD⁹ 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.

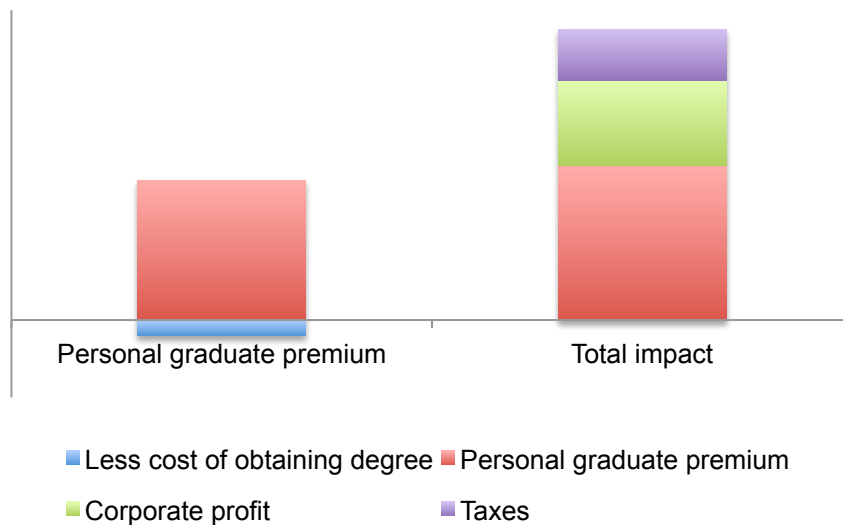
The analysis considered the after tax earnings of a graduate compared to the after tax earnings of a non-graduate. Direct costs, such as tuition fees less student support, and indirect costs, such as foregone earnings, were then subtracted from the gross graduate premium for each degree subject to give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

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 or the taxes paid to the Treasury. As illustrated in Figure 8.1 the impact presented in this section is therefore likely to underestimate the full impact that graduates generate for their national economies.

⁸ Department for Business Innovation & Skills (June 2011), The Returns to Higher Education Qualifications.

⁹ OECD, Education at a Glance: OECD Indicators series

Figure 8.1 – Personal Graduate Premium Benefit Vs. Economic Benefit



8.2 Estimating the Graduate Premium

Looking specifically at the educational aspect of the work of the Universities, there is a lifetime earnings premium generated by training graduates across a spectrum of subjects that occurs as a direct result of an individual possessing a university qualification.

The economic value of teaching and learning are a different kind of contribution, compared to the others described in previous chapters, because this contribution occurs over the *working lifetime of graduates* rather than in the year of their graduation. These contributions would not have been realised in 2014, which is the year our analysis covers. However, in 2014 graduates from previous years will be creating these contributions and this has not been captured elsewhere in this study. Therefore the future contribution of the 2014 cohort of graduates have been quantified and added in to ensure that the full contribution of teaching and learning is reflected in the analysis.

The key inputs used in estimating the value of the graduate premium are shown in Table 8.1 and the full description of how these were derived and applied can be found in the Supplementary Methodological Appendix.

Table 8.1: The Universities – Inputs for Graduate Premium

The Universities	
Total number of first degree graduates	11 285
Total number of postgraduate graduates	14 786
% graduates living in France	94%*
% graduates living in Europe	95%*

Source: *The Universities*. *BiGGAR Economics Assumption

This results in a predicted contribution of €1 813,7 million in France and €1 885,3 million in Europe as a whole as a result of people graduating in any subject from

the Universities in 2014. As this contribution is a productivity gain it is measured in terms of GVA and consequently does not have associated employment gains.

Table 8.2: The Universites – Graduate Premium Contribution

	GVA (€mn)
France	1 813,7
Europe	1 885,3

Source: BiGGAR Economics Analysis

9 SUMMARY ECONOMIC CONTRIBUTION

9.1 Total Contribution

By bringing together the various sources of economic value discussed in this report it can be estimated that the Universities contribute:

- GVA of €7 250,7 million and supports 75 142 jobs in France; and
- GVA of €7 546,7 million and supports 84 378 jobs in Europe as a whole (including France).

In 2014 the Universities directly contributed €1 615,2 million to the French economy and generated a total quantifiable contribution of €7 250,7 million GVA. This implies that the GVA multiplier of the Universities is 4,49 and means that each €1 GVA directly generated by the Universities contributes €4,49 to the European economy.

In 2014 the Universities directly contributed €1 615,2 million to the European economy and generated a total quantifiable contribution of €7 546,7 million GVA. This implies that the GVA multiplier of the Universities is 4,67 and means that each €1 GVA directly generated by the Universities contributes €4,67 to the European economy.

The Universities supported 75 142 jobs in France, which includes 23 168 people directly employed by the Universities. This implies that each job directly created by the University supported 3,24 jobs throughout Europe.

The Universities supported 84 378 jobs in Europe, which includes 23 168 people directly employed by the Universities. This implies that each job directly created by the University supported 3,64 jobs throughout Europe.

In 2014 the Universities received €1 905,4 million in income and generated a total economic contribution of €7 250,7 million GVA to the French economy. This implies that the University generated €3,81 in the French economy for every €1 income earned.

In 2014 the Universities received €1 905,4 million in income and generated a total economic contribution of €7 546,7 million GVA to the European economy. This implies that the University generated €3,96 in the European economy for every €1 income earned.

A breakdown of all economic contributions that can be quantified is provided in Table 9.1.

Table 9.1 – The Universities – Summary of Economic Contributions

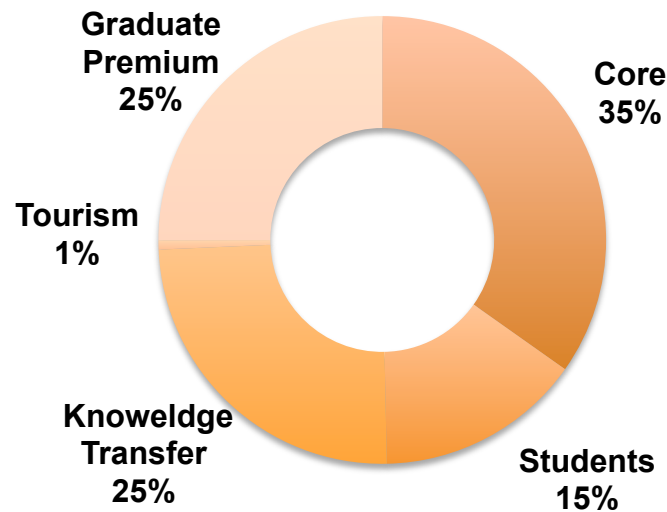
	France		Europe	
	GVA (€mn)	Jobs	GVA (€mn)	Jobs
Core Contribution	2 523,0	37 066	2 569,0	39 208
Direct Contribution	1 615,2	23 168	1 615,2	23 168
Supplier Contribution	285,8	4 176	304,3	5 635
Staff Spending Contribution	540,7	8 592	565,7	9 258
Capital Spending Contribution	81,4	1 130	83,9	1 147
Student Contribution	1 078,7	17 931	1 153,4	21 194
Student Spending	825,9	12 600	890,7	15 683
Student Working	141,6	3 743	149,8	3 923
Student Placements	111,2	1 588	112,8	1 588
Knowledge Transfer Contribution	1 786,5	19 423	1 889,8	23 162
Licensing	40,2	464	41,6	527
Consultancy	338,5	3 976	373,1	5 276
Contract and Collaborative Research	1 085,8	12 544	1 149,8	14 737
Start-ups and Spin-outs	188,2	2 439	188,2	2 623
Workforce Training (CPD)	32,3	-	35,0	-
Staff Volunteering	101,5	-	102,0	-
Tourism Contribution	48,8	722	49,2	813
Visits to Staff & Students	28,4	421	28,7	474
Conferences & Events	20,4	301	20,5	339
Sub-Total	5 437,0	75 142	5 661,4	84 378
Graduate Premium	1 813,7	-	1 885,3	-
Total	7 250,7	75 142	7 546,7	84 378

Source: BiGGAR Economics Analysis, figures may not total due to rounding

9.2 Contribution by Source of Impact

The figure below shows that the largest types of contribution generated by the Universities are those associated with core operations such as direct employment, expenditure on supplies, staff expenditure and capital expenditure. Core operations account for 35% of economic contribution at the national level, providing €2 523,0 million in GVA and more than 37 066 jobs to the French economy.

Figure 9.1 – GVA Contribution by Source, France



**Percentages may not total to 100 due to rounding*

The Universities deliver a strong economic contribution as a result of knowledge transfer activities, including licensing, consultancy, research, new companies, workforce training and staff volunteering. Together, these activities contribute €1 786,5 million in GVA and over 19 423 jobs to the French economy, making up 25% of the Universities' overall economic contribution to France. This is testament to the strength of the research intensive model in creating benefits for the nation that go well beyond their perceived primary aim of creating knowledge.

Students who come to the Universities to live, study and work bring with them considerable spending power. They deliver 15% of the economic contribution of the Universities, providing €1 078,7 million in GVA and 17 931 jobs to the French economy. When they graduate, they continue to provide economic benefits, with their lifetime earnings reflecting the economic value of the teaching and learning experienced at the University. This graduate premium provides a further 25% of the institutions' economic contribution, equivalent to €1 813,7 million.

The University sector is not designed to be a provider of tourism revenue to the national economy. However, its contribution to the tourism sector is not to be understated, at €48,8 million in GVA and 722 jobs.

9.3 Economic Contribution of French Research Universities

The three French universities that are members of LERU, the University of Strasbourg, UPMC and Université Paris-Sud, represent three of the 16 members of La Coordination des universités de recherche intensive françaises (CURIF).

The results from this study can be used to estimate the economic contribution of the research universities sector in France as a whole, by using the findings as a sample that can then be grossed-up to the level of the whole group of research universities.

The University of Strasbourg, UPMC and Université Paris-Sud together account for 21% of the students enrolled at CURIF universities, 25% of the total budget

and 23,5% of staff. It would therefore be reasonable to consider the three LERU members to represent around 23% of the French research universities sector.

On that basis, the overall economic contribution of the French research universities sector is estimated at:

- GVA of €31 524,8 million and supports 326 704 jobs in France; and
- GVA of €32 811,7 million and supports 366 861 jobs in Europe as a whole (including France).

This approach is likely to underestimate the full economic contribution of the French research universities. This is because it will not take into account the catalytic impacts that having multiple research universities in a country or region will have on that area and its ability to support development. Similarly, impacts that have only been considered partly attributable to the individual universities, (for example, Science Parks will have a higher additionality when the whole sector is considered).

10 CONCLUSIONS

This study has examined the contribution that the three French universities that are members of LERU, the University of Strasbourg, UPMC and Université Paris-Sud, make to the economies of France and of Europe. In order to do this the quantifiable economic value generated by the wide-ranging activities of the Universities has been considered. This included the contribution from their core activities, students while they are studying and after graduating, knowledge transfer and commercialisation activities and attracting visitors.

In 2014 the Universities are estimated to have generated a total economic value of €7,25 billion in GVA and 75 142 jobs in France and €7,55 billion in GVA and a total of 84 378 jobs across Europe.

The scale of this impact is substantial, and implies that each €1 GVA directly generated by the Universities contributes almost €4,67 to the French economy and every job directly created by the Universities supports almost 3,24 jobs in the French economy as a whole.

Although the magnitude of this contribution is considerable, the true contribution of research universities is much larger than these figures indicate, as there are limitations to assessing economic contribution.

For example, the Universities are collectively engaged in a wide range of world-leading research that will ultimately provide the foundations for the technologies of the future to be developed. However these significant time lags make it difficult to account for these contributions. In addition, many technological and medical breakthroughs are collaborative efforts building on the research undertaken by other universities and industry partners. They are also often the result of an open innovation approach whereby universities co-locate with companies and knowledge spill-over effects come into play. Therefore even if all the contributions could be quantified the significant interplay would make it impossible to separate these effects.

Additionally, research universities have many wider impacts, which although unquantifiable, are equally important. For example, the Universities are involved in medical research and even when the outputs of research are commercialised or translated directly into clinical practice it is impossible to quantify the wider benefits that this has for society.

Research universities also impact wider society by improving social cohesion, facilitating social mobility, encouraging better health and wellbeing and greater civic engagement. Furthermore, each of the Universities contributes to the overall character and vibrancy of the cities and regions in which they are located by attracting students, staff and tourists to the area. The value of these outcomes to individuals and the collective impact on society as a whole simply cannot be quantified but should not be overlooked.

Research universities also have a crucial overarching role as drivers of long term sustainable economic growth. Economic growth in advanced economies is driven by productivity growth, which is in turn driven by knowledge and its diffusion (innovation). Research universities have a unique role to play in this by pushing the boundaries of academic discovery and increasing the pool of knowledge available to society and, at least as importantly, their ability to diffuse this

knowledge throughout the economy to provide the basis for future productivity improvements and therefore economic growth. Research universities support the diffusion of knowledge by providing high quality graduates for the labour market as well as through their commercialisation activities, such as spin-out companies and intellectual property licensing. In doing so they contribute to the strategic aim of Horizon 2020, to achieve economic growth and create jobs by investing in research and innovation. Particularly in the current economic climate the role of Research universities in driving economic growth should not be underestimated.

Moreover, research universities create highly successful innovation ecosystems that are major clusters of activity. They provide a space for discussion and create connections between academics, students and companies. They therefore make the regions they are located in attractive places to invest in and so are vital to drawing inward investment. This university ecosystem is entirely built on the world-class research undertaken at research universities, as it is this that attracts students, researchers, businesses and investment, helping to catalyse innovation and create the knowledge sectors of the future.

Each of the three Universities interacts with its local and regional economic strengths. The University of Strasbourg is based in an important diplomatic city attracting a wide range of organisations and institutions to the economic and political influence that resides here. The presence of a strong academic institution in the city plays a role in the region's attractiveness. The University's international profile is reflected in its student population attracting around one in five of its students from abroad.

UPMC provides a focus for significant economic activity in the centre of Paris, contributing to the vibrancy of the historic Latin Quarter. A substantial part of its impact is in the field of knowledge transfer; UPMC engages with industry and supports the commercialisation of intellectual property, through a collaborative approach to knowledge transfer. This activity is of fundamental importance to the French economy because it ensures that innovations developed within the University do not remain within the University but can instead be exploited for the benefit of the French economy and society as a whole.

Université Paris-Sud makes a substantial impact on the French economy and on the local area in which it is based. Its unique location also means it is well placed to act as an anchor institution for the Paris Saclay campus. The University's focus on establishing long-term relationships with industry partners and undertaking collaborative projects with them to meet their needs should also boost the attractiveness of the Paris Saclay campus as a hub for innovative businesses.

This report has demonstrated the significant ways that the University of Strasbourg, UPMC and Université Paris-Sud deliver positive economic benefits to the people of France.

This study has been undertaken in parallel with an assessment of the economic contribution of research universities across Europe. The French higher education and research systems are structured in a different way from most other European countries, including the co-existence of the universities with national research institutions and with the grandes écoles. This structure can mean that French universities may not score as highly in international comparative studies and rankings as might be expected since they may not be assessed on a like-for-like basis (for example, research undertaken in partnership with national research

institutions would not be attributed to the French universities while funding from national research organisations would be included as part of the research income to universities in many other countries).

However, despite these differences, the study has found that the University of Strasbourg, UPMC and Université Paris-Sud, make similar economic contributions as other LERU members, including those that are internationally recognised for the excellence of their education and research and as drivers of regional and national economic development. The other members of LERU are: University of Amsterdam, Universitat de Barcelona, University of Cambridge, University of Edinburgh, University of Freiburg, Université de Genève, Universität Heidelberg, University of Helsinki, Universiteit Leiden, KU Leuven, Imperial College London, University College London, Lund University, University of Milan, Ludwig-Maximilians-Universität München, University of Oxford, Utrecht University and University of Zurich.

This should not be a surprise, since the generation of new knowledge through research and the diffusion of that knowledge through education and knowledge transfer activity, the twin drivers of productivity growth in an advanced economy are by their nature collaborative activities. So, for example, the Universities and the national research institutions are mutually supportive and work closely together, as part of a wider culture of collaboration with industry and with international researchers.

There are also features of research universities that mean they have a particularly important role in the wider French economy. Many of the graduates from research universities are in fields such as medicine, sciences and engineering, all of which have high levels of 'graduate premium', meaning that they are associated with long term productivity benefits for the economy. The research undertaken at the Universities and associated knowledge transfer activities mean that they provide the ideas that drive productivity improvement in existing sectors of the economy and the foundation for the emergence of new sectors. Furthermore, the combination of the research base and availability of high quality graduates help to retain and attract leading companies.

In summary, this study has found that the benefits of the three French universities that are members of LERU, the University of Strasbourg, UPMC and Université Paris-Sud, to the economies of France and Europe are much greater than the costs of the three institutions.

11 APPENDIX A – ABBREVIATIONS AND TERMS

This section contains a list of common abbreviations and terms used in this report.

Assumptions are the data upon which calculations are based.

FTE (or fte) – Full Time Equivalent a unit to measure employed persons or students in a way that makes them comparable although they may work or study a different number of hours per week. The unit is obtained by comparing an employee's or student's average number of hours worked to the average number of hours of a full-time worker or student. A full-time person is therefore counted as one FTE, while a part-time worker / student gets a score in proportion to the hours he or she works or studies. For example, a part-time worker employed for 20 hours a week where full-time work consists of 40 hours, is counted as 0,5 FTE.

GDP – Gross Domestic Product refers to the market value of all final goods and services produced within a Country in a given period.

GVA – Gross Value Added is also a measure of the value of goods and services produced in an area, industry or sector. GVA is linked to Gross Domestic Product (GDP) because both are measures of output. The relationship is defined as:

$$\text{GVA} + \text{taxes on products} - \text{subsidies on products} = \text{GDP}$$

As the total aggregates of taxes on products and subsidies on products are only available at whole economy level, GVA is used for measuring entities smaller than a whole economy (such as universities). In simple terms at the level of an organisation, it is represented by turnover less the non-labour costs of production.

GVA/turnover ratio is a measure of the relationship between the total turnover of a particular sector and the GVA it generates. It is calculated by dividing total GVA by total turnover and can be used to estimate how much GVA will be created as a result of an increase in output (turnover or expenditure).

Spin-outs are companies that are created to commercialise a university's intellectual property; usually involving a licensing agreement and/or staff transfer.

Start-ups are businesses that are set up by university staff and/or former students. Although such companies will draw on the experience acquired by the founders during their time at the university, they have no formal intellectual property relationship with the university.