The Economic Contribution of the Flemish Universities

VLIR Vlaamse Interuniversitaire Raad

A report prepared by

BiGGAR Economics

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BiGGAR Economics
Pentlands Science Park
Bush Loan, Penicuik
Midlothian, Scotland, EH26 0PZ
+44 131 514 0850
info@biggareconomics.co.uk
www.biggareconomics.co.uk

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Our thanks also go to those who helped organise the site visits and interviews given to members of our study team. The discussions that took place during these visits helped to inform the structure of our model and the format of our final report.

1 EXECUTIVE SUMMARY

In Autumn 2017, BiGGAR Economics was invited by VLIR to quantify the economic contribution created by the five Flemish Universities[1]. This report presents the findings of the study.

With a combined income of € 2.2 billion each year, a staff complement of 32,000 people, and 125,200 Bachelors and Masters students, the Flemish Universities have a significant presence in Flanders. They are complex organisations that interact on many levels to create multiple, separate benefits to individuals, society, industry, organisations and public services. While firmly based in Flanders[2], the Flemish Universities have a global reach and are able to attract people and investment from around the world.

As well as producers of intellectual capital and high-quality research, the Flemish Universities also make important contributions to other socially valuable outcomes, such as improving social cohesion, facilitating social mobility, encouraging better health and wellbeing and facilitating greater civic engagement. The value of these outcomes to individuals and to society as a whole simply cannot be quantified.

The quantifiable economic contribution is therefore one of many impacts that the Flemish Universities have on the economy, on individuals and on society and it is essential that their economic contribution, as set out in this report, is understood within this wider context.

1.1 Key Quantifiable Findings

In 2016, the Flemish Universities are estimated to have contributed **€ 12.0 billion GVA** and **121,800 jobs** throughout Europe**.** Around 82% of the GVA contribution and 75% of the jobs contribution occurs within Flanders where the estimated overall economic contribution is **€ 9.8 billion GVA**[3] and **91,800 jobs.**

This implies that:

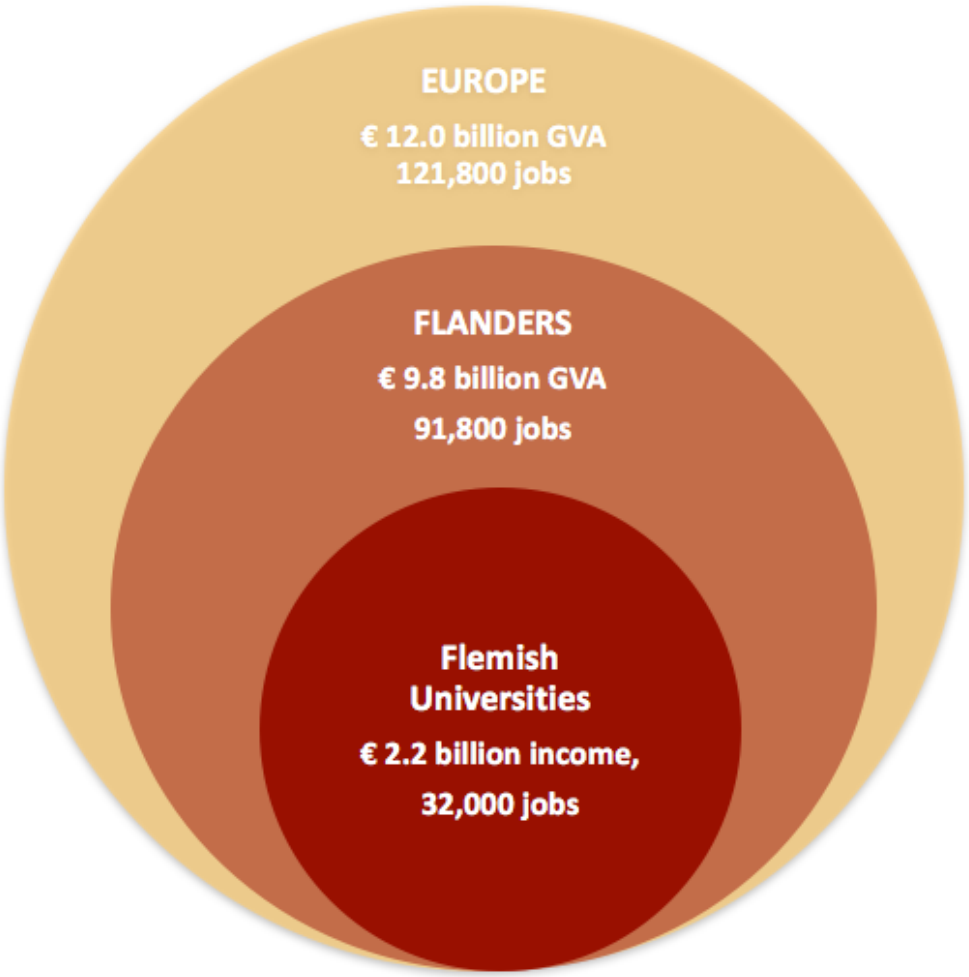
- for each € 1 generated through their direct operations in GVA terms, they created almost € 6 in total benefits for the economy of Flanders; and
- for each person directly employed the Flemish Universities supported almost three jobs in total throughout Flanders.

The Flemish Universities received approximately € 1.0 billion in core government funding in 2016 which gives a ratio of core government funding to impact of around € 1 : € 10 in Flanders and € 1 : € 12 throughout Europe.

The summary headline contributions are shown in Figure 1.1.

[1] The five members are: University of Antwerp, KU Leuven, the Vrije Universiteit Brussel (VUB), Ghent University and the University of Hasselt (UHasselt). Hospitals, business schools and scientific strategic research centres that are separate institutions from the Flemish Universities have not been included in this study.
[2] Flanders includes Brussels for the purposes of this study.
[3] Gross Value Added (GVA) is a measure of the value that an organisation, company or industry adds to the economy through its operations. In the case of Universities this is estimated by subtracting the non-staff operational expenditure (mainly represented by expenditure on goods and services) from the total income of the Universities.

Figure 1.1 Flemish Universities – Summary GVA and Employment Contribution, 2016

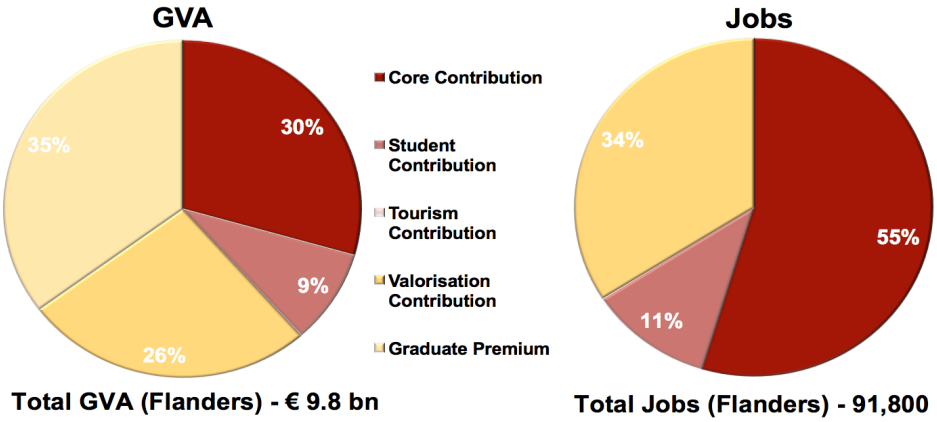


Source: BiGGAR Economics (Note: not to scale)

1.2 Sources of Contribution

There are two main groups of economic contribution generated by the Flemish Universities: ***Incidental benefits*** and ***Purposeful benefits***. These are illustrated in Figure 1.2 and described below.

Figure 1.2 Flemish Universities – Economic Contribution in Flanders by Source, 2016



Source: BiGGAR Economics

Incidental benefits arise from the core business of employing people and delivering services. In the case of the Flemish Universities, this amounts to 39% of the total GVA contribution generated in Flanders. The incidental benefits are:

- **Core Contribution –** which includes the activity directly supported by the Flemish Universities' expenditure in their supply chain, capital and infrastructure expenditure and staff expenditure in the economy. In 2016 this was estimated to generate € 2.9 billion GVA and 50,180 jobs in Flanders.

- **Student Contribution** – there were 125,200 Bachelors and Masters students studying at the Flemish Universities in 2016. Student expenditure, student employment (outside the Flemish Universities) and student volunteering generated a further € 0.9 billion GVA and 10,320 jobs for the economy of Flanders.

- **Tourism** – friends and family visiting staff and students as well as attendees to conferences and events hosted by the Flemish Universities generated an estimated € 8.2 million GVA and supported around 80 jobs in Flanders.

Purposeful benefits arise from the value of the services delivered. This type of activity is conceived specifically with the aim of driving innovation and productivity growth within the economy. In the case of the Flemish Universities, this accounts for the remaining 61% of the total GVA contribution generated in Flanders. The purposeful benefits are:

- **Valorisation** – Flemish Universities undertake a wide range of valorisation activity that supports business and innovation in Flanders and beyond. This includes licensing technology and supporting the formation of new businesses (spin-off companies) as well as providing research and professional development services to businesses, offering student placements, providing access to research infrastructure and supporting science parks. These activities were estimated to generate € 2.6 billion GVA and 31,210 jobs in Flanders.

- **Graduate Premium** – this contribution is conceptually different from the others in that it occurs over a much longer period of time. There are several aspects to the benefits of education for individuals and for society, some of which can be quantified and some cannot. The individual graduate premium that can be quantified in monetary terms recognises the increased earnings over a lifetime that stem from educating people to degree level. In 2016 there were 37,400 graduates from the Flemish Universities. The contribution from this group is estimated to be worth € 3.4 billion GVA in Flanders. Non-quantifiably, there are wider benefits from attaining a higher education that are shown through studies on health, well-being and social cohesion as well as spill-over benefits within the workplace.

In each case, the fundamental assumption is that these impacts would not have been generated without the Flemish Universities. As a dynamic group of organisations, some of their activities produce impacts almost immediately while other activities will create benefits over a longer period of time. This is difficult to account for in traditional approaches to economic impact analysis. Therefore a further simplifying assumption has been made that activity in 2016 will produce benefits in the same year. In reality some impacts occurring in 2016 are the result of historic activity while in other cases impacts will be realised at some future point.

1.3 Wider Impacts

As well as the teaching and research they deliver, there are other, wider benefits arising from the presence of the Flemish Universities to the individual, to the economy, to science and to society as a whole.

A number of examples illustrate this point. The Universities attract students from a wide range of social and ethnic backgrounds which can encourage greater tolerance and acceptance of other cultures which is of great benefit to social and political stability. They offer wider access to education to those from less favourable social and economic backgrounds which can facilitate social mobility. They provide museums and libraries which enhance and enrich the quality of life and the vibrancy of the areas in which they are based. They also encourage the engagement of the wider public in science and encourage thinking about moral and ethical issues which fosters societal stability and cohesion.

These benefits are rightly included when considering the overall range of benefits that are attributable to the Flemish universities.

1.4 Conclusion

The Flemish Universities are respected and acknowledged on a global scale and its institutions play a major role in supporting the regional and national economy. This is due to the way in which they work, the quality and extent of their commercialisation and valorisation activities and the quality of their graduates.

2 INTRODUCTION

BiGGAR Economics was commissioned by VLIR (Vlaamse Interuniversitaire Raad) in mid 2017 to identify and quantify the contribution that Flemish Universities make to the economy of Flanders, Belgium and Europe in 2016.

2.1 Background

The VLIR was established in 1976 to represent the Flemish Universities, to serve as a platform to facilitate cooperation between the Flemish Universities, and to interact with the Flemish government in all matters concerning higher education policy. Topics such as education and research policy, university management and administration are within their remit.

The five Flemish Universities[4] in the VLIR group are:

- University of Antwerp;
- Vrije Universiteit Brussel (VUB);
- Ghent University;
- University of Hasselt (UHasselt);
- KU Leuven.

VLIR is also the forum where the Flemish Universities synchronise quality assurance on an inter-university level. Internationalisation strategies are discussed at VLIR and recommendations are formulated to ministers of education and innovation and the government. In short, VLIR is the place where the Flemish Universities debate, interact, learn from each other, collaborate, and formulate shared solutions regarding all of these topics.

The Flemish Universities get a first-rate ranking on a global scale and the largest Flemish institutes, are often present in the top-200 of more than 17,000 institutes for higher education in the world.

As a group of organisations, the Flemish Universities make a crucial contribution towards the economy and society in Flanders. This is vital for a competitive and successful economy and, as such, for employment and prosperity in the country. A brief description of the five members of VLIR is contained in Appendix A.

2.2 Study Objectives

The study sets out to address four overarching objectives:

- demonstrate the **scale** of the economic contribution created by the Flemish Universities;
- demonstrate the **range** of impacts, distinguishing between those that are *incidental* and arise from the operations of the Universities and those that are *purposeful* and are associated with the outputs of each organisation;

[4] Hospitals, business schools and scientific strategic research centres that are separate institutions from the Flemish Universities have not been included in this study.

- demonstrate the **return** to private and public investment; and
- provide strong **evidence** for government and other agencies on the benefits and impacts associated with the Flemish Universities.

In most cases the reference year for data is 2016, however in some cases i.e. student numbers, it is 2015/16. The study is intended to give a snapshot of the contributions made by the Flemish Universities at the level of the Flanders, Belgian and European economies in this year.

2.3 Report Structure

The remainder of this report is structured as follows:

- section three introduces the theoretical framework within which the economic contributions of the Flemish Universities are measured;
- section four outlines the methodology and approach adopted for the study and discusses the classification of economic contributions into incidental benefits (sections 5 – 7) and purposeful benefits (sections 8 and 9). A more detailed discussion on the methodology is contained in Appendix C;
- section five describes the economic contribution arising from the core activities of the Flemish Universities. This includes the contributions associated with direct income and employment, their combined expenditure on goods and services, staff spending and capital spending;
- section six describes the contributions associated with students whilst studying through spending in the local economy, working part-time in local businesses, volunteering and undertaking placements which form part of their course;
- section seven assesses the combined contribution of the Flemish Universities to tourism from family visits to students and staff, business tourism and from expenditure at conferences and events hosted at each organisation;
- section eight discusses the economic contribution arising from the increased earnings generated during the working life of graduates as a result of having a university level education;
- section nine presents an analysis of the contribution that arises from the valorisation work of all five Flemish Universities;
- section ten discusses the wider benefits that arise from the work of the Flemish Universities;
- section eleven presents a summary of the combined economic contribution of the Flemish Universities and draws conclusions from our research.

Appendix A presents a summary description of the work of each member institution.

Appendix B provides a guide to abbreviations and terms used throughout the report.

Appendix C provides a detailed Methodological Appendix.

3 THEORETICAL FRAMEWORK

In advanced economies, economic growth comes from productivity growth and this, in turn, is driven by the diffusion and exchange of knowledge. As a result, universities play a critical role in driving economic growth through their role as providers of knowledge and innovation.

This chapter begins by considering the role that academic research plays in stimulating productivity and, by extension, economic growth. It then presents a theoretical framework that describes the various ways in which universities generate economic benefits and how these are classified into those that are incidental and those that are purposeful.

3.1 Productivity and Innovation

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 Stiglitz[5] 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 large 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 indicates that there is considerable scope for higher rates of economic growth.

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 of investment in knowledge and innovation, will mean that the pace of innovation slows because underinvestment compounds over time.

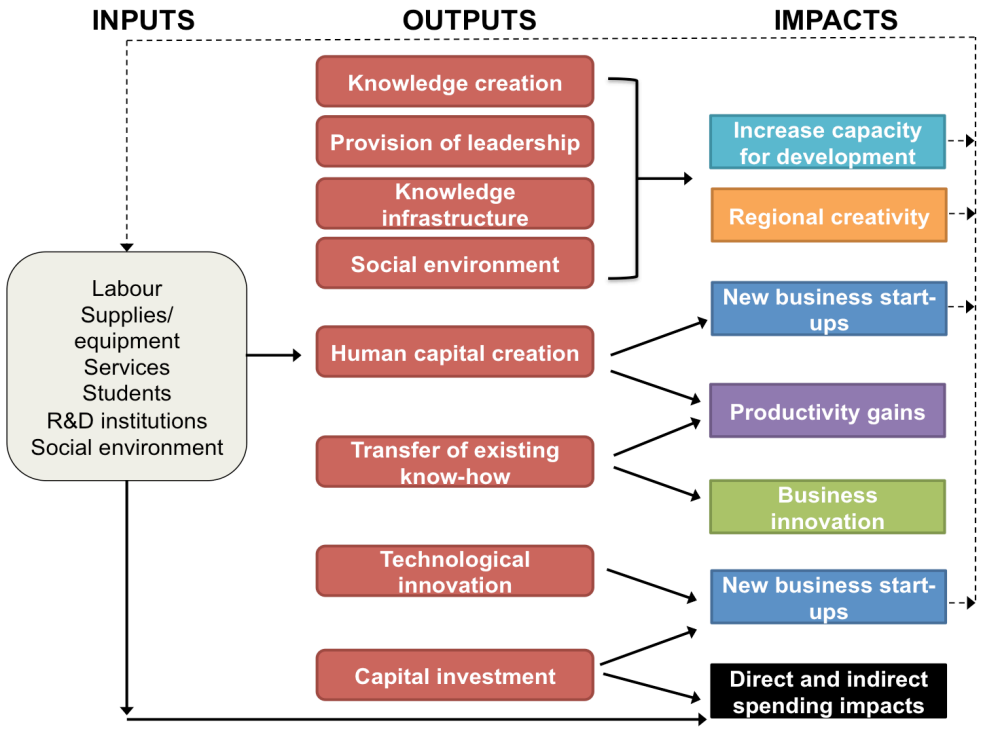
In summary, knowledge and innovation are fundamental to economic growth, since it is productivity growth that drives economic growth and productivity growth is in turn driven by knowledge and its diffusion (innovation).

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

3.2 Framework

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

Figure 3.1 University Outputs and Expected Economic Impacts



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

The inputs of staff time (labour), supplies, equipment, research services and students create a set of outputs that range from the creation of knowledge and infrastructure to the transfer of existing know-how, technological innovation and capital investment.

Through these outputs, a set of impacts arise which result in economic growth and development. This includes productivity gains, business innovation, new business start-up activity and an increased capacity for development. All of this activity produces further direct and indirect impacts on the economy through expenditure and multiplier effects. Some of these outputs and impacts are discussed in more detail below.

3.2.1 Intellectual and Human Capital Creation

The two fundamental activities of universities are the creation of both intellectual and human capital. They contribute to knowledge creation through undertaking basic and applied research that has given rise to the most influential technologies of today and will continue to shape the technologies of the future. Universities also provide high quality graduates for the labour market that in turn increases the innovation potential of the economy, as well as leading to productivity gains.

3.2.2 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 areas with universities also have large numbers of associated knowledge infrastructures such as science parks, which can ultimately develop into knowledge clusters.

3.2.3 Exchange of Existing Knowledge and Technological Innovation

Over and above these fundamental activities, universities also work to exchange existing knowledge throughout the economy through their interactions with businesses such as through commissioned research and further education, which increases productivity and business innovation. Universities are also vital sources of technological innovation through the commercialisation activities that they undertake such as spin-out companies and intellectual property licensing.

3.2.4 Social Environment – The Ecosystem

Universities can also create an impact on their local environment as their staff and students contribute to the overall vibrancy of the cities and towns they are located in.

In addition, they contribute to the attractiveness of a region as a knowledge centre and this wider role 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 research ecosystems which, in turn, draws more people.

In the case of the Flemish Universities, the members have a clear role in helping to attract investment into several science parks throughout the region in Leuven, Antwerp, Brussels, Ghent and Hasselt. The Universities also have campuses in other towns such as Bruges, Ostend and Kortrijk which makes these areas attractive places in which to invest. As a result, the universities are vital in helping to draw and retain inward investment in the region.

In a marketplace for inward investment that is increasingly competitive on a global scale, this is a particular strength for the region as a whole.

The international dimension of the research undertaken at the Flemish Universities and the international character of the institutions themselves contributes to improving the region's brand as a whole, making the country more interlinked and providing opportunities for partnerships with the wider global economy by attracting inward investment.

The ecosystems are entirely built on the world-class research undertaken by the universities and it is this world-class research that attracts companies and investment into the Flanders region, helping to catalyse innovation in local businesses. The fundamental research undertaken by them therefore creates the knowledge sectors of the future.

3.3 Incidental and Purposeful Benefits

The contributions associated with the Flemish Universities can be grouped into two main categories: ***incidental benefits*** and ***purposeful benefits***.

Incidental benefits result from the existence of any large organisation with a significant staff complement, an extensive supply chain and a large consumer base. These types of benefits occur regardless of the nature of the business or organisation and for this reason are thought of as incidental benefits. In the case of the Flemish Universities these include:

- the core operational effects of the Flemish Universities, including the people they employ, their expenditure and that of their employees on goods and services and their expenditure on capital and research infrastructure;
- the effects generated by students at the member organisations including the impact of student expenditure on goods and services and the contribution that students make to the local economies in which they live by working or undertaking voluntary activity during the course of their studies; and
- the contribution to the tourism sector made by visitors to staff and students at the Flemish Universities.

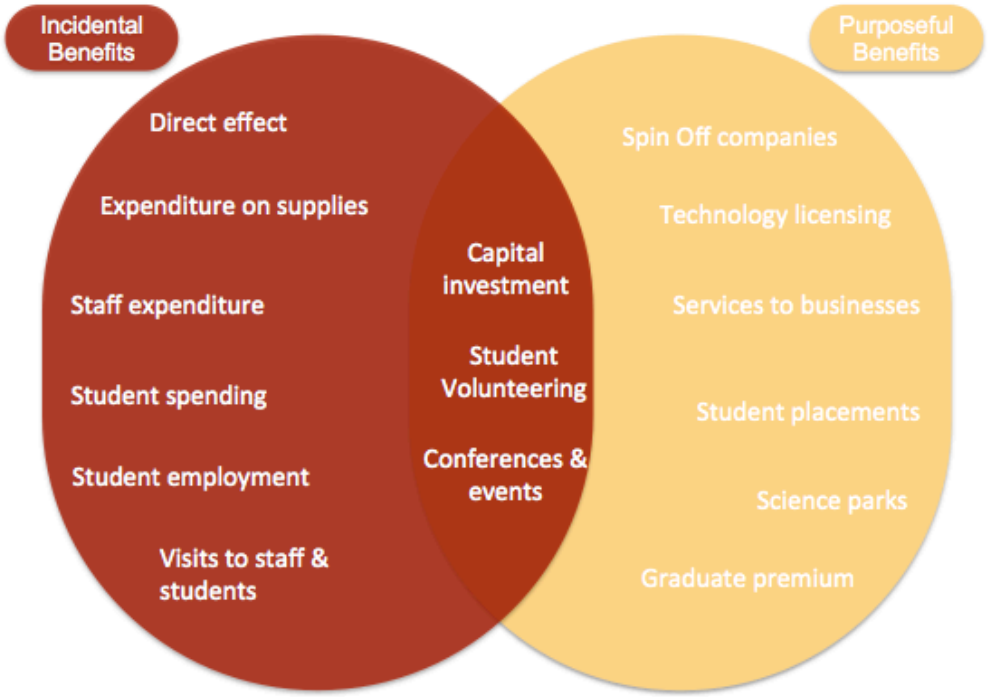
Purposeful benefits this type of activity is conceived specifically with the aim of driving innovation and productivity growth within the economy. These benefits are associated with the nature of the activity undertaken by the universities rather than their existence as organisations and might therefore be described as "purposeful benefits". These include:

- the contribution that graduates from the Flemish Universities make to the productivity of the economy as a result of the skills and experience they gain during their time at these organisations;
- the economic value of the research undertaken by the Flemish Universities; and
- the contribution that the Flemish Universities make to long-term economic growth by supporting innovation and the creation and development of businesses within the economy.

The distinction between "incidental" and "purposeful" benefits is depicted in Figure 3.2 which illustrates that the distinction is not always clear-cut.

For example, some of the tourism benefits described in section 7 are associated with conferences and events that are directly related to core areas of research or knowledge exchange activity. Similarly, students who decide to volunteer often do so independently of the member organisations – but their ability to do so often rests on skills or knowledge gained during their work or studies.

Figure 3.2 Flemish Universities - Incidental and Purposeful Benefits



Source: BiGGAR Economics

3.4 Conclusion

The growth of advanced economies is associated with a role for universities as providers of the intellectual and human capital required for a successful modern economy.

The Flemish Universities were formed with a mandate to drive research and knowledge in their respective fields and to find and disseminate solutions to identified national and global issues.

As major drivers of knowledge and innovation, the Flemish Universities are, therefore, fundamental to regional economic growth and beyond since it is productivity growth that drives economic growth and productivity growth is in turn driven by knowledge and its diffusion (innovation).

4 METHODOLOGY AND APPROACH

This chapter describes the overall approach undertaken during this study and the broad principles used to assess economic contribution. It also outlines the methodology used to quantify the economic contributions considered and discusses the parameters of the study[6]. Primarily these centre around the benefits arising from the work of the Flemish Universities which are non-quantifiable.

4.1 Previous Uses of Method

BiGGAR Economics is an independent economic development consultancy based near Edinburgh in Scotland. Over the past decade, the company has become recognised for its market and thought-leadership on the contribution of higher education institutions at a regional, national and global scale.

The methodology followed is one that has been in wide usage for at least 20 years. During that time, BiGGAR Economics has worked with more than 70 leading institutions and groups of institutions in the UK, Ireland and Europe, assessing historic, current and potential future economic contributions. The approach used in this report has been developed and informed by this experience. Recent examples of our work in this field include:

- ETH Domain (BIGGAR Economics, 2017);
- League of European Research Universities (BiGGAR Economics, 2014 & 2017);
- Universities Estonia (BiGGAR Economics, 2017);
- Finnish Universities (BiGGAR Economics, 2017);
- University of Oxford (BiGGAR Economics, 2016);
- University of St Andrews (BiGGAR Economics, 2016);
- Amsterdam Universities (BiGGAR Economics, 2014);
- University of Edinburgh (BiGGAR Economics, 2008, 2012, 2014 & 2017).

Some other examples of similar studies undertaken by other organisations include the University of Birmingham (Oxford Economics, April 2013), the University of British Columbia (2009, Planning and Institutional Research), the University of Iowa (September 2010, Tripp Umbach), the University of Notre Dame, Indiana (September 2013, Appleseed). Also relevant is work by Universities Scotland[7] on the contribution of the sector to economic growth and a study by UniversitiesUK that demonstrates the contribution made by the higher education sector to the UK economy[8].

The approach used for the economic impact of universities is also consistent with Guidance issued by several governments and public sector organisations. For example, the methodology is consistent with the principles set out in European

[6] A detailed description of the Methodology used in contained in Appendix C.
[7] Universities Scotland (2013*), Grow Export Attract Support: Universities' contribution to Scotland's economic growth* (available at http://www.universities-scotland.ac.uk)
[8] Viewforth Consulting Ltd (April 2014), *The Impact of Universities on the UK Economy* (available at http://www.universitiesuk.ac.uk/highereducation)

Commission Guidance[9] on major projects, which highlights the importance of assessing the fullest range of potential economic effects possible.

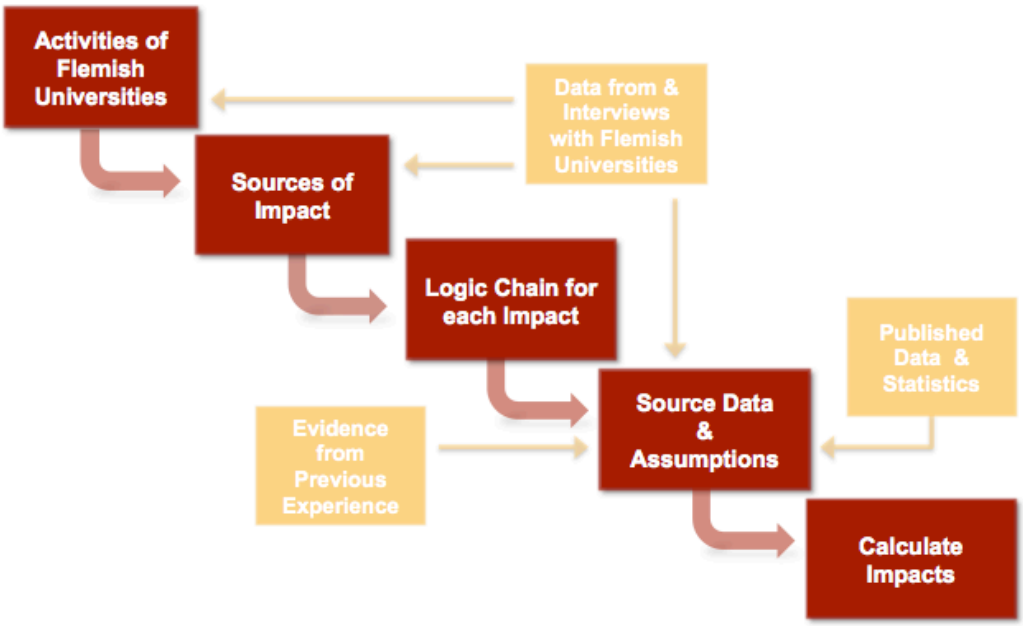
From this, BiGGAR Economics has established credibility with policy makers and sector organisations. Our impact studies have been used to demonstrate the value that universities have to stakeholders, policy makers and the public as well as being used in support of funding applications.

4.2 Approach and Methodology

4.2.1 Overall Study Approach

The overarching objective of this research is to illustrate the scale and breadth of the economic contribution made by the Flemish Universities. The different steps involved in this process are illustrated in Figure 4.1.

Figure 4.1 VLIR: Study Approach



Source: BiGGAR Economics

The starting point for our analysis was to consider the various activities undertaken by the different Universities and to identify those that were likely to generate an economic contribution. To help understand why certain activities have been included it is necessary to consider the counterfactual situation: would this contribution have occurred if the Flemish Universities did not exist? If the contribution would not have existed without the Flemish Universities it has been included in the analysis.

Logic chains were then developed to describe how each type of activity generates economic value and these were then used to build an economic model that estimated the economic contribution of each University.

[9] European Commission (July 2008), *Guide to Cost Benefit Analysis of Investment Projects* [in particular section 2.5 on Economic Analysis] (available at http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf)

The next step was to consider how the value generated by each type of activity might be measured and what data would be required to do this. For most types of activity two types of information were required: source information about the scale of activity and data that could be used as the basis for assumptions to measure the economic value generated by this activity.

Where possible, source data was obtained directly from the Flemish Universities. In cases where no data were available, an appropriate assumption was made based on data provided by other Flemish Universities and also BiGGAR Economics' previous relevant experience from studies of other universities. Interviews were also held with key staff members at each University which helped to clarify and refine assumptions where relevant.

Where it was necessary to make such an assumption and a range of potential values were available, the approach taken was to make a conservative assumption. For this reason it is likely that the values reported in this study tend to underestimate, rather than overestimate, the total contribution of the Flemish Universities.

The data required for the general assumptions used in the model was obtained either from published reports, official statistical sources or based on BiGGAR Economics' previous experience within the higher education sector. The key statistical sources used were the OECD's Input-Output Tables for Belgium, 2011 (multipliers calculated were Leontief Type 1 and Type 2). The various sources used are specified in the relevant sections of the report and in the Methodological Appendix.

This data was then used to populate the economic model and estimate the value of each source of contribution for each University. Each type of contribution was then aggregated in order to produce an estimate of the total contribution of all Flemish Universities.

4.2.2 Units of Measurement

As far as possible this report has attempted to express the economic value generated by the Flemish Universities using two widely accepted measures of economic contribution: jobs and gross value added (GVA).

- **Gross Value Added (GVA)** is a measure of the value that an organisation, company or industry adds to the economy through its operations. The report used the production approach to measuring this contribution, where the GVA is equal to the value of production less the value of the inputs used. Typically this is estimated by subtracting the non-labour costs of the organisation(s) from the organisation's total revenue. In the case of the Flemish Universities, this is estimated by subtracting the non-staff operational expenditure (€ 565.6 million) from the total income of the Universities (€ 2.2 billion); and

- **employment** (jobs) is measured in terms of headcount jobs supported unless stated otherwise.

One of the reasons that these measures are so widely used is because they provide a convenient way of capturing the entire economic contribution of an organisation in a single number. While the appeal of such measures is easy to understand they do have parameters which should be kept in mind (Section 4.3).

4.2.3 Sources of Quantifiable Contributions

The economic contributions quantified in this report have been grouped into five themes:

- core contributions, including direct effects, supplier effects, staff spending and capital spending;
- student-related contributions from students spending, working part-time, and volunteering;
- the tourism contribution created by visitors to staff and students and attendance at conferences and events held at the Flemish Universities;
- the life-time productivity gains from teaching and learning delivered by the Flemish Universities on graduates;
- the contribution arising from the commercialisation and valorisation activity undertaken by the Flemish Universities. This includes the contribution of technology licensing, spin-off companies, student placements, working with businesses and research infrastructure. Activity associated with the region's science parks that has been influenced by their association with the Flemish Universities is also included in this category;

The methodology for each of these calculations is briefly described throughout the report as each contribution is discussed. A more detailed discussion is contained in the methodological appendix at the end of this report.

4.2.4 Baseline Year, Measures and Geography

The economic contributions described in this report are for 2016, which is the latest year for which published data on income, staff and students was available from each University at the time of writing in Autumn 2017.

Each area of contribution requires the use of three types of economic assumptions:

- GVA to turnover ratio – this is used to estimate the GVA contribution of the spend in an area. The ratio for each sector for Belgium is obtained from the OECD;
- turnover per employee – this is used to estimate the employment contribution of the spend in area. This is also obtained from the OECD and is available by sector for Belgium; and
- GVA and employment multipliers – these are used to estimate the contribution of the initial direct economic contribution elsewhere in the supply chain and through the spending of the salaries associated with the direct economic contribution. These multipliers were estimated by BiGGAR Economics using OECD Input-Output tables for Belgium for 2011. These multipliers were then adjusted to reflect the size of the economy in each study area. Further detail is provided in the Methodological Appendix.

These terms are defined further in Appendix B. The economic contributions quantified in this report are those at the level of the Flanders, Belgian and European economies.

4.2.5 Avoiding Double Counting

Given the approach summarised in Figure 4.1 above, it was necessary to make adjustments to some of the calculations, to avoid double counting. So, for example, where a spin-out company from one of the Universities also has a license agreement with them and is based on one of the University-linked research parks, the associated contribution has been counted only once.

4.2.6 Economic Contribution and the Counterfactual

The question that arises from any study of economic contribution or impact that considers the outputs and impacts delivered by a given set of resources and inputs is what the counterfactual position could have been, that is, what outputs and contributions could have been achieved by using the same resources and inputs in a different way?

This study does not seek to directly compare the economic contribution of Universities with that made by other organisations or sectors. Rather, the counterfactual position is to imagine an alternative situation where the Flemish Universities did not exist and where the activities that they undertake did not take place.

In practical terms, only those economic contributions that can be considered additional and attributable to the Flemish Universities have been included. So, for example, the economic contribution of student part-time work has been included, but adjustments have been made to exclude employment that could have been taken by non-student employees. Where the role of a University has been important in delivering economic benefits, but where other organisations or activities may also have been important drivers (for example, the development of research/science parks), only a part of the economic contribution has been attributed to the Flemish Universities.

4.2.7 Timescale of Contributions

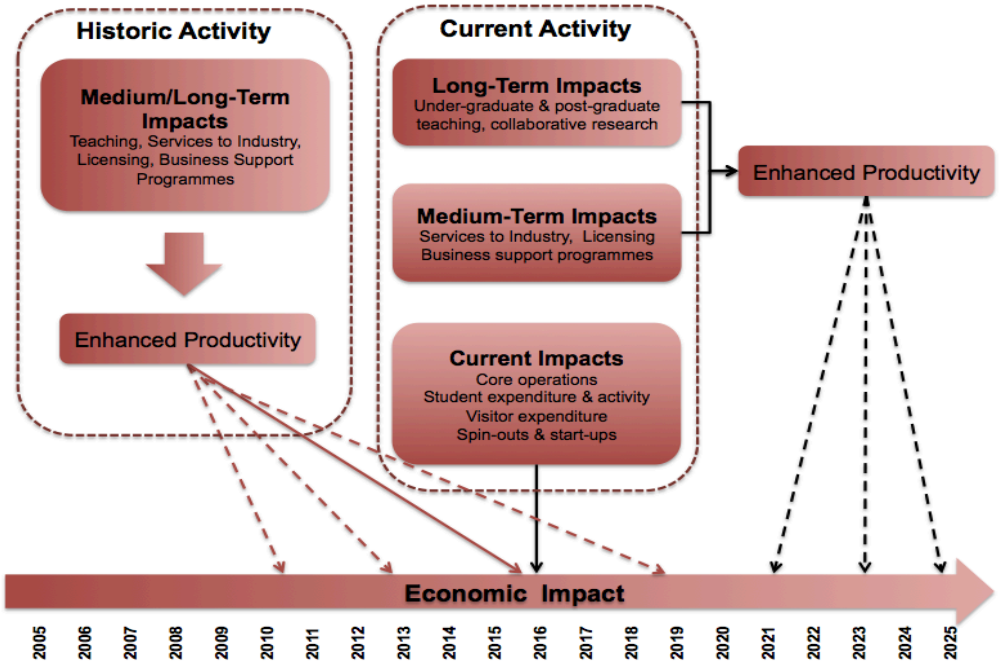
Universities are dynamic organisations. Some of their impact is realised immediately but other activities will take more time to generate impacts. Traditional approaches to economic analysis cannot easily take account of this feature.

For example, purchases of goods and services made by the Universities generates activity amongst their suppliers almost immediately. However, much of the work of the Flemish Universities produces an on-going dynamic economic contribution which will be realised over the course of several years. For example, the Flemish Universities are collectively engaged in a wide range of research that will ultimately provide the foundations for technologies and products upon which entirely new economic sectors will be based.

Although developing such technologies is fundamental to long-term competitiveness, it also involves considerable time-lags of the sort that are difficult to account for using traditional approaches to economic impact analysis.

This concept is illustrated in Figure 4.2. The enhanced productivity that results from historic and current activity produces impacts over time rather than in just one year.

Figure 4.2 VLIR: Impact Timeframe



Source: BiGGAR Economics

Limitations in data availability mean that it is generally not possible to estimate the actual impact of historic activity that is realised in any particular year. To overcome this, the report makes the simplifying assumption that activity undertaken in 2016 generates impact in 2016. This is reasonable because although the impact of some activity that occurs in 2016 will not transpire until a later date, some of the impact that was realised in 2016 will have been generated by historic activity.

The timeframe of the economic contributions quantified in the report are summarised in Table 4-1.

Table 4-1 Timescale of Economic Contributions

Contributions realised in 2016	Contributions realised in the Future
Core Operations	Graduates
Students	Services to Businesses
Tourism	
Spin-offs	
Science Parks	
Licensing	
Student Placements	

4.2.8 Number Formats

This report has been produced using UK number formatting, i.e. € 1 billion is presented as € 1,000,000,000.00 where the symbol for the decimal marker is a point on a line[10].

4.3 Parameters of the Study

While every attempt has been made to measure the economic contribution of the Flemish Universities as consistently and accurately as possible, there are certain parameters to the study that should be considered.

The report aims to quantify the economic contribution that the Flemish Universities make using the two widely accepted economic measures of GVA and employment. However, using GVA and jobs as a basis for measuring economic contribution gives equal weight to all types of economic activity regardless of their wider value to society.

As well as this, it is not always possible to quantify all of the benefits of a University due to the lack of available data. It is important to note, therefore, that the impacts presented in the report give only a partial picture of the total economic contribution of the Flemish Universities.

For example, there is a philosophy of collaboration amongst the Flemish Universities that contributes very real benefits that cannot be measured in quantifiable terms.

In addition, through their work the employees of the Flemish Universities generate a wide variety of benefits for the regional economy and wider society. They help to improve the productivity of the workforce by providing high-quality education and training, stimulate innovation within the business base through their research and enable the development of new economic sectors that will provide the basis for future national competitive advantage.

The Flemish Universities also make important contributions to other socially valuable outcomes, such as improving social cohesion, facilitating social mobility and encouraging greater civic engagement. The value of these outcomes to the individuals affected and society as a whole simply cannot be quantified. It is therefore essential that the economic contribution of the Flemish Universities be understood as part of this wider context.

Finally, the presence of the Flemish universities can add to issues with the availability of housing in nearby areas and especially so in smaller cities where the supply of rented housing is less plentiful. There can also be issues linked to the availability and cost of transport on routes that serve the universities. These "costs" are especially difficult to quantify due to the lack of data on a counterfactual situation: i.e. what would rental levels and transport availability be like if the universities did not exist? Moreover, where such effects can be observed, it could be argued that the impacts on prices could be related to market and / or government failures that constrain supply, as much as to the additional demand generated by the presence of the universities. This would require detailed local analysis and so these issues are outside the scope of this work.

[10] 22nd General Conference on Weights and Measures, 2003.

5 CORE CONTRIBUTION

There are four elements to the core contribution from the Flemish Universities:

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

In terms of the framework for analysis set out in section 3.3, the benefits described in this chapter are considered to be "incidental benefits". The possible exception to this is capital investment, which is sometimes undertaken with the aim of achieving specific economic development objectives.

5.1 Direct Contribution

The direct contribution of a group of organisations (or a single organisation) is the value it adds to the economy and the number of jobs it supports in a given time frame.

In 2016, the five Flemish Universities had a combined income from all sources of € 2.2 billion. The largest element of this was core grant funding from government, which accounted for 44% of the total, with research contributions accounting for a further 28% of income. The sources of revenue are shown in Table 5.1.

Table 5-1 Flemish Universities: Combined Direct Effect Assumptions – Total Operating Revenue

	Total (€ m)
Revenues related to teaching, research and service, *of which*	2,106.1
- Government grants and subsidies - core funding (1st GS)	977.0
- Government Contribution fundamental research (2nd GS)	286.0
- Government contributions applied scientific research (3rd GS)	335.9
- Contract research with the private sector and law. Services (4th GS)	278.1
- Other income related to teaching, research and service	229.2
Change in value of projects in progress	1.5
Fixed assets	-
Gifts, donations and bequests	19.6
Other operating income	105.8
Total Operating Income	2,233.0

Source: Flemish Universities (Note – figures may not sum due to rounding)

In addition, the Flemish Universities had a total employment headcount of 31,960 staff, which was equivalent to 25,120 full-time jobs (Table 5-2).

Table 5-2 Flemish Universities: Combined Direct Effect – Employment

	Total
Flemish Universities employment (headcount)	31,960
Flemish Universities employment (full-time equivalent jobs)	25,120

Source: Flemish Universities

The economic value arising from this revenue and employment is measured using Gross Value Added (GVA), which can be estimated by subtracting all of the non-staff operating expenditure (amounting to € 565.6 million) from the total operational revenue of the Flemish Universities (amounting to € 2.2 billion). Non-staff operating expenditure is mainly represented by expenditure on goods and services and this creates a further economic contribution which is discussed later in this section. In simple terms, GVA is the value of the service created less the value of inputs used to create it.

The direct GVA created by the Flemish Universities in 2016 was € 1.7 billion and the direct employment was 31,960 jobs. This is shown in Tables 5.2 and 5.3.

Table 5-3 Flemish Universities: Combined Direct Effect – GVA

	Total (€ m)
Total Income	2,233.0
Less Non-staff operational cost	565.6
Direct GVA	1,667.3

Source: Flemish Universities

5.2 Staff Spending Contribution

The 31,960 people employed directly by the Flemish Universities spend their wages and salaries in the wider economy and this also increases turnover and supports employment in local businesses and throughout the region as a whole.

The economic contribution of this depends on where staff spend their wages, which in turn depends on where they live. Data provided directly by the Flemish Universities indicates that 91% of employees live in Flanders.

The second step is an assumption about how much of a person's wage is spent in each study area. This is an assumption about the location of people's expenditure and not about where the products that are purchased are originally from, as this is already accounted for in the economic multipliers. It was assumed that 70% of staff expenditure takes place in Flanders, 94% of staff expenditure takes place in the Belgian economy and 99% in the EU. This is based on data from the Brussels Institute for Statistics on expenditure patterns by region within the country[11].

An adjustment of 10% is then made to deduct the VAT element from expenditure items that incur VAT to ensure that the estimates are in line with OECD data[12].

[11] Source: Brussels Institute for Statistics and Analysis (2015), Revenus et depenses des menages - Enquete sur le budget des menages

[12] Source: European Commission (2013) A study on the economic effects of the current VAT rates structure

This figure comes from a study by the European Commission 2013 on the economic effects of the current VAT rates structure.

The key assumptions used in calculating this contribution are shown in Table 5-4.

Table 5-4 Flemish Universities: Combined Staff Spending – Assumptions

Staff Numbers	
Number of jobs (headcount)	31,960
Total personnel expenses (€ billion)	1.4
Staff Location	
Flanders	91%
Belgium	97%
Europe	100%
VAT	
VAT as a proportion of staff expenditure	10%
Location of Spending	
Flanders	70%
Belgium	94%
Europe	99%

Source: Flemish Universities, Brussels Institute for Statistics and European Commission

The economic contribution of staff spending as measured by GVA and employment supported is estimated by applying the assumptions described above. Appropriate economic ratios and multipliers were then applied in order to estimate the economic contribution.

This results in a staff spending contribution of € 669.5 million GVA and 10,470 jobs in Flanders, € 1,086.8 million GVA and 17,440 jobs in Belgium and € 1,298.2 million GVA and 21,160 jobs in Europe. These figures are summarised in Table 5-5.

Table 5-5 Flemish Universities: Combined Staff Spending – Total Contribution

Staff Spending Contribution	GVA (€ m)	Employment
Flanders	669.5	10,470
Belgium	1,086.8	17,440
Europe	1,298.2	21,160

Source: BiGGAR Economics Analysis

5.3 Supplier Contribution

The supplier effect is the economic contribution that universities generate by buying in goods and service as these purchases generate GVA and support employment in businesses that supply the Flemish Universities.

The inputs used to estimate the supplier effect are shown in Table 5-6. In 2016, the Flemish Universities spent € 565.6 million on goods and materials, premises costs and other operating costs. Of this total, approximately 80% was spent on

suppliers based in Flanders, and 90% was spent on suppliers based in Belgium. In cases where a University was unable to provide full information about the location of their suppliers, an average was applied which was estimated from those who were able to supply this data.

Table 5-6 Flemish Universities: Combined Supplier Effect – Assumptions

Amount Spent on Goods and Services	
Total Expenditure on Goods and Services, € million	565.6
Location of Suppliers	
Flanders	80%
Belgium	90%
Europe	97%

Source: Flemish Universities

The supplier expenditure was then analysed by sector since the resulting GVA supported reflects the differing GVA to turnover ratios for each sector of the economy. The direct GVA contributions were estimated by dividing the expenditure in each sector by the appropriate GVA to turnover ratio. Direct employment was estimated by dividing the direct GVA by the turnover to employment ratio in the industries relevant to the expenditure.

The initial expenditure by the Flemish Universities creates multiplier effects throughout the economy, reflecting the increased demand from their suppliers on down the supply chain. This is the indirect effect. As a result, the level of household income throughout the economy will increase due to increased employment. A proportion of this increased income will be re-spent on final goods and services, which is the induced effect. These multiplier effects were estimated by applying GVA and employment multipliers appropriate to the sectors in which the expenditure occurred.

The total supplier effect for the Flemish Universities is shown in Table 5-7. It is estimated that spending on goods and services by the Flemish Universities supports € 390.7 million GVA and 5,810 jobs in Flanders, € 508.7 million GVA and 7,630 jobs in Belgium and € 616.0 million GVA and 9,290 jobs in Europe.

Table 5-7 Flemish Universities: Combined Supplier Effect Contribution (Direct & Multiplier)

Supplier Contribution	GVA (€ m)	Employment (jobs)
Flanders	390.7	5,810
Belgium	508.7	7,630
Europe	616.0	9,290

Source: BiGGAR Economics Analysis

5.4 Capital Contribution

There are two elements to the economic contribution made by capital expenditure from the Flemish Universities – money spent on buildings and estates and money spent on equipment (research infrastructure).

Estates investment made by the Flemish Universities provides an important source of income and employment for the regional construction and maintenance

industry. The total amount spent changes from year to year, reflecting campus development plans and building renovations. To reduce any skewing effects arising from 2016 being an atypical year, an average figure for estates expenditure over the 10 year period from 2012 - 2021 (inclusive) has been used to reflect the impact of any ongoing and future capital investment programmes.

The Flemish Universities also invest in research infrastructure and equipment each year. Across the group this covers a very wide range of purchases including technical scientific equipment.

Over the last five years, the Flemish Universities had an average capital spend per year of € 230.5: 72% of this was spent on estates development and maintenance and 28% was spent on equipment. This income can be converted into GVA by applying a turnover to GVA ratio for the construction sector and machinery/equipment sector accordingly. The employment contribution of this expenditure is estimated by dividing the GVA contribution by an estimate of average GVA per employee in these sectors.

The indirect contribution of this expenditure is then estimated by applying GVA and employment multipliers. In this way it is estimated that the total contribution of capital expenditure for the Flemish Universities amounts to € 218.8 million GVA, and 2,790 jobs. Around 70% of this contribution occurs in Flanders.

The assumptions used in this calculation are summarised in Table 5.8 and the resulting contributions are summarised in Table 5.9.

Table 5-8 Flemish Universities: Combined Estates Expenditure – Assumptions

Estates Expenditure	
Average Annual Estates Expenditure, 2012-16 (€ m)	230.5
Location of Spending	
Flanders	92%
Belgium	96%
Europe	100%

Source: Flemish Universities

Table 5-9 Flemish Universities: Combined Estates Contribution

Estates Expenditure Contribution	GVA (€ m)	Employment
Flanders	150.5	1,940
Belgium	184.5	2,370
Europe	218.8	2,790

Source: BiGGAR Economics Analysis

5.5 Summary Core Contribution

The contribution associated with the core activity of receiving income, supporting employment, spending on goods and services and spending on capital projects results in an estimated contribution of **€ 2.9 billion GVA and 50,180 jobs in Flanders**. These figures include the multiplier effects of the core activity. The remaining contributions occur outside the region.

The core contributions are summarised in Table 5-10.

Table 5-10 Flemish Universities: Combined Core Contribution – Summary

Flanders	GVA (€ m)	Employment
Direct	1,667.3	31,960
Staff Spending	669.5	10,470
Supplier	390.7	5,810
Capital Spending	150.5	1,940
Total Core Contribution	2,878.0	50,180
Belgium	**GVA (€ m)**	**Employment**
Direct	1,667.3	31,960
Staff Spending	1,086.8	17,440
Supplier	508.7	7,630
Capital Spending	184.5	2,370
Total Core Contribution	3,447.3	59,400
Europe	**GVA (€ m)**	**Employment**
Direct	1,667.3	31,960
Staff Spending	1,298.2	21,160
Supplier	616.0	9,290
Capital Spending	218.8	2,790
Total Core Contribution	3,800.5	65,210

Source: BiGGAR Economics Analysis (numbers may not sum due to rounding)

6 STUDENT CONTRIBUTION

The contributions covered in this chapter are those associated with Bachelors and Masters students at the Flemish Universities. Doctoral students are treated differently in our analysis. They are regarded as staff at the institutions; therefore, their expenditure contribution has been included in section 5.2 on staff expenditure. Their lifetime earnings contribution (graduate premium) has been included in section 8 on the graduate premium.

There are three elements to the student contribution:

- student spending – the employment and GVA contribution that arises from the combined expenditure of students while studying at university;
- the impact arising from students working part-time while studying for their degree; and
- student volunteering.

In terms of the framework for analysis set out in section 3.3 the benefits described in this chapter are considered "incidental benefits". The possible exception to this is student volunteering, which is sometimes encouraged to support important regional development objectives.

6.1 Student Population

The combined Bachelors and Masters student population at the Flemish Universities in 2016 was 125,238 people (Table 6.1).

Approximately 52% were studying for bachelors degrees and 34% were studying for masters degrees. The remainder were studying for further masters courses, schakelprogramma and voorbereidingsprogramma..

Table 6-1 Flemish Universities: Student Population, 2016

	Total
Bachelors degree	65,639
Masters degree	43,049
Master na master	5,745
Schakelprogramma	6,733
Specifieke lerarenopleiding na master	1,220
Voorbereidingsprogramma	2,852
Total	125,238

Source: Flemish Universities

6.2 Student Spending

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

The total number of students at the Flemish Universities in 2016 was 125,238 of which 66% live in rented or wholly owned accommodation. A further 24% live with

parents in a family home and 10% live in institution-owned accommodation. It was further assumed that bachelors degree students who live outside the family home do so for 10 months a year, while masters students who live outside the family home do so for 12 months a year. The expenditure levels of students differ according to where they live during term-time i.e. students who live at home will not pay rent for accommodation.

An overall student expenditure profile has been calculated. This is based on student spending information provided to students by Ghent University and published on their website.[13] The information relates to 2017/18 and was then adjusted for each city to reflect the different costs of living in each area. Numbeo calculates a cost of living index for each city which was applied to the general monthly student expenditure. It also calculates a rent index which was applied to the accommodation costs in order to reflect the difference in rents across the cities in which the Flemish Universities are based.

These profiles of expenditure were applied to the number of students at the five universities to provide an overall estimate for total student expenditure of € 518.6 million in Flanders.

The key inputs used in making these calculations are shown in Table 6-2.

Table 6-2 Flemish Universities: Student Spending – Assumptions

Total Number of Students	Value
Living with parents	29,662
Living in rented accommodation	82,433
Institution-owned accommodation	13,143
Total number of students	125,238
Monthly Student Expenditure in € per month, including VAT	
Brussels	736
Leuven	659
Antwerp	651
Hasselt	651
Ghent	630

Source: Flemish Universities, Ghent University, BiGGAR Economics assumptions (Numbeo 2017)

VAT was then removed from the expenditure figures to allow the estimates to be in line with OECD economic data. This was done by analysing the expenditure categories to establish those that incurred VAT and then eliminating this element from total expenditure as this money is not spent directly in the local economy. It was assumed that 100% of student spending occurred in Flanders.

We then estimated how much GVA this level of expenditure provided and how many jobs it supported across the relevant sectors of the economy using national level economic ratios for each sector.

A further round of GVA and employment was supported indirectly through this level of spending (the indirect effect) and this was estimated by applying sector-

[13] Source: Ghent University, Raming van de totale studiekost 17-18 - info studenten (nl).pdf.

specific multipliers to the direct contribution. Finally, these figures were added together to estimate the total contribution arising from student spending. The results are shown in Table 6-3.

Table 6-3 Flemish Universities: Student Spending Contribution

Student Spending Contribution	GVA (€ m)	Employment
Flanders	436.5	3,890
Belgium	489.0	4,470
Europe	552.3	5,140

Source: BiGGAR Economics Analysis

This results in a student spending contribution of € 436.5 million GVA and 3,890 jobs in Flanders, € 489.0 million GVA and 4,470 jobs in Belgium and € 552.3 million GVA and 5,140 jobs in Europe.

6.3 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. In estimating this impact it is assumed that a proportion of these jobs could not be filled by non-students due to local labour market conditions.

Research published by DIBISS[14] suggests that 46% of students at the Flemish Universities work to supplement their income and that they work, on average, for 4.12 hours per week.

Consultations regarding the labour market conditions for the cities where the Universities are based suggests that the students are generally not displacing other potential employees; however, it is reasonable to assume that some jobs may otherwise have been filled by non-students. In order to reflect this, we have taken a view on the additionality of student jobs and assume it is inversely related to the level of youth unemployment in each area. In this case, the level of additionality used is 91%.

The analysis of the contribution of part-time work is based on the number of students living in each area as it is assumed that students take part-time jobs locally to where they live. The key assumptions used in calculating the contribution of student part-time work are shown in Table 6-4.

Table 6-4 Flemish Universities: Student Part-time Working – Assumptions

Number of Bachelors & Masters Students	125,238
Percentage of students who undertake part-time work	46%
Additionality of part-time work	91%
Average hours worked per week	4.12

Source: Flemish Universities, DIBISS, BiGGAR Economics

The value of the additional economic activity (GVA) supported by student employment is estimated by applying national ratios of GVA per employee for the

[14] DIBISS, 2016, Studenten tewerkgesteld met een overeenkomst voor studenten

sectors in which students typically work. Most students typically take up employment in the retail, restaurant, catering, hospitality and residential care sectors while studying for their degrees.

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 € 400.1 million GVA and 6,430 jobs in Flanders, € 449.6 million GVA and 7,080 jobs in Belgium and € 508.1 million GVA and 7,890 jobs in Europe (Table 6-5).

Table 6-5 Flemish Universities: Student Part-time Working – Contribution

Student Working Contribution	GVA (€ m)	Employment
Flanders	400.1	6,430
Belgium	449.6	7,080
Europe	508.1	7,890

Source: BiGGAR Economics Analysis

6.4 Student Volunteering

Students make a contribution to society through volunteering. Based on data provided in a 2015 study by the King Baudouin Foundation[15], it is assumed that 13.7% of students engage in voluntary work whilst studying.

It was further assumed that those who participate volunteer for 240 hours per year and that the average monetary value of these hours is equivalent to the minimum wage in Flanders of € 10.83 per hour. The assumptions used to arrive at the estimated contribution from student volunteering are shown in Table 6-6.

Table 6-6 Flemish Universities: Student Volunteering – Assumptions

Number of students who volunteer	17,158
Percentage of students who undertake voluntary work	13.7%
Estimated number of hours volunteered per year per person	240
Estimated value per hour volunteered	€ 10.83

Source: Flemish Universities

The monetary value of the hours volunteered is estimated by multiplying the total number of hours volunteered by the wage that would be normally paid to a student. These inputs result in an estimate of the value of student volunteering of at least € 41.5 million GVA across the Flanders region. The nature of this type of activity is that it will contribute to increasing the productivity of the organisation volunteered for (by contributing to service provision) and will therefore be a GVA contribution rather than an employment contribution. This contribution is summarised in Table 6-7.

[15] King Baudouin Foundation (2015), Volunteering in Belgium

Table 6-7 Flemish Universities - Student Volunteering – Contribution

	GVA (€ m)
Flanders	41.5
Belgium	41.7
Europe	43.5

Source: BiGGAR Economics Analysis

In practice the value of student volunteering is greater than this figure suggests as the calculations are only an approximate method which captures the monetary value of the students' time. It does not reflect the wider community benefits such as:

- the value of volunteering to the service supported as many organisations could not run without these additional volunteers;
- the value of the services to the people who use them; and
- the value of the contributions on service users, as improvements in health and wellbeing will result in cost savings in health and social services.

6.5 Summary of Student Contributions

The contribution associated with student spending, student employment and student volunteering is estimated at **€ 0.9 billion GVA and 10,320 jobs in Flanders**, with a total of **€ 1.1 billion GVA and 13,030 jobs in Europe** (Table 6-8).

Table 6-8 Flemish Universities: Total Student Contribution – Summary

Flanders	GVA (€ m)	Employment
Student Spending	436.5	3,890
Student Working	400.1	6,430
Student Volunteering	41.5	-
Total Student Contribution	878.1	10,320
Belgium	**GVA (€ m)**	**Employment**
Student Spending	489.0	4,470
Student Working	449.6	7,080
Student Volunteering	41.7	-
Total Student Contribution	980.3	11,560
Europe	**GVA (€ m)**	**Employment**
Student Spending	552.3	5,140
Student Working	508.1	7,890
Student Volunteering	43.5	-
Total Student Contribution	1,103.9	13,030

Source: BiGGAR Economics Analysis (numbers may not sum due to rounding)

7 TOURISM CONTRIBUTION

This section considers the contribution that the Flemish Universities make to tourism in the Flanders region. This contribution arises from:

- visits from friends and family to staff and students; and
- visitors to conferences and events held at the universities.

In terms of the framework for analysis set out in section 3.3, the benefits considered in this chapter are considered "incidental benefits". The possible exception to this is conferences and events, which are sometimes used as a way of supporting regional economic development.

7.1 Visits to Staff and Students

The presence of staff and students at a university creates an economic contribution through visits from their friends and family who are not normally resident in the locality. These visitors spend money in the economy and this spending increases turnover in local businesses, which in turn supports local employment.

In order to estimate this contribution it is necessary to estimate the number of visits from friends and relatives (VFR) that students and staff will receive. Eurostat compile this information and data are available for Belgium for visits in 2015. The number of VFR trips per person is multiplied by the number of students and staff at each institute to provide an estimate of the number of visits stimulated by the Flanders Universities.

This total number of visits is multiplied by the average spend of tourists on a visiting friends and families trip. Data on average tourist spend for VFR trips is sourced from Eurostat for Belgium. 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 assumptions used and the contribution resulting is shown in Table 7-1 and Table 7-2.

Table 7-1 Flemish Universities: Visits to Staff and Students - Assumptions

Assumptions	Value
Total number staff & students	157,196
No. visits per staff/student	0.14
Weighted trip spend per visitor (€)	395

Source: Flemish Universities and Eurostat data for Belgium, 2015

Table 7-2 Flemish Universities: Visits to Staff and Students – Contribution

	GVA (€ m)	Employment
Flanders	5.9	40
Belgium	6.9	40
Europe	8.0	50

Source: BiGGAR Economics Analysis

This results in an estimated contribution from visits to staff and students of € 5.9 million GVA and 40 jobs in Flanders and € 6.9 million GVA and 40 jobs in Belgium.

7.2 Conference & Event Contribution

The Flemish Universities organise and/ or host conferences that generate an economic contribution by attracting delegates to the area who would not otherwise have visited. This brings additional revenue to the economy both inside and outside the universities.

Flemish Universities provided information on conference and event attendees. In 2016, the five universities organised conferences and events that involved approximately 13,600 attendees. However, it has been assumed that delegates from Flanders would have spent their money in the region regardless of the conference, therefore their expenditure is not additional at the regional level and has been excluded from the calculations. Only delegates from outside Flanders have been counted in the calculations. Based on data provided by the five universities, an estimated 65% of delegates were from outside Belgium.

These visits are converted into an expenditure estimate using data on average trip spend for a business visitor to Belgium which is sourced from Eurostat. This source suggests that visitors on a business trip spend, on average, € 437 per trip. The key assumptions used in calculating this contribution are shown in Table 7-3.

Table 7-3 Flemish Universities: Conference & Event Contribution – Assumptions

Assumption	Value
No. of delegates to conferences and events organised by Flemish Universities	13,600
Estimated % of International attendees	65%
Trip spend per business trip (€) – professional	437

Source: Flemish Universities and Eurostat data for Belgium, 2015

The resulting tourism expenditure estimate is converted to additional GVA and employment by using ratios and multipliers appropriate to the sector.

This results in a contribution from conferences and event activities of an estimated € 2.3 million GVA and 50 jobs in Flanders. The resulting contribution is presented in Table 7-4.

Table 7-4 Flemish Universities: Conference & Event Contribution – Summary

Conferences & Events	GVA (€ m)	Employment
Flanders	2.1	40
Belgium	2.3	50
Europe	0.7	10

Source: BiGGAR Economics Analysis

In the table above, the impacts at a European level are lower than at the Flanders level due to the nature of displacement associated with tourist expenditure. That is, if people had not visited a university in the Flanders region they would likely have visited one outside the region or outside the country. Therefore while the spending is additional at a regional level, it is less so over the larger geographies.

7.3 Open Days

Prospective students who attend open days at the Flemish universities will make an economic contribution by spending money during their visits. Four out of the five universities were able to provide data about open days.

In 2016, an estimated 29,380 people attended University open days. Data provided by the Universities indicates that the vast majority of attendees (94%) are from Belgium with the remainder from elsewhere.

It was assumed that visitors from outside Belgium stay overnight in the area and so the average spend of international visitors to Flanders per leisure trip (€ 195) was therefore applied to these visitors.

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

Table 7-5 Flemish Universities: Open Days Contribution – Assumptions

Assumption	Value
No. of candidates attending open days from outside Belgium	1,909
Estimated % of International attendees	7%
Trip spend per candidate (€) – leisure	€ 195

Source: Flemish Universities and Eurostat data for Belgium, 2015

The resulting tourism expenditure estimate is converted to additional GVA and employment by using ratios and multipliers appropriate to the sector.

This results in a contribution from open days of an estimated € 0.2 million GVA and 4 jobs in Flanders. The resulting contribution is presented in Table 7-6.

Table 7-6 Flemish Universities: Conference & Event Contribution – Summary

Conferences & Events	GVA (€ m)	Employment
Flanders	0.2	4
Belgium	0.2	4
Europe	0.1	0

Source: BiGGAR Economics Analysis

7.4 Summary of Tourism Contributions

The contribution of the Flemish Universities to the economy through attracting visitors results in an estimated € 6.6 million GVA and 70 jobs per year in Flanders (Table 7-7).

The impacts at a Belgian and European level are lower than at the Flanders level due to the nature of displacement associated with tourist expenditure. That is, if people had not visited a university in the Flanders region they would likely have visited one outside the region or outside the country. Therefore while the spending is additional at a regional level, it is less so over the larger geographies.

Table 7-7 Flemish Universities: Tourism Contribution – Summary

Flanders	GVA (€ m)	Employment (jobs)
Visits to Staff and Students	5.9	40
Visits to Conferences & Events	2.1	40
Open Days	0.2	4
Total Tourism Contribution	8.2	80
Belgium	**GVA (€ m)**	**Employment (jobs)**
Visits to Staff and Students	6.9	40
Visits to Conferences & Events	2.3	50
Open Days	0.2	4
Total Tourism Contribution	9.4	90
Europe	**GVA (€ m)**	**Employment (jobs)**
Visits to Staff and Students	8.0	50
Visits to Conferences & Events	0.7	10
Open Days	0.1	0
Total Tourism Contribution	8.7	60

Source: BiGGAR Economics Analysis (numbers may not sum due to rounding)

8 GRADUATE PREMIUM

One of the most important ways in which the Flemish Universities create an economic contribution is through the long-term economic effects of their teaching activity, as realised through their graduates.

8.1 Graduate Premium

The skills and knowledge gained by students while studying at the Flemish Universities enables students to become more productive employees after graduation. This enables them to contribute more to their employer and generate a greater benefit for the regional and national economies than they would otherwise be able to.

The GVA of this productivity gain includes the additional profits that employers of graduates are able to generate and the additional employment costs they are willing to pay in order to attract graduates of the required calibre.

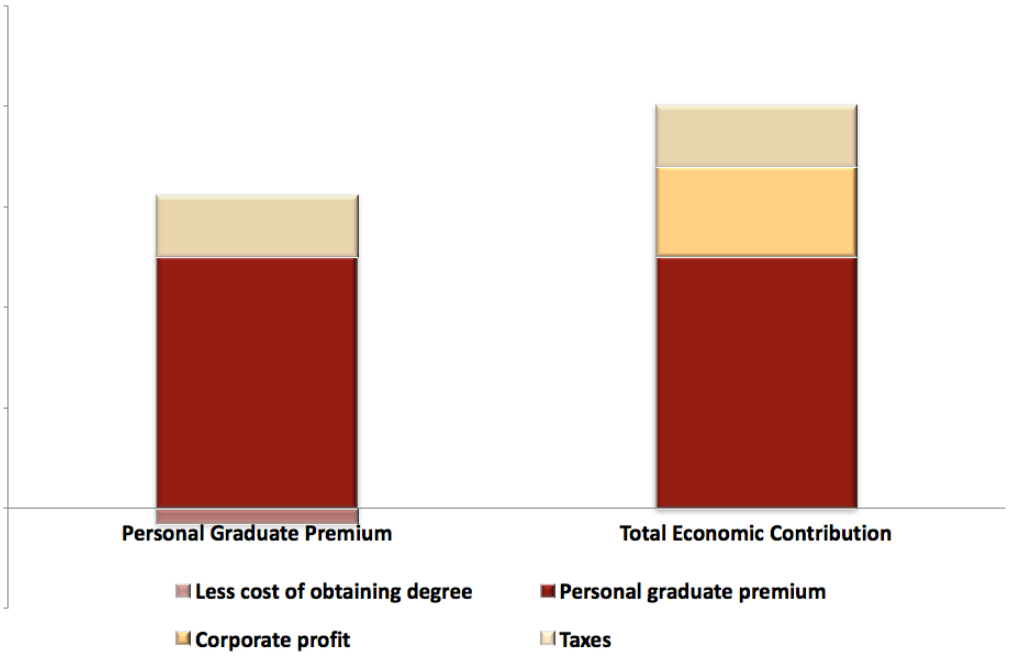
Information about the earnings of graduates is available from OECD, Education at a Glance, 2014 and can be used to provide a measure of the additional contribution graduates make to the Belgian economy each year[16].

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 here is likely to underestimate the true productivity impact of learning. The total graduate premium presented here therefore relates to 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. It does include taxes paid, however, the net benefits to graduates are discussed in more detail in the methodological appendix.

For these reasons (as illustrated in Figure 8.1) the contribution presented in this section is likely to underestimate the full contribution that graduates from the Flemish Universities generate for the economy.

[16] Education at a Glance 2016: OECD Indicators - © OECD 2016, Table A6.4

Figure 8.1 – Personal Graduate Premium Benefit Vs. Economic Benefit

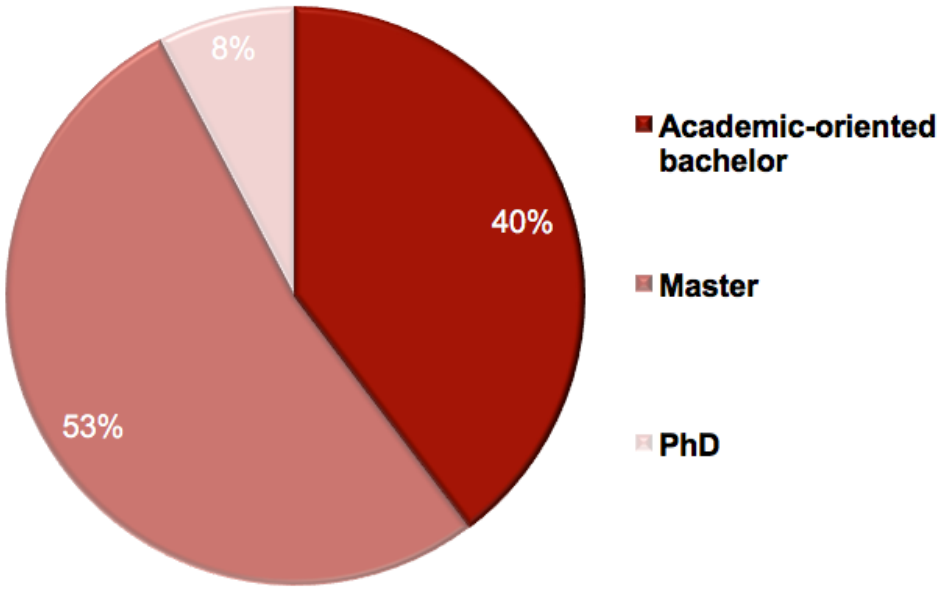


Source: BiGGAR Economics

8.2 Estimating the Graduate Premium

In 2016, there were a total of 37,450 graduates from the Flemish Universities, of which 97% were Belgian and 3% were from outside the country. Approximately 40% of graduates received a Bachelors degree, 53% received a Masters degree and 8% received a Doctorate qualification.

Figure 8–2: Graduates from the Flemish Universities by type of Degree, 2016



Source: Flemish Universities

It is assumed that 90% of Belgian graduates remain in Flanders after graduation, and that 96% remain in Belgium on completion of their studies. For non-Belgian graduates it is assumed that much greater proportions leave the region on completion of their studies.

8.3 Methodology

As well as the level of qualification attained, the subject that a student graduates in determines the earnings premium that they can expect to achieve over the course of their working life. These figures are summarised in Table 8-1.

Table 8-1: Graduate Premium Assumptions (€)

	Bachelors	Masters
Teacher training & education science	77,084	111,645
Humanities, languages & arts	88,096	127,594
Social sciences, business & law	103,513	149,923
Science, maths & computing	110,120	159,493
Engineering, manufacturing & construction	105,715	153,113
Health & welfare	90,298	130,784
All fields (Average)	96,906	140,354

Source: BiGGAR Economics Analysis and OECD

In 2016, almost 37,450 students graduated from the Flemish Universities. A breakdown of graduates by level of qualification is provided in Table 8-2.

Table 8-2: The Flemish Universities – Graduates

	Value
Bachelors	14,860
Masters	19,690
Doctoral	2,890
Total Graduates	**37,450**

Source: Flemish Universities

The impact associated with graduates from the Flemish Universities was estimated by applying the graduate premium for each degree subject (Table 8-1) to the number of graduates in each subject area. Adjustments were than made for the proportions of Belgian and non-Belgian graduates who left the country after graduating based on data provided by the Flemish Universities.

In this way it was estimated that graduates of the Flemish Universities have an estimated graduate premium contribution of € 3.4 billion in Flanders, € 3.7 billion in Belgium and € 3.8 billion in Europe. This contribution is a productivity gain, measured in terms of GVA and consequently does not have associated employment gains.

Table 8-3 Flemish Universities: Graduate Premium

Graduate Premium	GVA (€ m)
Flanders	3,436.2
Belgium	3,672.9
Europe	3,849.8

Source: BiGGAR Economics Analysis

8.3.1 Societal Impacts

A further point to consider is that the additional benefits of having a graduate level education are not purely confined to increased earnings. There is a large body of literature that has explored the wider benefits of learning and the complex relationship it has across all aspects of life and well-being.

Within the framework of the European Lifelong Learning Indicators (ELLI) project, the Centre for the Wider Benefits of Learning at the University of London's Institute of Education[17] reviewed more than 200 international studies and research projects on the effects of learning in all phases and areas of life.

Their findings summarised the literature into five themes:

- Learning and identity: all forms of learning in various phases over the course of a lifetime impact on an individual's self-confidence, self- esteem, resilience and the development of social skills;
- Learning and health: numerous studies have made clear the direct relationship between the duration and frequency of the learning processes in

[17] Centre for Research on the Wider Benefits of Learning, Institute of Education, University of London, 2011, *The Wider Benefits of Learning Part2: Learning and Health*, Bertelsmann Stiftung.

various phases of life and mental and physical well-being, health behaviour, life expectancy and other physical and mental health aspects;

- Learning, life satisfaction and happiness: there is a positive correlation between learning and happiness, well-being and personal optimism;
- Learning and community vitality: learning has a positive impact on social cohesiveness and community vitality through its influence on social mobility, active citizenship, social participation, tolerance and inter-cultural sensitivity. This theme also investigates the link between learning and lower levels of criminality; and
- Learning spill-overs and interplays: more complex reciprocal effects of learning and living processes. Positive learning experiences impact people's future learning behaviour, followed by the complex relationships between learning and occupational prospects. In addition, it explores the multifaceted impacts of learning on family situations. These include, for example, the influence of the educational and learning level of parents on the development of their children.

The message from this research is that the benefits of having undertaken a higher-level education extend well beyond the personal earnings premium. There is a much wider range of benefits to the individual, to the workplace and to society that are associated with higher education that cannot be measured in monetary terms but are, nonetheless, highly valuable.

9 VALORISATION

The Flemish Universities support technological innovation in the region through a broad range of valorisation activities. This includes the commercialisation of knowledge through the licensing of intellectual property developed at the Universities as well as the creation of new businesses (spin-off companies) based on research undertaken at the Universities. It also includes work that supports the exchange of knowledge, information, skills and research with companies and public organisations. This allows businesses and organisations to utilise academic knowledge in a way that generates economic benefits such as reducing the time taken to develop new products and, ultimately, increase the income and employment in the companies supported.

The quantitative impact of the combined range of valorisation activities undertaken by the Flemish Universities is presented in this chapter.

9.1 Commercialisation

9.1.1 Licensing

Licence agreements give companies the legal right to use a particular technology or other type of intellectual property, developed at the Flemish Universities, to generate additional sales, reduce costs or otherwise improve profitability. In return, companies pay royalties to the Universities. Without the initial research outcomes of the Flemish Universities, the productivity gains would not have been possible. Therefore, the benefits to the economy from this activity can be rightfully be attributed to the Universities.

All five of the universities receive licensing income. One example of the effect this can have is the case of the antiviral agent developed in 1993 in association with KU Leuven which has since become the most commonly used anti-HIV drug in the world (see Figure 9–1).

Figure 9–1: KU Leuven Licensing Activity – Medical Research into Antiviral Agents

Leuven has a long tradition of developing innovative and effective medications. One such medication is the antiviral agent tenofovir disoproxil fumarate, discovered in 1993 by Professor Erik De Clercq and Professor Jan Balzarini of the KU Leuven Rega Institute for Medical Research, in collaboration with Professor Antonin Holý of the IOCB in Prague and Dr. John Martin of Gilead Sciences.

Tenofovir was licensed to the American biopharmaceutical company Gilead Sciences, which further developed it and now produces and distributes the drug under the trade name Viread® in exchange for royalty payments to KU Leuven. Tenofovir is also an essential component of the combination drugs Truvada®, Atripla®, Complera® and Stribild®, and has become the most commonly used anti-HIV drug in the world. In 2016, sales of Truvada® and Atripla® totaled over $4.5 billion and $3 billion respectively, while sales of Viread® reached over $1 billion. Drugs containing tenofovir are effective at reducing the HIV-titre in the blood, stopping the infection from being lethal. HIV-infected patients treated with these medications can manage the disease for many years.

The discovery of the phosphonates, the class of compounds to which tenofovir belongs, has also contributed to the creation of the KU Leuven spin-off company Okapi Sciences, which specialises in the development of drugs for the treatment or prevention of viral infections in animals, such as swine fever and foot-and-mouth disease. In 2014, Okapi Sciences was acquired by Aratana Therapeutics.

Source: KU Leuven

In 2016 the Flemish Universities received € 125.0 million in royalties from their license agreements. On average across the five Universities, 93% of this income was from licence holders in Flanders.

Table 9-1 Flemish Universities: Licensing Contribution – Assumptions

Licensing income	
Total licensing income, € million	125.0
Location of license holders	
Flanders	93%
Belgium	93%
Europe	94%

Source: Flemish Universities

The relationship between the royalty paid for a technology and the turnover it generates depends on the details of the licensing agreement and can vary considerably between agreements. In order to agree a licence, negotiators must first form a view of how much the IP is worth to the prospective licensee. There are a wide variety of variables that may inform this judgement, but a training manual issued by the World Intellectual Property Organisation states that a common starting point is the "well known and widely quoted" 25% rule.

The 25% rule is a general rule of thumb according to which the licensor should receive around one quarter to one third of the profits accruing to the licensee and has been used by IP negotiators for at least 40 years. The rule is based on an empirical study first undertaken in the 1950s and updated in 2002[18]. The study found that royalty rates were typically around 25% of the licensee's profits, which equates to around 5% of sales from products embodying the patented

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

technology. This implies that royalties paid for a technology typically represent around 5% of the total turnover generated by that technology.

Applying this to the assumptions described above suggests that in 2016, intellectual property developed by the Flemish Universities enabled Belgian businesses to generate additional turnover. The GVA and employment contribution associated with this were estimated by applying economic ratios for the sectors in which licence agreements were made. The effect of subsequent spending rounds was captured by applying GVA and employment multipliers. The effect in each study area was estimated based on the location of the business that licenced each technology.

In this way it was estimated that the licensing activity of the Flemish Universities contributed € 30.0 million GVA and 370 jobs in Flanders, and € 73.6 million GVA and 910 jobs in Belgium and € 138.4 million GVA and 1,710 jobs in Europe.

Table 9-2 Flemish Universities: Licensing Contribution

Licensing Contribution	GVA (€ m)	Employment (jobs)
Flanders	30.0	370
Belgium	73.6	910
Europe	138.4	1,710

Source: BiGGAR Economics Analysis

9.1.2 Spin-off Companies

The Flemish Universities support the formation of new businesses based on intellectual property developed at the Universities. These spin-off companies make an economic contribution to the region through the turnover they generate and the employment they support.

In 2016 there were an estimated 253 active spin-out companies from the Flemish Universities. All spin-off companies created prior to 2016 that continue to be active in 2016 have been included in this contribution. This is because these companies are generating turnover and supporting employment in 2016.

Table 9-3 Flemish Universities: Spin-off Contribution – Assumptions

	Total
Number of active spin-offs	253
Number of jobs supported	5,790
Turnover generated	€ 737.3 million

Source: Flemish Universities and BiGGAR Economics Analysis

The spin-off companies from the Flemish Universities were estimated to employ 5,790 people and generate € 737.3 million turnover. The total economic impact is the sum of the GVA and employment contribution of the spin-off companies themselves and the activity that these companies generate within their supply chain and through the spending of their staff.

This is estimated to be € 707.8 million GVA and 10,790 jobs in Flanders, and € 915.5 million GVA and 12,490 jobs in Belgium and € 928.9 million GVA and 13,790 jobs in Europe.

Table 9-4 Flemish Universities: Spin-off Contribution

Spin-off Contribution	GVA (€ m)	Employment (jobs)
Flanders	707.8	10,790
Belgium	915.5	12,490
Europe	928.9	13,790

Source: BiGGAR Economics Analysis

9.2 Knowledge Exchange

9.2.1 Services for Businesses

The expertise of the Flemish Universities makes them well placed to support businesses and other organisations in the Flanders region. There are several ways in which the Flemish Universities do this:

- collaborating with businesses or other organisations to undertake commissioned research;
- undertaking consultancy projects for businesses or public organisations to address specific problems;
- delivering professional training and further education to help businesses develop the skills of their workforce; and
- hiring out facilities and/ or equipment.

In 2016 the Flemish Universities generated € 180.8 million by providing these types of services to businesses and other organisations.

It is reasonable to assume that the businesses that invest in this type of support do so because they expected the projects to generate positive returns. Detailed information about the level of these returns is not available; however, an estimate can be made based on the findings of research from similar activity elsewhere.

In 2013 BiGGAR Economics undertook an evaluation of Interface, the agency responsible for brokering relationships between businesses (and other organisations) and universities in Scotland[19]. The connections that Interface has made have covered a range of different types of engagement from small consultancy projects and access to university equipment and facilities through to company sponsored PhDs. The BiGGAR Economics evaluation found that the costs to Interface's clients of participating in this programme was £12.9 million and the direct benefit to these organisations was £46.4 million GVA. Therefore the direct return to investment was 360%. In other words, every £1 invested by businesses generated £3.60 GVA in direct economic benefits.

This finding is similar to other studies done in similar areas. In 2009 PriceWaterhouseCoopers LLP undertook a study for the Department of Business, Enterprise & Regulatory Reform[20], which considered the impact of Regional Development Agency spending. One of the aspects of this report considered the GVA returns to business development and competitiveness interventions

[19] BiGGAR Economics (2013), Evaluation of Interface, the knowledge connection for industry
[20] PriceWaterhouseCoopers, Impact of RDA spending – National report – Volume 1 – Main Report, March 2009, DBERR

between 2002 and 2007. This found that interventions in "Science, R&D and innovation infrastructure had achieved cumulative GVA equivalent to 340% the cost of the projects and that this could increase to 870% if the long-term benefits were taken into account. This suggests that the 360% multiplier estimated by BiGGAR Economics could be conservative.

Although both of these studies related to activity undertaken in the UK rather than the Flanders region, the nature of the collaboration considered in both studies is very similar so the findings of the research are likely to be applicable to this study. The economic contribution of the Flemish Universities working with businesses was modelled using the lowest of the range of possible assumptions (i.e. 340%).

Table 9-5 Flemish Universities: Services for Businesses Contribution – Assumptions

		€ million	Source
Total income from services for businesses, of which...		180.8	Flemish Universities
	Contract research	153.1	
	CPD	25.3	
	Facilities hire	2.4	
GVA contribution from services for businesses		340%	PWC

Source: As shown

These assumptions were applied to the total value of income received by the Flemish Universities for delivering these services to business. In this way it was estimated that the Flemish Universities contributed € 1.2 billion and 12,250 jobs in Flanders in 2016. This contribution is summarised in Table 9-6.

Table 9-6 Flemish Universities: Services for Businesses Contribution

Services for Businesses Contribution	GVA (€ m)	Employment (jobs)
Flanders	1,245.7	12,250
Belgium	1,270.4	14,740
Europe	1,626.0	21,350

Source: BiGGAR Economics Analysis

9.2.2 Science Parks and Incubators

In total, there are eight science parks and 12 incubators associated with the Flemish Universities. In some cases, these are privately financed and in other cases they have been established directly by one of the Universities.

Science parks provide a physical environment in which researchers working in academia and the private sector can meet and exchange ideas with one another. This helps to stimulate new ideas and facilitate opportunities for collaborative research. The overall aim is to create optimum conditions for innovation between local companies and academic researchers and also to attract new companies to locate there.

Ultimately the success of these parks is due to the academic partners involved, as without them the science parks would simply be a collection of businesses with little incentive or stimulus to collaborate. For this reason, it is appropriate to include the value generated by these parks within this report. Science parks

generate economic benefits by increasing the level of economic activity as well as attracting more companies to the area.

The details provided by the Flemish Universities suggests that 9,000 science park employees and around 1,300 employees at incubators that have not been considered elsewhere in this study. Unlike spin-off companies most of the businesses that are located on the science parks would have existed even if the science park did not. This means that it would not be appropriate to attribute all of the economic impact of these businesses to the universities.

If the science parks did not exist then it is possible that some of the businesses located on the science parks would have chosen to locate elsewhere in Europe or elsewhere in the world instead. It is also likely that colocation with a university has enabled many of these businesses to achieve higher levels of growth than would otherwise have been possible.

In assessing the economic contribution of science parks and incubators, it was necessary to consider both of these factors and come to a view about the extent to which this impact was additional. These assumptions are discussed in further detail in the methodological appendix. After accounting for this, the economic contribution of the science parks was estimated using a similar approach to the spin-offs contribution.

Using this approach, it was estimated that the involvement of Flemish Universities in science parks generated € 519.6 million GVA for the Flemish economy in 2016 and supported around 6,470 jobs.

Table 9-7 Flemish Universities: Science Parks Contribution

Science Parks Contribution	GVA (€ m)	Employment (jobs)
Flanders	519.6	6,470
Belgium	522.5	6,450
Europe	409.7	5,010

Source: BiGGAR Economics Analysis

9.3 Internships/ Student Placements

In 2016, 9,700 work placements were undertaken by students from the Flemish Universities during the course of their studies, when they spent time working for a business or organisation in a sector that was relevant to their field of study. Of these, 4,700 (49%) were medical placements and the remainder were non-medical placements of up to 6 months in duration. Placements provide students with an opportunity to apply what they have learned while studying in a work setting and gain valuable work experience that should help to improve their employment prospects after they graduate.

Placements can also have a number of benefits for host businesses. There are four main types of benefits:

- **the work undertaken by the student/graduate** – i.e. helping to implement new procedures or completing specific projects, by freeing up time from other staff, doing things that other staff did not have the time to do;

- **the outlook of the graduate or student** – i.e. the idea that students/graduates can bring a fresh perspective that can stimulate organisations to question whether they are doing things in the best way;
- **improved skills, knowledge or experience of existing staff –** e.g. the management experience gained by employees involved in organising or supervising placements, new skills picked up from the student/graduate and the potential for organisations to use placements to vet potential employees;
- **other benefits** – such as direct cost savings or the opportunity to develop a relationship with a higher education institution.

The value that a student delivers for their host organisation will depend on a number of factors including the duration of the placement, the skills of the individual and the nature of the work undertaken. It is however possible to estimate the impact of placements based on the amount of time that students spend working within their host organisations.

The nature and duration of student placements undertaken by students at the Flemish Universities varies, but for the purposes of this analysis only placements of 12 weeks or longer were considered. This is because it was assumed that placements of a shorter duration would be primarily observational in nature.

To estimate the value of this impact it was first necessary to establish how much time students spent on placement and how many full time staff this time would be equivalent to. Students on placement are likely to be less productive than an average worker because they have less experience and require more supervision. The value that students added to their host organisations was then estimated by assuming that students contributed half of the GVA that an average worker in the same industry would generate over the same period of time. Appropriate multipliers were then applied to capture the effect of subsequent spending rounds.

Table 9-8 Flemish Universities: Placement Contribution – Assumptions

	Value	Source
Total number of students placements of >12 weeks	9,714	Flemish Universities
% of placements undertaken outside Flanders	9%	
Student productivity as % of fully trained member of staff	50%	BiGGAR Economics

Source: Flemish Universities and BiGGAR Economics Analysis

Using this approach, it was estimated that students at the Flemish Universities contributed € 73.3 GVA million to the regional economy and supported 1,330 jobs as a result of undertaking placements during the course of their studies. This contribution is summarised in Table 9-9.

Table 9-9 Flemish Universities: Student Placements Contribution

	GVA (€ m)	Employment (jobs)
Flanders	73.3	1,330
Belgium	80.4	1,430
Europe	94.1	1,650

Source: BiGGAR Economics Analysis

9.4 Summary Valorisation Contribution

The Flemish Universities make a significant economic contribution through their valorisation activities, such as the creation of new companies, licensing of intellectual property and their knowledge exchange activities through services to businesses, supporting the growth and development of science parks and through student placements. The total monetary value of this in 2016 was estimated to be € 2.6 billion GVA and 31,210 jobs in Flanders.

Table 9-10 Flemish Universities: Commercialisation Contribution – Summary

Flanders	GVA (€ m)	Employment
Licensing	30.0	370
Spin-offs	707.8	10,790
Services to Businesses	1,245.7	12,250
Science Parks	519.6	6,470
Student Placements	73.3	1,330
Total Valorisation Contribution	2,576.4	31,210
Belgium	**GVA (€ m)**	**Employment**
Licensing	73.6	910
Spin-offs	915.5	12,420
Services to Businesses	1,270.4	14,740
Science Parks	522.5	6,450
Student Placements	80.4	1,430
Total Valorisation Contribution	2,862.4	36,020
Europe	**GVA (€ m)**	**Employment**
Licensing	138.4	1,710
Spin-offs	928.9	13,790
Services to Businesses	1,626.0	21,350
Science Parks	409.7	5,010
Student Placements	94.1	1,650
Total Valorisation Contribution	3,197.1	43,510

Source: BiGGAR Economics Analysis (numbers may not sum due to rounding)

10 WIDER BENEFITS

As well as the teaching and research they deliver, there are other, wider benefits arising from the Flemish Universities to the individual and to society as a whole. Some of these have already been described in section 8.3.1 on the wider benefits of higher education to the individual. However, other factors exist and are rightly included when considering the overall range of benefits that are attributable to the Flemish Universities.

The range of factors described in this section include the contribution that the members make to the research, development and innovation landscape in Flanders and throughout Belgium that supports and underpins the country's strong international reputation; the appeal they have that is attractive to multinational companies; the spirit of collaborative working they encourage between education, industry and government and the contribution the Universities make towards providing public goods and creating health benefits for society. The benefits the universities bring at a social level are also outlined.

10.1 Global Competitiveness

The World Economic Forum's Global Competitiveness Report for 2016-17[21] assesses the competitiveness landscape of 138 countries, providing insight into the drivers of their productivity and prosperity. The index is found that Belgium ranked in the top 20 countries on the Global Competitiveness Index and had improved its position by two rankings compared to the previous year.

The impact of the higher education sector in determining the country's position in this ranking is clear. Based on twelve pillars of performance, the country ranks highest in indicators relating to higher education and training (particularly the quality of the education system, the quality of maths and science education and the quality of management schools) and on health and primary education.

On innovation, the country ranks in 9th position out of 138 for university-industry collaboration in research and development.

10.2 Attracting International Investment in R&D

A large proportion of private sector research and innovation is conducted by multinational enterprises. In turn, they make a substantial contribution towards GDP. They also create opportunities for skilled jobs, maintain ties with various international innovation actors and collaborate with higher education and research institutions and regional companies to generate and disseminate new knowledge.

At an international level, countries and cities have become increasingly competitive in attempting to attract mobile foreign direct investment due to the many benefits they bring.

The Flemish Universities play an important role in attracting multinational enterprises to the regions through research work and through their involvement in the associated science parks.

[21] K Schwab, 2017, The Global Competitiveness Report 2016-2017, World Economic Forum

10.3 Collaborative Working

The Flemish Universities have a long-established and highly valued system of collaborative working.

Collaboration operates on several levels: between the Flemish Universities themselves, between the Flemish Universities and government, between the Flemish Universities and industry and between the Flemish Universities and other education and research institutions both in Belgium and abroad.

This is a variation on the Triple Helix[22] approach to economic development whereby education, industry and government work together in a complex and dynamic series of interactions that generate new knowledge, encourage innovation and, as a result, contribute to economic development.

This has led to the observation that an academic revolution is progressing with the role of academia now extending far beyond teaching and research. Higher education and research institutions now incorporate a third mission into their strategies: to be active players in economic development through the creation of scientific and technological knowledge and, consequently, of innovation[23].

In the Triple Helix approach, the interactions between the sectors enable the rapid identification of and response to the frequent changes that occur in a society organised around knowledge. These interactions occur at many levels and result in: (a) internal transformation in the respective sectors; (b) the influence of organisations in one sector on organisations in the other sectors; (c) the creation of new structures; and (d) a recursive effect among the three sectors.

The concept of the Triple Helix provides an analytical tool for identifying and evaluating the behaviour in the education, university, industry and government spheres to develop appropriate policies and strategies to promote innovation and the economic development it supports. It can be also an 'inspiration' for policy makers not only to develop policies to support the R&D infrastructure, as in previous approaches to national innovation systems, but also to improve the linkages between the spheres.

Research groups act as quasi-firms and cooperate with actors in other sectors. Thus the 'entrepreneurial university' emerges, and the inter-sectoral linkages take on a new hybrid configuration. Products of this new configuration include spin-off companies, incubators and technology parks, intellectual property and technology commercialisation offices. The outcome is that innovation and economic development becomes a more embedded and valued part of the economy instead of being an isolated undertaking by a single organisation.

The international dimension is particularly important in the Flemish model as the institutions pride themselves as having an outward looking approach to research and collaboration which helps them to harness the potential offered by global academic thinking in the widest sense possible.

[22] The Triple Helix concept was developed originally by Henry Etzkowitz and Loet Leydesdorff in the 1990s as a result of their preliminary studies on the role of the academy and of complex systems dynamics. Over the years the concept has been spread through academic papers, books and special issues in the scientific press.

[23] M Amaral, 2011, The Triple Helix in the economic development of cities, regions and countries, in Industry and Higher Education, Vol 25, No 5

A good example of collaborative working that involves the Flemish Universities, government and industry is VIB, a life sciences research institute based in Flanders which performs basic research with a focus on translating scientific results into pharmaceutical, agricultural and industrial applications (Figure 10–1).

Figure 10–1: Collaborative Working through VIB

With departments, labs and research facilities at all VLIR member universities, VIB is a non-profit, autonomous research institute headed by a general assembly and financed by the Flemish government.

Over time VIB has developed a vast network of reliable business partners, generating a turnover of € 13.3 million in 2016 alone through industrial activities. The same year it signed 137 partnership agreements with industry partners of which 47% were located in Flanders.

VIB has major partners in research and development both inside and outside Belgium, such as:

- Oxford BioMedica – preclinical trials for MoNuDin which treats amyotrophic lateral sclerosis);
- Sanofi Aventis – joint development of a universal flu vaccine for humans which has been pioneered by researchers from VIB and Ghent University;
- Cellectis – the French genome engineering specialist and VIB together conduct research into new approaches to cure haemophilia;
- BASF PlantScience – a joint collaboration on plant genetic mechanisms that increase yield and improve tolerance to environmental stress such as drought and cold;
- Ablynx – along with VIB is engaged in the discovery and development of Nanobodies to treat a range of serious human diseases. It was established as a spin-off of VIB and the VUB; and
- Bayer CropScience – an ongoing collaboration into the mechanisms with which plants cope with stress factors such as extreme temperatures or persistent drought. The results are crucial for the development of crops with higher yield.

Source: VIB website

10.4 Health Benefits

The Flemish Universities make a contribution to individuals and wider society through health-related research. Their reputation in the medical field is long-established and well-regarded throughout the country. The medical research work of the universities generates impact through health gains to individuals, as well as stimulating private sector investment.

10.5 Staff Volunteering

Staff at the Flemish Universities often contribute their time to other activities and organisations, outwith their contracted hours. For example, they may play an important role in civic leadership by contributing to the legislative process, advising on committees and supporting economic development at the regional and national level through their expertise. They may also use their expertise to contribute to non-governmental external bodies and professional organisations and engage with the public through a variety of events such as public lectures, festivals and exhibitions.

As well as the clear social benefits of these interactions there are also economic benefits from the improved efficiency that results from the creation of better informed policies and initiatives.

10.6 Social Benefits

As universities attract students from a wide range of social and ethnic backgrounds, interaction with fellow students can lead to increased sensitivity towards other cultural perspectives, cultivate freedom of expression, and a higher acceptance of differences.[24] Universities therefore help to shape individuals and consequently societies that are open to new ideas and diversity.

Higher education can also help to break cycles of educational deprivation. Increasing higher education in one generation can enhance the prospects, and therefore skills, of future generations, thereby improving social mobility.

Better health and wellbeing, reduced risk of depression and better health behaviours in general are also impacts of higher education.[25] Impacts like this can have wider economic benefits that are impossible to quantify; better physical and psychological health can lead to reduced health costs for the economy.

Higher education participation can also have positive knock on effects in terms of civic participation. Across OECD countries, educational attainment is generally positively associated with electoral participation.[26] Greater civic engagement would in turn have consequences for democratisation and wider political stability.

Public engagement in science is a further benefit that is brought about by the universities. Students are invited to come to university to see and take part in workshops and activities to introduce science to the wider public.

A further wider benefit of higher education is personal growth and social development beyond academic learning through off-campus activities such as part-time work and volunteering. This benefit has further spill-over effects after graduation with those individuals being more likely to interact in social networks, such as participation in voluntary and charitable organisations.

The Flemish Universities also have social benefits through the museums and libraries that they operate, which are open to the public and therefore support wider cultural engagement.

Universities therefore have significant wider impacts which although unquantifiable are equally important on an individual and societal level. The impacts described in this report therefore present only a partial picture of the wider contribution of the Flemish Universities.

10.7 International Students

The Flemish Universities attract international students from around the world. In 2015/16, approximately 15% of students at the Flemish Universities were international students (defined here as students from outwith Belgium).

[24] Department for Business Innovation & Skills (September 2013), *The Wider Benefits of International Higher Education in the UK*.
[25] Department for Business Innovation & Skills (October 2013), The Benefits of Higher Education Participation for Individuals and Society: key findings and reports "The Quadrants".
[26] OECD (2011), *Education at a Glance 2011*: OECD Indicators.

International students make an economic contribution while they are studying and after graduating. It can be estimated that the international students at the Flemish Universities contribute € 16.3 million through their spending while they are studying. After graduation, if these international students were to stay in Belgium they would contribute an estimated € 130.5 million GVA over their working lives through their earnings premium and the taxation benefits arising from this.

In countries where there are substantial numbers of international students, the Universities also benefit from any income received directly from the students in the form of tuition fees. As this contributes to the overall income of the University, this underpins and therefore indirectly supports all of the other economic contributions discussed in the report. In addition, there would be other, wider benefits stimulated by international students, such as benefits for the tourism economy through visits from friends and family.

10.8 Summary

The benefits described here cannot reliably be quantified in economic terms but they are highly valuable nonetheless. They have an influence that extends beyond teaching and research to impact on the economic, social and environmental quality of the country and the health, safety and social cohesion of its people.

11 SUMMARY OF CONTRIBUTIONS

This chapter summarises the quantifiable economic contribution of the Flemish Universities within Flanders, within Belgium and across Europe.

11.1 Total Contribution

By bringing together the various sources of economic contribution discussed in this report it can be estimated that, in 2016, the five Flemish Universities contributed **€ 12.0 billion GVA** to the European economy and supported a total of **121,800 jobs**.

The contribution in Flanders was **€ 9.8 billion GVA** and **91,800 jobs**.

This implies that:

- each € 1 generated through the direct operations of the Flemish Universities, supported € 6 in total benefits for the economy of Flanders; and
- each person directly employed by the Flemish Universities supported almost 3 jobs throughout Flanders.

The total income of the Flemish Universities in 2016 was € 2.2 billion and so the ratio of total income to total impact in Flanders was € 1 : € 4.

The core government funding contribution to the five Flemish Universities in 2016 was € 1.0 billion which gives a ratio of government funding to impact of €1 : € 10 in Flanders.

A breakdown of the total contribution by GVA and by employment is provided in Table 11-1 and Table 11-2 respectively.

Table 11-1 – Flemish Universities– Summary Contribution – GVA, € million

	Flanders	Belgium	Europe
Direct Effect	1,667.3	1,667.3	1,667.3
Staff Spending Effect	669.5	1,086.8	1,298.2
Supplier Effect	390.7	508.7	616.0
Capital Investment	150.5	184.5	218.8
Core Contribution	**2,878.0**	**3,447.3**	**3,800.5**
Student Spending	436.5	489.0	552.3
Student Working	400.1	449.6	508.1
Student Volunteering	41.5	41.7	43.5
Student Contribution	**878.1**	**980.3**	**1,103.9**
Visits to Staff and Students	5.9	6.9	8.0
Visits to Conferences & Events	2.1	2.3	0.7
Open Days	0.2	0.2	0.1
Tourism	**8.2**	**9.4**	**8.7**
Technology Licensing	30.0	73.6	138.4
Spin-outs	707.8	915.5	928.9
Services to Businesses	1,245.7	1,270.4	1,626.0
Science Parks	519.6	522.5	409.7
Student Placements	73.3	80.4	94.1
Valorisation	**2,576.4**	**2,862.4**	**3,197.1**
Sub-Total	**6,340.6**	**7,299.5**	**8,110.1**
Graduate Premium	3,436.2	3,672.9	3,849.8
TOTAL	**9,776.8**	**10,972.4**	**11,960.0**

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

Table 11-2 – Flemish Universities – Summary Contribution – Jobs

	Flanders	Belgium	Europe
Direct Effect	31,960	31,960	31,960
Staff Spending Effect	10,470	17,440	21,160
Supplier Effect	5,810	7,630	9,290
Capital Investment	1,940	2,370	2,790
Core Operations	**50,180**	**59,400**	**65,210**
Student Spending	3,890	4,470	5,140
Student Working	6,430	7,080	7,890
Student Volunteering	-	-	-
Student Contribution	**10,320**	**11,560**	**13,030**
Visits to Staff and Students	40	40	50
Visits to Conferences & Events	40	50	10
Open Days	<10	<10	<10
Tourism Contribution	**80**	**90**	**60**
Technology Licensing	370	910	1,710
Spin-offs	10,790	12,490	13,790
Services to Businesses	12,250	14,740	21,350
Science Parks	6,470	6,450	5,010
Student Placements	1,330	1,430	1,650
Valorisation	**31,210**	**36,020**	**43,510**
Sub-Total	91,790	107,060	121,800
Graduate Premium	-	-	-
TOTAL	91,790	107,060	121,800

Source: BiGGAR Economics Analysis

The figures in Table 11-1 and Table 11-2 reflect the estimated economic contribution made by the Flemish Universities in terms of GVA and jobs. However, it is important to note that their total contribution is much wider than that which can be measured in quantifiable terms. The nature and quality of their wider benefits should be included in the overall assessment of the total economic contribution to give a more rounded view of the true value which they create.

11.2 Comparisons

The scale of the economic contribution made by the five Flemish Universities can be put in some context by reflecting on the findings of broadly similar studies undertaken by BiGGAR Economics that considered the economic contribution made by other groups of universities.

On employment, the ratio of direct jobs to total employment contribution is 1 job : 4 jobs in Europe for the Flemish Universities. This is similar to the ratio for the Finnish Universities which was also 1 direct job : 4 total jobs and less than the ratio for the LERU Universities of 1 : 6.

On GVA, the ratio of direct GVA to total GVA is € 1: € 7 for the Flemish Universities at the European level. This ratio is different to the ratio of government funding to impact as it considers the direct GVA of the institutions rather than the government funding. The direct GVA is estimated by considering the *total* income of the institutions less their operating revenue.

The direct GVA to total GVA ratio for the Flemish Universities is similar to the ratios for both the Finnish Universities and the LERU Universities which were €1 : €8 and €1 : €7 respectively.

However, while these comparisons are interesting to note, it is important to highlight that a true "like for like" comparison *cannot* be drawn. This is for several reasons:

- although each study follows a similar approach, data sources and methods of compiling data differ from country to country. This makes a direct comparison unrealistic; and
- input-output ratios differ between countries reflecting the differences in national economies and the extent to which they trade with other countries. Part of the total impact comes from the interaction of the universities with the national economy and part comes from the nature of the economy itself which is beyond the control of the Flemish Universities.

For these reasons it is more appropriate to consider the contribution made by the Flemish Universities on its own merits for which there is no direct parallel.

12 APPENDIX A: OVERVIEW OF VLIR MEMBERS

12.1 University of Antwerp

History: The roots of the University go back to 1852 when it was founded as a school for higher education and commerce, becoming one of the first European business schools to offer formal university degrees. The present University of Antwerp was formed in 2003 from the merger of three institutions

Scale & Structure: In 2016, the University had around 18,000 students from 116 nationalities: approximately 19% were international students. Also in 2016, the University had an income of €273.5 million and employed just under 4,300 staff.

The university is organised into 9 faculties: pharmaceutical, biomedical and veterinary sciences; medicine and health; arts; design sciences; law; social sciences; applied economics; applied engineering and science.

Rankings: In its 2018 rankings[27], QS placed the University of Antwerp in 14th position globally for universities under 50 years old.

Research and Innovation: The University of Antwerp has six frontline research domains in drug research; ecology and sustainable development; harbour, transport and logistics; imaging; infectious diseases and materials characterisation. It has emerging research domains in the fields of neurosciences; socio-economic policy and organisation; urban history and contemporary urban policy; multilevel governance, globalisation and federalism; oncology and proteomics, genomics and metabolomics.

12.2 Vrije Universiteit Brussel (VUB)

History: The Vrije Universiteit Brussel (UVB) is the offshoot of the French-speaking Université Libre de Bruxelles (ULB) that was founded in 1834. The Dutch-speaking university was split off from its French-speaking sister institution in 1969.

Scale & Structure: In 2016, the University had almost 13,000 students including over 3,400 (21.5%) international students from 128 nationalities. The university had over 3,600 staff and an income of € 230.9 million.

Teaching is organised into eight faculties: economic and social sciences and the Solvey business school; law and criminology; medicine and pharmacy; psychology and educational sciences; arts and philosophy; sciences and bio-engineering sciences; engineering and physical education and physiotherapy.

Rankings: Reuters have ranked VUB in 50th position in the top 100 most innovative universities in Europe.

Research & Innovation: The VUB has nine research clusters: city dynamics, societal challenges; brain behaviour; the circle of life; smart engineering; smallest particles; fighting diseases; environmental issues and big data. The University has around 30 active spin-offs and filed 25 new patents in 2016.

[27] Published in 2017 for the next year.

12.3 Ghent University

History: Founded in 1817 as a Latin-speaking State University, the Ghent University went on to became the first Dutch-speaking university in Belgium in 1930.

Scale & Structure: In 2016 the University had approximately 38,700 students, 9,500 staff members and an income of € 638.2 million.

The University is organised into 11 faculties: arts and philosophy; law and criminology; sciences; medicine and health sciences; engineering and architecture; economics and business administration; veterinary medicine; psychology and educational sciences; bioscience engineering; pharmaceutical sciences and political and social sciences. In addition, the University has five Doctoral Schools just for doctoral researchers.

Rankings: The ARWU rankings for 2017 place the Ghent University in 69th position globally. The university is often placed in the top 100 institutions worldwide by several ranking sources.

Research and Innovation: Over the course of its 200 year history Ghent University has built up a strong scientific reputation. It invests both in fundamental, high risk science and in applied research. The university is known for its scientific expertise in life sciences and medicine, materials and agricultural science, veterinary medicine, psychology and history, and many more.

12.4 Hasselt University

History: The predecessor of Hasselt University (the Limburg University Centre) was founded in 1973 and offered six programmes of study. Working jointly with the University of Maastricht, it formed the Transnational University of Limburg in 2002. It was renamed as Hasselt University in 2005.

Scale and Structure: In 2016 the University had approximately 5,900 students, 1,400 staff members and an income of € 89.1 million.

Teaching and research is organised into six faculties: business economics; medicine and life sciences; law; sciences; architecture and art and engineering technology. The School of Transportation Sciences was added in 2014.

Rankings: The University is placed in 73rd position globally by the Times Higher Education's rankings of Young Universities (aged 50 or under) for 2017.

Research and Innovation: The University has chosen six research priorities: life sciences; environmental technology; biostatistics; visual computing and human computer interaction; new materials and road safety and mobility.

12.5 KU Leuven

History: KU Leuven is one of the oldest universities in Europe and will celebrate its 600th anniversary in 2025. KU Leuven has fifteen campuses spread across 11 cities in Flanders.

Scale and Structure: In 2016 the University had approximately 49,600 students, 13,100 staff members and an income of € 1.0 billion.

Teaching and research is organised into fifteen faculties which cover almost all fields. All faculties offer education while research activities are organised by departments and research groups. The faculties and departments are clustered into three groups: humanities and social sciences; science, engineering and technology (SET) and biomedical sciences. Each group has a doctoral school for its doctoral training programmes.

Rankings: KU Leuven ranks among the top 100 universities worldwide based on the QS, and ARWU rankings for 2018. The Times Higher Education ranking placed the University in the top 50 worldwide in 2018.

Research and Innovation: Research is focused on nine key areas, all of them highly multidisciplinary. The nine areas are: human health; medical technologies; bio-sciences and environment; matter, materials and energy; nature unlimited; manufacturing and ICT; arts, religion and culture; economy, law and society and human behaviour.

13 APPENDIX B: ABBREVIATIONS AND TERMS

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

Assumptions are the data upon which the economic contribution calculations are based.

FTE (or fte) – Full Time Equivalent is a unit that measures 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.

Gross Value Added (GVA) is a measure of the value that an organisation, company or industry adds to the economy through its operations. In the case of the Flemish Universities this is estimated by subtracting the non-staff operational expenditure (mainly represented by expenditure on goods and services) from their total income.

This report uses the production approach to measuring the GVA contribution, where the GVA is equal to the value of the service produced less the value of the inputs used. Typically this is estimated by subtracting the non-labour (goods and services) costs of the organisation from the organisation's total income.

Multipliers – every expenditure and employment has a multiplier effect throughout the economy. Multipliers are a numeric way of describing the secondary impacts that stem from a business, industry, service or organisation. For example, an employment multiplier of 1.8 suggests that for every 10 employees in Organisation A, 8 additional jobs would be created in other supplier industries such that 18 total jobs are supported by Organisation A.

Direct effect – this relates to the income and employees directly engaged by the Flemish Universities.

Indirect effect – this arises from the business-to-business transactions required to satisfy the direct effect. It is a second round impact that would not occur were it not for the Flemish Universities and it relates to the businesses engaged in their supply chain for goods and services.

Induced effect – as a result of the direct and indirect effects the level of household income throughout the economy will increase as a result of increased employment. A proportion of this increased income will be re-spent on final goods and services, which is the induced effect

Multipliers differ between sectors and countries. Each country calculates their individual multipliers in the form of Input-Output tables which form part of the national accounts. The Input-Output tables are quantitative techniques that represent the interdependencies between different branches of a national economy. The multipliers used in this report have been calculated from the OECD Input-Output Tables Belgium for 2011.

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

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

Turnover/employee is a ratio of the amount of turnover required to support one full-time equivalent job for one year. It varies by sector depending on the relative labour intensities of different industries e.g. agriculture is a relatively labour intensive process compared to oil refining therefore the amount of turnover required to support an oil refining job is much higher than that required to support an agricultural job. The ratios used in this report are calculated from the OECD Input-Output Tables for Belgium for 2011.

Turnover/GVA is a ratio of the amount of turnover required to produce a certain amount of GVA in each sector. This relationship varies between sectors and countries.

14 APPENDIX C: METHODOLOGICAL APPENDIX

This Methodological Appendix describes in more detail, the approach and assumptions that are used in the calculation of some of the key economic contributions of the Flemish Universities. The calculations that are described in more detail in this Appendix are those for which the approach is too complicated to be included in the main body of the report. Those contributions that have been described fully in the main report have been omitted from this Appendix.

14.1 Core Contributions

14.1.1 Direct Effect

The direct contribution is estimated by subtracting all of the non-staff operating expenditure from the total operational income of the Flemish Universities.

In 2016 the Flemish Universities had a total income of € 2.2 billion.

14.1.2 Expenditure on Supplies

The Flemish Universities have an impact on the economy through the goods and services that they purchase from their suppliers.

In 2016 the non-staff operating expenditure of the Flemish Universities amounted to € 565.6 million. Non-staff operating expenditure excludes staff costs, interest payments, depreciation, expenditure on capital projects and any payments to students, such as scholarships or bursaries.

In order to estimate the economic contribution of this it is necessary to categorise the supplier spend data provided by Flemish Universities into the industries used for economic ratios and multipliers. This is so that sector appropriate economic ratios and multipliers can be applied in order to estimate the GVA and employment contribution from this spend.

Previous work undertaken by BiGGAR Economics on behalf of LERU found that the largest category of supplier spend was in the professional, scientific and technical activities sector. A complete breakdown of supplier expenditure by category is provided in the table below.

Table 14-1 – Supplier Expenditure by Summary Category

Industrial Category	Proportion
Administrative and support service activities	16%
Professional, scientific and technical activities	27%
Real estate activities[28]	5%
Information and communication	3%
Accommodation and food service activities	5%
Transportation and storage	4%
Wholesale and retail trade	16%
Construction	1%
Electricity, gas, steam and air conditioning supply	4%
Other	19%
Total	100%

Source: BiGGAR Economics analysis of LERU Members

The spend in each sector supports different GVA depending on the turnover to GVA ratio for that sector. The direct GVA contribution was estimated by dividing the expenditure in each sector by the appropriate turnover to GVA ratio. Direct employment was estimated by dividing spend in each sector by the appropriate turnover/employment ratio. Indirect effects were estimated by applying sector appropriate Type 2 multipliers.

In order to calculate the economic contribution by study area it is necessary to know where the suppliers of the Flemish Universities are located. Data provided by the Flemish Universities indicates that 80% of suppliers are located in Flanders. As a general rule, where one university was not able to provide data the average of the data provided by the remaining universities was applied.

The economic contribution associated with this expenditure was estimated in line with the methodology described in Table 14.2.

[28] Applies to estate management and maintenance. Investment in new buildings has been calculated separately in the Capital Contribution section.

Table 14.2 – Economic Contribution of Expenditure on Supplies

Formulas
$$GVA = \sum_{a} (Exp_{(a)} / \frac{T_{i(a)}}{G_{i(a)}} * M(G)_i^2)$$
$$Employment = \sum_{a} (Exp_{(a)} / \frac{T_{i(a)}}{E_{i(a)}} * M(E)_i^2)$$
Inputs
$$Exp_{(a)} = Expenditure\ \ on\ commodity\ (a)$$
$$\frac{T_{i(a)}}{G_{i(a)}} = \frac{Turnover}{GVA}\ ratio\ in\ industry\ associated\ with\ commodity\ (a)$$
$$\frac{T_{i(a)}}{E_{i(a)}} = \frac{Turnover}{Employment}\ ratio\ in\ industry\ associated\ with\ commodity\ (a)$$
$$M(E)_i^2 = Type\ 2\ Employment\ Multiplier\ in\ industry(i)$$
$$M(G)_i^2 = Type\ 2\ GVA\ Multiplier\ in\ industry(i)$$

14.1.3 Staff Spending

The staff employed by the Flemish Universities have an impact on the economy by spending their salaries. In 2016, personnel expenses at the Flemish Universities amounted to € 1.4 billion.

The level of salary paid in each study area was assumed to be proportional to the number of staff that live in each area. Data provided by the Flemish Universities indicates that 91% of staff live in Flanders. This was applied to the staff salaries paid by the Flemish Universities in order to estimate how much of the staff spending occurs in each study area.

The second step is an assumption of how much of a person's wage is spent in each study area. This is an assumption about the location of people's expenditure and not an assumption about where the products that are purchased are originally from, as this is already accounted for in the economic multipliers. Analysis of household expenditure data from the Brussels Institute for Statistics and Analysis indicated that 94% of spending takes place in the national economy, of which 70% is within Flanders[29]. This allows for an estimate of total staff expenditure in each of the study areas.

The total spending does not account for savings made from salaries paid in 2016. Deducting savings would underestimate the impact associated with staff wages,

[29] Brussels Institute for Statistics and Analysis (2015), Revenus et depenses des menages - Enquete sur le budget des menages

since some earnings from past savings will have been spent in 2016. On this basis, this simplifying assumption is reasonable.

The economic ratios used in the analysis are taken from the OECD Input-Output Tables. As the OECD does not include Value Added Tax (VAT) in its turnover figures[30], it was necessary to deduct VAT from the total staff salaries paid. A study undertaken by the European Commission[31] indicates that 10% of general household expenditure in Belgium is spent on VAT, and this proportion of spend was therefore excluded.

Employees spend their wages on a wide variety of goods and services. Brussels Institute for Statistics and Analysis data on the expenditure pattern of Belgian households also provides a breakdown of household spending by category. This is summarised in Table 14-3.

Table 14-3 – Household Spending by Category in Flanders (including Brussels)

Household Spending Category	Proportion
Food and non-alcoholic beverages	13%
Alcoholic beverages, tobacco and narcotics	4%
Clothing and footwear	5%
Housing, water, electricity, gas and other fuels	24%
Furnishings, household equipment and routine maintenance of the house	6%
Health	6%
Transport	11%
Communication	2%
Recreation and culture	9%
Education	<1%
Restaurants and hotels	8%
Miscellaneous goods and services	12%
Total	100%

Source: Brussels Institute for Statistics and Analysis (2015), Revenus et depenses des menages - Enquete sur le budget des menages

Each category listed in Table 14-3 was assigned a matching economic sector. Based on this and the proportion of spend in each category it was then possible to calculate an overall weighted turnover/GVA and turnover/employee ratio as well as Type 2 employment and GVA multipliers.

[30] OECD (1999), The OECD Input Output Database
[31] European Commission (2013) A study on the economic effects of the current VAT rates structure

Table 14.4 – Calculating Staff Spending Contribution

Formulas
$$GVA = SE_{Study\ Area} / \frac{T_s}{G_s} * M(G)_s^2$$
$$Employment = SE_{Study\ Area} / \frac{T_s}{E_s} * M(E)_s^2$$
Inputs
$$\frac{T_s}{G_s} = \frac{Turnover}{GVA}\ ratio\ for\ staff\ spending$$
$$\frac{T_s}{E_s} = \frac{Turnover}{Employment}\ ratio\ for\ staff\ spending$$
$$M(E)_s^2 = Type\ 2\ Employment\ Multiplier\ for\ staff\ spending$$
$$M(G)_s^2 = Type\ 2\ GVA\ Multiplier\ for\ staff\ spending$$
$$SE_{Study\ Area} = Value\ of\ staff\ expenditure\ (less\ VAT)\ spent\ in\ each\ study\ area$$

14.1.4 Capital Contribution

Over the last five years, the Flemish Universities spent an average capital spend of € 230.5 million per year. Data provided by some of the Flemish Universities indicated that on average 72% of this was spent on estates development and maintenance and 28% was spent on equipment.

92% of the capital suppliers of the Flemish Universities were located in Flanders. The first step in estimating this contribution is to attribute the estates and research infrastructure spending of the Flemish Universities by study area.

This expenditure can be converted into GVA by applying economic ratios and multipliers. For the estates spending contribution, economic ratios and multipliers for the construction sector were used. For the research infrastructure contribution economic ratios and multipliers for the machinery and equipment sector were used.

Table 14.5 – Calculating Capital Spending Contribution

Formulas
$$GVA = \sum_{a} \left(\langle Estates\ expenditure \rangle / \frac{T_C}{G_C} * M(G)_C^2 \right) + \left(\langle Research\ expenditure \rangle / \frac{T_M}{G_M} * M(G)_M^2 \right.$$
$$Employment = \sum_{a} \left(\langle Estates\ expenditure \rangle / \frac{T_C}{E_C} * M(E)_C^2 \right) + \left(\langle Research\ expenditure \rangle / \frac{T_M}{E_M} * M(E)_M^2 \right.$$
Inputs
$$\frac{T_C}{G_c} = \frac{Turnover}{GVA}\ ratio\ in\ the\ construction\ industry$$
$$\frac{T_C}{E_c} = \frac{Turnover}{Employment}\ ratio\ in\ the\ construction\ industry$$
$$M(E)_C^2 = Type\ 2\ Employment\ Multiplier\ in\ construction\ industry$$
$$M(G)_C^2 = Type\ 2\ GVA\ Multiplier\ in\ construction\ industry$$
$$\langle Estates\ expenditure \rangle = Average\ estates\ expenditure\ over\ 5\ years$$
$$\frac{T_M}{G_M} = \frac{Turnover}{GVA}\ ratio\ in\ the\ manufacturing\ industry$$
$$\langle Research\ expenditure \rangle = Average\ research\ infrastructure\ spend\ over\ 5\ years$$

14.2 Student Contributions

14.2.1 Student Spending

Expenditure levels of students differ according to where they live during term-time. An overall student expenditure profile has been calculated based on an analysis of student spending provided by Ghent University. This was then adjusted for each city according to the relative cost of living in different localities as reflected in data provided by Numbeo for 2017.

As with the staff spending contribution it was necessary to exclude spending on VAT. VAT was therefore deducted from VAT applicable items.

Table 14-6 shows the VAT rates of the key categories of student expenditure.

Table 14-6 – VAT Rates for Student Expenditure

Type of Expenditure	VAT Rate
Accommodation	21%
Food	21%
General	21%
Transportation	6%
Leisure	6%
Educational materials	21%

Source: BiGGAR Economics and http://taxsummaries.pwc.com/ID/Belgium-Corporate-Other-taxes

Spending on accommodation has been excluded for those students who live in university accommodation.

These assumptions are used to estimate the total level of additional expenditure from students in each of the study areas for each of the types of expenditure. This expenditure is then applied to the methodology given in Table 14.7 in order to estimate the overall economic contribution of student expenditure.

Table 14.7 – Economic Contribution of Student Expenditure

Formulas

$$GVA = M(G)_i^2 * \sum_a (Exp_{(a)} * \frac{T_{i(a)}}{G_{i(a)}})$$

$$Employment = M(E)_i^2 * \sum_a (Exp_{(a)} * \frac{E_{i(a)}}{E_{i(a)}})$$

Inputs

$$Exp_{(a)} = \ Expenditure \ \ on \ commodity \ (a)$$

$$M(E)_i^2 = \ Type \ 2 \ Employment \ Multiplier \ in \ industry(i)$$

$$M(G)_i^2 = \ Type \ 2 \ GVA \ Multiplier \ in \ industry(i)$$

$$\frac{T_{i(a)}}{G_{i(a)}} = \frac{Turnover}{GVA} \ ratio \ in \ industry \ assocaited \ with \ commodity \ (a)$$

$$\frac{T_{i(a)}}{E_{i(a)}} = \frac{Turnover}{Employment} \ ratio \ in \ industry \ assocaited \ with \ commodity \ (a)$$

14.2.2 Student Part-Time Work

The economic contribution of students working part-time is estimated by applying the average GVA per employee to the number of equivalent average employees

in each sector where students work. It is assumed that students are employed in the same study area in which they reside.

Student employment is not all additional. Some of the employment that the students could take up by residents at the local area. The proportion of student employment is assumed to be inversely proportional to the level of youth unemployment in the area. That is, the higher the level of youth unemployment the lower the additionality as more people in the area are likely to be in a position to fill these roles.

However, a proportion of student part time workers will always be additional, regardless of the level of youth unemployment. These are students employed in positions in which their status as a student of the Flemish Universities is a positive attribute, for example this could include students who are employed as tutors for local children. Therefore a floor of 10% additionality has been set.

The additionality of youth unemployment will vary between each of the study areas based on the different levels of youth unemployment in these areas. The formula used to calculate part time employment additionality is given in the table below.

Table 14.8 – Calculations of Student Labour Additionality

Formulas
$LSA_{(Study\ Area)} = 10\% + (1 - \frac{1}{50\%} * Min\{YUR_{(StudyArea)}, 50\%\}) * (1 - 10\%)$
Inputs
$LSA_{(Study\ Area)} = Labour\ Supply\ Additionality\ in\ study\ area$
$YUR_{(Study\ Area)} = Youth\ Unemployment\ Rate\ in\ study\ area$

The resulting additionality is shown in Table 14.9.

Table 14.9 – Student Part Time Employment Additionality

Study Area	Youth Unemployment*	Student Work Additionality
Flanders	5.1%	91%

*Source: BiGGAR Economics Analysis, *Statbel (2016), Unemployment rate by regions*

The industries that students work in play a significant role in their economic output. Research published by DIBISS indicates the sectors that students work in and this enables the economic ratios and multipliers to be matched with the appropriate sectors.

The induced impacts associated with student expenditure are already considered as part of the student expenditure calculations and therefore the multiplier impacts are limited to the indirect Type 1 Multipliers, which only consider the implications for the supply chain.

The GVA contribution of these additional jobs was estimated by applying an estimate of the average GVA/employee for sectors in which students typically work. Indirect effects were then captured by applying appropriate multipliers. This methodology is outlined in Table 14.10.

Table 14.10 – Calculations of Student Part-time Work Contribution

Formulas
$$Employment = M(E)_i^1 * (SW * \frac{\langle Hrs_{St} \rangle}{\langle Hrs_i \rangle} * LSA_{(Study\ Area)} * \frac{\langle Months\ studying \rangle}{12})$$ $$GVA = M(G)_i^1 * (Employment * \frac{G_i}{E_i})$$
Inputs
$LSA_{(Study\ Area)} = Labour\ Supply\ Additionality\ in\ study\ area$ $Employment_{(Equivalent)} = Equivalent\ employment\ in\ industries\ of\ student\ work$ $SW = Number\ of\ students\ with\ part\ time\ job$ $M(E)_i^1 = Type\ 1\ Employment\ Multiplier\ in\ industry(i)$ $M(G)_i^1 = Type\ 1\ GVA\ Multiplier\ in\ industry(i)$ $\langle Hrs_{St} \rangle = Average\ weekly\ hours\ worked\ by\ students$ $\langle Hrs_i \rangle = Average\ weekly\ hours\ of\ employment\ in\ industries\ of\ student\ work$ $\langle Months\ studying \rangle = Average\ months\ of\ the\ year\ spent\ at\ University$ $\frac{G_i}{E_i} = \frac{GVA}{Employment}\ ratio\ in\ industries\ of\ student\ work$

14.3 Tourism Contribution

14.3.1 Visits to Staff and Students

The friends and relatives who visit the staff and students of the Flemish Universities bring additional tourism to Belgium that can be attributed to the Flemish Universities.

In order to calculate this contribution, it is necessary to estimate the number of visits from friends and relatives (VFR) that students and staff will receive. Eurostat compile data on the number of VFR trips from domestic or from overseas visitors.

The number of domestic VFR trips per person is multiplied by the number of students and staff at the Flemish Universities to provide an estimate of the visits stimulated by the Flemish Universities. This total number of visits is multiplied by the average spend of domestic and overseas tourists on a visiting friends and families trip.

Eurostat also provides data on tourism expenditure by category. Each of these categories was assigned an appropriate economic sector. In this way it was possible to calculate overall weighted economic ratios and multipliers for tourism spending which were applied to the total expenditure of VFR visitors.

Table 14.11 – Calculations of Visits to Staff and Students Contribution

Formulas
$$Visitor\ Spend = (N_{Students} + N_{Staff}) * T_{(S)} * S_{(S)}$$ $$GVA = Visitor\ Spend * \frac{T_i}{G_i}$$
Inputs
$$N_{Students} = Number\ of\ students$$ $$N_{Staff} = Number\ of\ staff$$ $$T_{(S)} = VFR\ Trips\ per\ person\ in\ Switzerland$$ $$S_{(S)} = VFR\ spend\ per\ trip\ in\ Switzerland$$ $$\frac{T_i}{G_i} = \frac{Turnover}{GVA}\ ratio\ in\ industries\ of\ tourism\ spend$$

14.3.2 Conferences and Events

The Flemish Universities provided data on the number of delegates attending events that they hosted throughout the year. These delegates who are additional to the area would contribute to the tourism economy through their expenditure. Only attendees from overseas have been considered as additional.

The total visitor expenditure associated with conferences and events was estimated by applying the spend per trip to the overall additional visitors. The economic contribution of this increased tourism spend was then calculated by applying the weighted economic ratios and multipliers for tourism expenditure.

Table 14.12 – Calculations of Conference and Event Contribution

Formulas
$$Visitor\ Spend = (A_{All} - A_D - A_E) * S_{(S)}$$ $$GVA = Visitor\ Spend * \frac{T_i}{G_i}$$
Inputs
$$A_{All} = Attendees$$ $$A_D = Domestic\ attendees$$ $$A_E = Attendees\ counted\ elsewhere$$ $$\frac{T_i}{G_i} = \frac{Turnover}{GVA}\ ratio\ in\ industries\ of\ tourism\ spend$$

14.4 Commercialisation

14.4.1 Licensing

The starting point for calculating the impact generated by licensing activity is to consider the royalties or licence fees that the institution receives from licence holders; this reflects the value of the licence to the licence holder. However, as licence holders retain a proportion of the income generated by the licence this income only reflects a proportion of the total value of the technology. In order to estimate the full impact of the technology, it is necessary to estimate how much turnover the licences generate within the license holding company.

The relationship between the royalty paid for a technology and the turnover it generates depends on the details of the licensing agreement and can vary considerably from company to company. In order to agree a licence, negotiators must first form a view of how much the intellectual property (IP) is worth to the prospective licensee. There are a wide variety of variables that may inform this judgement but a training manual issued by the World Intellectual Property Organisation states that a common starting point is the "well known and widely quoted" 25% rule[32].

The 25% rule is a general rule of thumb according to which the licensor should receive around one quarter to one third of the profits accruing to the licensee and has been used by IP negotiators for at least 40 years. The rule is based on an empirical study first undertaken in the 1950s and updated in 2002. The study found that royalty rates were typically around 25% of the licensee's profits, which equates to around 5% of sales from products embodying the patented technology. This implies that royalties paid for a technology typically represent around 5% of the total turnover generated by that technology.

[32] World Intellectual Property Organisation (2005), Exchanging Value - Negotiating Technology Licensing Agreements: A Training Manual.

In 2002 Goldscheider et al[33] undertook further empirical analysis to test the continued validity of the 25% rule. The analysis was based on more than 1,500 licensing agreements from 15 different sectors between the late 1980s and the year 2000. The study found that although royalty rates ranged between 2.8% in the food sector to 8% in the media and entertainment sector, on the whole they differed very little from those used in the 1950s. The sectors considered in the Goldscheider analysis, along with the respective royalty rates are summarised in Table 14.13.

Table 14.13 – Royalty Rates by Sector

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

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

The economic contribution of licencing activity undertaken by the Flemish Universities was estimated by applying these royalty rates to the total amount of licensing income received by Flemish Universities.

The employment supported by this turnover can be estimated by dividing the additional turnover generated by an estimate of turnover per employment for the relevant sector. The GVA of the licensing activity can be estimated by multiplying the additional turnover by an estimate of the turnover/GVA ratio for the relevant sector.

[33] Goldscheider, Jarosz and Mulhern (2002), Use of the 25% rule in valuing IP, les Nouvelles.

Table 14.14 – Calculations for Licensing Contribution

Formulas
$$Rev(L_i) = \frac{Income\ (L_i)}{Rate_i}$$
$$GVA(L) = \sum_i M(G)_i^2 * \frac{Rev\ (L_i)}{(T_i/G_i)}$$
$$Employment(L) = \sum_i M(E)_i^2 * \frac{Rev\ (L_i)}{(T_i/E_i)}$$
Inputs
$$GVA(L) = Total\ GVA\ associated\ with\ licences$$
$$Rev(L_i) = Revenue\ generated\ from\ licences\ in\ industry\ (i)$$
$$\left(T_i/G_i\right) = \frac{Turnover}{GVA} ratio\ in\ industry\ (i)$$
$$\left(T_i/E_i\right) = The \frac{Turnover}{Employment} ratio\ in\ industry\ (i)$$
$$M(E)_i^2 = Type\ 2\ Employment\ Multiplier\ in\ industry(i)$$
$$M(G)_i^2 = Type\ 2\ GVA\ Multiplier\ in\ industry(i)$$
$$Rate_i = Royalty\ rate\ for\ industry(i)$$
$$Income(L_i) = Income\ to\ the\ institute\ from\ licences\ in\ industry\ (i)$$

14.5 Graduate Premium

OECD Education at a Glance (2014)[34] provides data on the lifetime earnings from tertiary education. It includes information on the net earnings benefits (i.e. the benefits to the individual from obtaining a degree) and the gross earnings benefits (i.e. the individual benefits as well as taxation benefits).

Analysis of this data indicates that the average Bachelors student would generate additional earnings and taxation benefits of $247,431 PPP over their working life[35] than if they had not gone to University. This is equivalent to €96,906 in Belgium. In terms of net benefits, the average Bachelors student would earn the equivalent of $117,939 PPP over their working life, equivalent to €46,190 in Belgium. These figures are summarised in the table below.

[34] OECD (2014) Education at Glance 2014, What are the Incentives to Invest in Education – Indicator A7
[35] OECD (2016) Education at a Glance 2016, Fig A7.1

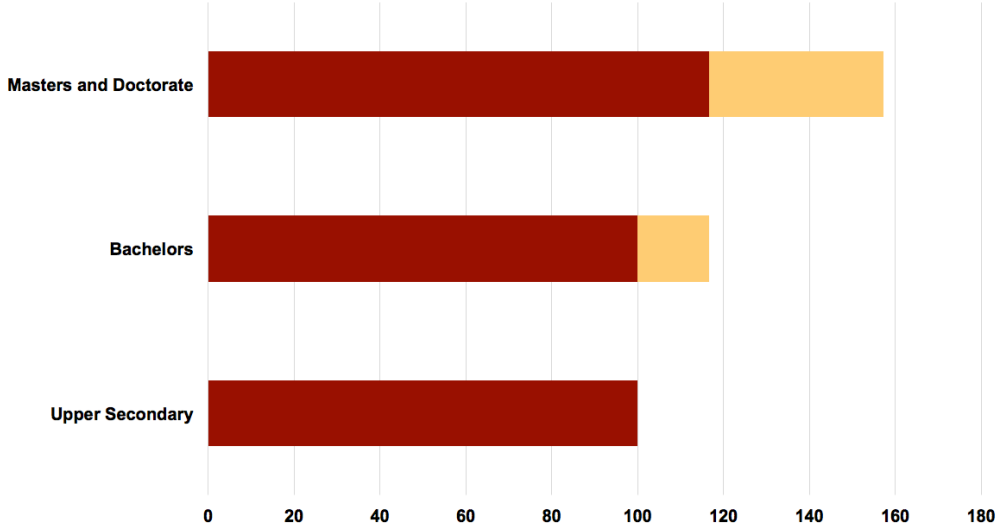
Table 14.15 – Net Vs Gross Earnings Benefits in Belgium

	Net Earnings Benefits	Gross Earnings Benefits
USD PPP	117,939	247,431
Euros	46,190	96,906

Source: OECD (2014) Education at a Glance 2014, What are the Incentives to Invest in Education – Indicator A7 and BiGGAR Economics Analysis

The Education at a Glance figures do not give an equivalent figure for individuals with Masters/Doctoral degrees. However, the OECD Education and Earnings dataset provides details on the relative earnings of those with postgraduate, undergraduate and upper secondary education. This shows that in 2014, full time workers with a Bachelors degree earned 17% more than those with just an upper secondary level of education. Those with Masters/Doctoral degrees earned 57% more than individuals with just an upper secondary degree. This allowed the differential between degree earnings to be estimated. The graduate premium calculated for Bachelors degrees were based on the comparison with individuals with upper secondary education and the graduate premium for Masters/Doctoral students was based on the comparison with individuals with Bachelors education.

Figure 14.1 – Earnings in Belgium by Highest Achieved Education Level

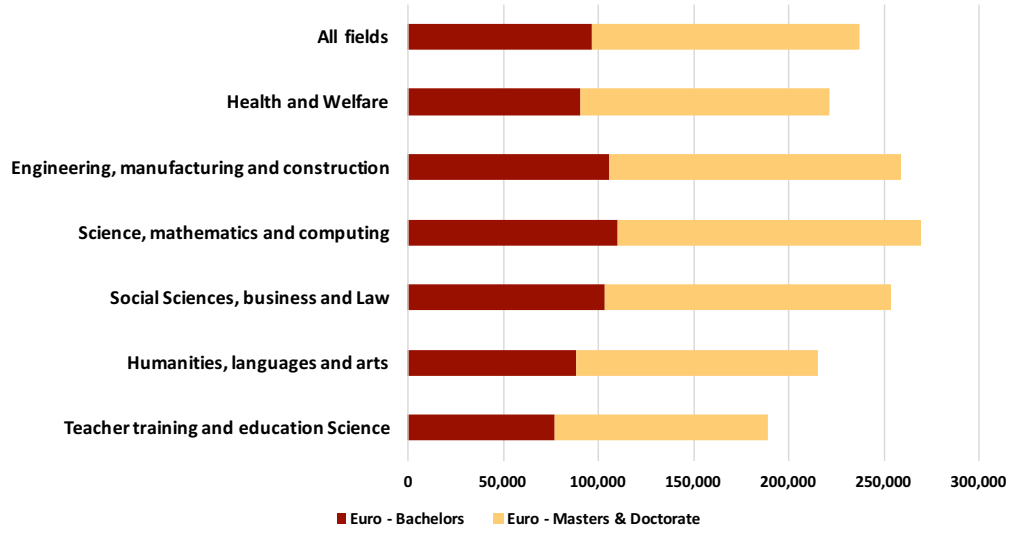


Source: OECD (2017) Education and Earning 2014

These averages disguise subject variation. The subject in which a student graduates in determines the earnings premium that they can expect to achieve over the course of his or her working life. The OECD Education at a Glance study also considers the monthly earnings of graduates by subject of study[36]. This found that graduates in Flanders, in science, mathematics and computing can expect to earn an average of USD 5,000 PPP each month while graduates in teacher training and education science can only expect to earn an average of USD 3,500 PPP each month. The average for all graduates was USD 4,400 PPP. The gross graduate premium by subject is outlined in Figure 14.2.

[36] OECD (2016) Education at a Glance 2016, Table A6.4

Figure 14.2 – Gross Graduate Premium in Belgium by Subject



Source: BiGGAR Economics Analysis

The total economic contribution from the graduate premium is estimated by multiplying the average premium for each subject (**Error! Reference source not found.**) by the number of graduates in each field. This is summarised below.

Table 14.16 – Calculations of Graduate Premium Contribution

Formulas
$$GVA = \sum_{d} (G_d * P_d)$$
Inputs
$$G_d = Number\ of\ graduates\ with\ degree\ (d)$$
$$P_d = Graduate\ premium\ for\ graduate\ with\ degree\ (d)$$

In this way it was estimated that graduates of the Flemish Universities have an estimated graduate premium contribution of € 3.4 billion in Flanders, € 3.7 billion in Belgium and € 3.8 billion in Europe. This is based on the gross earnings benefits and therefore includes taxation benefits.

The net benefit of graduates of the Flemish Universities was estimated to be € 1.6 billion in Flanders, € 1.8 billion in Belgium and € 1.8 billion in Europe.

14.6 Valorisation

14.6.1 Placements

A number of courses require students to undertake placements. These internships have an impact on the economy through the students' contribution to the companies that they are placed with. Only internships that are longer than 12 weeks are included as internships shorter than this would not allow students enough time to learn enough about the organisation's activity and make a contribution. It was assumed that on average placements lasted 12 weeks.

The employment contribution of internships can be estimated by calculating the FTE equivalent of the weeks spent undertaking internships. The GVA contribution of this can be estimated by multiplying the fte equivalent by the GVA/employee ratio in the sector in which internships are undertaken.

The contribution of these students to the organisations that they are placed in is lower than the average output that would be expected by a worker due to a student having less experience. To reflect this it is assumed that the GVA of students undertaking an internship is 50% of the average workers' GVA.

The multiplier effects were then estimated by applying Type 1 employment and GVA multipliers.

Table 14.17 – Calculations of Student Placements Contribution

Formulas
$$GVA = \sum_i \frac{G_i}{E_i} * \frac{\sum(Weeks)_i}{52}$$
Inputs
$$\frac{G_i}{E_i} = \frac{GVA}{\text{Employment}} \; ratio\ in\ industries\ of\ student\ placement$$ $$(Weeks)_i = Number\ of\ weeks\ student\ spends\ on\ placement\ in\ industry\ (i)$$

14.6.2 Services to Businesses

In 2016 the Flemish Universities generated €180.8 million income by providing services to businesses and other organisations. This provides the basis for the calculations outlined below.

Table 14.18 – Calculations and Inputs for Services to Businesses Contribution

Formulas
$$GVA(SB) = M(G)_i^2 * \sum_i 340\% * Income(SB_i)$$
$$Employment(SB) = M(E)_i^2 * \sum_i \frac{GVA(C_{SB})}{(G_i/E_i)}$$
Inputs
$$GVA(SB) = Total\ GVA\ associated\ with\ Services\ to\ Businesses$$
$$GVA(SB_i) = GVA\ associated\ with\ SB\ in\ industry\ (i)$$
$$M(E)_i^2 = Type\ 2\ Employment\ Multiplier\ in\ industry(i)$$
$$M(G)_i^2 = Type\ 2\ GVA\ Multiplier\ in\ industry(i)$$
$$Employment(SB) = Total\ Employment\ associated\ with\ SB$$
$$\left(G_i/E_i\right) = The\ \frac{GVA}{Employment}\ ratio\ in\ industry\ (i)$$
$$Income(C_i) = Income\ from\ Services\ to\ Businesses\ in\ industry\ (i)$$

14.6.3 Science Parks

The main assumption to be made was how much of the economic activity that was created at these science parks could be attributable to the Flemish Universities. Many of the companies would have found properties elsewhere in the country if the science parks were not available. Larger companies that did chose to move into the country as a result of the science park would have been likely to find somewhere else in the world to operate if that particular science park was not available.

Previous studies by BiGGAR Economics, particularly one carried out for the University of Surrey in 2013, found that approximately 1/3 of the economic activity in its science park was attributable to the University. As the additionality for the EU would be less than that for an individual country, this was assumed to be 20%. These additionality assumptions were applied to each science park.

Table 14.19 – Science Park Additionality

Study Area	Additionality
Flanders	40%
Belgium	33%
EU	20%

Source: BiGGAR Economics

The direct economic contribution of each science park was calculated based on total employment data provided by the Flemish Universities.

It was also important to take account of double counting. All employees in spin-off companies of the Flemish Universities located on the science parks were excluded. The turnover of tenants in the science park can be estimated by applying sector appropriate turnover/employment ratios.

Table 14.20 – Calculations and Inputs for Science Park Contribution

Formulas
$$GVA(SP) = SPA_{(Study\ area)} * Turnover\ (SP) / \left({}^{T_{(i)}}/_{G_{(i)}}\right) * M(G)_i^2$$
$$Employment\ (SP) = SPA_{(Study\ area)} * Direct\ Employment\ (SP) * M(E)_i^2$$
Inputs
$$Turnover\ (SP) = Annual\ Turnover\ of\ Science\ Park$$
$$Direct\ Employment\ (SP) = Employment\ in\ SP\ excl\ ETH\ employees\ \&\ spin-off\ companies$$
$$\left({}^{T_{(i)}}/_{G_{(i)}}\right) = The\ \frac{Turnover}{GVA}\ ratio\ of\ the\ industry\ (i)$$
$$M(E)_i^2 = Type\ 2\ Employment\ Multiplier\ in\ industry(i)$$
$$M(G)_i^2 = Type\ 2\ GVA\ Multiplier\ in\ industry(i)$$
$$SPA_{(Study\ area)} = Science\ Park\ additionality\ in\ the\ study\ area$$
$$GVA(SP) = Total\ GVA\ of\ Science\ Park$$
$$Employment\ (SP) = Total\ Employment\ of\ Science\ Park$$

14.7 Economic Ratios and Multipliers

14.7.1 Economic Ratios

The main economic ratios are derived from the total turnover, employment and GVA for sectors across the economy. These ratios are derived from the OECD (2011), Input-Output Tables for Belgium and are summarised below.

Table 14.21 – Economic Ratios

Industry	Turnover/GVA	Turnover/Employee	GVA/Employee
Agriculture, hunting, forestry and fishing	3.3	116,649	35,083
Basic metals	6.5	760,086	116,490
Chemicals and chemical products	3.6	592,151	162,784
Coke, refined petroleum products and nuclear fuel	29.0	6,711,318	231,828
Computer and related activities	2.0	213,226	106,261
Computer, Electronic and optical equipment	2.8	238,345	85,120
Construction	3.6	242,285	68,269
Education	1.1	74,869	65,679
Electrical machinery and apparatus, nec	2.6	211,009	82,711
Electricity, gas and water supply	2.0	610,937	302,906
Fabricated metal products	3.5	212,268	60,553
Financial intermediation	2.0	338,175	169,268
Food products, beverages and tobacco	5.5	407,751	74,184
Health and social work	1.7	80,610	48,197
Hotels and restaurants	2.7	100,198	37,793
Machinery and equipment, nec	2.7	234,041	85,593
Manufacturing nec; recycling	4.4	309,473	69,775
Mining and quarrying	3.3	405,106	122,130
Motor vehicles, trailers and semi-trailers	7.3	505,495	69,210
Other community, social and personal services	2.4	97,801	40,142
Other non-metallic mineral products	3.4	285,905	83,693
Other transport equipment	3.2	217,247	68,601
Post and telecommunications	1.9	213,351	112,733
Public administration and defence; compulsory social security	1.4	80,178	58,827

Pulp, paper, paper products, printing and publishing	3.2	275,917	85,110
R&D and other business activities	2.1	113,940	53,317
Real estate activities	1.4	1,623,352	1,155,290
Renting of machinery and equipment	2.2	621,951	287,013
Rubber and plastics products	3.1	300,441	96,801
Textiles, textile products, leather and footwear	4.0	203,327	50,289
Transport and storage	3.1	266,639	86,750
Wholesale and retail trade; repairs	2.1	147,116	70,606
Wood and products of wood and cork	4.0	252,559	62,636

Source: BiGGAR Economics based on OECD Input-Output Tables Belgium

14.7.2 Economic Multipliers

The economic contribution associated with the indirect and induced impacts are captured in the economic multipliers.

There are two types of multiplier. Type 1 (M_1) multipliers only consider the economic impact in the supply chain, whereas Type 2 (M_2) multipliers also include the spending of the staff involved in the process. The multipliers are expressed as the final figure for both GVA and Employment. For example, if there is a T_2 GVA Multiplier of 1.75, then € 1.00 of direct GVA (D_{GVA}) would result in € 1.75 of total GVA (T_{GVA}) impact. Therefore in order to extract the pure multiplier effect it is necessary to subtract 1 from the initial figure given as the multiplier.

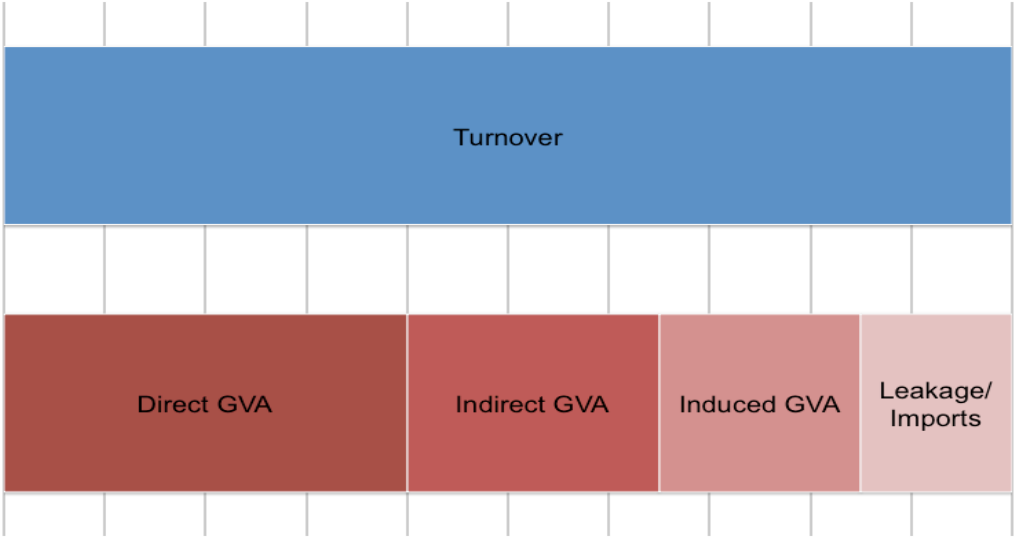
$$T_{GVA} = D_{GVA} + (M_1 - 1) * D_{GVA} + (M_2 - M_1) * D_{GVA}$$

Direct Indirect Induced

The multipliers are important because the final value of a product includes the values added at each stage of the supply chain as well as the direct value added. The multipliers therefore enable the total economic activity supported to be estimated.

The relationship between the initial turnover and the final GVA varies between sectors and countries. In a totally closed economy (no imports/exports) the sum of the Direct and indirect GVA would equal the value of the final turnover. In this closed economy, the induced GVA would mean additional impact, spurred on by the original expenditure. However, most countries are not closed and therefore the Direct and Indirect GVA will equal less than the turnover. The induced GVA may make up for some of this gap, however there is still likely to be leakage, especially in industries with a high GVA/Turnover ratio.

Figure 14.3 Relationship between Turnover, GVA and Multipliers



The economic multipliers were calculated using the Input Output Tables for Belgium, which are provided by the OECD. The multipliers that were calculated using input output tables were Leontief Type 1 GVA and Employment Multipliers and Leontief Type 2 GVA and Employment Multipliers. Type 2 multipliers consider the impact of supply chain and staff expenditure and Type 1 multipliers just consider supply chain expenditure.

The methodology followed for the calculation of the Type 1 & Type 2 Multipliers is described below. More detail on the methodology is given in the Scottish Government's Input-Output Methodology Guide[37].

In order to calculate the GVA and employment multipliers, the values in the Input-Output tables were converted to their equivalent direct GVA and employment statistics for each industry using the ratios described in Section 7.1.

For those industries that are based on a combination of sectors, namely LERU Supply Chain and Industries working with Academia, the multipliers were not calculated directly from the Input Output tables but were based on weighted averages of the sectors involved. These industries are marked with a (*) in the table below.

The direct requirements matrix considers how much input from each sector is required to produce one unit of output from the first sector. The level of input that is required by industry is taken from the consolidated Input-Output tables.

For example, if the Accommodation and food service activities sector had a total output of € 1,000 and this required € 50 of goods and services bought from the Construction (C) sector, the direct requirements entry for the Construction sector in Accommodation and food Services would be 0.05.

$$A_{FB} = \frac{Input\ of\ (A) consumed\ by\ industry\ (F)}{Total\ output\ of\ industry\ (F)}$$

[37] The Scottish Government, *Input-Output Methodology Guide,* September 2011 (available http://www.gov.scot/Resource/Doc/919/0116738.pdf)

$$A_{FB} = \frac{50}{1{,}000}$$

$$A_{FB} = 0.05$$

Completing this operation for each entry in the Input Output matrix gives the resulting square A Matrix.

$$A = \begin{bmatrix} A_{AA} & \cdots & A_{MA} \\ \vdots & \ddots & \vdots \\ A_{AM} & \cdots & A_{MM} \end{bmatrix}$$

In order to calculate the GVA and employment multipliers, the values in the Input-Output tables were converted to their equivalent direct GVA and employment statistics for each industry using the ratios described earlier.

The identity matrix is the equivalent of '1' in matrix algebra. Therefore when any matrix (M) multiplied by the identity matrix (I) the result is the original matrix (M), in the same way that if any number is multiplied by '1', the result is the original number.

The identity matrix is simply one that has all entries as 0, apart from those on the diagonal, which have a value of 1.

$$I = \begin{bmatrix} 1 & \cdots & 0 \\ \vdots & 1 & \vdots \\ 0 & \cdots & 1 \end{bmatrix}$$

Also as with numbers, the inverse of any number (x) is the one that gives the result below. For example, the inverse of 2 is 0.5.

$$x * x^{-1} = 1$$

Therefore the inverse of any matrix (M) is the one, which gives the result below.

$$M * M^{-1} = I$$

The Leontief Matrix is the Inverse of the Identity matrix minus the A Matrix.

$$L = (I - A)^{-1}$$

In the formula above *L* is the Leontief Inverse Matrix, *I* is the Identify Matrix and *A* is the direct requirements matrix.

The overall multiplier for any industry is the sum of its headed column in the Leontief Matrix.

$$L(A) = \sum_{i=A}^{M} L_{Ai}$$

The resulting multipliers are given in the table below.

Table 14-22 – Economic Multipliers for Belgium

	Type 1		Type 2	
Multiplier Industry	GVA	Employment	GVA	Employment
Agriculture, hunting, forestry and fishing	2.09	1.51	2.41	1.64
Basic metals	3.24	4.66	4.19	5.85
Chemicals and chemical products	2.24	3.36	2.79	4.32
Coke, refined petroleum products and nuclear fuel	6.00	14.90	7.43	18.47
Computer and related activities	1.63	1.81	2.08	2.32
Computer, Electronic and optical equipment	1.85	1.94	2.43	2.47
Construction	2.46	2.31	3.02	2.73
Education	1.09	1.08	1.52	1.38
Electrical machinery and apparatus, nec	1.71	1.76	2.23	2.22
Electricity, gas and water supply	1.55	3.16	1.83	4.06
Fabricated metal products	2.13	1.90	2.74	2.30
Financial intermediation	1.67	2.20	2.05	2.89
Food products, beverages and tobacco	3.28	3.38	4.05	3.99
Health and social work	1.38	1.26	1.80	1.47
Hotels and restaurants	1.90	1.42	2.34	1.60
Industries working in Academia*	2.34	2.31	2.97	2.84
LERU Supply Chain*	1.9	2.1	2.4	2.5
Machinery and equipment, nec	1.79	1.87	2.28	2.33
Manufacturing nec; recycling	2.58	2.43	3.29	2.96
Mining and quarrying	2.05	2.57	2.50	3.16
Motor vehicles, trailers and semi-trailers	3.23	3.01	4.21	3.74
Other community, social and personal services	1.83	1.52	2.30	1.72
Other non-metallic mineral products	2.12	2.18	2.68	2.68
Other transport equipment	1.84	1.76	2.43	2.20
Post and telecommunications	1.55	1.70	1.88	2.10

Public administration and defence; compulsory social security	1.20	1.14	1.64	1.42
Pulp, paper, paper products, printing and publishing	2.22	2.32	2.79	2.84
R&D and other business activities	1.68	1.50	2.04	1.71
Real estate activities	1.26	3.92	1.32	4.69
Renting of machinery and equipment	1.68	3.29	1.90	3.97
Rubber and plastics products	2.03	2.19	2.60	2.78
Textiles, textile products, leather and footwear	2.60	2.03	3.32	2.42
Transport and storage	2.10	2.19	2.61	2.67
Wholesale and retail trade; repairs	1.65	1.56	2.04	1.86
Wood and products of wood and cork	2.50	2.32	3.11	2.73

Source: BiGGAR Economics based on OECD (2011), Input-Output Tables Belgium

There is likely to be a high degree of variance between the size of multiplier considering how much leakage that there is within any particular geography. In order to address this, our current method is to adjust each multiplier (for each industry and both Type 1 and Type 2) by the same proportion. These proportions are given below.

Table 14.23 – Geographic Multipliers as % of Belgium

Area	Multiplier
Flanders	75%
Belgium	100%
EU	120%

Source: BiGGAR Economics

BiGGAR Economics

Pentlands Science Park,
Bush Loan, Penicuik,
Midlothian, Scotland
EH26 0PZ
Tel. +44 (0)131 514 0850
info@biggareconomics.co.uk
www.biggareconomics.co.uk